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ИНСТИТУТ

ЗАДАНИЯ И КОНТРОЛЬНЫЕ РАБОТЫ ДЛЯ СТУДЕНТОВ, ИЗУЧАЮЩИХ АНГЛИЙСКИЙ ЯЗЫК

Специальности: метеорология, экономика
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Курсы II, III

Подлежит возврату
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Задания и контрольные работы для студентов, изучающих английский язык. СПб.: изд. РГГМИ, 1997. 63 с.

В заданиях приведены тексты и упражнения для осмысления грамматического и лексического материала, а также контрольные работы.

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ПРЕДИСЛОВИЕ

Практическое владение английским языком при заочной форме обучения означает умение самостоятельно читать со словарем литературу на английском языке по специальности, извлекать полезную для работы информацию, а также уметь переводить читаемое на русский язык.

Предлагаемые задания имеют целью выработку у студентов навыков чтения и перевода научно-технической литературы на английском языке, а также развитие умений понимать содержание прочитанного.

Здесь не дается системного повторения курса грамматики, усвоенного на I и II курсах, а предполагается лишь повторение и закрепление этого курса. С этой целью в заданиях к каждому тексту указано, на какие грамматические явления необходимо обратить внимание перед тем, как приступить к работе над текстом.

Тексты № 1, 2, 3, 4, 5, 6, 7 (II к.), № 1, 2, 3, 4, 5, (III к.) и упражнения к ним предназначены для самостоятельной (домашней) работы, тексты № 12, 13, 14, 15, 16 (II к.), № 10, 11, 12, 13 (III к.) с упражнениями — для работы в аудитории в период сессии или межсессионных занятий под руководством преподавателя. Дополнительные тексты 17—23 (II к.), 14—19 (II к.) могут быть использованы как в аудитории, так и дома для просмотрового чтения, цель которого попять общее содержание прочитанного и уметь передать его на русском языке. Перед выполнением контрольной работы № 1 необходимо проработать тексты № 1, 2, 3 (II к.) № 1, 2 (III к.) и указанные к ним разделы грамматики, перед выполнением контрольной работы № 2 — тексты № 4, 5, 6, 7 (II к.), № 3, 4, 5 (III к.) с соответствующей грамматикой. Вариант 2 контрольных работ выполняется только по требованию преподавателя.

Прежде чем приступить к чтению текста, рекомендуем Вам повторить (а если необходимо, то и выучить) указанный грамматический материал. При работе над текстом сле-

дует вести словарь, в который записываются все незнакомые слова (с транскрипцией) в исходной форме, т. е. существительные в единственном числе, глаголы в форме инфинитива и т. д.

Затем выполняются лексико-грамматические задания в той последовательности, в какой они даны, т. к. они расположены в порядке постепенного нарастания трудностей. Выполнение всех заданий обеспечит закрепление и прочное усвоение как лексического, так и грамматического материала.

При оформлении контрольных работ Вы должны соблюдать правило: английский текст пишите слева, справа от него перевод, оставляя широкие поля для рецензента.

Для получения зачета перед экзаменом Вы должны представить рецензии на выполненные работы, а также сдать тексты № 1—7, 14—16, (II к.); № 1—5, № 10—13 (III к.).

II КУРС

Текст 1. *COMPOSITION OF THE ATMOSPHERE*

Задание 1. Прочтите и устно переведите текст, предварительно повторив степени сравнения прилагательных и наречий. Обратите внимание на значение any, no, since.

Dry air is composed of about 78% nitrogen (N_2), 21% oxygen (O_2), and 1% argon (A), by volume. The average molecular weight of these gases is 29.0. In addition, dry air contains such trace elements as CO_2, O_3, and many other gases and particles in varying amounts. Of these, CO_2 has the greatest concentration, about 330 parts per million (ppm), and increasing. By the year 2000, it is expected to reach 380—400 ppm. Most of the other gases are classified as pollutants and occur in varying amounts.

In addition, the atmosphere contains water in gaseous, liquid and solid form. Water vapor is most plentiful, varying from about 4% by mass in hot, humid air to more than a hundred times less in very cold air. Small water particles (much less than 10^{-3} m in diameter) exist as clouds aloft or as fog on the ground; larger solid and liquid particles fall out in various forms of precipitation.

The major gases in dry air are radiatively quite inactive. However, oxygen does have considerable absorption in the red and some in the orange. Even so, the total fraction of sunlight absorbed is relatively small, and constant. However, at high altitudes, O_2 absorbs short ultraviolet waves strongly, thus preventing them from reaching lower levels and, at the same time, causing heating of the atmosphere above 100 km height. Nitrogen is even less optically active, but also contributes to absorption in the very high atmosphere. Argon is quite inert.

Of the other gases, the most important for heating and cooling of the atmosphere are water vapor, carbon dioxide, and ozone, in that order. There is very little ozone near the ground, the concentration reaching 1 part in 10 million only in polluted areas. But above 10 kilometers, its concentration rises to a maximum (per unit volume) at about 25 km and

then decreases again. Even in the high atmosphere, the mixing ratio of ozone just surpasses 10 ppm; and the total ozone, if it were brought to sea-level at a temperature of 0° C would form a layer only 4×10^{-3} m thick.

But, in spite of its small concentration, ozone is important to the earth's climate and to human welfare. This is true primarily because it absorbs radiation strongly between 200 and 320 nanometers wavelength. Below 290 nm, the absorption is essentially total, so that radiation below this wavelength does not reach the ground, but is used to heat the atmosphere above 10 km, with maximum effect near 50 km. Between 290 nm and 320 nm, the absorption is partial. This means that some radiation in this wavelength region reaches the surface. The exact amount depends on the amount of ozone, which varies primarily with latitude and season. Human skin happens to be particularly sensitive in the same wavelength region, so that the condition of human skin depends on the total ozone in the atmosphere.

Ozone also absorbs (but rather weakly) visible radiation and has an absorption band in the infrared, which is important mainly in rather specialized problems involving the high atmosphere.

Water vapor is concentrated at low levels. It has several strong absorption bands in the infrared. The bands at wavelengths below 4 microns are important because they prevent more than 10% of the sun's radiation from penetrating to the ground. The absorption bands above 4 microns prevent a very large proportion of infrared radiation emitted by the ground from going out into space. Instead these wavelengths are absorbed by the water vapor, and less radiation goes out into space from the colder water vapor aloft. Finally clouds absorb and reflect sunlight. With all the absorption and scattering combined, roughly only 50% of the radiation falling on the top of the atmosphere reaches the ground.

When no clouds are present, most radiation reaches the surface. But only a small portion of the radiation emitted by the ground can penetrate through the atmosphere, due to the combined absorption by clouds, water vapor, carbon dioxide, and ozone; instead, these substances re-emit the radiation back toward the surface. Thus, the air near the ground is kept warmer **thanit** would be without the presence of the absorbing gases. This effect is often called the «greenhouse effect». This term is a misnomer because the air in a greenhouse is kept

warm mostly by the limitation on the convection rather than by the infrared absorption by the gases.

Since CO_2 contributes to the «greenhouse effect», any increase in the concentration of this gas will tend to warm the lower (and cool the upper) atmosphere. The concentration of CO_2 is known to increase due to burning of fossil fuel. The consequent temperature rise is, at present, believed to be the most important effect of human activity on climate change. The average surface warming by the year 2000 is estimated to be 0,5 C with the warming at the poles several times as large. Other gases produced by man's activity also absorb strongly in the infrared and can contribute to the greenhouse effect, e. g., NO_2 and fluorocarbons (also known as Freons, their trade name).

Задание 2. Найдите в тексте предложения, которые являются ответами на следующие вопросы.

1. What gases are the most important for heating and cooling of the atmosphere?
2. At what elevation does the concentration of ozone rise to a maximum?
3. Does ozone absorb radiation?
4. What is the «greenhouse effect»?

Задание 3. Переведите предложения на русский язык, обращая внимание на перевод some any, no.

1. Some of the most important types of circulation are land-sea breezes and mountain-valley winds.
2. How hot the atmosphere becomes over any region depends on a number of factors.
3. No part of the earth is more necessary to life than our atmosphere.
4. Without an atmosphere there will be no clouds, no rains, no running water, and no wind.
5. No standard instruments exist, but two instruments have been developed for measuring some features of hail.

ТЕКСТ 2. *HORIZONTAL WINDS*

Задание 1. Прочтите и устно переведите текст, предварительно повторив правила перевода страдательного залога.

Horizontal winds are two-dimensional vectors, which are usually specified in terms of their direction and magnitude (although Cartesian components are also often used, particularly in theoretical work). Wind direction is the direction from

which the wind comes. At ground stations, it is determined from vanes. If given in degrees, it is counted clockwise from North. For public consumption, it is usually given only in terms of the cardinal directions.

The wind speed near the surface is usually found from mechanical «anemometers», either of the windmill or rotor type. In practical work, knots (nautical miles per hour) are commonly used. For theory and upper-air measurements, m/sec are preferred (1 knot=0,51 m/sec). For recording high-frequency wind fluctuations, sonic and hot-wire or drag anemometers are required.

Winds aloft are found by following balloons, metallized parachutes, or other tracers, usually by radio or by radar. «Stationary» satellites give cloud pictures which are used to infer cloud drift. These can often be interpreted in terms of wind. One difficulty is the establishment of the height to which these winds apply. Infrared temperatures in the «atmospheric window» (near 10 micrometers, where the atmosphere is nearly transparent) give the temperatures of the cloud tops, which are crude indicators of cloud height. The other difficulty is that not all clouds move with the wind. However, some comparisons with measured winds have made possible the identification of those clouds which travel with local winds.

As was the case with temperatures, the representativeness of winds is a more serious problem than their accuracy is. According to convention, all winds near the surface should be measured 7 m off the surface in a wellexposed area. In practice, this condition is not satisfied; further, the actual wind speed at a given height varies with terrain condition and other variables.

Also, theoretically, the best winds for weather map analysis are one-hour average winds. In practice, winds tend to be averages over one or two minutes. Averages over such periods tend to be affected by small-scale atmospheric flow patterns. As a result, the wind field on weather maps contains many irregularities (noise) which must be smoothed out in the analysis of large-scale weather patterns.

Задание 2. Переведите предложения, обращая внимание на союзы.

1. Energy can neither be created nor destroyed.

2. Upon striking the earth the energy from the sun is either absorbed or reflected, or both.

3. The greatest part of the matter on the earth is fluid, either liquid or gas.

Задание 3. Переведите предложения, обращая внимание на модальные глаголы.

1. Energy may reach 30 m/s (65 mph) and more in gusts in Africa.
2. The wind shear must be strong to overcome the effect of the stratification.
3. Parts of the tropical zone can be very suitable for human occupation.
4. A charge separation must take place inside the thunderstorm cloud.
5. Cloud thickness may be 3 km or more, probably giving some showers.

ТЕКСТ 3. *COVERAGE OF METEOROLOGICAL OBSERVATIONS*

Задание 1. Прочтите и устно переведите текст, обращая внимание на время и залог сказуемых.

Atmospheric variables near the surface are measured frequently over most of the inhabited parts of the world. At airways stations, such variables as temperature, dew point, wind, cloudiness, visibility, pressure and cloud height are typically measured and disseminated every hour. More complete spatial information is given every 6 or 12 hours. Traveling ships report weather along their routes, and a few stationary weather ships determine atmospheric variables at oceanic locations not usually reached by commercial vessels still, even surface observations over oceans are insufficient to define weather patterns unambiguously.

The situation with coverage aloft is even more unsatisfactory. Winds, pressure, temperature and humidity are derived from rawinsondes, which are released at Greenwich mean noon (and also 12 hours later, at some places), at many land stations and a few ships. Observations typically extend to 30 km height, that is, throughout 99% of the atmosphere. Moreover, the density of rawinsonde stations is low in the poorer areas of the world, and very low over the oceans. At higher altitudes, rocket sensors are deployed three times weekly at a few sites.

In principle, this situation can be improved by satellite measurements. Satellites primarily locate clouds; this helps

in determining circulation centers, in particular centers of hurricanes. Also, in principle, the temperatures inferred from CO_2 radiation should be helpful in temperature analysis aloft, especially over the oceans. Unfortunately, temperatures so derived depend on a «first guess» of the temperature field. In regions where conventional temperature coverage is least satisfactory, the first guess will be poor (based mostly on a forecast), and therefore also the temperatures finally computed. Another drawback of satellite observations is that they cannot be made simultaneously («synoptically») all over the world. But this difficulty can be largely overcome by modern analysis techniques. Finally, clouds present difficulties for the temperature determinations below them, which will be largely overcome by use of microwaves, emitted by oxygen.

For the end of the seventies, several special meteorological periods were set aside by the world's weather services (World Weather Watch), in which the usual observational coverage was amplified by additional soundings, additional satellites, and a network of weather buoys in cloudy and poorly observed regions of the world. Based on these measurements, special forecasting experiments were scheduled.

In the late sixties and early seventies, a set of regional experiments with dense observations has been carried out, particularly in the tropics, where both theory and observations had been seriously deficient. Results from these experiments should be very helpful to the general problems of global meteorological analysis and forecasting.

Задание 2. Найдите в тексте предложения, которые являются ответом на следующие вопросы:

1. Is the situation with coverage near the surface and aloft unsatisfactory? Why?
2. Can it be improved?
3. What are the drawbacks of satellite observations?
4. How was the usual observational coverage amplified?

ТЕКСТ 4. *FORMS OF PRECIPITATION*

Задание 1. Повторите способы перевода простых форм на -ing. Устно переведите текст.

The meteorologist makes an emphatic distinction between rain and rain showers. Cumulus clouds produce showers; they last only a short time, usually minutes, but the rainfall rate is heavy. A large fraction of this rain runs off into rivers be-

cause soil cannot accept water at high precipitation rates, which often exceed 2,5 cm (1 in) per hour.

Steady rain is derived mainly from altostratus clouds associated with middle-latitude cyclones. If the mixed-phase process initiates the rain, the ice crystals melt before they reach the ground. Rain usually persists for several hours, sometimes for a day. The precipitation rate is low or moderate, perhaps 2 mm (0,08 in) per hour, assuring maximum opportunity for the water to sink into the soil.

In winter, when temperatures are below freezing in the whole atmosphere, the ice crystals falling from the altostratus do not melt. They reach the ground as snow, the winter counterpart of rain. The flakes form by coagulation of many ice crystals. Snow showers also occur, mainly behind cold fronts.

Dangerous weather develops when raindrops or melted snowflakes fall through a layer with temperatures below freezing. The drops then refreeze to form solid globes of ice, usually transparent, called ice pellets, sleet, or grains of ice. Often they are not frozen solid when they reach the ground. Interspersed, moreover, are drops that have barely started to freeze or consist entirely of water. This mixture is freezing rain, a disastrous form of precipitation.

When it strikes cold ground, it freezes to form a solid sheet of ice called glaze. Winter ice storms can break transmission lines and heavily damage forests and orchards by stripping trees of their branches under the weight of the ice. Further, all transportation may be interrupted.

Snow pellets, also known as soft hail or graupel, fall in showers from cumuli. Such showers develop regularly in the high mountains during the summer because temperatures are cold enough for the pellets to reach the ground before melting. Often they precede and accompany mountain thunderstorms. The pellets are circular or conical and consist of whitish ice particles formed when supercooled waterdrops coalesce with falling ice crystals.

Ice needles are long thin crystals forming on very cold winter days through sublimation, direct transition from vapor to ice. As they float in the air, they provide a magnificent spectacle when the sun is shining on them.

Drizzle is a type of rain consisting of many very small particles with radii of less than 500 micrometers, it yields only traces or minute amounts of water. Drizzle forms in very low clouds with a high water content but not subject to

much, if any, lifting. Relative humidity in the shallow layer below the cloud base near 100 percent prevents the small drops from evaporating on their short journey from cloud base to ground. Snow grains are the frozen counterpart of drizzle.

Задание 2. Найдите в тексте предложения, которые являются ответом на следующие вопросы.

1. What is the difference between rain and rain shower?
2. Do snow showers occur?
3. Why is «freezing rain» called a disastrous form of precipitation?
4. What is «sublimation»?
5. In what clouds does «drizzle» form?

ТЕКСТ 5. *RADIATION FOG*

Задание 1. Прочтите и устно переведите текст, обращая внимание на -ing формы глаголов.

This type of fog is dependent on long nights and clear skies for maximum cooling of the ground and adjacent air at night. It requires high relative humidity near sunset, so that only a small amount of cooling will lower the temperature to the dew point. Further, winds must be light, but there should not be complete calm. In still air, radiation fog is patchy and often only waist-deep. A light wind of 2 to 3 mph is favorable; the small amount of stirring it brings mixes the air particles cooled in contact with the ground a little, thus ensuring a solid fog layer up to 10 to 30 m (30 to 100 ft) thick.

Because cold air drains downhill, radiation fog is thickest in valley bottoms, with the surrounding hillsides rising above it. When one sees low foggy and high clear stretches alternating in rolling country near sunrise on a quiet morning, radiation fog and cold-air drainage are the causes. As soon as the sun has warmed the ground sufficiently, 1 to 3 h after sunrise, radiation fog normaly disappears. The rise of saturation vapor pressure in the air with rising temperature, and turbulent stirring, which brings drier air down to the ground, both contribute as well as intrusion of warmer air from the edges which makes the fog blanket shrink with time.

Autumn and winter generally are the most favorable seasons for radiation fog. In autumn, air moisture is still high, and in winter, the nights are longest. The center of a high-pressure area is a favorable spot for radiation fog, since winds

are light and skies usually clear. When a high-pressure center stagnates during winter, the same air will be cooled by radiation for several successive nights.

Radiation fog occurs even in the tropics, though not very often as a rule. Some tropical inland valleys exposed to cold air draining downslope are subject to recurrent fog that may not clear away until midday. Coastal areas, and especially swampy estuaries, sometimes become fog-covered; there the relative humidity is particularly high at nightfall, and the nighttime cooling may be just enough to start condensation.

Ice fog is formed directly by sublimation of water vapor (direct change of water vapor into ice). It occurs occasionally at airports in the Rocky Mountains during winter and very frequently near the Artic Circle.

Задание 2. Найдите в тексте предложения, которые являются ответом на следующие вопросы.

1. Which seasons are the most favourable for radiation fog?
2. Does it occur in the tropics?
3. Why do the coastal areas and swampy estuaries become fog-covered?

Задание 3. Переведите предложения, обращая внимание на время и залог сказуемого.

1. Elevation differences are always introducing temperature changes.
2. Closed isotherms separate the city from the general temperature field, and this condition has become known as the «urban heat island».
3. The differences between the urban and the rural area depend on the synoptic conditions.
4. Radiation is the physical process by which energy is emitted from a source in the form of electromagnetic waves.
5. The electromagnetic waves travel along straight paths until they hit objects from which they are partly reflected and partly absorbed.

ТЕКСТ 6. *CUMULONIMBUS*

Задание 1. Прочтите и устно переведите текст, обращая внимание на различные функции глагола to have. Повторите правила перевода конструкции «there is». Обратите внимание на -ing формы глаголов и функции причастия II.

The thunderstorm cloud is the cumulonimbus which often extends to the tropopause. Cumulonimbi have a duration of at least 1 h, compared to 10 to 15 min for the smaller cumuli. Some thunderstorm cloud conglomerations with diameters of 50 km (30 miles) and more have been tracked for a number of hours. «Conglomeration» is appropriate: a cloud mass so large contains several updraft areas which, after some minutes, are replaced by others, all within the same massive envelope. Shifting of active centers can be observed clearly at night from an airplane. There is hardly a finer weather sight than that provided by traveling in quiet air under a starry sky beside a boiling thunderstorm mass and watching the lightning illuminate first one set of turrets and then another in different parts of the huge, dark cloud. Some sections of this cloud suddenly come to life: they contain new and active updrafts of air. In other parts the lightning display dies out, indicating that the air motion has turned downward. Cells with updrafts and downdrafts often closely adjoin one another.

As the nighttime spectacle suggests, the cells in a thunderstorm which may be several miles in extent, go through a life cycle. The downdrafts, often violent, carry the condensation product to the ground. After some minutes, a downdraft may encompass a whole cell, which then dies. A large thunderstorm can be expected to have cells in various stages of the life cycle.

To picture how the downdraft begins, consider a mass of water (or water and ice mixed) carried upward in an updraft and then falling out into nearby air whose temperature is typical of the thunderstorm's environment. The water evaporates into this unsaturated air, which cools, acquires downward buoyancy and starts to sink.

In a typical summer situation, the downdraft air will arrive at the surface with relatively cold temperatures of about 22° C (72° F). The drag of the falling rain also accelerates the downdraft.

Задание 2. Переведите предложения, обращая внимание на время и залог сказуемого.

1. The troposphere is well-mixed, often moist, and contains all the clouds and precipitation of the atmosphere.

2. The tendency for cumuli to align in streets, or rows, has been observed for many years.

3. For large-scale processes the pressure can be regarded as a measure of the weight of the atmosphere above a given level.

4. The temperature distribution is used to classify the various layers of the atmosphere.

5. The circumstances that produce the charge separation have not been fully understood.

6. Circulation systems are produced by changes of elevation, differences between land and water, differences in thermal properties of the ground.

ТЕКСТ 7. *THUNDERSTORMS*

Задание 1. Прочтите и устно переведите текст, предварительно повторив правила перевода основных грамматических конструкций (неличные формы глагола, сослагательное наклонение).

Lightning and Thunder. We do not know exactly what causes lightning. It is thought to be part of a mechanism which conducts an electric current from earth to ionosphere. Normally, i. e., during fair weather, the atmosphere conducts a current from the positively charged ionosphere to the ground, which carries a negative charge. This leakage would wipe out the earth's charge in about ten minutes unless a return or supply current from earth to ionosphere constantly restored the prevailing charge distribution. Observations of the electric field strength between the earth and the ionosphere, made at widely separated places, have shown that the field strength varies daily in its intensity, reaching a peak simultaneously over the whole earth. This peak, referred to Greenwich mean time (GMT), which is the local time at longitude 0°, occurs during the afternoon and early evening. This is precisely the time that thunderstorm activity is greatest over the earth as a whole, because of afternoon maxima over equatorial Africa and South America. Because the earth and the ionosphere are both conductors, the peak occurs all over the earth sumultaneously, irrespective of local time in other areas. The correlation suggests that thunderstorms may furnish the mechanism for the return current. If so, the field strength would be largest when thunderstorm activity is greatest.

A lightning stroke heats the air along its path to as much as 10,000° C (18,000° F). Tremendous expansion of the air column follows, sending a vibrating pressure wave outward.

This wave, moving at almost 3000 m/s (1000 ft/s), i. e., at the speed of sound, makes the noise known as thunder. We can compute how far away the lightning is by counting the number of seconds between the time when the lightning flash is seen and the time when the thunder is heard, at least up to 10 s, which indicates a distance of 3 km (2 miles). At greater distances the sound may become refracted, so that it is difficult to associate thunderclaps with the correct lightning strokes.

Задание 2. Найдите в тексте предложения, которые являются ответами на следующие вопросы:

1. When does the peak of the electric field strength occur?
2. What is thunder?
3. How can we compute how far the lightning is?

КОНТРОЛЬНАЯ РАБОТА № 1

Вариант I

ТЕКСТ 8. *FOG*

Задание: Переведите текст письменно.

A cloud with its base at the ground or very close to it is called FOG. Fog interferes with all modes of transportation. Persistent thick winter fog, reducing traffic to a crawl for many hours is notorious in the interior valleys of California. Some super-highways in the Eastern United States and elsewhere have been built without concern for fog dangers. Almost every winter the headlines report chain-reaction accidents involving twenty cars or more in fog on crowded high-speed arteries.

In spite of many control devices, low clouds and fog remain a primary obstacle for air traffic: even when traffic is not shut down entirely, it is greatly slowed down because landings must be carried out with great care. Fog may be light, restricting visibility to perhaps one or two miles; or it may be thick to very thick, with visibility only a few hundred feet or less. The infamous London pea-soup fog was the prime example of thick yellow fog that could shut down one of the world's largest cities. This fog no longer exists. Produced in part by a heavy cotribution from city pollution sources, it disappeared when London successfully introduced stringent pollution-control measures.

Most fog formation involves actual withdrawal of heat from the air, mainly through radiation cooling and movement of air over colder ground. The temperature is cooled to the dew point along the ground when saturation is reached. In contrast, we have seen that stratus and cumulus clouds form when air is lifted to the condensation level.

Вариант 2

ТЕКСТ 9. *AVERAGE VERTICAL STRUCTURE*

Задание. Переведите текст письменно.

The layer between 10 and 50 km (on the average) is called the stratosphere, and the surface separating troposphere and stratosphere is the tropopause. More precisely, the height of the tropopause varies from about 9 km at the poles to 16 km at the equator. In the lower stratosphere, the temperature is essentially constant with height, except near the equator, where it immediately increases upward. Higher up, the temperature generally increases with height. The stratosphere is hydrostatically stable, and therefore poorly mixed, and the variables in it tend to be stratified. Also, the stratosphere contains about 97% of the ozone in the atmosphere.

The stratopause, at about 50 km height, separates the stratosphere from the mesosphere, a region where the temperature again falls with height. Here, the lapse rate is positive. This is a region of strong winds, steady from the east in the summer and variable from the west in winter. Also, in this region, ionization is strong enough to reflect very long radiowaves sent up from the surface.

At the top of the mesosphere lies the mesopause, the coldest layer of the atmosphere. Here, also, clouds (called noctilucent clouds) are sometimes seen in arctic or antarctic summers. The reason is that the temperature is so low that even the small amount of water vapor there will sometimes freeze.

In the thermosphere, above the mesopause, the temperature again increases upward, eventually reaching 1,000° and more above 100 km. In the older references, this region is also called the ionosphere because ionization increases to a peak at about 250 km. This region has long been explored by radiowaves. It is controlled by solar activity. When the sun is active, auroras are produced here, as well as disturbances in

the electric characteristics of the thermosphere, which are responsible for magnetic storms and difficulties with broadcasting.

КОНТРОЛЬНАЯ РАБОТА № 2

Вариант 1

ТЕКСТ 10. *VERTICAL VELOCITY*

Задание. Переведите текст письменно.

Vertical and horizontal velocity are treated separately because they have completely different properties. Large-scale vertical velocities (corresponding to weather systems and representing averages over times periods of the order of an hour and/or distances of the order of hundreds of kilometers) are of the order of 1 cm/sec. Local vertical velocities are typically of the order of 1 m/sec but may reach values more than ten times as large in strong convection, especially in thunderstorms. Only these small-scale vertical motions can be measured directly, e. g., by bidirectional vanes or by the difference of the speed of sound directed upward and downward.

The intensity of small-scale vertical velocities varies greatly in space and time. Above the atmospheric boundary layer, large magnitudes occur only in convective cells and in regions of strong vertical variation of the horizontal wind vector. Near the ground, large small-scale vertical motions are common almost everywhere because the wind there varies rapidly with height and heating of the ground provides additional energy in the daytime.

Large-scale vertical motion is too small to be measured directly. But its effect on the structure of temperature, moisture and winds is quite significant. Hence, vertital motion can be estimated from measurements of other variables.

Upward vertical motion, both small-scale and large-scale, is responsible for most of the cooling and consequent condensation of air, including the formation of precipitation. Small-scale large vertical motion is responsible for showers and thunderstorms; largescale vertical motion for extended precipitation areas.

Вариант 2

ТЕКСТ 11. *CYCLONS AND ANTICYCLONES*

Задание. Переведите текст письменно.

Weather-map scale (also called synopticscale) systems in middle and high latitudes are primarily cyclones, which are circulations around low pressure centers (lows) or anticyclones, circulating around high-pressure centers (highs). The diameters of cyclones are of the order of 1,000 km; those of anticyclones, somewhat larger. Both types of system tend to travel from west to east, being «steered» by the global circulation. Winds in cyclones circulate clockwise in the Southern Hemisphere, counter-clockwise in the Northern. Anticyclones have the opposite circulations. The axes of both cyclones and anticyclones slope westward with height. In the tropics, atmospheric disturbances generally move from east to west.

Cyclones are generally associated with surface convergence, precipitation and strong winds; anticyclones have the opposite characteristics. Cyclones come in two varieties: extratropical and tropical. The latter are also called hurricanes, typhoons or just cyclones, depending on the region in which they occur. Extratropical cyclones form in frontal zones and take their energy from the temperature gradient in the frontal region; they form in middle latitudes and are most intense in late fall, winter, and early spring. Tropical cyclones intensify over oceans and take their energy from the latent heat released when water vapor condenses. They form between latitudes 5° and 30°, either north or south, move westward and poleward at first, and recurve further toward the pole and generally eastward at higher latitudes. The hurricane season is in late summer and early fall. In contrast to extratropical cyclones, tropical cyclones tend to have nearly vertical axes. They are also characterized by calm «eyes». Excellent mathematical models of tropical cyclone structure are in existence.

Except for tropical cyclones, weather-map scale systems are not as important in the tropics as in higher latitudes; instead, waves on the global easterly circulation there are associated with precipitation. Also, smaller-scale disturbances are relatively more frequent.

ТЕКСТ 12. *ADVECTION FOG*

Задание 1. Прочтите и устно переведите текст, предварительно повторив значение суффикса -s и явление конверсии.

When warmer air blows, or is advected, over a colder surface, fog develops under conditions very different from those causing radiation fog. The air gives off heat to the ground, and this cools the air temperature to the dew point.

The temperature of the earth's surface in the Northern Hemisphere normally decreases northward: thus, advection fog forms mainly when air currents blow from the south, especially when they carry high moisture. In winter, tropical air moving northward over the Central and Eastern United States is likely to encounter ground with a temperature near freezing, often covered by snow. Turbulence at wind speeds of 15 to 20 mph distributes the cooling through a layer some 300 to 600 m thick (1000 to 2000 ft). This shallow layer will be mixed; the temperature lapse rate will be adiabatic and the moisture constant through the layer. At the top a temperature inversion forms and gradually strengthens. Relative humidity first reaches 100 percent near the top of the mixed layer, where a stratus deck forms. Underneath, the air becomes very hazy: water vapor begins to condense on sea salt and combustion particles at relative humidites of 90 percent and less.

When the tropical air continues northward, the mixed layer becomes saturated at lower and lower levels and the base of the stratus approaches the surface. The fog layer is very thick and persists day and night, unlike radiation fog. Warm rain falling into the fog layer often contributes to fog density.

In summer, advection fog is rare when tropical air is flowing northward over the United States, besause the sun heats the northern tier of states. Over the Atlantic and Pacific Oceans, however, tropical air advances northward to latitude 50° and beyond, where temperatures remain relatively low through the summer, and leads to extensive and persistent fog. Around Newfoundland, fog occurs through as much as one-third of the summer. Water temperatures decrease northeastward along the American coast; winds from the south or west predominate, bringing air with a dew point of 15 to 20° C (60 to 70° F) and higher over water with temperatures of 10° C (50° F) or less.

Dense fog often extends across the congested shipping lanes between Europe and North America. Even modern shipboard radar could not prevent the ramming of the liner Andrea Doria on 25 July 1956. She went to the bottom with a loss of fifty-one lives. Fog remains a constant matter of concern for shipping and all other transport services.

Задание 2. Определите от каких глаголов образованы следующие имена существительные. Переведите их.

distribution, mixture, development, difference.

Задание 3. Найдите в тексте английские эквиваленты для следующих словосочетаний:

точка росы, относительная влажность, температурный градиент, температурная инверсия.

Задание 4. Переведите предложения, учитывая видовременную форму сказуемого.

1. An observer collects snow samples once a day.
2. The field of urban climatology has grown rapidly in recent years.
3. The winds blowing back towards the equator are moving from a region of slower eastward movement into the region of fastest movement.
4. Temperatures do not vary gradually from the tropics towards the poles.
5. Upon striking the ground, the water froze.
6. Positive current will flow from the upper cloud portion to the ionosphere.
7. The vast majority of thunderstorms over the tropics produce no rain.

Задание 5. Переведите предложения, принимая во внимание многофункциональность глагола to be.

1. Many moisture variables are in meteorological use.
2. The lunar day is 24 hours and 50 minutes in duration.
3. The earth is rotating at great speed (1600 km/hr) relative to the moon.
4. The meteorological stations are spaced uniformly.
5. The next step was to introduce an allowance for the difference in temperature at different levels.

Задание 6. Определите, к какой части речи принадлежат выделенные слова. Переведите предложения.

1. A slight rise in the grass-surface temperature can be noted at 2020 hr.

2. As the temperature of the air in the bulb r i s e s, the air expands and the liquid in the stem falls, whereas it rises as the temperature falls.

3. Most of the troposphere is filled with west winds which i n c r e a s e with height.

4. This i n c r e a s e is consistent with the «thermal» wind equation, since temperatures d e c r e a s e poleward from the equator.

5. The pressure d e c r e a s e s with height.

6. The d e c r e a s e with height dependes primarily on temperature.

7. The temperature c h a n g e s caused by radiatively active pollutants remain a minor factor in the development of vertical temperature structure.

8. As the temperature of both glass and mercury c h a n g e, their volumes change.

9. The barometer d r o p s rapidly as the storm a p p r o a c h e s.

10. The a p p r o a c h of the storm can be determined by the d r o p s of the barometer.

11. Weather conditions a f f e c t pollutant concentrations and there are some e f f e c t s of pollutants on weather.

ТЕКСТ 13. *STEAM FOG*

Задание. Прочтите и устно переведите текст, обращая внимание на модальные глаголы.

On early summer mornings, long columns of steam often rise over small lakes and river valleys. At that time of year water temperature and vapor pressure are at their highest. Air draining down the slopes toward the water may be 10° C (18° F) colder. Water evaporating from the surface may supersaturate this air at once; then evaporated water recondenses and rises with the air that is heated from below.

In winter when cold air moves from a land mass out over water perhaps 25° C (45° F) warmer than the air, the discontinuity in the surface leads to violent displays. Suddenly tremendous heating and evaporation set in with large vapor-pressure differences between the water and the air. The steaming becomes so intense that it consolidates into a «fog» called a r c t i c s e a s m o k e. It can be observed when air is pouring off the Arctic ice shelves into the open ocean or off the East Coast of the United States when cold continental air moves over the Gulf Stream, but it also occurs along the

western shore of Lake Michigan with cold outbreaks from northwest. During a high wind, thousands of weaving steam plumes can be watched from shore, sometimes for days, a picturesque sight. Beyond the lake, much of the newly acquired moisture often falls out again as snow. The comparatively mild steaming from warm highways following an afternoon rain shower also belongs here. Such steaming can be quite a nuisance for drivers. If the rain occurs toward sunset, followed by radiation cooling, actual fog layers may develop and persist through the night.

Задание 2. От следующих глаголов образуйте существительные при помощи суффиксов -tion, -ment по образцу.

to observe — observation
to move — movement
to construct — to evaporate —
to protect — to radiate —
to develop — to achieve —
to improve — to equip — to agree —

Задание 3. Определите время и залог сказуемого. Переведите предложения.

1. The radiation from the earth's surface is called terrestrial radiation.
2. Many tests have been performed with wind shielding.
3. Certain limited features of global climate can be studied by physical models.
4. Synoptic weather observations are done simultaneously everywhere on earth, in intervals of 3 hours.
5. The extent of snow cover was seen in satellite pictures.
6. Microwaves are reflected by raindrops and ice crystals.
7. If burning of fossil fuels is not limited the atmosphere's carbon dioxide will be doubled some time near the middle of the 21 st century.

Задание 4. Переведите предложения, обращая внимание на конструкцию the . . . , the.

1. The higher the temperature, the more rapid is the motion of the molecules.
2. Since the barometer measures the pressure of the atmosphere, the greater the elevation, the lower the barometer reading.
3. The smaller the particles, the faster they move.

4. The higher we ascend, the rarer becomes the atmosphere.

Задание 5. Переведите предложения, обращая внимание на многофункциональность глагола «to have».

1. The effect of turbulence on various waves has many applications.

2. Specialists have explained the disappearance of rains from Sahel.

3. Rather complex models have to be run in the computer for a long time to produce results.

ТЕКСТ 14. *MEASUREMENT OF PRECIPITATION*

Задание 1. Прочтите и устно переведите текст, обращая внимание на:

1) значение видовременных форм,

2) оборот «there is (are),

3) функции причастия II,

4) функции инфинитива.

Intensive efforts in advancing radar techology from far northern countries like Finland to the deep tropics have led to improvements in relating radar reflectivity to precipitation, so that rain intensity and rain (but not snow) can be measured over large and small areas with this method as well or better than with conventional equipment. In time, the latter is likely to disappear from many countries. Rain computations from radar have been started over some ocean areas since 1974. Soundings from satellites are being explored for their rainmeasuring capability. Microwaves, i. e., electromagnetic waves of the same range of wavelength as radar waves, will penetrate through clouds unlike the short solar waves which are mostly reflected and, to a small extent, absorbed. From the cloud thickness and the wave energy returned to the satellite, radar-like rain computations can be made. Further, the temperature of cloud tops, measured by their radiation to space, can be used for rainfal correlations when the temperature can roughly be related to height of cloud.

The conventional equipment is a stick gauge when only one day's rainfall total is wanted. Most rain gauges have a diameter of 20 cm (8 in) at the top. From there the water flows through an opening which is very narrow in order to prevent evaporation. After the height is measured (in milimeters or inches, with a stick), the gauge is emptied for the

next day. Some remote stations have large containers for accumulation over a week, a month, or even a season.

Much more refined and complex is the weighing rain gauge that records precipitation continuously. Its record permits determination of quantities such as extreme rain intensity for 1, 5, 10, and 60 min. Besides, the instrument can act as accumulator, so that it yields all quantities of interest in rainfall analysis. There are many servicing problems, so that this instrument can usually be operated only where it is readily accessible.

Measuring problems arise with all gauges because such obstacles as buildings and trees channel the wind flow and with it the path of raindrops. A rain gauge must be freely exposed, well removed from buildings and other obstructions. Even so, during high wind speeds, droplets may be driven horizontally over rain gauges.

Snow is collected in cylinders, in appearance similar to rain gauges, but usually of greater diameter and without the constriction at the top. Normally snow depth, measured in centimeters or inches with a stick, and water equivalent, measured by weighing after melting, are the two quantities recorded and published.

Задание 2. По следующей модели образуйте цепочки из двух существительных и переведите их на русский язык.

Model: intensity of rain — rain intensity
speed of wind — wind speed

motion of air; distribution of temperature; strength of wind; maps of weather; crystals of ice; systems of circulation; patterns of weather; content of heat; climate of town.

Задание 3. Переведите предложения, учитывая степени сравнения прилагательных и наречий.

1. The troposphere is the thinnest layer of the atmosphere in the sense of its height, but the thickest in terms of the density of air within it.
2. Cooling is the most common way in which water vapor is saturated and changes to liquid or ice.
3. The stratosphere is warmer than the top of the troposphere.
4. Most important is the vertical variation, the vertical wind shear.

Задание 4. Переведите, обращая внимание на порядок слов в русском предложении.

1. There are about 7000 synoptic weather stations on earth.

2. There is the formation of a pollutant layer in the city.
3. There are many physical models of tornadoes.
3. Today there is a lot of information about past climate.

Задание 5. Переведите, обращая внимание на модальные глаголы и их эквиваленты.

1. The fog may last as long as several days.
2. The pollutant layer can cause heat loss by outgoing radiation.
3. The two types of turbulence may act separately, or jointy.
4. The notable surface temperature anomalies of the urban area must show an effect in the vertical dimension.
5. The pollution products can either promote or inhibit precipitation.
6. The whole thermometer should be at the same temperature.

ТЕКСТ 15. *SQUALL LINES*

Задание 1. Прочтите и устно переведите текст, обращая внимание на особенности перевода английской пассивной конструкции на русский язык.

From time to time, most often in spring and early summer, thunderstorm cells in the United States form a line which can be as long as several hundred kilometers, usually oriented north-south or northeast-southwest. The line may persist for six to eight h; normally it travels toward the east. There is a large difference between an isolated thunderstorm on a hot afternoon and thunderstorms along a squall line. The latter tend to be much more severe. A mammatus sky often precedes a squall line: a dark overcast, usually of middle clouds, with downward bulging protuberances, or pouches. Virtually incessant lightning marks the arrival of the squall line. Winds become very strong and may attain hurricane force, with gusts to as much as 100 mph. Squall lines are often referred to as mesoscale disturbances because their size is intermediate between that of individual cloud masses (10 km scale) and cyclones (1000 km scale).

Severe squall lines form with greatest frequency over the Western Plains in the United States and then travel eastward. However, they are known in most parts of the world, notably in Argentina, the southwestern part of the U.S.S.R., Central Europe, and northwestern India. Violent squall lines occur

over western Africa during the Northern Hemisphere rainy season. There, they travel westward in the prevailing winds from east. Their speed often is very rapid, as much as 30 knots (35 mph) or twice the normal travel speed of rain systems in the tropics, yet not much more than half of the most rapid displacement (50 mph) observed occasionally in the United States.

Задание 2. Определите, к каким частям речи относятся следующие слова. Переведите их.

to evaporate — evaporation
to use — useful — useless — usefulness
to connect — to disconnect — connection
to appear — to disappear — appearance — disappearance
to differ — different — difference — differently
to penetrate — penetration

Задание 3. Переведите предложения, учитывая различные значения it.

1. It is possible to observe sunrise and sunsets on Mars just as on the Earth.
2. The summer temperature at the equator of Mars is about 25° C and in winter, at the poles, it drops to 100° C.
3. It seems quite certain that in the nearest future, man's actions will be able to influence future climate.
4. High above the ground this wind blows so strongly that it is called the jet stream.
5. It is seen from the definition of relative humidity that it can be increased either by adding more water vapour or decreasing the «saturation specific humidity».

Задание 4. Переведите, обращая внимание на особенности перевода пассивных конструкций.

1. The modern scientific forecasts of weather can be fully relied upon.
2. Heat is radiated by the Sun to the earth, but the land, the sea, and the air are affected differently by this radiation.
3. We live at the bottom of an ocean of air, and our lives are influenced by the change and movement of this gas.
4. Single atoms of oxygen are seldom met with.
5. We were shown a number of experiments illustrating the presence of high-energy particles in the cosmic radiation.

Задание 5. Переведите, обращая внимание на различные значения «that».

1. Chemists tell us that, out of 100 parts of atmospheric air, 99,5 consist of oxygen and nitrogen.

2. The lunar day is 24 hours and 50 minutes. That is, the moon passes a given location on earth once in that period of time.

3. The weight of the atmosphere is equal to that of a solid globe of lead sixty miles in diameter.

4. The atmosphere feeds the flame of life exactly as it does that of the fire.

5. Air density, typically of the order of 1/1000 of that of water near the ground is almost never measured.

Задание 6. Найдите в тексте английские эквиваленты для следующих слов и словосочетаний:

время от времени,
ураганная скорость,
преобладающие ветры,
сильные порывы ветра.

ТЕКСТ 16. *CONVECTION AT WORK*

Задание 1. Прочтите и устно переведите текст, обращая внимание на различные значения слова it, оборота there is.

Convection is best summed up in the old adage, «hot air rises». At its simplest, the general circulation of the atmosphere is a result of hot air rising in the tropics and being displaced north and south of the equator as more hot air rises underneath. The displaced air cools, because it radiates heat away as infra-red energy into space and sinks at higher latitudes, where it gives up more heat to the surface of the Earth in regions which do not get the benefit of tropical sunshine. But this simple picture disguises all the interesting features of the weather machine which make our weather and climate so changeable.

First, there is a difference between the amount of heat being radiated by the Sun and arriving at the top of the atmosphere (usually called the «solar constant», even though some astronomers believe that the heat output of the Sun itself does vary slightly) and the amount of heat getting through the atmosphere to each square metre of the ground, which is called the «insolation». Although the atmosphere itself is almost transparent to solar energy, clouds in the atmosphere can reflect away a great deal of incoming sunlight, while tiny dust particles scatter the incoming sunlight in all directions. This scattering makes the sky blue, because the shorter wavelengths, corresponding to blue light, are more

easily scattered and bounced around to appear from all parts of the sky. Red wavelengths are less easily scattered, so they penetrate directly through even a dusty layer of the atmosphere to the ground — which is why sunsets are red. The red of a sunset is the left-over colour after the shorter wavelengths have all been scattered out.

Once the energy reaches the ground it may all be absorbed if it falls on a dark surface such as a dense tropical forest, or it may be almost entirely reflected back out into space if it falls on a shiny surface cover such as the Antarctic ice-cap. And because the amount of insolation (heat per unit area) depends on the angle the Sun is above the horizon, it varies with time of day, with latitude, and with the seasons. When the Sun is low in the sky, its incoming energy is spread thinly over a wide surface area; when it is high in the sky, the energy is concentrated and the insolation reaches peak values. It is because the Sun is always high in the sky at noon in the tropics that the equatorial regions absorb more heat than the high latitude and set the circulation of the weather machine in motion. The high latitudes get plenty of insolation in summer, when their hemisphere is tilted towards the Sun, but over the polar regions this is more than compensated for by the reflectivity of the snow and ice fields that are the legacy of many long, cold winters with scarcely any sunshine at all. Even when the Sun is high in the sky it cannot warm the polar regions dramatically because so much of its heat is reflected straight back into space.

Задание 2. Образуйте степени сравнения следующих прилагательных по образцу и переведите:

hot — hotter — the hottest.

high warm long
short low little
wide cold good

Задание 3. Переведите предложения, обращая внимание на многозначность служебных слов «since», «for», «as».

1. This condition is always satisfied, since small particles exist everywhere in the atmosphere.

2. Because of the spin of the earth, the simple circulation pattern rapidly becomes more complicated as we move away from the equator.

3. For temperatures and dew points such a procedure may work out satisfactorily, but for wind speed, visibility and precipitation it is unsatisfactory.

4. As can be demonstrated, this effect can initiate precipitation in urban areas.

5. In studying nature the scientist has to procede carefully, for nature is full of surprises.

6. The Weather Bureau uses maximum and minimum thermometers which register the highest and the lowest temperatures reached since the last setting.

7. Since ancient times people studied nature and natural phenomena.

Задание 4. Переведите предложения, обращая внимание на перевод усилительных (эмфатических) конструкций.

1. It was this project that brought this field of scientific inquiry to its present level.

2. It is physics that has given us mechanical and electrical inventions of the modern world.

3. It was only in 1840 that official records of temperature, rainfall and so on began to be kept, at the Royal Observatory, Greenwich, in London.

4. Very seldom do these thunderstorms contain hail.

5. The results of this study did show the crossover effect on frequent occasions.

6. It is by radiation that the earth receives its heat from the sun.

7. It is the weight of air that gives rise to atmospheric pressure.

Задание 5. Переведите предложения, обращая внимание на модальные глаголы и их эквиваленты.

1. Certain features of global climate can be studied by physical models.

2. A lot of meteorological stations should be set up in the inner city.

3. Both dew-point and wet-bulb temperatures can be easily measured.

4. Generally, compromise solutions have to be found.

5. Every household should possess several thermometers such as a room thermometer, an out-of-door thermometer, and a clinic or «fever» thermometer.

Задание 6. Измените предложения из действительного в страдательный залог.

1. The atmosphere warms or cools the ocean.

2. Stratosphere absorbs energy from the incoming sunlight.

3. Interactions between land, sea, air, and ice affect the workings of the weather machine.

4. Different groups of scientists developed the General Circulation Models.

5. These models produce a variety of estimates.

6. Motor vehicles cause the air pollution.

Задание 7. Найдите в тексте английские эквиваленты для следующих слов и словосочетаний:

частицы пыли, циркуляция атмосферы, атмосфера почти прозрачна для солнечной энергии, широта, длины волн, солнечный свет, проникать, отражать.

ТЕКСТ 17. *SURFACE WEATHER*

Задание. Прочтите текст без помощи словаря и ответьте, какие явления происходят при приближении масс холодного воздуха.

When it reaches the ground, the cold air spreads out on all sides, most rapidly in the direction toward which the thunderstorm is moving. At the approach of the cold mass the wind dies out, and the barometer, which usually has been falling slowly, levels off. Then a dark line of very low clouds approaches rapidly, often whirling up dust along its front. The wind shifts and begins to blow with gusts of 40 mph and more from the direction of the thunderstorm. Temperature falls suddenly by some 10° C (18° F), relieving the heat; the barometer starts to rise in jerks.

All this may happen a few minutes before the main thundercloud arrives overhead, carrying heavy rain. The extreme precipitation seldom lasts more than 1/2 h, but in that short time 1 to 5 cm (0,4 to 2 in) or more rain may fall, with runoff of most water and potentially dangerous flooding.

ТЕКСТ 18. *METEOROLOGICAL VARIABLES*

Задание. Прочтите текст без помощи словаря и ответьте, какими законами управляется поведение шести метеорологических переменных.

Most of the characteristics of the atmosphere can be described in terms of six variables: pressure, p; temperature, T; density; moisture concentration by mass, q; vertical velocity, w; and the horizontal velocity vector, V. The reason for splitting the three-dimensional velocity vector into horizontal and ver-

tical is the fact that these quantities behave very differently from each other, at least for large-scale motions.

For some meteorological problems, this list of variables is not enough; we also need the concentrations of certain trace constituents, e. g., ozone, oxides of nitrogen, particles of various sizes, water drops, and so forth. However, the bulk of basic meteorological problems can be attacked with the study of the six principal variables alone.

The behavior of the six variables is governed by six equations: the gas law; the first equation of thermodynamics (heat equation); the equation of continuity (equation of mass conservation); an equation expressing conservation of moisture, and Newton's second law (equation of motion), which will be used separately in the vertical and the horizontal.

Given the six variables and the six equations, it is possible, to solve meteorological problems by integrating the equations from a given state forward. In this integration, proper boundary conditions must be applied at the bottom and top. Finally, when the domain of interest does not extend around the globe, lateral boundary conditions have to be prescribed as well.

ТЕКСТ 19. *ATMOSPHERIC PRESSURE*

Задание. Прочитайте текст без помощи словаря и расскажите, в каких единицах измеряется атмосферное давление в США.

Atmospheric pressure, p, is generally measured only for the larger atmospheric scales, e. g., those which can be resolved on weather maps and slightly smaller. In almost all such cases, the pressure can be regarded as the weight of the atmosphere. The conventional meteorological pressure unit is the millibar, which is defined as 1000 dynes/cm^2 or 100 pascals (newtons/m^2). The average sea-level pressure is 1013 mb. For surface measurements, and in connection with some uses in aviation, pressure is also given in inches of mercury in the U.S.A (mm of mercury elsewhere). One inch equals 33.87 millibars.

At weather stations, pressure is measured with a mercury barometer. On ships and radiosondes, bellows are employed in an instrument called «aneroid barometer», similar to conventional barometers used in homes. The pressure compresses a metal tube in a vacuum; the tube directs a pointer which makes electrical contact in various positions, permitting transmission of signals to the ground.

ТЕКСТ 20. *FOG DISPERSION*

Задание. Прочтите текст без помощи словаря и расскажите, какими способами пытаются рассеивать туман, какие вещества при этом применяются и какой вид тумана легче поддается рассеиванию.

Fog is a severe hindrance to aviation, with attendant economic loss. Many experiments have been performed to try and disperse it: whirling propeller blades on the edge of the airport; seeding with nuclei meant to precipitate the fog droplets; and spraying with water where the large drops might function to scour the air. The preceding description of fogs should make it clear that an attack on the radiative type is most likely to be successful; it is thin, and it moves only slowly in light winds. An advection fog proves to be a much tougher obstacle. Even if one succeeded in making a hole in it, the hole would move quickly away from an airport carried by winds of 10 to mph and more; besides, the hole would soon be closed up by eddying air motions. Of course, a reasonably sized hole might be just large enough to permit a few aircraft to land; the cost of a continuing fog-clearing operation may be small compared to the benefits of uninterrupted traffic movement.

Apart from plain water, such chemicals as ammonia, sodium chloride, and others have been tried out on fog. We cannot go into these experiments in detail, but we note that fog dispersion has been put on an operational basis in some airports.

ТЕКСТ 21

Задание. Прочитайте текст без помощи словаря и скажите, каковы были воззрения метеорологов на климат вплоть до 20-го века, найдите в тексте предложения, доказывающие, что климат на Земле изменяется.

The term «normal weather» is meaningless without some explanation of the span of time over which the normal conditions have been determined. In most parts of the world the weather changes dramatically, although to a large extent predictably, in the course of a single year, with the «normal» march of the seasons. But no two years are exactly alike, and no two decades exactly follow the same pattern of changing weather. The simplest definition of climate is indeed «average weather» — but the average weather of the 1970 s, say, was

very different from the average weather of the 1670 s, while only 20,000 years ago, a short time in the history of the Earth, our planet was in the grip of a full Ice Age. Climate is always changing, on all time scales; but this realization is very much a feature of modern science, for until well into the twentieth century meteorologists believed that the only changes in the weather were fluctuations around the average, and that given a long enough span of measurements to average they would be able to define the normal weather conditions — the climate — for any location on Earth.

ТЕКСТ 22. *TEMPERATURE*

Задание. Прочитайте текст без помощи словаря и ответьте на вопрос:
«What termometers are needed for determination of rapid fluctuations?»

Atmosphere temperature, T, varies on all scales, from millimeters to tens of thousands of kilometers, and from thousandths of seconds to millions of years. In theoretical work, degrees Kelvin are used; of course, temperature differences can equally well be described in degrees Celsius. For measurements of surface temperatures, ordinary mercury thermometers are usually sufficient. The accuracy of measurement is usually 1/2 to 1° C. More important than the accuracy, particularly near the ground, is the representativeness. Temperatures are supposed to be obtained about 1 1/2 meters above the surface, at a well-exposed site, in a well-ventilated shelter. However, for determination of rapid fluctuations, platinum-wire thermometers and thermistors (small semiconducting beads) are needed. Also, sonic thermometers, measuring the speed of sound over a path of order 25 cm, can record rapid fluctuations of temperature.

ТЕКСТ 23. *TEMPERATURE* (продолжение)

Задание. Прочитайте текст без помощи словаря и ответье на вопросы.

1) Why is the intensity of the radiation a measure of stratospheric temperature?

2) What are thermistors?

Temperatures in the free atmosphere are measured from balloon-borne instruments, called radiosondes or rawinsondes,

which transmit temperatures to the ground. Sensing elements are usually thermistors. The height of the balloon is inferred mostly from the pressure measured by a small, bellows-type barometer, corrected for temperature and moisture.

Also, some meteorological satellites are designed to sense temperatures in thick layers by sensing radiation emitted from the CO_2 in the atmosphere in a band near 15 micrometers. In the center of the band, CO_2 is quite opaque, and only radiation from the stratosphere or even higher levels can reach the satellite. Therefore, the intensity of the radiation is a measure of stratospheric temperature.

In the wings of the band, the radiation comes from lower levels. By sensing radiation at a series of wavelengths with different absorptivities, a greatly smoothed vertical sounding can be constructed. Satellite techniques have been refined to yield temperatures up to 90 km. On the other hand, standard balloons are generally useless above 30 km and are replaced by small rockets carrying thermistors (resistance thermometers).

III КУРС

ТЕКСТ 1. *MECANISMS OF AIR MASS MODIFICATION*

Задание 1. Прочтите и переведите устно текст, предварительно повторив способы перевода пассивных конструкций, -«ing» — forms.

The mechanisms by which air masses are modified are, for convenience, treated separately, although this rigid distinction is often not justified in practice.

a) Thermodynamic changes. An air mass may be heated from below either by passing from a cold to a warm surface or by solar heating of the ground over which the air is located. Similarly, but in reverse, it can be cooled from below. Heating from below acts to increase air-mass instability so that the effect may be spread rapidly through a considerable thickness of air, whereas surface cooling produces a temperature inversion which greatly limits the vertical extent of the cooling. For this reason cooling mainly occurs through radiative heat loss by the air.

Changes can also occur through increased evaporation, the moisture being supplied either from the underlying surface or by precipitation from an overlying air mass layer. In reverse, the abstraction of moisture by condensation or precipitation can also cause changes. A parallel, and most important, change is the respective addition or loss of latent heat accompanying this condensation or evaporation.

b) Dynamic changes. Dynamic (or mechanical) changes are different from thermodynamic changes because they involve mixing or pressure changes associated with the actual movement of the air mass. The distribution of the physical properties of air masses is considerably modified, for example, by a prolonged period of turbulent mixing. This process is particularly important at low levels where surface friction intensifies the natural turbulence of airflow, providing a ready

mechanism for the upward transfer of the effects of thermodynamic processes.

The radiative and advective exchanges are nonadiabatic, but the ascent or descent of air causes adiabatic changes of temperature. Large scale lifting may result from forced ascent by a mountain barrier or from airstream convergence. Conversely, sinking may occur when high-level convergence sets up subsidence or when stable air, having been forced up over high ground by the pressure gradient, descends in its lee. Dynamic processes in the middle and upper troposphere are a major cause of air-mass modification. The decrease in stability aloft, as air moves away from the areas of subsidence, is a common example of this type of mechanism.

Задание 2. Не прибегая к помощи словаря постарайтесь понять значения слов, имеющих сходный по звучанию корень в английском и русском языках.

mechanism — n, practice — n, thermodynamic — adj, inversion — n, vertical — adj, process — n, condensation — n, parallel — adj, turbulent — adj, convergence — n, troposphere — n, modification — n.

Задание 3. Выберите правильную форму сказуемого. (Active voice — Passive voice).

Переведите предложения.

1. The mechanisms of air-mass modification (treat/are treated) separately.

2. Surface cooling (produces/is produced) a temperature inversion which greatly (limits/is limited) the vertical extent of the cooling.

3. The moisture (supplies/is supplied) from the underlying surface.

4. Ascent or descent of air (causes/is caused) adiabatic changes of temperature.

5. One approximate means of indirect measurement (bases/is based) on the moisture balance equation.

6. The technique (allows/is allowed) the determination of daily evapotranspiration amounts.

7. Potential evapotranspiration (calculates/is calculated) as the difference between precipitation and percolation.

8. The snow-covered source regions of these two air masses (lead/are led) to marked cooling of lower layers.

ТЕКСТ 2. *DIVERGENCE, VERTICAL MOTION AND VORTICITY*

Задание 1. Прочтите и устно переведите текст, повторив особенности перевода пассивных конструкций и независимого причастного оборота.

These three terms essentially hold the key to a proper understanding of modern meteorological studies of wind pressure systems on a synoptic and global scale. Mass uplift or descent of air occurs primarily in response to dynamic factors related to horizontal airflow and is only secondarily affected by air-mass stability.

When streamlines (lines of instantaneous air motion) converge (or diverge) this is termd confluence (or diffluence). Confluence causes an increase in the velocity of the air particles, but no mass accumulations. There being a net accumulation of air in a limited sector, convergence occurs, and there being net outflow, divergence does. Confluence may reinforce mass convergence, but sometimes the isotach (line of equal wind speed) cancels out the effect of streamline confluence. It is important to note that if all winds were geostrophic, there could be no convergence or divergence and hence no weather.

Horizontal inflow or outflow near the surface has to be compensated by vertical motion. Air rises above a low-pressure cell and subsides over a high-pressure, with compensating divergence and convergence, respectively, in the upper troposphere. In the middle troposphere there is a level at which horizontal divergence or convergence is effectively zero; the mean «level of nondivergence» being generally at about 600 mb. Large-scale vertical motion is extremely slow compared with convective and down/draught currents in cumulus, for example. Typical rates in large depressions and anticyclones are of the order of 5—10 cm sec^{-1} whereas updraughts in cumulus may exceed 10 m sec^{-1}.

Vorticity implies the rotation or angular velocity of minute (imaginary) particles in any fluid system. The air within a depression can be regarded as comprising an infinite number of small air parcels, each rotating cyclonically about an axis vertical to the earth's surface. Vorticity has three elements-magnitude, direction and the sense of rotation. Rotation in the same sense as the earth's rotation-cyclonic in the northern hemisphere — is defined as positive. Cyclonic vorticity may

result from cyclonic curvature of the streamlines, from cyclonic shear, or a combination of the two. Anticyclonic vorticity occurs with the corresponding anticyclonic situation. The component of vorticity about a vertical axis is referred to as the vertical vorticity. This is generally the most important, but near the ground surface frictional shear causes vorticity about an axis parallel to the surface and normal to the wind direction.

Vorticity is related not only to air motion about a cyclone or anticyclone (relative vorticity), but also to the location of that system on the rotating earth. The vertical component consists of the relative vorticity and the latitudinal value of the Coriolis parameter. At the equator the local vertical is at right angles to the earth's axis, at the north pole cyclonic relative vorticity and the earth's rotation acting in the same sense.

Задание 2. Переведите предложения, содержащие сказуемые с модальными глаголами.

1. An air mass may be heated from below.
2. Similarly, but in reverse, it can be cooled from below.
3. Changes must also occur through increased evaporation.
4. Heating from below may be spread rapidly.
5. The abstraction of moisture by condensation or precipitation can also cause changes.
6. Large-scale lifting may result from forced ascent by a mountain barrier.
7. Horizontal inflow or outflow near the surface has to be compensated.
8. Evapotranspiration losses from natural surfaces cannot be measured directly.
9. The speed has to be corrected because the instrument is not at the standard height.

Задание 3. Переведите предложения, учитывая функцию причастий (определение, обстоятельство, часть сказуемого).

1. Convergence occurs when there is a net accumulation of air in a limited sector.
2. Vertical motion is extremely slow compared with convective and downdraught currents.
3. The air within a depression can be regarded as comprising an infinite number of small air parcels.
4. These are the horizontal flow patterns producing divergence and convergence.

5. Anticyclonic vorticity occurs with the corresponding anticyclonic situation.

6. The tropical sources are maritime, originating in the oceanic subtropical high-pressure cells.

7. The maritime type is characterized by high temperatures accentuated by the warming action to which the descending air is subjected.

Задание 4. *Укажите в тексте предложения, содержащие независимый причастный оборот, определите его местонахождение. Предложения переведите.*

Задание 5. Ответьте на вопросы.

1. When does convergence occur?
2. What does vorticity imply?
3. What elements has vorticity?

ТЕКСТ 3. *ATMOSPHERIC MOTION*

Задание 1. Прочтите и устно переведите текст, предварительно повторив формы и функции инфинитива.

The atmosphere acts somewhat in the same way as a gigantic heat engine in which the constantly maintained difference in temperature existing between the poles and the equator provides the energy supply necessary to drive the planetary atmospheric circulation. The conversion of the heat energy into kinetic energy to produce motion must involve rising and descending air, but vertical movements are generally much less than horizontal ones, which may cover vast areas and persist for periods of a few days to several months.

The downward-acting gravitational field of the earth sets up the observed decrease of pressure away from the earth's surface that is represented in the vertical distribution of atmospheric mass. This mutual balance between the force of gravity and the vertical pressure gradient is referred to as hydrostatic equilibrium. This state of balance, together with the general stability of the atmosphere and its shallow depth, greatly limits vertical air motion.

There are four controls on the horizontal movement of air near the earth's surface: pressure gradient force, Coriolis force, centripetal acceleration and frictional forces. The primary cause of air movement is the development of a horizontal pressure gradient and the fact that such a gradient can persist results from the effect of the earth's rotation in giving rise to the Coriolis force.

The pressure gradient force has vertical and horizontal components but the vertical component is more or less in balance with the force of gravity. Horizontal differences in pressure can be due to thermal or mechanical causes, and these differences control the horizontal movement of an air mass. The pressure gradient serves as the motivating force which causes the movement of air away from areas of high pressure and towards areas where it is lower.

The Coriolis force arises from the fact that the movement of masses over the earth's surface is usually referred to a moving co-ordinate system. The simplest way to begin to visualize the manner in which this deflecting force operates is to picture a rotating dics on which moving objects are deflected. Every object follows a straight path in relation to a fixed frame of reference, but viewed relative to co-ordinates rotating with the disc the objects swing to the right of its initial line of motion. This effect is readily demonstrated if a pencil line is drawn across a white disc on a rotating turntable. In the analogous case of the rotating earth there is apparent deflection of moving objects to the right of their line of motion in the northern hemisphere and to the left in the sounthern hemisphere, as viewed by observers on the earth. The Coriolis force always acts at right angles to the direction of the air motion to the right in the northern hemisphere and to the left in the sounthern hemisphere.

Задание 2. Выберите подходящие по смыслу слова из предлагаемых в скобках вариантов. Предложения переведите.

1. The conversion of the heat energy into kinetic must involve rising and descending (area/air/axis).
2. This mutual (balance/base/barrier) between the force of gravity and the vertical pressure gradient is hydrostatic equilibrium.
3. Horizontal differences in pressure can be due to thermal or mechanical (centres/causes).
4. The primary cause of air movement is the (development/decrease/depth) of a horizontal pressure gradient.
5. The atmosphere acts in the same manner as a gigantic heat (equator/engine/energy).

Задание 3. Переведите предложния, учитывая функцию инфинитива.

1. The equator provides the energy supply necessary to drive the planetary atmospheric circulation.

2. The conversion of heat energy into kinetic energy to produce motion must involve rising and descending air.

3. The simplest way to begin to visualize the manner in which this deflecting force operates is to picture a rotating disc on which moving objects are defecting.

4. The distribution of the physical properties of air masses has been shown to be considerably modified.

5. A wind vane to indicate direction should be free from friction.

6. The higher the wind speed the greater the current generated, and the meter is marked to show the wind speed in knots.

7. Admiral Beaufort devised a scale to decribe the effect of various wind strengths.

8. The effect of the wind on the surface of the sea was also used by sailors to estimate the wind strength.

Задание 4. Найдите в тексте предложения, которые являются ответами на вопросы.

1. What limits the vertical air motion?
2. What is the primary cause of air movement?
3. What components has the pressure gradient force?
4. How does the Coriolis force act?

ТЕКСТ 4. *LAND AND SEA BREEZES*

Задание 1. Устно переведите текст, предварительно повторив формы и функции герундия в предложениях, значения «-ing forms».

Another type of air movement is the land and sea breeze. The vertical expansion of the air column occuring daily during the hours of heating over the more rapidly heated land tilts the isobaric surfaces downwards at the coast, causing onshore winds at the surface and a compensating offshore movement aloft. At night the air over the sea is warmer and the situation is reversed, although much of this reversal is often the effect of downslope winds blowing off the land. The advancing cool sea air may form a distinct line (or front) marked by cumulus cloud development, behind which there is a distinct wind velocity maximum. This often develops in summer, for example, along the Gulf Coast of Texas. On a smaller scale such features can also be observed in Britain, particularly along the south and east coasts. The sea breeze has a depth of about 1 km (3300 ft), although it thins towards

the advancing edge, and may penetrate 50 km (30 miles) in land. Typical wind speeds in such sea breezes are 4—7 m sec^{-1}, although these may be greatly increased where a well-marked low-level temperature inversion produces a «Venturi effect» in constricting and accelerating the flow. The much shallower land breezes are usually only about 2 m sec^{-1}. The counter currents aloft are generally less evident and may be obscured by the regional airflow, but recent work along the Oregon coast has suggested that under certain conditions this upper return flow may be very closely related to the lower sea breeze conditions, even to the extent of mirroring the surges in the latter. It is worth noting that in middle latitudes the Coriolis deflection causes turning of a well-developed onshore sea breeze (clockwise in the northern hemisphere) so that eventually it may blow more or less parallel to the shore. Analogous «lake breeze» systems develop adjacent to large inland water bodies such as the Great Lakes.

Задание 2. Переведите предложения, учитывая различные употребления «-ing forms».

1. It is worth n o t i n g that in the middle latitudes the Coriolis deflection causes t u r n i n g of a well developed onshore sea breeze.

2. The a d v a n c i n g cool sea air may form a front.

3. The vertical expansion of the air column o c c u r i n g daily during the hours of h e a t i n g, tilts the isobaric surfaces.

4. At night the air over the sea is warmer because of the downslope winds blowing off the land.

5. A broad g r o u p i n g can be made according to the mechanism of vertical motion.

6. The stability produced by the effect of surface c o o l i n g prevents vertical m i x i n g so that further c o o l i n g occurs more slowly.

7. If an air parcel is impelled downwards it will become colder than its s u r r o u n d i n g s.

8. A well-marked low-level temperature inversion produces a «Venturi effect» in c o n s t r i c t i n g and a c c e l e r a t i n g the flow.

9. Programs aimed at i n c r e a s i n g winter snowfall by s e e d i n g cyclonic storms regard the rain- (or s n o w-) m a k i n g as routine operations.

10. Eventually the mixing and modification necessarily accompanying the air mass movement will cause the rate of energy exchange with surrounding to diminish.

11. This convection is due to the c o o l i n g of the fog top by radiation into space.

ТЕКСТ 5. *SMOG*

Задание 1. Прочтите и устно переведите текст, повторив предварительно значения глаголов «should», «would».

In 1953 a special committee reported to parliament that the «smog» which covered Greater London in the five days 5 to 9 December 1952 resulted in some 4,000 deaths. There have been other disastrous smogs before and since then, in London, Glasgow and near Pittsburgh. We* are particularly subject to them in Britain. What is smog how does it kill and what are we doing about it?

Suppose the Science Museum had managed to keep a roomful of the very bad London fog as a specimen, of volume 100 m^3. The air and suspended matter would weigh about 100 kg (2 cwt). To this the water droplets would contribute only about 100 g, but the water vapour would weigh more, about 650 g. Ordinary air contains some carbon dioxide, but this room would contain perhaps ten times the normal amount, say 400 g, largely the product of combustion of fuel. Other combustion products would be 15 g of carbon monoxide, 0,3 g of smoke, 0,3 g of sulphur dioxide and (dissolved in the fog droplets) 0,02 g of hydrochloric acid and 0,002 g of fluorine.

Only the amounts of smoke and sulphur dioxide are taken from measurements made at that time; the others have been calculated. In addition there may have been chemical changes in the more reactive materials of the smog, particularly the formation of sulphur acid dissolved in fog droplets or attached to smoke particles. One calculation suggests that there might have been nearly 0,5 g of sulphuric acid dissolved in droplets in the specimen room.

Medical opinion will not decide categorically which of the above constituents was responsible for the 4,000 deaths. This is still an unsolved mystery because none of the poisonous materials was present in what is considered to be a fatal concentration. However, it is fair to say that smoke and sulphur compounds are blamed about equally. Both are poured into

the air at the rate of hundreds of thousands of tons a day in the London area, so much fuel is burnt.

We* get fogs of this type when the pressure distribution is antycyclonic, and when there is a temperature inversion (a layer of the atmosphere in which the temperature in increasing with height) hindering the normal vertical mixing of the air.

If the variation of temperature with height is as shown, there is some mixing below the inversion level, enough to bring flue gases from the tallest chimneys into circulation and to form a fairly well mixed soup for people to breathe. But little of the bad air escapes above the inversion level, and if the winds are light and variable there is small chance of polluted air being blown sideways out of a contaminated area. The sun, which breaks up a morning ground fog, cannot warm the air or the ground beneath the inversion level because its energy is reflected back into space from the white fog top.

The meteorological situation is at present irremediable. To raise the air temperature in London by 1° C an hour, and thus dissipate the fog by heat, would require 3 million megawatts. To pump in fresh air and produce one air-change per day would require a pumping rate of 200 000 tons per minute.

The best we can do to prevent a recurrence of these disasters is to reduce the emission of smoke and other noxious gases at all times and to limit the use of fuels in an emergency. At present the main effort in Britain is towards the elimination of smoke. Since the Clean Air Act many local authorities have established smokeless zones, and the average concentration of smoke over the whole country has been diminishing at a rate of about 7 per cent each year. In London the emission of smoke is claimed to reduce by 60%. The smog of 1962 contained about 1.000 tons of smoke particles. If the same meteorological event happened this winter, she smog would contain «only» 210 tons of smoke.

A. R. Meetham,

National Physical Laboratory,

London.

* WE — здесь переводите как «они».

Задание 2. Переведите предложения, учитывая различные значения глаголов:
«should», «would».

1. If the same meteorological event happened this winter, the smog would contain «only» 210 tons of smoke.
2. Suppose we have a roomful of very bad London fog as a specimen, this room would contain the combustion products: carbon monoxide, smoke, sulphur dioxide, hydrochloric acid and fluorine.
3. To pump in fresh air would require a pumping rate of 200.000 tons per minute.
4. To raise the air temperature in London by 1° C an hour would require 3 million megawatts.
5. It should be noted that wind speed is usually recorded in knots or as a Beaufort force.
6. Had a wave cloud been supercooled and become frozen the ice crystals would not have evaporated.
7. It should be borne in mind that condensation occurs with utmost difficulty in clean air.
8. It was originally thought that atmospheric turbulence by making cloud particles colide would cause a significant proportion to coalesce.
9. Had the air been cooled at constant pressure without addition or removal of vapour saturation would occur.
10. It was also suggested that large drops would grow at the expense of small ones.

Задание 3. Найдите в тексте предложения, содержащие придаточные условные предложения, сослагательное наклонение.

Задание 4. Ответьте на вопросы.

1. What can be done to prevent smoke in London?
2. What meteorological situation favours this disastrous type of fog?
3. What efforts are done to eliminate smog?

КОНТРОЛЬНАЯ РАБОТА № 1

Вариант 1

ТЕКСТ 6. *STRATUS*

Задание. Переведите текст письменно.

Stratus is the name given to layers of cloud which show no internal structure either like cumulus or cirrus. Fog is a

form of stratus, but it usually has a lumpy structure caused by convection. This convection is due to the cooling of the fog top by radiation into space, this producing convection just as effectively as heating at the bottom. Fog is usually formed by the cooling of the air by contact with, or close proximity to, the ground which has become cold by radiation into space. Such stratus is thus not formed by lifting the air.

Layers of stratus can be formed by a slow uniform lifting of the air over a large area. Thin stratus layers do not remain formless for long, but soon break up into cloudlets perhaps because of the convection due to the heat lost from the top and they are then usually called strato-cumulus, or alto-cumulus if the layer is higher above the ground so that the cloudlets look smaller. Some such layers are called cirrocumulus, but they are in fact not fibrous convection clouds but alto-castellanus at the same level as a fibrous cloud, indicating that they will soon freeze and become fibrous.

Ice stratus is a formless layer of ice-crystal cloud which is usually very deep, but very tenuous. This is the cloud in which haloes are well formed. The particles falling into warmer air and melting or the cloud being initially composed of water droplets so that it is more dense otherwise it would evaporate, the sun is gradually obscured and haloes disappear.

Вариант 2

ТЕКСТ 7. *THE OCCLUSION*

Задание. Переведите письменно текст.

Occlusions are classified as either cold or warm, the difference depending on the relative states of the cold air masses lying in front and to the rear of the warm sector. If the air is colder than the air following it then the occlusion is warm, but if the reverse is so (which is more likely over the British Isles) it is termed a cold occlusion. The air in advance of the depression is most likely to be coldest when depressions occlude over Europe in winter and very cold Polar air is affecting the continent.

The line of the warm air wedge aloft is associated with a zone of layered cloud (similar to that found with a warm front) and often of precipitation. Hence its position is indicated separately on some weather maps and it is referred to by Canadian meteorologists as a trowal* (trough of warm

air aloft). The passage of an occluded front and trowal brings a change back to polar airmass weather.

The occurrence of frontolysis (frontal decay) is necessarly linked with occlusion, although it represents the final phase of front's existence. Differences no longer existing between adjacent air masses, decay occurs.

This may arise in four ways: through their mutual stagnation over a similar surface, as a result of both air masses moving on parallel tracks at the same speed, as a result of their movement in succession along the same track at the same speed, or by the system incorporating into itself air of the same temperature.

* trowal =throwell.

КОНТРОЛЬНАЯ РАБОТА № 2

Вариант 1

ТЕКСТ 8. *LOCAL WINDS*

Задание. Переведите письменно текст.

To the practising meteorologist the special controls over air movement produced by local conditions is likely to provide many problems. Diurnal tendencies are superimposed upon both the large and small-scale patterns of wind velocity.

In normal conditions there is a general tendency for wind velocities to be least about dawn, at that time there is little vercal thermal mixing, the lower air not influencing the velocity of the more freely moving upper air. Conversely velocities of some local winds are greatest between 1300 and 1400 hours, for this is the time when the air suffers its greatest tendency to move vertically due to terrestrial heating, allowing it, subject to surface frictional effects to join in the freer upper-air movement. Upper air always moves more freely than air at surface levels because it is not subject to the retarding effects of friction and obstruction.

Terrain irregularities produce special meteorological conditions of their own. During warm afternoons the laterally constricted but vertically expanding air tends to blow up the valley axis. Such winds, termed valley winds, are known to be light and to require a weak regional pressure gradient in order to develop. This flow along the main valley develops

more or less simultaneously with anabatic winds which result from greater heating of the valley sides compared with the valley floor. These slope winds rise above the ridge line and feed an upper return current along the line of the valley to compensate for valley wind.

Вариант 2

ТЕКСТ 9. *WIND OBSERVATIONS*

Задание. Переведите текст письменно.

Sailors have always been interested in the wind and in this century they have been joined by the airmen: with the growth of glider and dinghy — sailing clubs, people who would otherwise have no cause to be interested in meteorology have become skilled in estimating wind force. Most dinghy owners know roughly the highest Beaufort force of wind in which they have sailed.

Meteorologists require wind observations at the surface and in the atmosphere in order to draw their synoptic charts; regular observations assisting the forecaster to detect approaching weather-systems. Observations made over a long period of years enable meteorologists to provide information for farming, industry and public services. For farming, prevailing winds over the years have been used for designing farm buildings in exposed areas, for planting shelter-belts to protect crops and for the study of evaporation, which is chiefly dependent on the wind. Discharge of gases and smoke particles from industrial chimneys can be controlled so as to produce the minimum local air-pollution by avoiding conditions of light winds and temperature inversions, both at certain times of the day and under certain weather conditions. New methods of constuction have been used to erect blocks of offices and flats to far greater heights than previously, and new calculations have been necessary to estimate the average and extreme wind forces to be expected locally.

ТЕКСТ 10. *ADIABATIC TEMPERATURE CHANGES*

Задание 1. Прочтите и устно переведите текст, учитывая различные функции причастий.

The displacement of an air parcel to an environment of lower pressure (without heat exchange with surrounding air)

causes an increase in its volume and a consequent lowering of its temperature. A volume increase involves work and the consumption of energy, thus reducing the heat available per unit volume and hence the temperature. Such a temperature change, involving no subtraction or addition of heat, is termed adiabatic. Vertical displacements of air are obviously a major cause of adiabatic temperature changes.

Near the earth's surface most processes of change are non-adiabatic (sometimes termed diabatic) because of the tendency of air to mix and modify its characteristics by lateral movement, turbulence and related physical processes. When a parcel of air is moving vertically the changes that take place often follow an adiabatic pattern because air is fundamentally a poor thermal conductor, and the air parcel as a whole tends to retain its own thermal identity which distinguishes it from the surrounding air masses. In some circumstances, on the other hand, mixing of air with its surroundings must be taken into account.

The rate at which temperature decreases in a rising, expanding air parcel is called the adiabatic lapse rate. If the upward movement of air does not produce condensation then the energy expended by expansion will cause the temperature of the mass to fall at what is called the dry adiabatic lapse rate. However, prolonged reduction of the temperature invariably produces condensation, and when this happens latent heat is liberated, counteracting the dry adiabatic temperature decrease to a certain extent. It is therefore a distinguishing feature of rising and saturated (or precipitating) air that it cools at a slower rate (i. e. the saturated adiabatic lapse rate) than air which is unsaturated. Another difference between the dry and saturated adiabatic rates is that whereas the former remains constant the latter varies with temperature. This is because air masses at higher temperatures are able to hold more moisture and on condensation therefore to release a greater quantity of latent heat. For high temperatures the saturated adiabatic lapse rate may be as low as 4° C/km, but this rate increases with decreasing temperatures, approaching 9° C/km.

In all, three different lapse rates can be differentiated, two dynamic and one static. There is environmental (or static) rate, which is the actual temperature decrease with height on any occasion, such as on observer ascending with a balloon would record. This is an adiabatic rate therefore and may assume any form depending on local air temperature conditions.

There are also the dynamic adiabatic dry and saturated lapse rates (or cooling rates) which apply to rising parcels of air moving through their environment. Close to the surface the vertical temperature gradient sometimes greatly exceeds the dry adiabatic lapse rate, that is, it is superdiabatic. This is particularly common in arid areas in summer. Over most ordinary dry surfaces the lapse rate approaches the dry adiabatic value at an elevation of 100 m or so.

The changing properties of moving air parcels can be conveniently expressed by plotting them as path curves on suitably constructed graphs.

Задание 2. Не прибегая к помощи словаря, постарайтесь понять значение слов, имеющих сходный по звучанию корень в английском и русском языках.

temperature, energy, adiabatic, vertical, non-adiabatic, process, characteristics, turbulence, prolonged, condensation, latent, to differentiate, dynamic, static, actual, local, form.

Задание 3. Выпишите из текста английские эквиваленты следующих русских словосочетаний:

вертикальное перемещение воздуха ..., тенденция воздуха к перемещению ..., связанные физические процессы ..., окружающие воздушные массы ..., расширяющийся объем воздуха ..., восходящее движение воздуха ..., длительное снижение температуры, фактическое уменьшение температуры, фактическое уменьшение температуры ..., местный температурный режим воздуха ....

Задание 4. Определите форму причастий (Participle I Active, Participle I Passive Participle II).

surrounded, surrounding, being surrounded;
involving, being involved, involved;
decreased, being decreased, decreasing.

Задание 5. Дайте эквиваленты русских причастий в скобках, используя глаголы данные справа, затем переведите сочетания на русский язык.

1. masses (нагретые) by radiation, radiation (нагревающая) the volume, (нагреваясь) the volume rises; 2. heat exchange with (окружающим) air, air parcel (окруженный) by cold masses; 3. the (меняющиеся) properties of the air, the (изменившиеся) properties of the air.

to surround
to heat
to change

Задание 6. Объедините два предложения в одно, используя Participle II в качестве определения по образцу.

Образец. Such winds are t e r m e d valley winds. They are generally very light. — Such winds t e r m e d valley winds are generally very light.

1. The continental type is r e s t r i c t e d mainly to North Africa. It is warm and dry. 2. This block is t e r m e d lysimeter. It is weighed regularly. 3. The amounts of smoke and sulphur dioxide are t a k e n at once. They are calculated.

Задание 7. Преобразуйте сложные предложения с придаточным обстоятельственным в простое предложение с причастным оборотом.

Образец: When ice crystals are formed, they grow rapidly. — When formed ice crystals grow rapidly.

1. When evaporation from oceans, lakes and moisture transpired from plants are taken together, they are often referred to as evapotranspiration. 2. When the water is converted into ice, its composition is not changed. 3. When these patterns are seen on satellite photographs, they are cellular, with a typical diameter of 30 km.

Задание 8. Определите функцию подчеркнутого причастия (определение, обстоятельство, часть сказуемого), предложения переведите.

1. A volume increase invoives work and the consumption of energy, thus r e d u c i n g the heat. 2. P r o l o n g e d reduction of the temperature produces condensation. 3. Latent heat is l i b e r a t e d, c o u n t e r a c t i n g the dry adiabatic temperature decrease. 4. The maritime type is c h a r a c t e r i z e d by high temperatures a c c e n t u a t e d by the w a r m i n g action to which the d e s c e n d i n g air is s u b j e c t e d. 5. There is a temperature inversion — a layer of the atmosphere in which the temperature is i n c r e a s i n g with the layer to have the same condensation level. 7. The cloud has an arched top and a flat base. 8. When falling, rain is evaporated into the air. 9. Stratus is the name given to layers of clouds which show no internal structure.

ТЕКСТ 11. *CONDENSATION*

Задание 1. Прочтите и устно переведите текст, обращая внимание на употребление причастий, «-ing» форм и пассивных конструкций.

Condensation, the direct cause of all the various forms of precipitation, occurs under varying conditions which in one

way or another are associated with change in one of the linked parameters of air volume, temperature, pressure or humidity. Thus, condensation takes place (i) when the temperature of the air is reduced but its volume remains constant and the air is cooled to dew point; (ii) if the volume of the air is increased without addition of heat; this cooling takes place because adiabatic expansion causes energy to be consumed through work, or (iii) when a joint change of temperature and volume reduces the moistureholding capacity of the air below its existing moisture content. The key to the understanding of condensation clearly lies in the fine balance existing between these variables. Whenever the balance between one or more of them is distributed beyond a certain limit condensation may result. The most common circumstances for condensation producing are those producing a drop in air temperature; namely contact cooling, mixing of air masses of different temperatures and dynamic cooling of the atmosphere. Contact cooling is produced, for example, within warm, moist air passing over a cold land surface. On a clear winter night strong radiation will cool the surface very quickly and this surface cooling will gradually extend to the moist lower air, reducing the temperature to a point where condensation occurs in the form of dew, fog or frost, depending on the amount of moisture involved, the thickness of the cooling air layer and the dew-point value. The latter being below 0° C, it is referred to as the hoar frost-point if the air is saturated with respect to ice. The mixing of the differing layers within a single air mass or of two differing air masses can also produce condensation. Undoubtedly the most effective cause of condensation, however, is the dynamic process of adiabatic cooling.

Задание 2. Дайте эквиваленты русских причастий в скобках, образуя их от следующих глаголов:

to cool (охлаждающий, охлажденный, охлаждая),

to pass (проходящий, прошедший, проходя),

to saturate (насыщающий, насыщенный, насыщая),

to exist (существующий, существуя, существовавший).

Задание 3. Переведите следующие предложения, принимая во внимание, что суффикс -«ing» служит для образования как причастия, так и существительного.

1. Snow occurs when the freezing level is below 300 m.
2. Accretion forms a casing of clear ice around the pellet.

3. This energy is generally provided by the removal of heat from the immediate surroundings causing an apparent heat loss.

4. The mixing of the differing layers within a single air mass can also produce condensation.

5. The maximum velocity occurs just before sunrise at the time of the maximum diurnal cooling.

6. The displacement of an air parcel causes an increase in its volume and a consequent lowering of its temperature.

7. Such a temperature change, involving no subtraction or addition of heat, is termed adiabatic.

Задание 4. Преобразуйте сложно-подчиненные предложения, используя независимый причастный оборот по образцу. Предложения переведите.

Образец: When the temperature of the air is reduced, condensation takes place. — The temperature of the air reducing, condensation takes place.

1. When the temperature of the air decreases, the air is cooled to the dew point. 2. As differences no longer exist between air masses, decay occurs. 3. Since the air temperature at the surface is about 1,5° C, mixed snow and rain is possible. 4. If there is a net accumulation of air in a limited sector, convergence takes place. 5. When several cloud layers are present in the atmosphere, natural seeding may be important.

Задание 5. Соедините два предложения в одно, используя независимый причастный оборот по образцу. Предложения переведите.

Образец. Three different lapse-rates can be differentiated. Two are dynamic and one static. — Three different lapse-rates can be differentiated, two being dynamic and one static.

1. The air can be regarded as an infinite number of small air parcels. Each rotates cyclonically about an axis. 2. Only six per cent of the annual precipitation of Arizona is of local origin. The remainder is transported into this area. 3. The pressure gradient force has vertical and horizontal components. The former is more or less in balance with the force of gravity. 4. Occlusions are classified as cold or warm. The difference depends on the relative states of air masses.

Задание 6. Переведите предложения, содержащие независимый причастный оборот, учитывая его место в предложении.

1. The air being warm and moist at the surface, stratiform cloud commonly develops. 2. In summer warming of the lower layers generates a steep lapse rate, the low relative and specific humidity preventing the cloud development and precipitation. 3. The air moving downslopes into an open valley, a «mountain wind» develops simultaneously along the axis of the valley. 4. There being warm afternoons, the laterally constricted but vertically expanding air tends to blow up the valley axis. 5. The wave form remains more or less stationary relative to the barrier, the air moving quite rapidly through it. 6. The air being colder than the air following it, the occlusion is warm.

ТЕКСТ 12. *EVAPORATION*

Задание 1. Прочтите и устно переведите текст, обращая внимание на употребление герундия в различных функциях.

It's worth noting that evaporation occurs whenever energy is transported to an evaporating surface if the vapour pressure in the air is below the saturated value. The saturation vapour pressure increases with temperature. The change in state from liquid to vapour requires energy to be expended in overcoming the intermolecular attraction of the water particles. This energy is generally provided by removing heat from the immediate surroundings causing an apparent heat loss (latent heat), and a consequent drop in temperature. The latent heat of vaporization to evaporate 1 g of water at 0° C is 600 calories. Conversely, condensation releases this heat, and the temperature of an air mass in which condensation is occuring is increased as the water vapour reverts to the liquid state. The diurnal range of temperature is often moderated by damp air condition, when evaporation takes place during the day and condensation at night.

Viewed another way, evaporation implies an addition of kinetic energy individual water molecules and, as their velocity increases, so the chance of individual surface molecules escaping into the atmosphere becomes greater. As the faster molecules will generally be the first to escape, so the everage energy (and therefore temperature) of those composing the remaining liquid will decrease and the quantities of energy required for their continued release become correspondingly greater. In this way evaporation decreases the temperature of

the remaining liquid by an amount proportional to the latent heat of vaporation.

The rate of vaporizing depends on a number of factors. The two most important are the difference between the saturation vapour pressure at the water surface and the vapour pressure of the air, and the existence of a continual supply of energy to the surface. Wind velocity can also affect the evaporation rate because the wind is generally associated with the importation of fresh, unsaturated air which will absorb the available moisture.

Задание 2. Переведите словосочетания, учитывая правило «цепочки существительных».

1. Vapour pressure..., saturation vapour pressure...; 2. Water particles..., water particles attraction...; 3. Temperature drop..., temperature drop increase...; 4. Air mass temperature..., air mass temperature increase....

Задание 3. Сравните перевод глагольных форм Gerund Indefinite Active, Gerund Indefinite Passive.

It's worth noting... — it's worth being noted...; it's provided on removing... — it's provided on being removed...; they enter by bursting... — they enter by being bursted...; it prevents from heating... — it prevents from being heated...; he objected reading... — he objected to being read...

Задание 4. Образуйте герундий, выбрав соответственно глагол справа. Предложения переведите.

1. Sea salts enter the atmosphere by (разрывая) the air bubbles.
2. Energy is required in (для преодоления) intermolecular attraction.
3. The rate of (испарения) depends on a number of factors.
4. This is of importance in (понимания) the behaviour of upper winds.
5. These forces prevent air from (прохождение) directly across the isobars.
6. (Нагревание) from below acts to increase air-mass instability.
7. Penman succeeded in (выразить) evaporation losses in terms of four meteorological elements.
8. For this purpose he suggested (определить) a convective condensation level.

to vaporize
to burst
to overcome
to understand
to define
to express
to heat
to move

Задание 5. Переведите предложения, учитывая различные функции герундия.

1. Theoretical methods for determining evaporation rates have followed two lines of approach. 2. Fog or low stratus with drizzle result from air mass mixing or warm advection. 3. Experimenting with a tephigram shows that the convective condensation level rises. 4. This method is generally satisfactory for routine forecasting. 5. Vertical mixing has the effect of averaging these conditions through the layer affected. 6. Show occurs when the aggregations of ice crystals do not have time to melt before reaching the ground.

Задание 6. Преобразуйте сложно-подчиненные предложения в простое с герундиальным оборотом. Предложения переведите.

Образец. When we convert water into ice we do not change its composition. — On (in) converting water into ice we do not change its composition.

1. When minute ice crystals have formed they grow rapidly by deposition from vapour. 2. When we subject air to very great pressure and cooling it is possible to transform it to the liquid state. 3. When sea salts burst the air bubbles they enter the atmosphere.

Задание 7. Переведите следующие предложения, учитывая, что суффикс «-ing» служит для образования как герундия, так и существительного.

1. Hailstones may fall considerable distances without melting. 2. The key to the understanding of condensation lies in the fine balance between these variables. 3. The depression usually achieves its maximum intensity 12—24 hours after the beginning of occlusion. 4. Anabatic winds result from greater heating of the valley sides compared with the valley floor. 5. The sky may clear very abruptly even before the passing of the surface cold front. 6. A drop of 1 mm radius falls 42 km before evaporating. 7. Typical wind speeds may be increased where low-level temperature inversion produces a «Venturi effect» in constricting and accelerating the floor. 8. The freezing of supercooled water drops may also produce ice splinters.

ТЕКСТ 13. *CONDENSATION NUCLEI*

Задание 1. Прочтите и устно переведите текст, учитывая различные функции инфинитива.

We know condensation to occur with the utmost difficulty in clean air; moisture must generally find a suitable surface upon which it can condense. If pure air is reduced in temperature below its dew point it becomes supersaturated (i. e. relative humidity exceeding 100%). To maintain a pure water drop of radius 10^{-7} cm requires a relative humidity of 320%.

Usually condensation occurs on a foreign surface which can be a land or plant surface, as is the case for dew or frost, while in the free air condensation begins around so-called hydroscopic nuclei. These particles are known to be dust, smoke, sulphur dioxide, salts (NaCl) or similar microscopic substances, the surfaces of which have the property of wettability. Moreover, hydroscopic aerosols are soluble. This is very important since the saturation vapour pressure is less over a solution droplet (for example, sodium chloride or sulphuric acid) than over a pure water drop of the same size and temperature. Indeed, condensation begins on hygroscopic particles before the air is saturated; in the case of sodium chloride nuclei at 78% relative humidity. Sea salts, being particularly hydroscopic, enter the atmosphere principally by bursting the air bubbles, fine soil particles and chemical combustion products raised by the wind being equally important sources nuclei. On average, oceanic air contains one million condensation nuclei per litre (thousand cm^3) and land air holds some 5 or 6 million.

The process of growth of water droplets is far from simple and much remains to be explained. In the early stages small drops grow more quickly than large ones, but, as the size of a droplet increases its growth rate by condensation decreases. The radial growth rate obviously slows down as the drop size increases because there is an increasingly greater surface area to add to with every increment of radius. However, the condensation rate is limited by the speed with which the released latent heat can be lost from the drop by conduction to the air and this heat reduces the vapour gradient. Moreover competition between droplets for the available moisture increasingly tends to reduce the degree of supersaturation.

The gradual process of condensation is inadequate to explain the rates of formation of raindrops which are often observed. For example in most clouds precipitation develops within an hour. It must be remembered too that falling raindrops undergo evaporation in the unsaturated air below the cloud base. A droplet of 4,1 mm radius evaporates after fal-

ling only 150 m at temperature of 5° C and 90% relative humidity, but a drop of 1 mm radius would fall 42 km before evaporating cloud-droplets are not likely to be the immediate source of raindrops.

Задание 2. Найдите в тексте английские эквиваленты русских словосочетаний.

...становится перенасыщенным...; ...инородная поверхность...; ...свойство увлажняемости...; ядра конденсации...; ...скорость радиального роста...; ...выделенное скрытое тепло...; ...постепенный процесс конденсации...; ...скорость образования дождевых капель...; непосредственный источник дождевых капель....

Задание 3. Переведите предложения, принимая во внимание различные функции инфинитива.

1. The change in state from liquid to vapour requires energy to be expanded.
2. To maintain a pure water drop of radius 10^{-7} cm requires a relative humidity of 320%.
3. The process of growth of water droplets is far from simple and much remains to be explained.
4. The gradual process of condensation is inadequate to explain the rates of formation of raindrops.
5. The faster molecules will generally be the first to escape.
6. To evaporate 1 g of water at 0° C the latent heat of vaporization is 600 calories.
7. Essentially the method is to measure the percolation through an enclosed block of soil with a vegetation cover.
8. The simplest way to visualize the manner in which this deflecting force operates is to picture a rotating disc on which moving objects are deflected.

Задание 4. Переведите предложения, содержащие объектный и субъектный инфинитивные обороты.

1. We know condensation to occur within the utmost difficulty in clean air.
2. These particles are known to be dust, smoke, salts, etc.
3. Cloud droplets are likely to be the immediate sources of raindrops.
4. Cooling takes place because adiabatic expantion causes energy to be consumed through work.
5. The air in advance of the depression is most likely to be the coldest.
6. The distribution of the physical properties of air masses has been shown to be considerably modified.

7. The origin of freezing nuclei has been the subject of much debate, but we consider fine soil particles to be a major source.

ТЕКСТ 14

Задание. Прочтите текст без помощи словаря и скажите, о чем говорится в нем: о содержании влаги в атмосфере или о видах осадков.

The moisture content of the atmosphere can be measured in a number of ways. The total mass of water in a given volume of air, i. e. the density of the water vapour, is one such measure. This is termed the absolute humidity and is measured in grams per cubic metre. Volumetric measurements are not greatly used in meteorology and more convenient is the mass mixing ratio. This is the mass of water vapour in grams per kilogram of dry air. For most pratical purposes the specific humidity is identical, being the mass of vapour per kilogram of air including its moisture.

ТЕКСТ 15

Задание. Прочтите текст и найдите в нем предложение, в котором сообщается о самых малых величинах влагосодержания.

The bulk of the atmosphere's moisture content is contained below 500 mb (5574 m). It is also apparent that the seasonal effect is most marked in the lowest 3000 m or so, that is below about 700 mb. Over southern Asia during the summer monsoon an air column holds 5—6 cm of precipitable water, compared with less than 1 cm in tropical desert areas. Minimum values of 0,1—0,2 cm occur over high latitudes and continental interiors of the northern hemisphere in winter.

ТЕКСТ 16

Задание. Прочитав текст, скажите, о какой классификации здесь идет речь: типов фронтов или типов облаков.

The great variety of cloud forms necessitates a classification for purposes of weather reporting. The internationally adopted system is based upon (a) the general shape, structure and vertical extent of the clouds, and (b) its altitude.

These primary characteristics are used to define the ten basic groups. High cirriform cloud is composed of ice crystals giving a generally fibrous appearance. Stratiform clouds are layer-shaped, while cumuliform ones have a heaped appearance and usually show progressive vertical development. Other prefixes are alto for middle level (medium) clouds and nimbo- for low cloud of considerable thickness, which appear dark grey and from which continuous rain is falling.

The height of the cloud base may show a considerable range for any of these types and varies with latitude.

ТЕКСТ 17

Задание. Прочтите текст и ответьте на вопрос, в каком случае имеют место сильные ливни с грозами.

The weather conditions observed at cold fronts are equally variable, depending upon the stability of the warm sector air and the vertical motion relative to the frontal zone. The classical cold-front model is of the ana-type, and the cloud is usually cumulo-nimbus. Over the British Isles air in the warm sector is rarely instable, so that nimbostratus occurs more frequently at the cold front. With the kata-cold front the cloud is generally stratocumulus and precipitation is light. With ana-cold fronts there are usually brief, heavy downpours sometimes accompanied by thunder. The steep slope of the cold front, roughly 2°, means that the bad weather is of shorter duration than at the warm front. With the passage of the cold front the wind veers sharply, pressure begins to rise and temperature falls. The sky may clear very abruptly, even before the passage of the surface cold front in some cases, although with kata-cold fronts the changes are altogether more gradual.

ТЕКСТ 18

Задание. Просмотрите текст и скажите: какие виды осадков упоминаются в нем.

Rain has been discussed at length because it is the most common form of precipitation. Snow occurs when the freezing level is so near the surface that aggregations of ice crystals do not have time to melt before reaching the ground. Generally this means that the freezing level must be below 300 m. Mixed snow and rain («sleet» in British usage) is especially

likely when the air temperature at the surface is about 1.5° C. Snow rarely occurs with an air temperature exceeding 4° C.

Soft hail pellets (roughly spherical, opaque grains of ice with much enclosed air) occur when the Bergeron process operates in a cloud with a small liquid water content and ice particles grow mainly by deposition of water vapour. Limited accretion of small super-cooled droplets forms an aggregate of soft, opaque ice particles 1 mm or so in radius. Showers of such pellets are quite common in winter and spring from cumulonimbus clouds.

ТЕКСТ 19

Задание. Прочитав текст, скажите: как увеличивается концентрация озона в атмосфере.

The ozone concentration in the earth's atmosphere increases vertically, reaching a maximum in a layer which may lie between heights of about 12 and 22 mi, depending on time and latitude. The amount of ozone in any vertical column in the atmosphere varies with changes in the atmospheric circulation. Hence, measurements of the distribution and variations of ozone at the surface and in the lower levels of the atmosphere provide clues to the vertical and horizontal motions of the lower stratosphere. Moreover, ozone is thought to be responsible for the large annual temperature variation in the stratosphere above the polar regions.

Задания и контрольные работы
для студентов, изучающих английский язык.

Специальности: метеорология, экономика природопользования, геоэкология

Курсы II, III

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