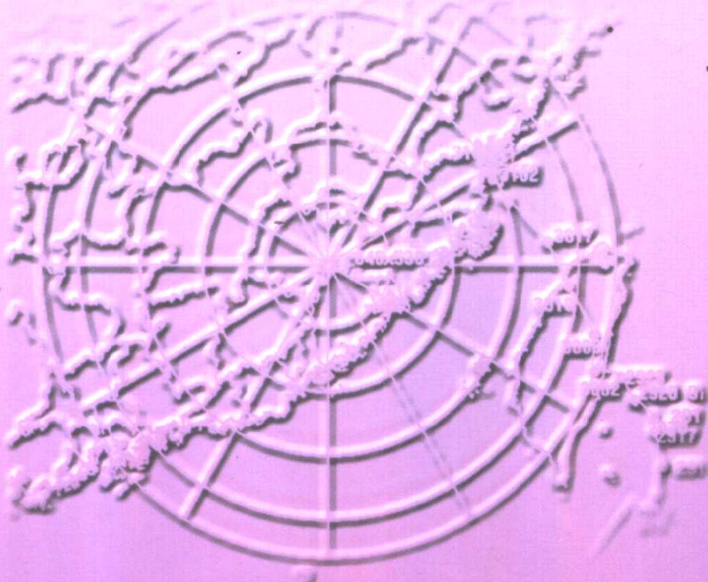
气象科技英语教程

THE COURSE OF ENGLISH FOR METEOROLOGICAL SCIENCE AND TECHNOLOGY

寿绍文 姚永红 编



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内容简介

科技英语是描述科技用语中各种语言现象和特性的一种英语体系，它是用来进行国际科技交流的重要手段。全面的科技英语能力应包括读、写、译、听、说等五个主要方面。本教程主要为气象专业的学生在这五个主要方面训练中提供必要的材料和知识。本书共分三大部分：第一部分为气象科技英语读物，主要训练阅读、翻译和写作能力；第二部分为气象科技英语听说材料，主要训练听说能力；第三部分为科技英语知识，目的是使学生对科技英语特点有较系统的认识。本教程主要是在南京气象学院历届科技英语讲义基础上，参考有关文献并结合作者多年的教学体会编写而成的。

本书可作为高等院校大气科学专业及相关专业学生的教材，也可作为气象、海洋、航空、农林、水利、环境等部门的科研人员和业务人员的参考用书。

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气象科技英语教程

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前　言

科技英语是描述科技用语中各种语言现象和特性的一种英语体系，它是用来进行国际科技交流的重要手段。全面的科技英语能力应包括读、写、译、听、说等五个主要方面。本教程主要为气象专业的学生在这五个主要方面训练中提供必要的材料和知识。

《气象科技英语教程》共分三大部分：

第一部分为气象科技英语读物，是基本的科技英语阅读材料，内容包括各种文体的科技论文，一般都含有不少生词和词组以及长句、难句，主要训练阅读、翻译和写作能力。

第二部分为气象科技英语听说材料，这一部分都是一些篇幅短小、内容浅近、生动有趣的材料，主要训练听说能力。

第三部分为科技英语知识，目的是使学生对科技英语特点有较系统的认识。

由于气象科技英语课程学时有限，一般仅约50学时左右，所以实际的课堂教学以第一部分为主，第二部分仅供课余自学，第三部分也以自学为主，教师可将这一部分的有关内容穿插在基本阅读材料的讲授过程中进行非常简要的介绍。本教程主要是在南京气象学院历届科技英语讲义基础上，参考有关文献并结合我们自己的教学体会编写而成的。在编写过程中得到许多老师多方面的关心、支持、帮助和指教。在此我们对他们表示深切谢意。最后，由于我们水平有限，时间仓促，书中错误和不足之处在所难免，敬请读者批评指正。

编　者

2002年2月

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第一部分　气象科技英语读物

Part one: Reading Materials of English for Meteorological Science and Technology

1. THE STRUCTIRE AND COMPOSITION OF THE ATMOSPHERE

Text

Like a fish in the ocean, man is confined to a very shallow layer of atmosphere. The gaseous envelope of the Earth is physically inhomogeneous in both the vertical and horizontal directions, although the horizontal inhomogeneity is much less marked than the vertical inhomogeneity.

Various criteria have been devised for dividing the atmosphere into layers. This division can be based on the nature of the vertical temperature profile, on the gaseous composition of the air at different altitudes, and the effect of the atmosphere on aircraft at different altitudes, etc. The division based on the variation of the air temperature with altitude is used most commonly in the meteorological literature.

According to a publication of the agrological commission of the World Meteorological Organization (WMO) in 1961, the Earth's atmosphere is divided into five main layers: the troposphere, the stratosphere, the mesosphere, the thermosphere and the exosphere. These layers are bounded by four thin transition regions: the tropopause, the stratopause, the mesopause and the thermopause.

The troposphere is the lower layer of the atmosphere between the Earth's surface and the tropopause. The temperature drops with increasing height in the troposphere, at a mean rate of 6.5°C per kilometer (lapse rate). The upper boundary of the troposphere lies at a height of approximately 8 to 12 km in the polar and middle latitudes and 16 to 18 km in the tropics. In the polar and middle latitudes the troposphere contains about 75% of the total mass of atmospheric air, while in the tropics it contains about 90%. The tropopause is an intermediate layer in which either a temperature inversion or an isothermal temperature distribution is observed.

The stratosphere is the atmospheric layer above the troposphere. In the stratosphere the temperature either increases with height or remains nearly constant. In the lower part of the stratosphere (up to approximately 20 km above the Earth's surface) the temperature is practically constant (about −56°C). While further up the temperature increases with altitude at a rate of about 1°C/km at heights of 20 to 30 km and about 2.8°C/km at altitudes from 32 to 47 km. Under the standard conditions the temperature at the 47 km level is normally $-2.5^{\circ}C$. This increase in temperature with height is due to the absorption of UV solar radiation by ozone molecules. It should be noted that about 99% of the total mass of atmospheric air is concentrated in the troposphere and stratosphere, which extend up to an altitude of 30 or 35 km. The stratopause is an intermediate layer between the stratosphere and the mesosphere (in the altitude region from 47 to 52 km), in which the temperature remains constant at about $0^{\circ}C$.

The mesosphere is an atmospheric layer in which the temperature continuously decreases with height at a rate of about $2.8^{\circ}C/km$ up to about 71 km and at a rate of $2.0^{\circ}C/km$ from 71 to 85 km. At heights of 85 to 95 km the temperature ranges from -85 to $-90^{\circ}C$. The mesopause is an intermediate layer between the mesosphere and the thermosphere (the base of the temperature-inversion region in the thermosphere). Normally the mesopause has an altitude of 85 to 95 km and it is characterized by a constant temperature of about $-86.5^{\circ}C$.

The thermosphere is the atmospheric layer above the mesopause. The temperature in this layer increases with increasing altitude, reaching about 2000 $^{\circ}C$ at about 450 km, the mean height of the upper boundary of the thermosphere. The temperature increase in this layer is mainly caused by the absorption of UV solar radiation by oxygen molecules, which dissociate as a result of this process.

The exosphere is the furthest out and the least studied part of the upper atmosphere. It is located above 450 km altitude. The air density in the exosphere is so low that atoms and molecules can escape from it into interplanetary space.

Finally, along with the above division of the atmosphere, we will also make use of a division based on the extent of atmospheric interaction with the Earth's surface. According to this principle, the atmosphere is usually divided into a so-called boundary layer (sometimes also called the friction layer) and the free atmosphere. The atmospheric boundary layer (up to 1 or 1.5 km) is influenced considerably by the Earth's surface and by eddy-viscosity forces. At the same time, we can neglect, as a first approximation, the influence of eddy-viscosity forces in the free atmosphere.

Of all the above atmospheric layers, only the troposphere (especially its boundary layer) is characterized by a marked instability of the vertical distribution of the meteorological parameters. It is in this layer that both temperature inversions and superadiabatic temperature variations with height are observed.

The Earth's atmosphere is a mixture of gases and aerosols, the latter being the name given to a system comprised of small liquid and solid particles distributed in the air. Air is not a specific gas: rather, it is a mixture of many gases. Some of them, such as nitrogen, oxygen, argon, neon, and so on, may be regarded as permanent atmospheric components that remain in fixed proportions to the total gas volume. Other constituents such as water vapor, carbon dioxide, and ozone vary in quantity from place to place and from time to time.

The principal sources of nitrogen, the most abundant constituent of air, are decaying from agricultural debris, animal matter, and volcanic eruption. On the other side of the ledger, nitrogen is removed from the atmosphere by biological processes involving plants and sea life. To a lesser extent, lightning and high temperature combustion processes convert nitrogen gas to nitrogen compounds that are washed out of the atmosphere by rain or snow. The destruction of nitrogen has in the atmospheres in balance with production.

Oxygen, a gas crucial to life on Earth, has an average residence time in the atmosphere of about 3000 years. It is produced by vegetation that, in the photosynthetic growth process, takes up carbon dioxide and releases oxygen. It is removed from the atmosphere by humans and animals, whose respiratory systems are just the reverse of those of the plant communities. We inhale oxygen and exhale carbon dioxide. Oxygen dissolves in the lakes, rivers and oceans, where it serves to maintain marine organisms. It is also consumed in the process of decay of organic matter and in chemical reactions with many other substances. For example, the rusting of steel involves its oxidation.

From the human point of view, the scarce, highly variable gases are of great importance. The mass of water vapor, that is, H_2O in a gaseous state, in the atmosphere is relatively small and is added to and removed from the atmosphere relatively fast. As a result, the average residence time of water vapor is only 11 days. Water vapor is the source of rain and snow, without which we could not survive. From common experiences it is well known that the water vapor content of air varies a great deal. In a desert region the concentration of water vapor can be so low as to represent only a tiny fraction of the air volume. At the other extreme, in hot, moist air near sea level, say over an equatorial ocean, water vapor may account for as much as perhaps 5 percent of the air volume.

There are large variations of atmospheric water vapor from place to place and from time to time, but the total quantity over the entire Earth is virtually constant.

The same can not be said about carbon dioxide (CO_2). The concentration of this sparse but important gas has been increasing for the last hundred years or so. Carbon dioxide is added to the atmosphere by the decay of plant material and humus in the soil, and by the burning of fossil fuels: coal, oil, and gas. The principal sinks of CO_2 are the oceans and plant life that uses CO_2 in photosynthesis. In the middle 1980s, atmospheric chemists were still debating about the effects on atmospheric CO_2 of burning, harvesting, and clearing of forests. The oceans take up large amounts of CO_2, about half the amount released by fossil fuel combustion. It is expected that this fraction will diminish with the passing decades whereas the total mass of CO_2 released will increase, at least through the early part of the next century. During the 1980s atmospheric CO_2 was accumulating at a rate of about 1 part per million (ppm) of air per year, but it is expected to increase more rapidly in decades to come. In 1983 it averaged about 340 ppm of air.

Ozone (O_3), another important, highly variable gas, occurs mostly at upper altitudes, but it is also found in urban localities having a great deal of industry and automotive traffic and a generous supply of sunshine. In cities such as Los Angeles, ozone concentration may be more than 0. 1 ppm in extreme cases. Most atmospheric ozone concentrations often exceed 1. 0 ppm and may be as large as 10 ppm. They vary greatly with latitude, season, time of day, and weather patterns. The high—altitude ozone layer is maintained by photochemical reactions. The ozone layer is important because, by absorbing UV radiation in the upper atmosphere, it reduces the amount reaching the surface of the Earth. Exposure to increased doses of ultraviolet rays would cause more severe sunburns and increase the risk of skin cancers. Biologists indicate that a substantial increase in UV radiation could also affect other components of the biosphere.

Certain gages, if they exist in sufficiently high concentrations, can be toxic to people, animal and plant life. For example, when ozone occurs in high concentrations, it is toxic to biological organisms. This does not happen often, but in heavily polluted localities such as Los Angeles, ozone near the ground sometimes is sufficiently abundant to cause leaf damage to certain plant species. Very large quantities of potentially hazardous gases are introduced into the atmosphere as a result of human activities. Air pollutants are emitted from furnaces, factories, refineries, and engines, particularly automobile engines. All these things and others like them burn fossil fuels: coal, oil, gasoline, and kerosene. In the process they emit gases and smoke particles that may spend a great deal of time in the atmosphere reacting with other substances and causing the formation of toxic compounds.

The most widespread and potentially hazardous gaseous pollutants are carbon monoxide, sulfur dioxide, nitrogen oxide, and hydrocarbons. The last of these compounds comes from vaporized gasoline and other petroleum products.

New Words

composition *n.* 组成，成分
gaseous *a.* 气体的
inhomogeneous *a.* 不均匀的
horizontal *a.* 水平的
inhomogeneity *n.* 不均匀性
marked *a.* 显著的
criterion (*pl.* criteria) *n.* 判断标准，依据
devise *v.* 设计，发明，想出
profile *n.* 分布，廓线
altitude *n.* 高度
meteorological *a.* 气象的
literature *n.* 文献，著作
aerological *a.* 高空的
WMO (Weather Meteorological Organization) 世界气象组织
troposphere *n.* 对流层
stratosphere *n.* 平流层
mesosphere *n.* 中间层
thermosphere *n.* 热成层
exosphere *n.* 外逸层
transition *n.* 过渡层
tropopause *n.* 对流层顶
stratopause *n.* 平流层顶
mesopause *n.* 中间层顶
thermopause *n.* 热成层顶
lapse rate *n.* 递减率
boundary *n.* 边界
polar *a.* 极的，极地的
latitude *n.* 纬度
tropics *n.* 热带
atmospheric *a.* 大气的
inversion *n.* 逆转，逆增(指温度)，逆温，逆减(指降水量)
isothermal *a.* 等温的
distribution *n.* 分布
absorption *n.* 吸收
ultraviolet (UV) *a.* *n.* 紫外线
ozone *n.* 臭氧
characterize *v.* 表示…的特征，描述
dissociate *v.* 分解
density *n.* 密度
interplanetary *a.* (行)星际的
interaction *n.* 相互作用
friction *n.* 摩擦
eddy-viscosity *n.* 涡动粘滞性
instability *n.* 不稳定度
parameter *n.* 参数
superadiabatic *a.* 超绝热的
aerosol *n.* 气溶胶
nitrogen *n.* 氮
argon *n.* 氩
neon *n.* 氖
component *n.* 成分，分量，部分
constituent *n.* 成分
decay *v.* 分解，腐败
agricultural *a.* 农业的

volcanic *a.* 火山的
debris *n.* 碎片
eruption *n.* 爆发、喷发
ledger *n.* 账本
biological *a.* 生物的
destruction *n.* 破坏,毁灭
residence *n.* 驻留,存在
crucial *a.* 极重要的,决定性的
photosynthetic *a.* 光合的
respiratory *n.* 呼吸的
inhale *v.* 吸入
exhale *v.* 呼出
dissolve *v.* 溶解,分解
marine *a.* 海洋的
organism *n.* 有机体
organic *a.* 有机的,器官的
rust *v.* *n.* 生锈
oxidation *n.* 氧化[作用]
concentration *n.* 浓度
equatorial *a.* 赤道的
virtually *ad.* 实际上
sparse *a.* 稀少的(scarce)
humus *n.* 腐殖质
fossil *n.* 化石
sink *n.* *v.* 汇
debate *v.* 争论,辩论
diminish *v.* 减少,减小
ppm (part per million)百万分之一
toxic *a.* 有毒的
absorber *n.* 吸收体
infrared *n.* *a.* 红外线
emit *v.* 发射
locality *n.* 地区,位置
generous *a.* 丰富的,慷慨的
photochemical *a.* 光化学的
sunbrun *n.* 太阳灼伤
substantial *a.* 显著的,实质的,基本上的
biosphere *n.* 生物圈
pollutant *n.* 污染物
refinery *n.* 提炼厂,炼油厂
smelter *n.* 冶炼厂
gasoline *n.* 汽油
kerosene *n.* 煤油
widespread *a.* 广泛的
potentially *ad.* 潜在的
hazardous *a.* 有危害的
sulfur *n.* 硫
hydrocarbon *n.* 碳氢化合物,烃类
petroleum *n.* 石油