

# 实用 **Practical** Meteorological English 气象英语教程

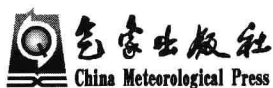
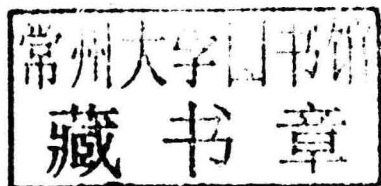
刘 华 周小刚 编著



# 实用气象英语教程

Practical Meteorological English

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## 内容简介

本书是为气象人员提供的英语学习教程。全书共分 12 个单元,1—10 单元是英文气象基础知识材料,11—12 单元含英语天气预报和警报实例。每个单元都包括课文、词汇、注释和练习四个部分。注释包括课文难句的翻译,词法、句法的讲解及例句;课后练习则依据课文内容,由阅读理解、写作和口语练习组成。此外,附录中包括了气象英文科技论文和气象科技论文英文摘要的写作、课文典型例句、总词汇表及练习答案。

本书可作为气象部门在职业务人员的英语培训教材,也可作为高等院校大气科学方向的本科生和研究生的教学参考书,以及广大气象业务、科研人员的专业英语学习参考书。

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### 实用气象英语教程

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# 序 言

对气象部门管理干部、业务技术人员开展外语继续教育和岗位培训,同时对出国进修人员进行英语强化培训,是中国气象局气象干部培训学院的重要工作内容。近年来,学院在教材建设方面取得了长足发展,先后组织编写并出版了《现代气象业务丛书》、《基层台站气象业务系列培训教材》等培训教材。《实用气象英语教程》的出版填补了学院英语培训教材的空缺,是学院教材建设的又一重要成果。

《实用气象英语教程》紧密结合气象业务,内容丰富实用,是作者经多次培训班使用、修改、反复凝练而成的一本气象科技英语培训教材。该书有三个特点:第一,针对性强。该书立足于满足气象在职人员的英语需求,内容涵盖了常见天气、气候现象成因以及卫星和雷达等新技术方法在气象预报中的应用等介绍,同时还增加了如何撰写英文气象科技论文的讲解。第二,实用性强。该书所选择的内容围绕现代气象业务的需要,循序渐进,由浅入深,包括阅读理解、写作、口语三方面的相关练习,对疑难句子给出了详尽的中英文注释,并从英语语法角度作了延伸解读,使读者能在扩大词汇量和知识面的同时,避免汉语式的英语思维。第三,可模仿性强。本书兼顾了气象专业知识和英语行文的规范,有助于读者在学习气象专业知识的同时,加强对专业英语表达的记忆和应用。

该书既可作为全国气象工作人员了解气象业务基础知识、学习英语的教材,也可作为高校气象专业学生学习英语及实用气象业务的参考书,同时也适用于相关业务和科技人员的自学,相信该书的出版会得到广大读者的欢迎。



(高学浩)

2011年10月

# 前 言

《实用气象英语教程》是针对气象部门在职业务人员需求编写的英语教材。本书从英语语言学习的角度出发,选编了语言规范、文笔流畅、内容丰富实用的英语气象材料作为课文正文的基础。

本书由 12 个单元和附录组成。主要内容有:(1)天气气候的基础知识,其中包括气旋、季风、温室气体、中国的气候和天气等单元。(2)天气预报的基础知识,其中包括云和降水、雾、温度和湿度等单元。(3)天气预报和警报的主要内容。(4)雷达和卫星探测能力及方式。附录主要介绍气象英文科技论文及摘要的写作方法。

本书力求处理好英语语言基础和气象专业英语应用的关系,突出加强气象英语的实用性;注重从英语的角度涵盖气象基础理论和业务应用的新进展;注重课文内容的深入浅出与语言规范性的结合;注重使本教材既适合教学又适合自学的统一。全书各单元由课文正文、词汇、课文注释、课后练习及答案组成。课文注释包括难句的翻译和词法、句法的讲解;课后练习包括阅读理解、写作及口语练习;附录里还包括了课文典型例句、总词汇表及练习答案。

本书是由编著者在中国气象局气象干部培训学院“实用气象英语远程培训班”、“天气预报工程师高级研修班”上使用的讲义为基础,其后该讲义作为气象干部培训学院的内部教材,在多期培训班使用并得到了学员的肯定。编者根据学员的反馈意见,对原讲义的结构进行了修订,并增加了课文生词、注解和练习(含答案)等内容。

在编写和出版本书的过程中,得到了中国气象局相关领导及气象干部培训学院各级领导的大力支持。《气象》编辑部俞卫平编审对本书的编写提供了宝贵的建设性意见。国家卫星气象中心杨忠东研究员为本书提供了气象卫星资料并给予了卫星专业知识的指导。在编写过程中,还得到了多位气象业务部门的专家及气象干部培训学院很多同仁的帮助。在此一并表示诚挚的谢意。

由于编者学识水平有限,在内容及结构上难免存在不足之处,敬请读者批评指正。

编著者  
2011 年 10 月

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# Unit 1

## Weather, Climate and General Circulation

### 1.1 Weather and Climate

Weather is the state of the atmosphere at a particular time and place. Weather is described in terms of variable conditions such as temperature, humidity, wind velocity and direction, precipitation, and barometric pressure. Weather on Earth occurs primarily in the troposphere, or lower atmosphere, and is driven by energy from the Sun and the rotation of the Earth. The average weather conditions of a region over time are used to define a region's climate.

Weather is a part of everyday life and can affect little things such as your choice of clothes or activities. Weather can also be severe and affect your life in bigger ways, as seen in the damage done by a hurricane or tornado<sup>(1)</sup>. Meteorologists study the components of weather — the conditions of the atmosphere such as temperature, precipitation, wind, and clouds — in an effort to predict the weather and help people be better prepared.

Weather is an all-encompassing term used to describe all of the many and varied phenomena that can occur in the atmosphere of a planet<sup>(2)</sup>. The term is normally taken to mean the activity of these phenomena over short periods of time, usually no more than a few days in length. Average atmospheric conditions over significantly longer periods are known as climate. Usage of the two terms often overlaps and the concepts are obviously very closely related.



Climate is defined as statistical weather information that describes the variation of weather at a given place for a specified interval<sup>(3)</sup>. In popular usage, it represents the synthesis of weather; more formally it is the weather of a locality averaged over some period (usually 30 years) plus statistics of weather extremes.

Climate is commonly considered to be the weather averaged over a long period of time, typically 30 years. Somewhat more precisely, the concept of “climate” also includes the statistics of the weather — such as the degree of day-to-day or year-to-year variation expected. The Intergovernmental Panel on Climate Change (IPCC)<sup>(4)</sup> glossary definition is:

Climate in a narrow sense is usually defined as the “average weather”, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years<sup>(5)</sup>. The classical period is 30 years, as defined by the World Meteorological Organization (WMO)<sup>(6)</sup>. These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate is the condition of the atmosphere at a particular location over a long period of time (from one month to many millions of years, but generally 30 years). It is the sum of atmospheric elements (and their variations): solar radiation, temperature, humidity, clouds and precipitation (type, frequency, and amount), atmospheric pressure, and wind (speed and direction). To the nonspecialist, climate means expected or habitual weather at a particular place and time of year. To the specialist, climate also denotes the degree of variability of weather, and it includes not only the atmosphere but also the hydrosphere, lithosphere, biosphere, and such extraterrestrial factors as the sun<sup>(7)</sup>.

The difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere “behaves” over relatively long periods of time. Weather is basically the way the atmosphere is behaving, mainly with respect to its effects upon life and human activities. Most people think of weather in terms of

temperature, humidity, precipitation, cloudiness, brightness, visibility, wind, and atmospheric pressure, as in high and low pressure. In most places, weather can change from minute-to-minute, hour-to-hour, day-to-day, and season-to-season. Climate, however, is the average of weather over time and space. An easy way to remember the difference is that climate is what you expect, like a very hot summer, and weather is what you get, like a hot day with pop-up thunderstorms.

When we talk about climate change, we talk about changes in long-term averages of daily weather. Today, children always hear stories from their parents and grandparents about how snow was always piled up to their waists as they trudged off to school<sup>(8)</sup>. Children today in most areas of the country haven't experienced those kinds of dreadful snow-packed winters, except for the Northeastern U.S. in January 2005. The change in recent winter snows indicates that the climate has changed since their parents were young. If summers seem hotter lately, then the recent climate may have changed. In various parts of the world, some people have even noticed that springtime comes earlier now than it did 30 years ago. An earlier springtime is indicative of a possible change in the climate.

We talk about climate change in terms of years, decades or even centuries. Scientists study climate to look for trends or cycles of variability (such as the changes in wind patterns, ocean surface temperatures and precipitation over the equatorial Pacific that result in El Niño and La Niña), and also to place cycles or other phenomena into the bigger picture of possible longer term or more permanent climate changes.

## 1.2 General Circulation

The worldwide system of winds, which transports warm air from the equator where solar heating is the greatest towards the higher latitudes, is called the general circulation of the atmosphere, and it gives rise to the Earth's climate zones. Fig. 1.1 shows the three-cell model of the general circulation and wind belts.

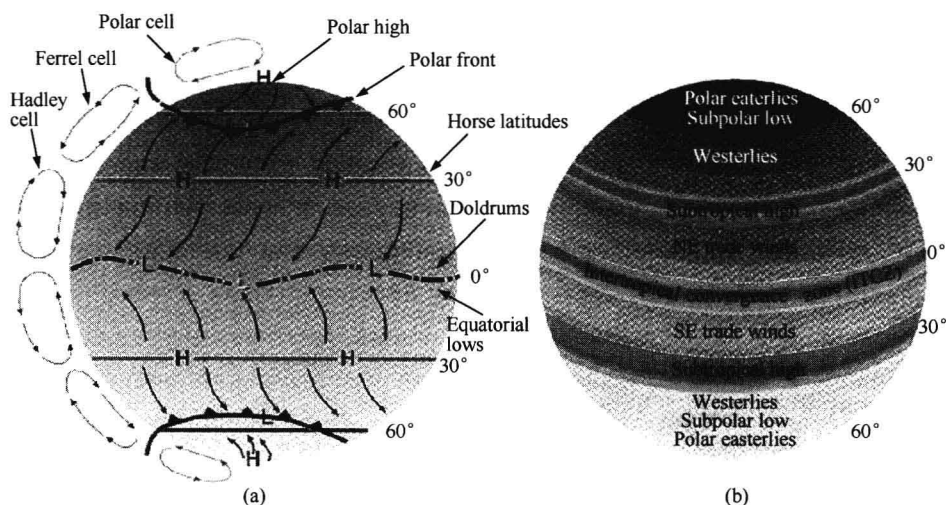


Fig. 1.1 Three-cell model of the general circulation and wind belts

The general circulation of air is broken up into a number of cells, the most common of which is called the Hadley cell<sup>(9)</sup>. Sunlight is the strongest near the equator. Air heated there rises and spreads out north and south. After cooling the air sinks back to the Earth's surface within the subtropical climate zone between latitudes 25° and 40°. This cool descending air stabilizes the atmosphere, preventing much cloud formation and rainfall<sup>(10)</sup>. Consequently, many of the world's desert climates can be found in the subtropical climate zone. Surface air from subtropical regions returns towards the equator to replace the rising air, so completing the cycle of air circulation within the Hadley cell.

Although the physical reality of Hadley cell has been questioned, they provide an excellent means for describing the way in which heat is transported across the Earth by the movement of air<sup>(11)</sup>. Other circulation cells exist in the mid-latitudes and polar regions. The general circulation serves to transport heat energy from warm equatorial regions to colder temperate and polar regions. Without such latitudinal redistribution of heat, the equator would be much hotter than it is whilst the poles would be much colder<sup>(12)</sup>.

Without the Earth's rotation, air would flow north and south directly across the temperature difference between low and high latitudes. The effect of the Coriolis

force as a consequence of the Earth's rotation however, is to cause winds to swing to their right in the Northern Hemisphere, and to their left in the Southern Hemisphere. Thus the movement of air towards the equator swings to form the northeast and southeast trade winds of tropical regions. Air flowing towards the poles forms the westerlies associated with the belt of cyclonic low pressure systems at about 50° to 60° north and south latitudes. In general, where air is found to descend, high pressure develops, for example at the subtropical latitudes and again near the poles. Where air is rising, atmospheric pressure is low, as at the equator and in the mid-latitudes where storms or frontal systems develop<sup>(13)</sup>.

### • New words and expressions •

in terms of 根据,按照,用……的话,在……方面

humidity [hju:'miditi] *n.* 湿度

velocity [vi'lɒsiti] *n.* 速度,高速,快速

precipitation [pri:sipi'teɪʃən] *n.* 降水

barometric [ˌbærə'metrik] *adj.* 气压(的),气压表(的)

troposphere [ˈtrɒpəʊsfɪə] *n.* 对流层

rotation *n.* 旋转

hurricane [ˈhʌrɪkən] *n.* 飓风,狂风

tornado [tɔ:'neɪdəu] *n.* 龙卷风

encompass [in'kʌmpəs] *v.* 围绕,包含,包括,涉及(大量事物)

all-encompassing *adj.* 全方位,包含所有的

phenomena [fi'nɒmɪnə] *n.* 现象(phenomenon 的复数)

component *n.* 成分,部件,要素,组成部分

statistical *adj.* 统计学的

variation [ˌveəri'eɪʃən] *n.* 变化,变量

interval *n.* 时间间隔,间歇

synthesis [ˈsɪnθɪsɪs] *n.* 综合,合成

locality *n.* 位置,地区,地点

rigorously [ˈrɪgərəsli] *adv.* 精确地,严厉地,残酷地

glossary *n.* 术语表,(书尾的)词汇表

radiation *n.* 辐射, 发散

habitual [hə'bitjuəl] *adj.* 习惯的

denote [di'nəut] *vt.* 指示, 表示, 标志, 意指

hydrosphere ['haɪdrəsfiə] *n.* 水圈

lithosphere ['liθəsfiə] *n.* 岩石圈

biosphere ['baɪəsfiə] *n.* 生物圈

extraterrestrial [ˌɛkstrətə'restriəl] *adj.* 地球外的, 宇宙的

with respect to 关于, (至于)谈到

pop-up *adj.* 突然发生或出现的

trudge [trʌdʒ] *v.* 跋涉, 吃力地走

indicative *adj.* (～ of) 指示的, 预示的, 可表示的

equatorial [ˌɛkwə'tɔ:riəl, ɪkw-] *adj.* 近赤道的, 赤道的

El Niño 厄尔尼诺(指赤道东太平洋、南美沿岸海水温度激烈上升的现象)

La Niña 拉尼娜, 反厄尔尼诺

permanent *adj.* 永久的, 持久的

general circulation 大气环流

equator *n.* 赤道

latitude *n.* 纬度, 范围

give rise to *v.* 引起, 使发生

Hadley cell 哈得来环流

subtropical *adj.* 亚热带的, 副热带的(～ high 副热带高压)

stabilize ['steɪbəlaɪz] *v.* 稳定

consequently *adv.* 所以, 因此, 从而

desert climate 沙漠气候

polar regions 极区, 极地

redistribution *n.* 重新分配, 再区分

whilst *conj.* 同时(= while)

Coriolis force 科里奥利力, 地转偏向力, 科氏力

Northern Hemisphere *n.* 北半球

Southern Hemisphere *n.* 南半球

trade wind 信风

westerlies 西风带

associate with *v.* 联合

atmospheric pressure 气压

cyclonic *adj.* 气旋的, 飓风的

cyclonic low pressure system 气旋式低压系统

descend [di'send] *v.* 下降, 下来, 下斜

## Notes

- (1) Weather can also be severe and affect your life in bigger ways, as seen in the damage done by a hurricane or tornado.

天气也可能是剧烈的, 并会对你的生活有较大影响, 如飓风或龙卷风造成的破坏。

句中 as seen in the damage done by a hurricane or tornado 是过去分词短语作定语, 相当于一个非限制性定语从句, as seen ... 意为: “正如(被)看到的那样”; done by a hurricane or tornado 也作定语, 修饰 damage。

- (2) Weather is an all-encompassing term used to describe all of the many and varied phenomena that can occur in the atmosphere of a planet.

天气是一个概括性的术语, 是用于描述行星大气中发生的各种变化的现象。

句中过去分词短语 used to describe... a planet 修饰 term, 其中包含一个定语从句, 由 that 引导, 修饰 phenomena。

- (3) Climate is defined as statistical weather information that describes the variation of weather at a given place for a specified interval.

气候定义为统计的天气特征, 描述给定地点、特定时期内的天气变化。

句中 that... interval 从句, 是 information 的同位语从句。

- (4) The Intergovernmental Panel on Climate Change (IPCC) 政府间气候变化专门委员会

人类活动的规模已开始对复杂的自然系统, 如全球气候产生干扰。许多人认为气候变化会造成严重的或不可逆转的破坏风险, 并认为缺乏充分的科学确定性不应成为推迟采取行动的借口。决策者们需要有关气候变化成因、其潜在环境和社会经济影响, 以及可能的对策等客观的信息来源。因此, WMO(世界气

象组织)和 UNEP(联合国环境规划署)于 1988 年建立了政府间气候变化专门委员会(IPCC)。它的作用是在全面、客观、公开和透明的基础上,对世界上有关全球气候变化的最好的现有科学、技术和社会经济信息进行评估。这些评估吸收了世界上所有地区的数百位专家的工作成果。IPCC 的报告力求确保平衡地反映现有各种观点,并具有政策相关性,但不具有政策指示性。IPCC 已编写了一系列出版物,这些出版物现已成为决策者、科学家、其他专家和人员广泛使用的参考书目。

- (5) Climate in a narrow sense is usually defined as the “average weather”, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years.

狭义上,气候通常被定义为“平均天气”,或者更严格的定义认为气候表示的是在从几个月到几千年或数百万年的时期内,相关变量的统计平均值和变化率。

句中表达时间跨度的结构 over (some time or period) ranging from ... to ... 表示“在从……到……的某段时间或时期内”。

- (6) the World Meteorological Organization (WMO) 世界气象组织

世界气象组织(WMO)是世界各国政府间开展气象业务和气象科学合作活动的国际机构,总部设在日内瓦。至 2007 年 4 月,世界气象组织已从 1950 年 3 月 23 日公约生效时的 30 个会员发展到目前 182 个会员(其中国家会员 179;地区会员 6 个,包括中国香港和中国澳门)。

世界气象组织的前身称国际气象组织(International Meteorological Organization,英文简称 IMO),它是 1872 年和 1873 年分别在莱比锡和维也纳召开的两次国际会议后于 1878 年正式成立的非官方性机构。1947 年 9 月在华盛顿召开的各国气象局长会议,通过了世界气象公约草案,1950 年 3 月 23 日该公约生效,国际气象组织改名为世界气象组织。1951 年 3 月 19 日在巴黎举行世界气象组织第一届大会,正式建立机构。同年 12 月,成为联合国的一个专门机构。

- (7) To the specialist, climate also denotes the degree of variability of weather, and it includes not only the atmosphere but also the hydrosphere, lithosphere,

biosphere, and such extraterrestrial factors as the sun.

对于专业人士而言,气候还表示天气的变化程度,它不仅包括了大气圈内,而且还包括了水圈、岩石圈、生物圈及地球外(如太阳)的要素。

- (8) Today, children always hear stories from their parents and grandparents about how snow was always piled up to their waists as they trudged off to school.

如今,孩子们总是听他们的父母、祖父祖母讲过去他们是如何在齐腰深的雪中艰难跋涉去上学的事。

句中 how...school 从句,是介词 about 的宾语,其中 as 引导时间状语从句,意为:“当……时,一边……一边……”,侧重表示两个动作同时发生(包括一个主语同时进行两个动作),或者一种动作随着另一种动作的变化而变化,如:I saw him as he was getting off the bus. (正当他下公共汽车时,我看见了他。)

- (9) The general circulation of air is broken up into a number of cells, the most common of which is called the Hadley cell.

大气环流被分裂为几个环流,其中最有名的被称为哈得来环流。

句中 the most common of which is called the Hadley cell 为非限制性定语从句,关系代词 which 所修饰的先行词是 cells。

- (10) This cool descending air stabilizes the atmosphere, preventing much cloud formation and rainfall.

冷空气下沉使大气稳定,阻止了云的形成和降水。

句中现在分词短语 preventing much cloud formation and rainfall 作状语,表示结果。

- (11) Although the physical reality of Hadley cell has been questioned, they provide an excellent means for describing the way in which heat is transported across the Earth by the movement of air.

尽管哈得来环流的物理真实性遭到质疑,但它们为阐明地球上的热量如何通过空气的运动而传输,提供了一个极好的手段。

句中 although 引导让步状语从句;in which 引导定语从句,修饰 the way。

- (12) Without such latitudinal redistribution of heat, the equator would be much



hotter than it is whilst the poles would be much colder.

如果没有这种纬度间的热量再分配,赤道地区会比现在更热,而极地地区也会比现在更冷。

这是一个虚拟语气条件句,without 介词短语相当于一个虚拟条件从句 If there were not such latitudinal redistribution of heat,主句中用 would be,表示与现在实际事实是相反的。但是,在主句中的比较从句 than it is 中,用的是现在一般现在时,表明与现在的实际情况相符,属于陈述语气。另外,whilst = while,是“而,与此同时”之意。

- (13) In general, where air is found to descend, high pressure develops, for example at the subtropical latitudes and again near the poles. Where air is rising, atmospheric pressure is low, as at the equator and in the mid-latitudes where storms or frontal systems develop.

一般而言,空气下沉的地方高压生成,如在副热带和靠近极地的区域;空气上升的地方低压生成,如风暴或锋面系统生成在赤道和中纬度地区。

句中前两个 where 引导的从句,均为地点状语从句;for example (例如)与 as(介词,“正如……那样”)意思一样,都是举例说明。后一个 where 引导是一个限制性定语从句,修饰 at the equator and in the mid-latitudes。

## AFTER YOU READ

### Understand details

Write the letter of the best answer according to the information in the Chapter.

\_\_\_\_\_ (1) Weather is an all-encompassing term used to describe all of the many and varied phenomena that can occur in the atmosphere of a planet, because \_\_\_\_\_.

a. it is the only way that the atmosphere behaves with respect to its effects upon social and economic activities

b. it is normally taken to mean the activity of these phenomena over long periods of time, usually several decades in length