气象专业英语文选

下　册

南京大学外文系
公共英语教研室编

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21. FACTORS AFFECTING WIND DIRECTIONAND SPEED

Because wind results basically from the pressure gradient, the initial determinant of its direction is the force exerted by the pressure gradient. However, as soon as air begins to move along the earth's surface its direction is altered by certain other factors acting together.① Most of the winds of the earth follow a generally curved path rather than a straight one be-

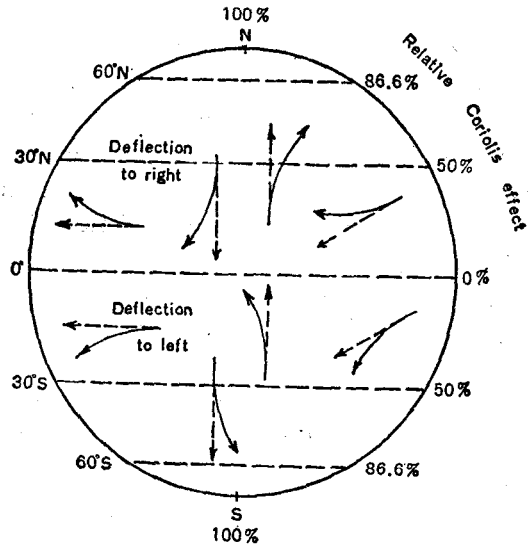

Fig.1 Deflection of winds by the Coriolis effect.

cause of these factors.

The deflective force due to the earth's rotation on its axis is one of the most potent influences upon wind direction. Known as the Coriolis force,② it is, strictly speaking, not a force but an effect resulting from the rotational movement of the earth and the movement of air relative to the earth (see Fig. 1). But because we live on the earth and are a part of its rotation, the apparent effect is that of a force③ which turns winds from the paths initiated by the pressure gradient. The Coriolis effect causes all winds (indeed all moving objects) in the Northern Hemisphere to move toward the right and those of the Southern Hemisphere④to move to the left with respect to the rotating earth. At the equator the effect has a value of zero and it increases regularly toward the poles. It acts at an angle of 90° to the horizontal direction of the wind and is directly proportional to horizontal wind speed. When the pressure gradient has initiated movement of air the resulting wind is deflected more and more to the right (left in the Southern Hemisphere) until it may be blowing parallel to the isobars, that is, at right angles to the pressure gradient. If the motion of the air is along curved isobars a net centripetal acceleration tends to pull it toward the center of curvature, producing the gradient wind and a rotating motion relative to the earth's surface. A counterclockwise flow in the Northern Hemisphere is termed cyclonic; clockwise flow is anticyclonic (see Fig.2).

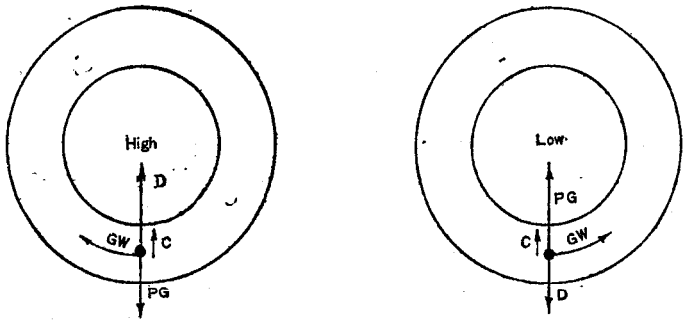

Fig. 2 Forces affecting the gradient wind around high- and low-pressure centers. PG, pressure gradient; D, deflective(Coriolis) effect; C, centripetal acceleration; GW, gradient wind resulting from balanced forces.

Along and near the earth's surface wind does not move freely in a horizontal plane. Irregularities in surface relief and local differences in thermal convection cause moving air to take on correspondingly irregular motion so that it undergoes abrupt changes in speed and direction. This fluctuating wind action, known as turbulence, is associated with lulls, gusts, and eddies and increases with increasing wind speeds. The effects of surface turbulence are not very great above 500 m, and at about 1, 000 m actual wind direction and speed are equivalent to the theoretical gradient wind, which may be calculated from the pressure gradient and other forces. The effect of surface friction is to reduce wind speed, in turn reducing the Coriolis effect so that the wind moves across the isobars at an angle toward lower pressure.

Other factors being equal, the difference in wind speed and direction between the surface and upper levels is greatest over rough land surfaces. Over water the surface wind more nearly approximates the gradient wind. On the average, low-speed winds cross the isobars over land at an angle of about 45° with a speed about 40 percent of the gradient wind speed; over oceans the angle is about 30° and the surface speed about 65 percent of the gradient wind speed. Recognizing the relationship of wind direction to pressure distribution, Buys-Ballot formulated the rule, If you stand with your back to the wind in the Northern Hemisphere, pressure is lower on your left than on your right. In the Southern Hemisphere, again with your back to the wind, lower pressure will be on your right and higher pressure on your left.

词　汇

basically ['beisikəli] *ad.* 基本上
initial [i'niʃəl] *a.* 最初的，起始的
determinant [di'tə:minənt] *n.* 决定因素
alter ['ɔ:ltə] *v.t.* & *v.i.* 改变，变更
curve [kə:v] *v.t.* & *v.i.* 弯曲
deflective [di'flektiv] *a.* 偏向的
potent ['pəutənt] *a.* 有力的
rotational [rəu'teiʃənl] *a.* 旋转的，自转的
apparent [ə'pærənt] *a.* 视的，明显的
centripetal [sen'tripitl] *a.* 向心的
acceleration [æk,selə'reiʃən] *n.* 加速
curvature ['kə:vətʃə] *n.* 弯曲
gradient wind ['greidjənt 'wind] *n.* 梯度风
cyclonic [sai'klɔnik] *a.* 旋风的，气旋的
clockwise ['klɔkwaiz] *a.* & *ad.* 右转(的)，顺时针(的)
anticyclonic ['æntisai'klɔnik] *a.* 反气旋的
relief [ri'li:f] *n.* 地形，地势
thermal convection ['θə:məl kən'vekʃən] *n.* 热对流
abrupt [ə'brʌpt] *a.* 突然的
equivalent [i'kwivələnt] *a.* 同等的
theoretical [,θiə'retikəl] *a.* 理论上的
approximate [ə'prɔksimeit] *v.t.* 近于，近似
Buys Ballot 白贝罗(人名)
formulate ['fɔ:mjuleit] *v.t.* 制定，用公式表示

词　组

(to)result from 由…引起
as soon as —…就
strictly speaking 严格地讲
parallel to 和…平行，平行于
with one's back to 背向

注　释

① …acting together.
这是现在分词短语，作定语，修饰前面的factors。

② Known as the Coriollis force…
这是过去分词短语，作插入语。

③ …the apparent effect is that of a force…
这里的that是指effect。这种用法见上册第5篇中注5。

④ …and those of the Southern Hemisphere…
这里的those代表all winds(同上册第5篇注释5)。

⑤ Other factors being equal…

此为独立分词结构，其作用和分词短语相似。但在结构上和分词短语有不同之处，它有其逻辑上的主语，本处为other factors，而分词短语则没有，它的动作执行者就是句子中的主语。

22. AIR MASS

An air mass is defined as an extensive portion of the atmosphere having characteristics of temperature and moisture which are relatively homogeneous horizontally. For a large body of air to acquire temperature and moisture properties that are approximately the same at a given level, that air must rest for a time on a source region,① which must itself have fairly homogeneous surface conditions. A large land or water area which has evenly distributed insolation affords a good source region, but a second prerequisite is necessary if a distinctive air mass is to be developed,② namely, large-scale subsidence and divergence of air over the source region. Air that subsides over a homogeneous source region will become homogeneous itself and tends to retain its characteristics when it moves away. The heat and moisture properties of the air mass gradually change, however, as it moves over other surface conditions. Zones of convergence and rising air are inimical to the production of air masses because the general movement of winds is toward these areas at surface levels, bringing a constant renewal of air with heterogeneous temperature and humidity properties.

An air mass source region has already been defined as a large area with approximately homogeneous temperature and moisture properties where there is a general

subsidence and divergence of air.③ These conditions are found to be best developed in the semipermanent high-pressure belts of the earth. In the belt of low pressure along the equator, however, the equatorial convergence may be weakly defined and stagnation of air will produce equatorial air masses. Where development of high pressure is seasonal, for example, over mid-latitude continental regions in winter, the source regions will likewise have seasonal maximum development.

Classification of air masses is based primarily upon their source regions and secondarily upon temperature and moisture properties. The two main categories are tropical or subtropical and polar or subpolar, because the great source regions are located at high and at low latitudes. Subdivision of these groups is made according to whether the source region is oceanic or continental, and further, according to what modifications the masses experience as they move from their source regions.④ Eventually, air masses become modified to such an extent that special designations are necessary. For climatological purposes this classification is of great importance because the extent to which air masses dominate different regions determines the climate of those regions.

In practice, letter symbols are used to designate air masses. Ordinarily **c** and **m** are used for **continental** and **maritime** and they are placed first in the designation. Following that the source region is indicated, **tropical**(T), **polar**(P), **equatorial**(E), **arctic**(A), and **antarctic**(AA). To indicate modifications of air masses

due to transfer of heat between the bottom of the mass and the surface over which it passes, another symbol is appended: k for air colder than the underlying surface or w for air warmer than the surface. Note that arctic air masses have their sources north of polar masses. This incongruity is explained by the history of air mass study. The term "polar" had already come into wide use to designate air masses in subpolar regions before the distinctive character of "arctic" air had been discovered.⑤

词　汇

homogeneous [ˌhɔmə'dʒiːnjəs] *a.*均匀的；同种的；均质的
horizontally [ˌhɔri'zɔntli] *ad.* 水平
approximately [ə'prɔksimitli] *ad.*大体，大致
source region ['sɔːs 'riːdʒən] *n.* 源地
evenly ['iːvənli] *ad.* 均匀，平等
distribute [dis'tribjuːt] *v.t.* 分布，分配
insolation [ˌinsəu'leiʃən] *n.* 日射
prerequisite ['priː'rekwizit] *n.* 必要条件
distinctive [dis'tiŋktiv] *a.* 有特色的，特殊的
namely ['neimliː] *ad.* 即，换句话说
subsidence ['sʌbsidəns] *n.* 下沉，平息
divergence [dai'vəːdʒəns] *n.* 辐散，发散
subside [səb'said] *v.t.* 下沉，平息
retain [ri'tein] *v.t.*保留，保持
convergence [kən'vəːdʒəns] *n.* 辐合
inimical [i'nimikəl] *a.* 不利的，有害的
renewal [ri'njuːəl] *n.* 更新，补充，恢复
heterogeneous ['hetərəu'dʒiːnjəs] *a.* 非均匀的，异质的
semipermanent ['semi'pəːmənənt] *a.* 半永久性的
equator [i'kweitə] *n.* 赤道
equatorial [ˌekwə'tɔːriəl] *a.* 赤道的
weakly ['wiːkliː] *ad.* 软弱地
stagnation [stæg'neiʃən] *n.* 停滞
seasonal ['siːzn] *a.* 季节的
continental [ˌkɔnti'nentl] *a.* 大陆的
likewise ['laikwaiz] *ad.* 同样地
secondarily ['sekəndərili] *ad.* 其次，在第二
tropical ['trɔpikəl] *a.* 热带的
subtropical ['sʌb'trɔpikəl]*a.* 副热带的
polar ['pəulə] *a.* 极地的
subpolar ['sʌb'pəulə] *a.* 副极地的

subdivision ['sʌbdi,vigən] *n.* 细分，再分
oceanic [,əuʃi'ænik] *a.* 大洋的，大海的
designation [,dezig'neiʃən] *n.* 名称；指名，指定
dominate ['dɔmineit] *v.t.* 控制，支配
symbol ['simbəl] *n.* 符号，记号；象征
designate ['dezigneit] *v.t.* 指出名字，指定
maritime ['mæritaim] *a.* 海（上）的，沿海的
arctic ['ɑ:ktik] *a.* 北极的
antarctic [æn'tɑ:ktik] *a.* 南极的
append [ə'pend] *v.t.* 增补，附加
underlying [,ʌndə'laiiŋ] *a.* 在下的；基础的
incongruity [,inkɔŋ'gruiti] *n.* 不一致，不调和
history ['histəri] *n.* 历史

词　组

according to 按照
in practice 在实践中，实际上
due to 由于
(to)come into use 开始被使用，采用

注　释

① For a large body of air to acquire temperature and moisture properties that are approximately the same at a given level, that air must rest for a time on a source region….

译文：一大团空气要获得在一定的高度上大体相同的温度和水汽性质，就必须在源地停留一段时间……

句中有两个 that，第一个 that 是关系代词，引出定语从句 that…level 修饰 properties；第二个 that 是指示代词，修饰air作定语。that air 指 a large body of air.

② …, if a distinctive air mass is to be developed…

句中 is to be developed 是一般将来时，to be developed是to develop 的被动语态。"be to + 动词原形"是一般将来时的另一种形式，用来表示按计划要发生的动作。

③ …a large area with approximately homogeneous temperature and moisture properties where there is a general subsidence and divergence of air.

a large area 为两个定语所修饰；介词短语 with…properties 和定语从句 where…air。当名词带有两个或两个以上的定语（短语或从句）时，一般短的在前，长的在后；关系密切的在前，关系不太密切的在后。

④ …according to whether the source region is oceanic or continental, and further, according to what modifications the masses experience as they move from their source regions.

两个介词according to 的宾语都是名词从句，一个由 whether…or 引导，另一个由what引导。what在这里译成"所…的"，作modifications的定语。这个名词从句中带一个时间状语从句as…regions.

⑤ …had been discovered.

这是被动语态的过去完成时。

23. FRONTS

A front, in meteorology, is an interface, or transition zone between two air masses of different density. Since we have learned from the hydrostatic and hypsometric relationships that temperature is the major regulator of density, we can conclude that a front almost invariably separates air masses of different temperatures.①This implies that the front also marks a contrast zone between air masses having different source regions, for it is principally its source region which establishes the temperature characteristics of a given air mass.②

Three primary frontal zones are recognized, two of which are of minor importance as far as dramatic weather change is concerned, tropical hurricanes excluded.③The Arctic front is located between very cold Arctic air in high latitudes, and less cold polar air. Because temperature differences across the Arctic front are generally small, contrasts in general are not great, and we can expect that circulation activities connected with this frontal zone will be weak. The Intertropical Front is found in the equatorial convergence zone between the opposing trade wind belts. Again, because of very small contrasts in the physical properties of the opposing air masses, circulation activity is very weak.