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地球科学

# Weather and Climate 天气与气候

REBECCA L. JOHNSON (美) 著

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**如**果你希望读到地道的英语，在享受英语阅读乐趣的同时又能增长知识、开拓视野，这套由外语教学与研究出版社与美国国家地理学会合作出版的“国家地理科学探索丛书”正是你的选择。

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这套丛书以英文注释形式出版，注释由国内重点中学教学经验丰富的英语教师完成。特别值得推荐的是本套丛书在提高青少年读者英语阅读能力的同时，还注重培养他们的科学探索精神、动手能力、逻辑思维能力和沟通能力。

本丛书既适合学生自学，又可用于课堂教学。丛书各个系列均配有一本教师用书，内容包括背景知识介绍、技能训练提示、评估测试、多项选择题及答案等详尽的教学指导，是对课堂教学的极好补充。

本套丛书是适合中学生及英语爱好者的知识读物。





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# Weather and Climate

## 天气与气候

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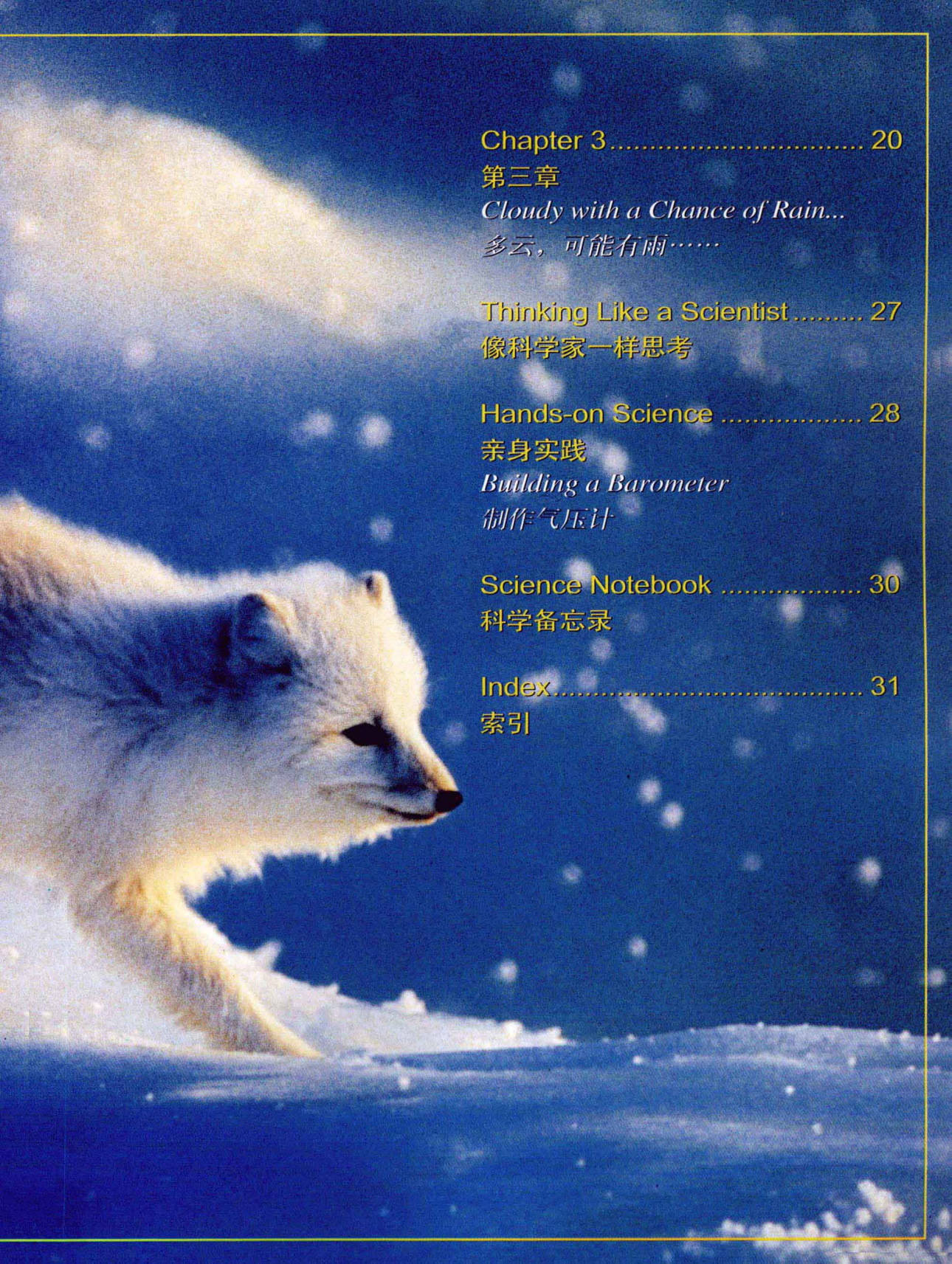
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各种各样的云

Arctic fox, Hudson Bay, Canada





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Introduction  
引言

# Spiral in the Sky

空气中的旋涡



*On October 21, 1998, masses<sup>1</sup> of clouds began to swirl<sup>2</sup> above the Caribbean Sea<sup>3</sup>. During the next few days, the clouds gradually<sup>4</sup> formed an enormous<sup>5</sup> spiral hundreds of kilometers across—and Hurricane Mitch<sup>6</sup> was born.*

**O**n October 29, Hurricane Mitch came ashore<sup>7</sup> in Honduras<sup>8</sup>. Winds shrieking<sup>9</sup> along at 250 kilometers an hour (155 mph) ripped apart<sup>10</sup> houses, tore boats from their docks<sup>11</sup>, and stripped<sup>12</sup> trees of their leaves. The storm drenched<sup>13</sup> the land with rain—as much as 64 centimeters (25 inches) in a single<sup>14</sup> day. In neighboring countries, roads, bridges, and buildings washed away. Banana, coffee, and citrus<sup>15</sup> crops disappeared<sup>16</sup>. The heavy rains triggered<sup>17</sup> mudslides<sup>18</sup> that roared<sup>19</sup> down mountainsides and buried<sup>20</sup> entire<sup>21</sup> villages in black mud.



Hurricane Mitch, one of the deadliest hurricanes of the past century, left at least 11,000 people dead. Thousands more were missing and millions lost their homes. Billions of dollars' worth of damage<sup>22</sup> occurred<sup>23</sup> throughout Central America.

No matter what form weather takes—from a warm, sunny, beautiful day to a raging<sup>24</sup> hurricane—it affects each of us. In this book you will take a closer look at weather. So get set to become weatherwise<sup>25</sup>.

1. mass	<i>n.</i>	(聚成一体的)团	14. single	<i>adj.</i>	一个的
2. swirl	<i>v.</i>	旋转; 打转	15. citrus	<i>n.</i>	柑橘属果树
3. Caribbean Sea		加勒比海	16. disappear	<i>v.</i>	消失
4. gradually	<i>adv.</i>	逐渐地	17. trigger	<i>v.</i>	引起; 促使
5. enormous	<i>adj.</i>	巨大的	18. mudslide	<i>n.</i>	泥石流
6. Hurricane Mitch		米奇飓风	19. roar	<i>v.</i>	呼啸
7. ashore	<i>adv.</i>	上岸; 上陆地	20. bury	<i>v.</i>	埋葬; 掩埋
8. Honduras		洪都拉斯	21. entire	<i>adj.</i>	全部的; 整个的
9. shriek	<i>v.</i>	尖啸	22. damage	<i>n.</i>	损失
10. rip apart		把……弄得凌乱不堪; 使裂开	23. occur	<i>v.</i>	发生
11. dock	<i>n.</i>	码头; 船坞	24. raging	<i>adj.</i>	狂暴的; 凶猛的
12. strip	<i>v.</i>	剥去; 除去	25. weatherwise	<i>adj.</i>	善于预测天气的
13. drench	<i>v.</i>	使湿透; 浸湿	26. whirl	<i>v.</i>	旋转

**Hurricane Mitch whirls<sup>26</sup> over the Caribbean in October 1998.**



# The Restless Air

## 永不平静的空气

*Your alarm<sup>1</sup> goes off<sup>2</sup>. A new day begins. What will you wear?  
What will you do? Your answers depend on the weather.*

- |  |             |           |
|--|-------------|-----------|
| 1. alarm   | <i>n.</i>   | (闹钟的)闹铃   |
| 2. go off  |             | 发出响声      |
| 3. colorful  | <i>adj.</i> | 多彩的       |
| 4. Washington State<br>International Kite Festival |             | 华盛顿州国际风筝节 |



Colorful<sup>3</sup> kites fill the sky at the Washington State International Kite Festival<sup>4</sup>.



**W**eather affects our lives in many different ways. For many people, knowing what the weather will do in an hour, a day, or a week is important. Airline pilots<sup>1</sup> know how fast and from what direction<sup>2</sup> winds are blowing before they take off<sup>3</sup> and land. People who fish are aware of<sup>4</sup> storms brewing<sup>5</sup> out at sea. Farmers wait for dry weather to start harvesting their crops.

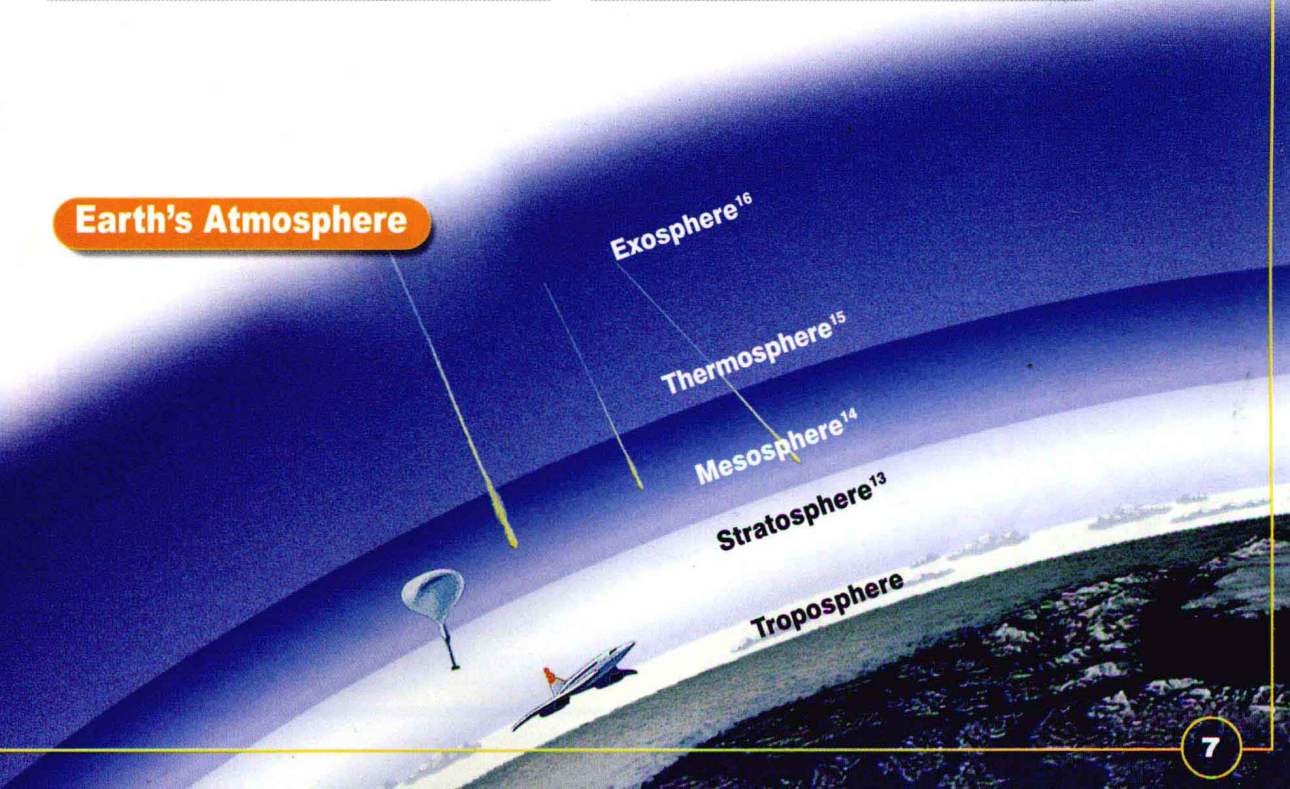
You probably talk about the weather at least once every day. Just what is weather? In simple terms, weather is what is happening in the air around you.

Earth is surrounded<sup>6</sup> by a blanket<sup>7</sup> of air called the atmosphere<sup>8</sup>, which extends<sup>9</sup> some 1,000 kilometers (625 miles) or so from the planet<sup>10</sup>'s surface<sup>11</sup>. However, weather—clouds, storms, wind, rain, and snow—occurs only in the troposphere<sup>12</sup>, the very lowest part of the atmosphere.

1. pilot	<i>n.</i>	飞行员
2. direction	<i>n.</i>	方向
3. take off		起飞
4. be aware of		意识到; 知道
5. brew	<i>v.</i>	(风暴等)酝酿; 行将发生
6. surround	<i>v.</i>	围绕; 环绕
7. blanket	<i>n.</i>	覆盖层; 似毯子的东西
8. atmosphere	<i>n.</i>	大气层

9. extend	<i>v.</i>	延伸
10. planet	<i>n.</i>	行星(此处指地球)
11. surface	<i>n.</i>	表面
12. troposphere	<i>n.</i>	对流层
13. stratosphere	<i>n.</i>	平流层
14. mesosphere	<i>n.</i>	中间层
15. thermosphere	<i>n.</i>	热层
16. exosphere	<i>n.</i>	外逸层

## Earth's Atmosphere



The diagram shows a cross-section of Earth's atmosphere, with layers labeled from bottom to top: Troposphere<sup>12</sup>, Stratosphere<sup>13</sup>, Mesosphere<sup>14</sup>, Thermosphere<sup>15</sup>, and Exosphere<sup>16</sup>. A yellow line indicates the boundary between the troposphere and stratosphere. A blue line indicates the boundary between the stratosphere and mesosphere. A red line indicates the boundary between the mesosphere and thermosphere. A green line indicates the boundary between the thermosphere and exosphere. A satellite is shown in the thermosphere, and a jet airplane is shown in the troposphere.



## Weather or Climate?

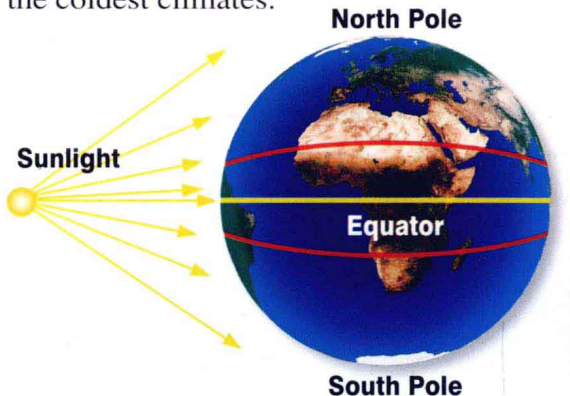
Weather is powered<sup>1</sup> by the sun heating Earth. This heat energy<sup>2</sup> is responsible for<sup>3</sup> creating different climates in different places on Earth. While weather changes from day to day, climate is a region<sup>4</sup>'s general pattern<sup>5</sup> of weather over a long period of time.

Why is the climate at the North Pole<sup>6</sup> so different from the climate of an island near the Equator<sup>7</sup>? The most important reason is the difference in the intensity<sup>8</sup> of sunlight these two places receive.

*How would you describe the climate where you live?*

1. power	v.	给……提供动力
2. heat energy		热能
3. be responsible for		对……负有责任
4. region	n.	地区; 地带
5. pattern	n.	型; 模式
6. North Pole		北极
7. Equator	n.	(地球)赤道
8. intensity	n.	强度
9. curved	adj.	弯曲的; 曲线形的
10. ray	n.	光线
11. strike	v.	到达
12. angle	n.	角度

Because Earth's surface is curved<sup>9</sup>, the sun's rays<sup>10</sup> strike<sup>11</sup> different parts of Earth at different angles<sup>12</sup>. The rays strike Earth more directly—and more intensely<sup>13</sup>—near the Equator than at the Poles. So places near the Equator, often called the tropics<sup>14</sup>, have the warmest climates. Those near the Poles have the coldest climates.



13. intensely	adv.	强烈地
14. tropics	n.	热带地区
15. mild	adj.	(天气等)温暖的; 暖和的
16. Winnipeg		温尼伯
17. Manitoba		马尼托巴省
18. roughly	adv.	大体上; 大约
19. ocean current		洋流
20. Gulf Stream		湾流
21. inland	adj.	内陆的
22. height above sea level		海拔高度
23. spot	n.	地点

## Interesting Questions

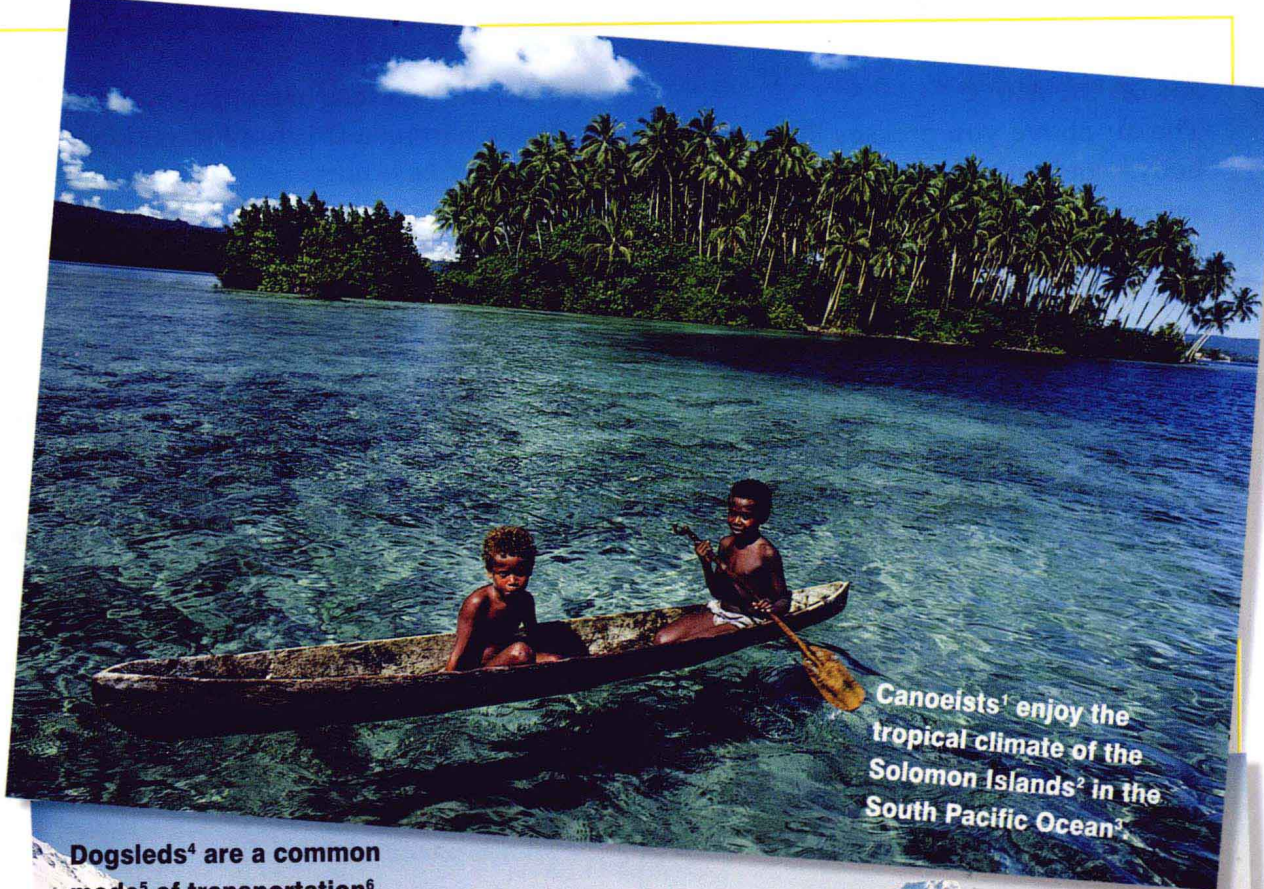
**Q: London, England, has a milder<sup>15</sup> climate than Winnipeg<sup>16</sup>, Manitoba<sup>17</sup>, Canada. But these two cities are roughly<sup>18</sup> the same distance from the North Pole. What's the deal?**

**A: Even though London is as far north as Winnipeg, London is on an island warmed by a mild ocean current<sup>19</sup>, called the Gulf Stream<sup>20</sup>. Places close to the ocean or some other large body of water usually have a milder climate than places far inland<sup>21</sup>.**

**Q: How does height above sea level<sup>22</sup> affect climate?**

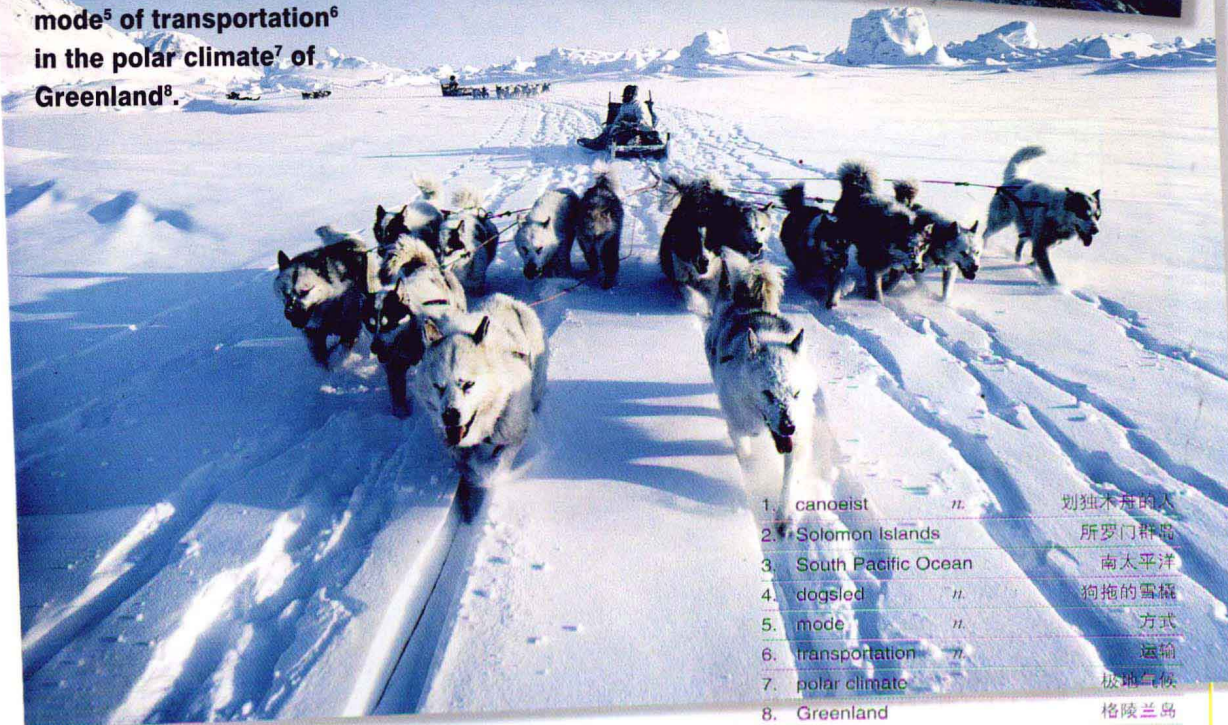
**A: Usually the higher you go, the cooler the climate. A spot<sup>23</sup> near the top of a tall mountain has a cooler climate than one near the mountain's base.**





Canoeists<sup>1</sup> enjoy the tropical climate of the Solomon Islands<sup>2</sup> in the South Pacific Ocean<sup>3</sup>.

Dogsleds<sup>4</sup> are a common mode<sup>5</sup> of transportation<sup>6</sup> in the polar climate<sup>7</sup> of Greenland<sup>8</sup>.



- |                        |           |        |
|------------------------|-----------|--------|
| 1. canoeist            | <i>n.</i> | 划独木舟的人 |
| 2. Solomon Islands     |           | 所罗门群岛  |
| 3. South Pacific Ocean |           | 南太平洋   |
| 4. dogsled             | <i>n.</i> | 狗拖的雪橇  |
| 5. mode                | <i>n.</i> | 方式     |
| 6. transportation      | <i>n.</i> | 运输     |
| 7. polar climate       |           | 极地气候   |
| 8. Greenland           |           | 格陵兰岛   |



## Air on the Move

The air above you presses down on your body—and on everything else on Earth's surface. This is called air pressure<sup>1</sup>. However, the air doesn't always push down with exactly<sup>2</sup> the same amount<sup>3</sup> of force. In other

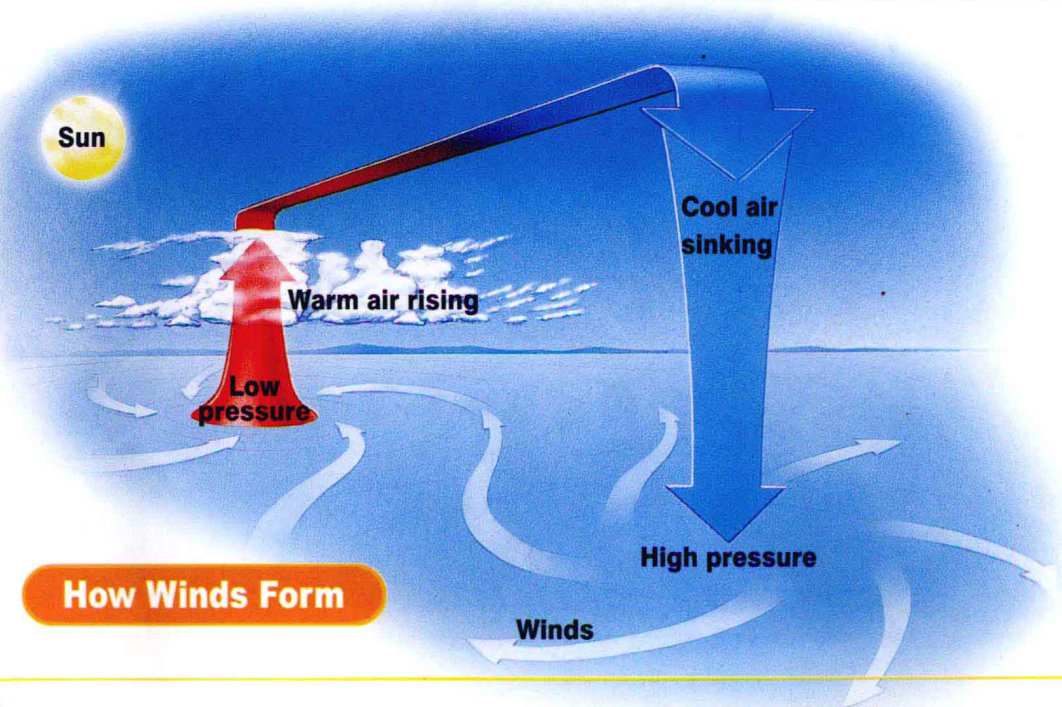
words, air pressure can change. A device<sup>4</sup> called a barometer<sup>5</sup> is used to measure<sup>6</sup> air pressure.

Warm air is less dense<sup>7</sup> than cool air. This means that particles<sup>8</sup> of warm air are farther apart than particles of cool air. So in the same amount of space, warm air weighs less than cool air. Warm air tends to<sup>9</sup> rise, and cool air tends to sink<sup>10</sup>.

The sun's rays heat Earth's surface, but some parts of the surface heat up more than others. Above these hotter spots, the air becomes warmer.



1. air pressure		气压
2. exactly	<i>adv.</i>	精确地; 确切地
3. amount	<i>n.</i>	数量
4. device	<i>n.</i>	装置
5. barometer	<i>n.</i>	气压计
6. measure	<i>v.</i>	测量
7. dense	<i>adj.</i>	密度大的
8. particle	<i>n.</i>	微粒; 颗粒
9. tend to		有……之势
10. sink	<i>v.</i>	下沉





When a mass of warm air rises, there is less air pushing down on that area of Earth's surface. The rising air creates<sup>1</sup> an area of low pressure beneath<sup>2</sup> it. In contrast<sup>3</sup>, when air cools, it gets heavier and sinks. Wherever air is sinking toward Earth's surface, an area of high pressure is produced.

Changes in air pressure lead to changes in the weather. Air always moves from an area of higher pressure to an area of lower pressure. This movement of air from one place to another creates wind. The larger the pressure difference between two areas, the

faster the air will move and the harder the wind will blow.

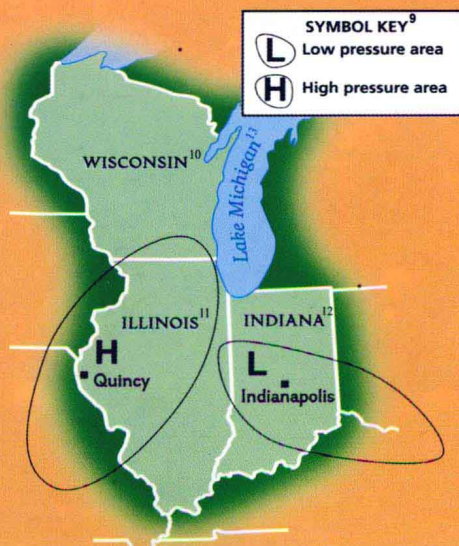
1. create	v.	产生
2. beneath	<i>prep.</i>	在……底下
3. in contrast		相反
4. predict	v.	预报; 预测
5. forecast	v.	预报; 预测
6. Quincy		昆西
7. Indianapolis		印第安纳波利斯
8. hint	n.	提示; 暗示
9. symbol key		符号图例
10. Wisconsin		威斯康星州
11. Illinois		伊利诺伊州
12. Indiana		印第安纳州
13. Lake Michigan		密歇根湖

## Thinking Like a Scientist: Predicting<sup>4</sup>

Weather scientists use information about high and low pressure areas to forecast<sup>5</sup>, or predict, how winds will blow. You can make the same kind of prediction.

On the map shown here, notice there are two pressure areas, one high and one low. Based on what you've learned about air pressure and wind direction, predict how the wind will blow. Will it go from the city of Quincy<sup>6</sup> toward Indianapolis<sup>7</sup>? Or from Indianapolis toward Quincy? Explain.

**HINT<sup>8</sup>:** Remember that air always moves from an area of high pressure to an area of low pressure.





# Water, Water Everywhere

水无处不在





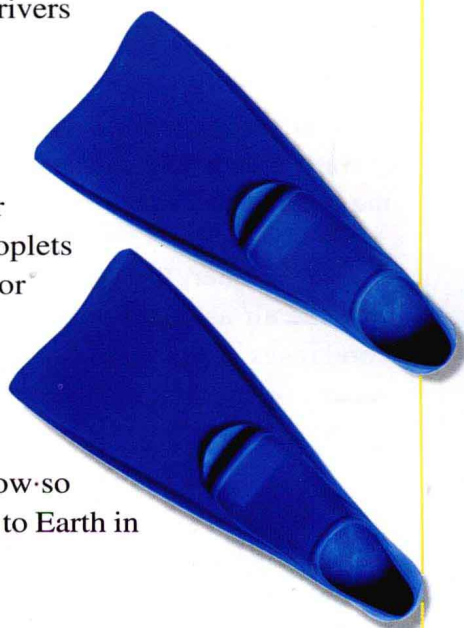
*After a swim you stretch out<sup>1</sup> in the sunshine to catch some rays. Soon your wet skin is dry. Where did the water go?*

**W**hen sunlight heats water droplets<sup>2</sup> on your skin, the droplets turn into invisible<sup>3</sup> water vapor<sup>4</sup> that rises into the air. This process<sup>5</sup> of turning liquid<sup>6</sup> water into water vapor is called evaporation<sup>7</sup>.

Millions of liters<sup>8</sup> of water evaporate from oceans, lakes, and rivers every day. Just how much moisture<sup>9</sup> air holds—the air's humidity<sup>10</sup>—depends on the temperature<sup>11</sup> and other factors<sup>12</sup>.

When warm air rises, it starts to cool. As air cools, the water vapor it contains condenses<sup>13</sup>, or changes back into tiny<sup>14</sup> droplets of liquid water. If rising air becomes cold quickly, the vapor condenses and freezes to form ice crystals<sup>15</sup>. This condensation of water vapor in the air creates clouds.

As the air in clouds swirls around, the droplets or ice crystals bump into each other and join together. Eventually<sup>16</sup> they grow so large and heavy that they fall as rain or snow. Water returning to Earth in this way is known as precipitation<sup>17</sup>.

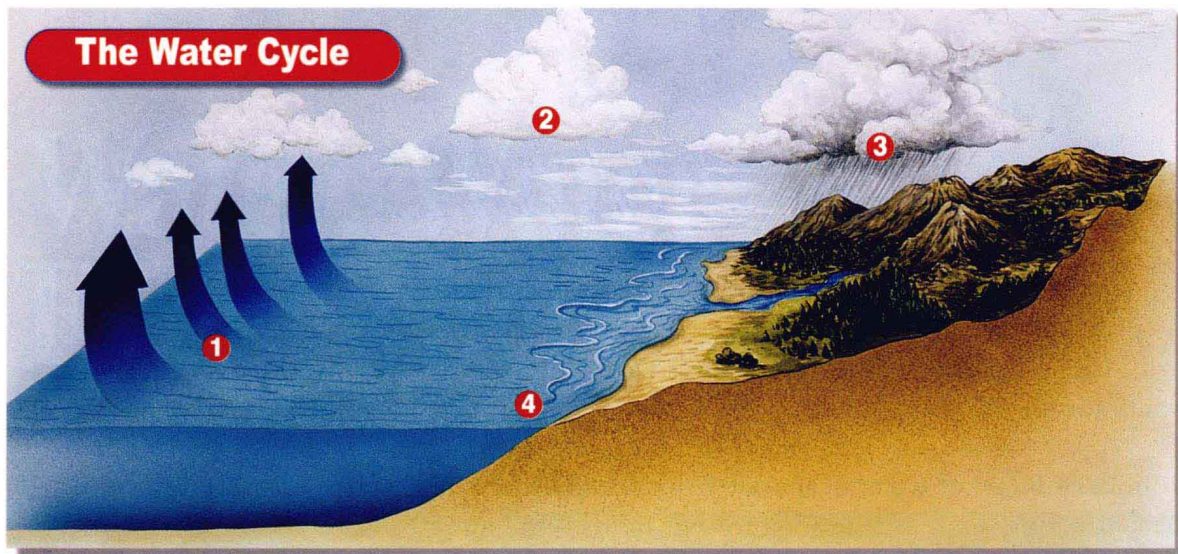


1. stretch out		伸展着身子躺
2. droplet	<i>n.</i>	小滴
3. invisible	<i>adj.</i>	看不见的
4. vapor	<i>n.</i>	水蒸气
5. process	<i>n.</i>	过程
6. liquid	<i>adj.</i>	液体的; 液态的
7. evaporation	<i>n.</i>	蒸发
8. liter	<i>n.</i>	升
9. moisture	<i>n.</i>	湿气; 水分

10. humidity	<i>n.</i>	湿度
11. temperature	<i>n.</i>	温度
12. factor	<i>n.</i>	因素
13. condense	<i>v.</i>	凝结; 冷凝
14. tiny	<i>adj.</i>	极小的; 微小的
15. ice crystal		冰晶(体)
16. eventually	<i>adv.</i>	最后; 最终
17. precipitation	<i>n.</i>	降水

**Swimmers in a wave pool await the next wave.**





- 1** Water evaporates and rises as water vapor. **2** Water vapor condenses to form clouds. **3** Water falls from clouds as rain or snow. **4** Water returns to rivers, lakes, and oceans, and the cycle begins again.

Sooner or later, the water evaporates, rises into the air as water vapor, and eventually condenses once again. This never-ending water cycle<sup>1</sup> continues every day around the world.

## Rain and Snow

Created by energy from the sun, great swirls of high and low pressure move around Earth. Wherever a mass of warm, moist<sup>2</sup> air meets a mass of cooler, drier air, a boundary<sup>3</sup> called a front<sup>4</sup> is formed.

You've probably heard weather forecasters talk about fronts. A cold front occurs when a cold air mass pushes under a warm air mass, forcing the warm air to rise. A warm front occurs when a warm air mass meets and glides<sup>5</sup> up over a cold air mass. A stationary<sup>6</sup> front occurs where warm and cold air masses

meet, but neither one moves.

Clouds typically<sup>7</sup> form in areas of low pressure and along fronts. These clouds can bring gentle<sup>8</sup> showers<sup>9</sup> or severe<sup>10</sup> storms. Thunderstorms<sup>11</sup> are violent<sup>12</sup> weather events. They can spring up quickly and bring heavy rain, lightning, thunder, and high winds. Some thunderstorms form on hot days when moist air close to the ground heats up and

1. water cycle		水文循环
2. moist	<i>adj.</i>	潮湿的
3. boundary	<i>n.</i>	界限
4. front	<i>n.</i>	(气压的)锋
5. glide	<i>v.</i>	滑行; 滑移
6. stationary	<i>adj.</i>	静止的; 停滞的
7. typically	<i>adv.</i>	一般地; 通常
8. gentle	<i>adj.</i>	和缓的
9. shower	<i>n.</i>	阵雨
10. severe	<i>adj.</i>	猛烈的; 强的
11. thunderstorm	<i>n.</i>	雷暴
12. violent	<i>adj.</i>	猛烈的; 强烈的