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ELEMENTS OF WEATHER

The four elements of weather are:

- I. Temperature**
- II. Air Pressure**
- III. Wind**
- IV. Moisture**

I. Temperature. The surface air temperature of the Earth varies for a number of reasons.

A. *Earth-sun relationships:* The insolation (energy received from the Sun) varies with:

- 1. The angle at which the sun's rays strike the surface of the Earth (daily; seasonal).
- 2. The length of day (equal in the tropics; varies in length toward the poles).

B. *Atmospheric reasons:* The amount of energy reaching the surface of the Earth varies with:

- 1. The amount of water vapor, carbon dioxide and dust in the air; albedo.
- 2. The length of passage of the rays through the atmosphere. The longer the path, the weaker the rays become; scattering increases.

C. *Surface reasons:* Once the rays pass through the atmosphere, the amount of energy absorbed by the surface varies with:

- 1. Whether the rays strike land or water (land heats up and cools off quicker than water).
- 2. The color of the surface (dark colors heat up quicker than light ones); albedo.
- 3. The elevation of the surface (the higher the elevation, the cooler the temperature); adiabatic lapse rate.
- 4. The orientation of the surface to the sun's rays (sun-facing slopes heat up quicker than those in shadow).

II. Air Pressure. The surface air pressure varies with temperature.

A. *Low pressure:* Warm air rises, thus lessening surface air pressure.

B. *High pressure:* Cool air falls, thus increasing surface air pressure.

III. Wind. Wind is the result of differences in air pressure.

A. *Wind* is air moving from an area with higher pressure to an area with lower pressure. The greater the difference between the area of high pressure and the area with low pressure, the stronger (faster) the wind will be.

B. *Wind direction.*

- 1. Determined by the direction from which they come, NOT to which they are heading.
- 2. Examples of wind directions:

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S wind

*
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SE wind

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*
NW wind

|
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N wind

C. *Wind systems:*

1. Global (see diagram in text)
2. Regional and seasonal
 - a) Monsoons
 - b) Cold winds (Bora, Mistral)
 - c) Hot and dry winds (Chinook, Sirocco, Santa Ana)
3. Local
 - a) Land and sea breezes
 - b) Mountain and valley breezes

D. *Importance of Wind*

1. Equalizes surface pressure and temperature.
2. Moves water vapor.
3. Natural cleaning agent.
4. Chief cause of the ocean currents.
5. Source of power (sail, wind mill)
6. Helps to shape the Earth's surface
 - a) Erosive power (sand and dust storms)
 - b) Builder (deposition; forms sand dunes, snow banks, loess)
7. Destructive nature
 - a) Violent storms (tornados, hurricanes, gales)
 - b) Desiccators (drying effect)

IV. Moisture. Moisture is a very important aspect of our Earth environment and includes such aspects as humidity, precipitation and cloud cover.

A. *Air Masses.*

1. Designated by their source region (tropical, polar, maritime, and continental).
2. Characterized by a unique combination of moisture and temperature conditions.

B. *Controlling Factor.* Temperature controls the amount of moisture in the atmosphere.

1. The colder the air, the less moisture it can hold.
2. The warmer the air, the more moisture it can hold.
3. When air cools, it loses its ability to hold moisture; condensation and precipitation occur.

C. *Precipitation.* Any moisture falling from the atmosphere (examples: rain, snow, sleet, fog, mist, etc.).

D. *Types of Precipitation and their Causes.*

1. Convictional precipitation -- heat generated
2. Orographic precipitation -- created by uplift along a landform barrier
3. Frontal or cyclonic precipitation -- created when warm and cold air masses meet.