

# 21.3 Climate Changes

## Natural Processes That Change Climates

### ◆ Volcanic Eruptions

- The presence of volcanic aerosols (ash, dust, and sulfur-based aerosols) in the air increases the amount of solar radiation that is reflected back into space. This causes Earth's lower atmosphere to cool.

### ◆ Ocean Circulation

- Changes in ocean circulation also can result in short-term climate fluctuations.

# Eruption of Mount Pinatubo



# Effect of El Niño



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### ◆ Solar Activity

- When the sun is most active, it contains dark blemishes called sunspots. The formation of sunspots appears to correspond with warm periods in Europe and North America.

### ◆ Earth Motions

- Geographic changes in Earth's land and water bodies cause changes in climate.
- Changes in the shape of Earth's orbit and the tilt of Earth on its axis are other Earth motions that affect global climates.

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## Human Impact on Climate Changes

### ◆ The Greenhouse Effect

- The **greenhouse effect** is a natural warming of both Earth's lower atmosphere and Earth's surface from solar radiation being absorbed and emitted by the atmosphere.

### ◆ Global Warming

- As a result of increased levels of carbon dioxide and other greenhouse gases, global temperatures have increased. This increase is called **global warming**.