

Volcanic Activity	The most significant effect of large volcanic eruptions is the soot, ash, and dust thrown high into the atmosphere.			The blanket of volcanic ash that circles the globe reduces the amount of solar radiation that can be received at Earth's surface.
Milankovitch Cycles				Variations in Earth's orbit around the Sun have a direct effect on the amount of solar energy received on Earth's surface.
Variations in the Sun's Energy Output				If less energy leaves the Sun, then less energy can be received on Earth's surface.

13. Plate tectonics and the global conveyor show the greatest degree of interconnectedness because they have overlapping effects on the lithosphere and the hydrosphere.

3.3 Questions, page 389

Knowledge

1. Brief descriptions follow in the table.

Time Frame	Description of Average Temperature Fluctuations	Theory of Cause	Description of Theory
Earth's Entire History	<ul style="list-style-type: none"> long warm periods (millions of years), each punctuated with periods of repeated glaciations occurred in Precambrian, Ordovician, Carboniferous, Jurassic, and Pleistocene 	Plate Tectonics	<ul style="list-style-type: none"> continents moving to polar regions allowed formation ice sheets changes to ocean-circulation patterns prevented heat transfer to polar regions
		Volcanic Activity	<ul style="list-style-type: none"> release of volcanic emissions into atmosphere prevented Sun's energy from reaching Earth in short term in long term, release of carbon dioxide can increase greenhouse effect
Pleistocene and Holocene	<ul style="list-style-type: none"> repeated glaciations every 80 000 to 120 000 years 	Milankovitch Cycles	<ul style="list-style-type: none"> periodic changes orbit shape, axial tilt, axial wobble match timing of repeated glaciations
		Natural Carbon Dioxide Fluctuations	<ul style="list-style-type: none"> correlation between atmospheric carbon dioxide and average global temperature

Little Ice Age	<ul style="list-style-type: none"> unusually cold period during medieval times 	Variations in Solar Intensity	<ul style="list-style-type: none"> decrease in number of sunspots corresponding to decrease in solar energy output may have caused lower temperatures
Last 100 Years	<ul style="list-style-type: none"> fluctuations but mainly upward trend 	Enhanced Greenhouse Effect	<ul style="list-style-type: none"> at least in part caused by human emissions of greenhouse gases—carbon dioxide and methane

- The *Holocene Epoch* began with the melting of the Laurentide Ice Sheet about 10 000 years ago. It continues to the present day.
- Conditions affecting certainty in predictions include a knowledge of the current variables in a system and an understanding of how the system works. There is still much to learn about the present state of the global climate system and how all of the components work together. The system is so complex that these two conditions will never be fully satisfied.
- The major theme is change. This is a change in landscape, climate, and life forms.

Applying Concepts

- This table shows one possible interpretation of the connections between science, technology, and society.

