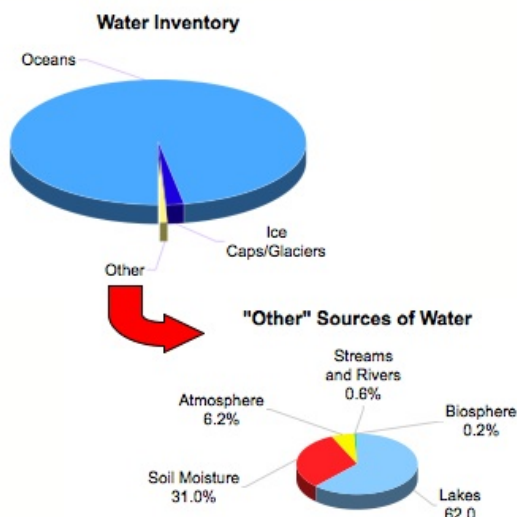


The Hydrosphere

Water Inventory

About seventy-one percent of the earth's surface is covered by an estimated 1,460 terratonnes of water (multiply by 10^{12}). Of the water on the planet, over 99% is contained in either the oceans or the ice cap/glaciers of the world. Of the less than 1% that remains outside those two sources, lakes and soil moisture store the greatest amount. What is left over is found in the atmosphere, streams and rivers, and the biosphere.

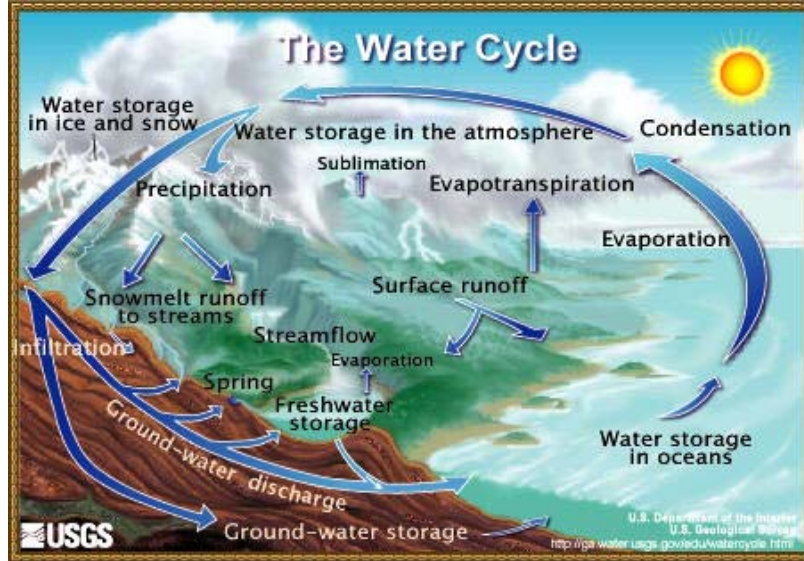


Global Freshwater Resources

Global Freshwater Resources by Continent			
Continent	Glaciers and Permanent Icecaps (km ³)	Groundwater (km ³)	Wetlands, Large Lakes, Reservoirs and Rivers (km ³)
North America	90,000 +2,600,000 (Greenland)	4,300,000	27,003
Europe	18,216	1,600,000	2,539
South America	900	3,000,000	3,431
Africa	0.2	5,500,000	31,766
Asia	60,984	7,800,000	30,622
Australia	180	1,200,000	221
Antarctica	30,109,800	n/a	n/a

Examine this table. There are a couple of statistics that you should find anything surprising. Discuss these anomalies – what are the potential problems (look at Antarctica) and what shouldn't be a problem (look at Africa) according to the numbers. Feel free to do some research if you need to.

The Hydrologic (Water) Cycle



"The Little Boy"

An anomaly of sustained temperatures greater than 0.5°C from the normal in the waters of the Pacific Ocean, off of the west coast of South America, can have a profound effect on both regional and global climate conditions. Known as El Niño, this phenomenon can last for extended periods of time. The most recent started in September 2006 and ended in early 2007.

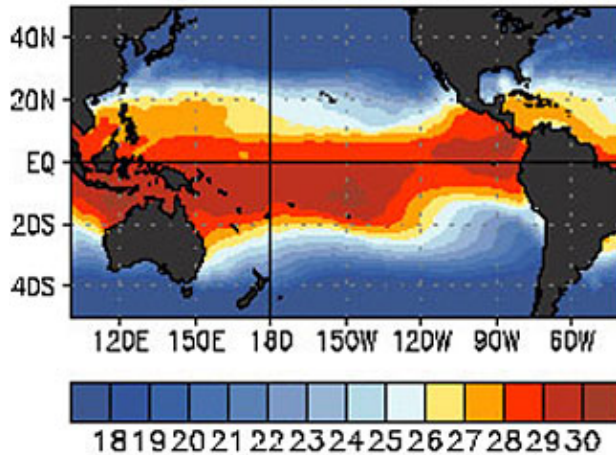
Local and regional impacts on the climate of South America include warmer and wetter summers along the coast of Peru and Ecuador. Southeast Asia and Northern Australia experience dry conditions during El Niño episodes, while the impact on North America is varied. Northern Mexico and Southern California experience wetter and cooler conditions during their winter months while the U.S. Midwest and Northeast, as well as Canada, have warmer winters.

These periods of increased water temperature also impact the ocean's ecosystems affecting the viability of the fishing industry in the South Pacific. Fewer fish were being attracted to the poor nutrient conditions that exist in the warmer water.

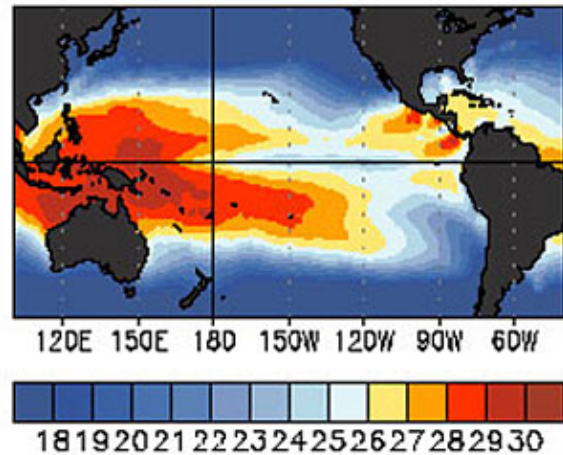
Often, after a period of El Niño, the ocean will experience a decline in temperatures where the waters are cooler than normal; this is called La Niña, "the little girl".

OCEAN TEMPERATURES (°C)

EL NIÑO Jan-Mar 1998



LA NIÑA Jan-Mar 1989



1) Examine the diagram of the water cycle and answer the following questions:

a) Define the following words:

- condensation
- evaporation
- sublimation
- evapotranspiration

b) Describe the process that is shown on the diagram. Begin with:

“The energy from the sun heats the ocean water, causing it to evaporate.” ...

c) Explain how the hydrologic cycle is a closed system. What are the disadvantages of this?

d) Consider the impact on the hydrologic cycle of the following events;

- Increases in the cloud cover over an extended period of time.
- The flow of a river is dammed by a hydro-electric company.
- A water company removes spring water for commercial sale.
- A marsh is drained for urban development.

e) Choose an event from part ‘d’ and research an example of where it happened and its impacts. Write a brief (1 or 2 paragraph) summary that includes the impacts on the various spheres.

2) What impacts do you think El Niño and La Niña might have on regional and global climate conditions?