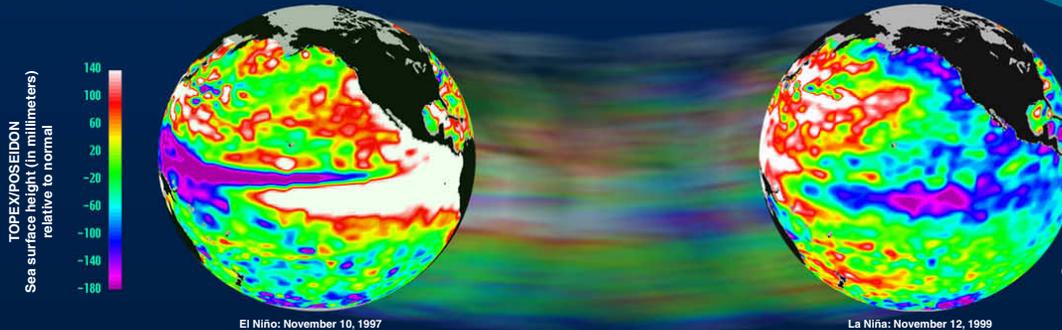


Pacific Pendulum Swings With Global Reach!

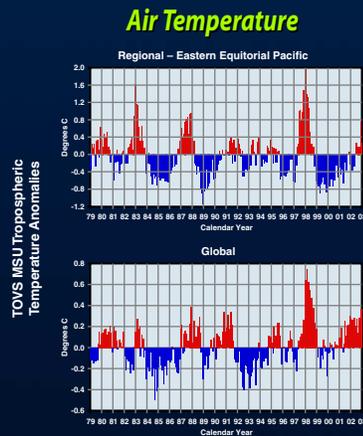
The El Niño of 1997–98 and the long La Niña of 1998–2001 forced Earth's environmental systems to totter.

EOSDIS data can be used to study El Niño and La Niña variations and their impacts on Earth's systems.



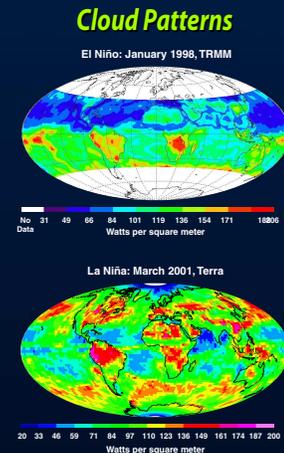
The hot-and-cold extremes of El Niño/Southern Oscillation (ENSO) are expressed as sea surface height anomalies. Higher (warmer) than normal water appears as white and red, and lower (cooler) than normal as blue and purple.

Images courtesy of NASA JPL TOPEX/POSEIDON Project



Replacement of warm water by cold water causes air temperature swings and humidity changes, affecting cloud patterns and winds.

All of these changes steer storms and rainfall to new locations.

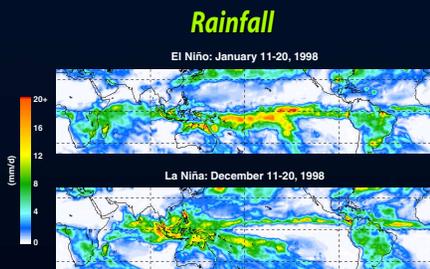


CERES monthly total-sky shortwave flux data display different patterns of high reflectivity (in pink and red) indicating clouds.

Images courtesy of NASA LaRC DAAC

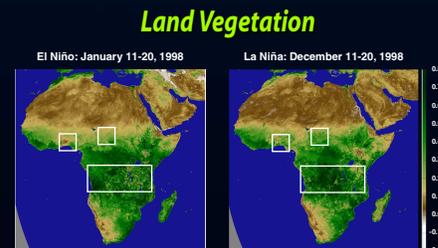
Data show temperatures higher than normal during El Niño and lower than normal during La Niña, even in the global chart.

Images courtesy of Global Hydrology and Climate Center

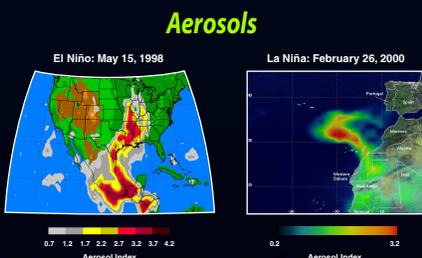


Images courtesy of NASA GSFC TRMM Project

Shifts in rainfall affect plant growth and areas of drought.



Images courtesy of NASA GES DAAC



Drought contributes to dust and smoke aerosols in the atmosphere.

TOMS aerosol data indicate smoke from drought-facilitated fires and dust from drought-impacted areas of Africa (right).

Images courtesy of NASA GSFC Scientific Visualization Studio

DAC Alliance



National Aeronautics and Space Administration

Pacific Pendulum Swings With Global Reach

NASA's Earth Observing System (EOS) satellites provide a wide range of interdisciplinary science data products useful to scientists for observing and analyzing environmental events, and predicting their effects. The data allow disaster and resource managers to monitor and react to hazards. The images featured on this poster represent a sample of the many EOS Data and Information System (EOSDIS) data products useful for studying climate, weather-related events, and their effects. EOSDIS data products and services are available from the Distributed Active Archive Center (DAAC) Alliance.

Extremes of El Niño and La Niña – *Ocean Topography Experiment (TOPEX)/POSEIDON*

El Niño and La Niña conditions represent extreme variations from normal circulation patterns. Changing trade winds push warm water masses in the equatorial Pacific eastward (El Niño) and westward (La Niña). Sea surface temperature (SST) anomalies associated with these extremes directly correlate to the sea surface height (SSH) anomalies. The global images of SSH anomalies are derived from TOPEX altimeter Geophysical Data Record (GDR) data.

Data set: TOPEX/POSEIDON Sea Surface Height Anomaly

References: <http://sealevel.jpl.nasa.gov> (JPL TOPEX/POSEIDON Project Office) and <http://podaac.jpl.nasa.gov/ost> (ocean surface topography products at JPL PO.DAAC)

Changes in SSH and SST in the equatorial Pacific Ocean drive the following environmental events:

◆ **Air Temperature Fluctuations – *TIROS Operational Vertical Sounder (TOVS) Microwave Sounding Unit (MSU)***

The Television Infrared Observation Satellite (TIROS) TOVS MSU climate data collection, covering a 23-year period, shows swings in atmospheric temperature driven by changes in SST. Note that El Niño and La Niña signatures exist in the global as well as the regional data.

Data set: AMSU/MSU LowTropo Day/Month Temp Anomalies and Annual Cycle

References: <http://ghrc.msfc.nasa.gov> and <http://www.ghcc.msfc.nasa.gov/MSU/msusci.html>

◆ **Shifts in Cloud Patterns – *Clouds and the Earth's Radiant Energy System (CERES)***

Monthly shortwave radiation (reflected sunlight) data can be used to show the different patterns of cloud cover in the Pacific and Indian Oceans and nearby continental areas. Note the differences for northern Australia, Japan, the equatorial Pacific, California, and Panama.

Data sets: El Niño: CER_ES4_TRMM-PFM_Edition2 and La Niña: CER_ES4_Terra-FM2_Edition2

Reference: <http://asd-www.larc.nasa.gov/ceres/ASDCeres.html>

◆ **Shifts in Rainfall – *Tropical Rainfall Measuring Mission (TRMM)***

Rainfall data show the different precipitation patterns in the Pacific and Indian Oceans and nearby continental areas. Note the differences for northern Australia, Japan, the equatorial Pacific, California, and Panama.

Data set: TRMM Gridded Data Products: 3B43: Monthly 1 x 1 Degree TRMM and Other Sources Rainfall Product

References: http://trmm.gsfc.nasa.gov/images_dir/images.html and <http://lake.nascom.nasa.gov/data/dataset/TRMM>

◆ **Changes in Land Vegetation – *Pathfinder Advanced Very High Resolution Radiometer (AVHRR)***

Normalized Difference Vegetation Index (NDVI) images show the responses of vegetation to precipitation. Comparisons show general patterns as well as local effects of above- and below-normal rainfall.

Data set: AVHRR 8-km Global Land 10-Day Composites Product; image subset by the GSFC Earth Sciences (GES) DAAC

References: http://daac.gsfc.nasa.gov/HDF_BROWSE/PAL10/1998/index_10d.html and

http://daac.gsfc.nasa.gov/data/dataset/AVHRR/01_Data_Products/03_Tenday/04_AVHRR_NOAA14/index.html

◆ **Atmospheric Aerosol Impacts – *Earth Probe (EP) Total Ozone Mapping Spectrometer (TOMS)***

Custom processing of Aerosol Index (AI) data shows the extent of windblown smoke and smog resulting from agricultural burning and forest fires in Central America. Several months of El Niño drought conditions set the stage for fires. During La Niña, winds carried dust from the drought-parched grasslands and deserts in Africa. Land surface and geographic information has been added to the TOMS data images.

Data set: TOMS 2-Day L3 AI (Aerosol Index)

References: <http://toms.gsfc.nasa.gov/index.html>, <http://toms.gsfc.nasa.gov/eptoms/ep.html>, and

<http://toms.gsfc.nasa.gov/aerosols/indonesia.html>

Additional Information

- ◆ NASA EOS missions and instruments: <http://eos.nasa.gov>
- ◆ NASA EOSDIS: http://eosdismain.gsfc.nasa.gov/eosinfo/EOSDIS_Site
- ◆ Data centers of the DAAC Alliance and their products and services: <http://nasadaacs.eos.nasa.gov>
- ◆ EOS Data Gateway (EDG) online search-and-order service: <http://eos.nasa.gov/imswelcome>