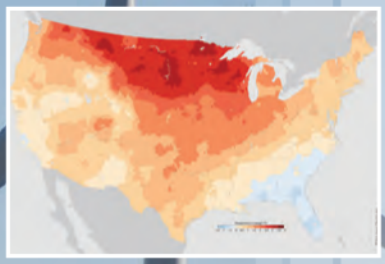
National Aeronautics and Space Administration



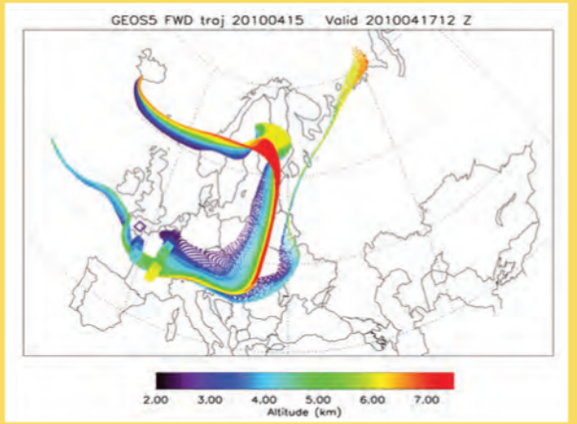
DEVELOP National Program

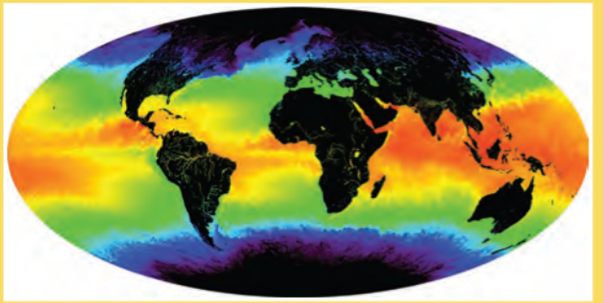
CLIMATE

California Coast Climate and Ecological Forecasting

Patterns of Change Along the California Coast: Analyzing the Impact of Coupled Ocean and Land Process Changes on Coastal Ecosystems

California's land-ocean interface is one of its most diverse biogeographical zones. This zone maintains a rich biodiversity of coastal grasslands, shrublands, and forests. Studies have shown that this biodiversity relies on constant climate variables such as precipitation, wind prevalence, fog, cloud cover, and temperature. However, changing summer marine fog events along California's Pacific Coast have declined by an estimated 33 percent in frequency since the early 1950s. As fog is one of the main sources of water for vegetation during the otherwise dry summer months, historical coastal ecosystems such as that of the coastal redwood tree, *Sequoia sempervirens,* have been dramatically affected. The rapid colonization of conifers into regions previously identified as shrubland and grassland is hypothesized to be related to the changing fog patterns. This advancement of conifer forests poses a management challenge to park and forest personnel. The primary objectives of this project were to identify the changing vegetation by geospatially mapping colonization into shrubland and grassland, to determine the succession rates of conifer forests, and to identify climate and ecosystem variables that contribute to the success of conifer establishments. Vegetation change was investigated using C-CAP and Landsat TM5 satellite images for a time-series change detection to identify the areas and rates of conifer encroachment. Moderate Resolution Imaging Spectroradiometer and Geostationary Operational Environmental Satellite sensors were used in conjunction with visibility data to create overlying fog and precipitation maps. These data were used to analyze the relationship between conifer encroachment and changing fog patterns in the California coastal region.





Climate sea surface temperatures

CALIPSO Trajectories

Aerosol Trajectory Modeling and GUI Design for Level 1 Data from the CALIPSO Satellite Through Earth's Atmosphere

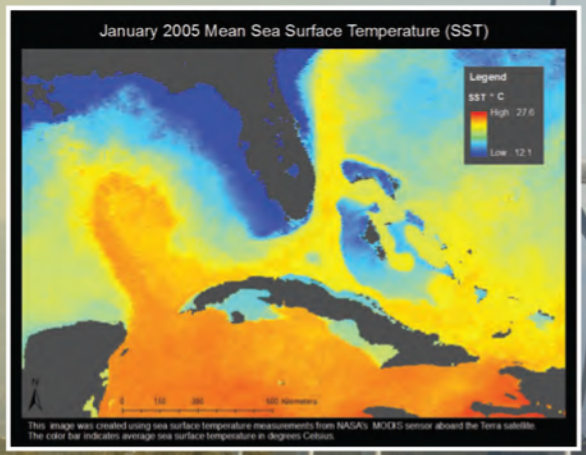
The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) mission measures the height of water droplets and aerosol particles in the atmosphere. CALIPSO data provide useful information for research into the effect of clouds and aerosols on Earth's energy balance and the environment. CALIPSO flies as a part of the NASA "A-Train" satellite constellation. The payload consists of three instruments, including the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP), which inputs data into programs created by the DEVELOP team. The goal of the CALIPSO DEVELOP team is to make CALIPSO data easier to manipulate so that existing resources at NASA Langley Research Center can be utilized in other areas of need. Another goal of the team is to facilitate atmospheric and environmental research. The CALIPSO DEVELOP team worked on two separate projects. For the first, a program was developed for transforming preprocessed LIDAR Level 1 data from the satellite into images that could be accessed and manipulated through a Graphical User Interface (GUI). For the second, a software code was developed that could be used to track aerosol features found in CALIPSO data such as smoke clouds and cloud droplets.

CLIMATE

Florida Keys Climate

Analyzing the Effects of Climate Change on Sea Surface Temperature Anomalies To Aid in Monitoring Coral Reef Health in the Florida Keys Using Sea Surface Temperature Data from AMSR-E Aboard Aqua and MODIS Aboard Aqua and Terra

In recent decades, the scientific community has grown more concerned with how climate change is affecting coral reef systems throughout the world, especially given the ecological importance of coral systems and vulnerability of these systems to decline and mortality. Scientists are constantly experimenting with new technology for monitoring coral reefs with the goal of understanding the climatic and oceanic changes that can lead to coral bleaching events. Elevated sea surface temperature (SST) is a well-documented cause of bleaching events. Many studies have used coarse-resolution data from the Advanced Very High Resolution Radiometer (AVHRR) aboard the National Oceanic and Atmospheric Administration's (NOAA's) Polar Operational Environmental Satellite (POES) to characterize and study SST anomalies with regard to bleaching events. In partnership with NOAA's Office of National Marine Sanctuaries (Southeast Atlantic, Gulf of Mexico, and Caribbean Region) and the University of South Florida's Institute for Marine Remote Sensing, this project aims to utilize higher-resolution SST data from Aqua's Advanced Microwave Scanning Radiometer for EOS (AMSR-E), Aqua and Terra's Moderate Resolution Imaging Spectroradiometer (MODIS), and AVHRR to create a 10-year record of SST anomalies in the vicinity of the Florida Keys from 2000 to 2010. The results from this project will demonstrate the feasibility of using AMSR-E and MODIS for detecting SST anomalies and improve upon the current techniques used to monitor coral reef health in the Florida Keys.



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