The California Current Ecosystem (CCE) research site is a coastal upwelling biome, as found along the eastern margins of all major ocean basins. These are among the most productive ecosystems in the world. The California Current system is of particular interest because it sustains active fisheries for a variety of fish and marine invertebrates, influences weather patterns and the hydrologic cycle of much of the western United States, and plays a vital role in the economy of myriad coastal communities.

The CCE LTER site is investigating nonlinear transitions between different states of the California Current coastal pelagic ecosystem, with particular attention to the effects of a long-term warming trend, the Pacific Decadal Oscillation, and El Niño. The objectives are to understand how these patterns and processes affect the structure and dynamics of this planktonic ecosystem.

Spatial differences provide a clue about long-term change. We use the spatial variability within the California Current to project how the planktonic ecosystem might change in response to climate variations over the long term. For example, the primary producers at the base of the food web may become increasingly dominated by tiny picoplankton cells rather than larger diatom cells.

Central Research Questions

- What are the mechanisms leading to different ecosystem states in a coastal pelagic ecosystem?
- What is the interplay between changing ocean climate, community structure, and ecosystem function?
- Mathematical Modeling is an integral part of this research. Models help test our level of understanding and eventually make ecosystem forecasts. CCE scientists are developing different types of models, including:
  - Biophysical models that couple interactions in the pelagic food web to computer simulations of 4-D ocean circulation
  - Nonlinear time-series models
  - Control volume property fluxes

Representing the ocean environment as a 'control volume' helps to understand fluxes of nutrients and organisms into and out of the boundaries of the study site.

CCE's Education and Outreach fosters partnerships that bridge research science and formal/informal learning environments. An outreach coordinator promotes in-curricula-based science and encourages community involvement.

Information Management: The CCE LTER team is building an information management system as part of an information environment that serves as a digital hub for the site. Please visit: http://ccter.lter.ucsd.edu

Long-term measurements, together with experiments and numerical ocean models, permit researchers to go beyond simple correlations to understand the complex nonlinear dynamics unifying ecosystem variability.

CCE measurement programs include:
- Four augmented CalCOFI cruises each year, on a regular grid of 65 sampling stations
- Experimental process cruises, to assess key biological rates and interactions
- Satellite remote sensing
- Benthic time series measurements
- Nearshore measurements from the Scripps pier and Dana Point (in cooperation with the Ocean Institute)
- Spray ocean glider surveys

Student research is an integral part of the CCE LTER site. There are opportunities for students to pursue their PhD research and for undergraduates to participate in research experiences at CCE.