Getting down to details

By Trish Barker

Researchers at Scripps Institution of Oceanography develop fine-scale climate datasets using a novel numerical technique on TeraGrid systems at SDSC and NCSA.

Climate research—particularly studies aimed at management of water, energy, forestry, fisheries, or agriculture—requires fine-scale data over long time periods. But it's nearly impossible to find data from multiple decades that is consistent, comparable, and of sufficient resolution.

To address this dearth of data, scientists turn to the process of reanalysis—integrating data from disparate sources within a numerical model in order to create a comprehensive dataset and to shed light on how and why climate has varied over the past half-century.

However, global reanalysis typically has a resolution that is too coarse for many application studies. Using compute resources at the San Diego Supercomputing Center (SDSC) and NCSA, Masao Kanamitsu, a research meteorologist at the Scripps Institution of Oceanography, and postgraduate researcher Hideki Kanamaru were able to carry out a fine-scale 10 km regional reanalysis of California covering 57 years, from 1948 to 2005 (CaRD10, for short). Their work is supported by the California Energy Commission Public Interest Energy Research program.

Kanamitsu and Kanamaru used a reanalysis technique called dynamical downscaling with the state-of-the-art Regional Spectral Model. They found that their reanalysis results compared well with observations and yielded more accurate wind and temperature data than other methods on all time scales, whether hourly or across decades. Their results, which will be published in the Journal of Climate, indicate that dynamical downscaling could be a reliable way to derive fine-scale regional detail from coarser analyses.

The data is being stored and made accessible to researchers who need detailed meteorological information through SDSC’s DataCentral service.

Experts at both TeraGrid sites were instrumental in helping the researchers get their simulations running smoothly.

Near surface wind for a Catalina Eddy event on May 22, 1984. Shades are surface height (in meters) for each analysis. CaRD10 is the dynamical downscaling of California. The analysis using surface observation is shown on the right. Image courtesy of Hideki Kanamaru and Masao Kanamitsu.