Another limitation is the CPU time required for the simulations. Currently, it takes about 2 days of DECstation 5000/240 time to simulate 1 day for the U.S. West domain. California takes twice as long, Maui will take 10 times longer. Global GCMs take less time but we tend to simulate longer periods of time.

**PRECIPITATION FIELD (slide 7)**

We visualize almost all of our output with 2-d NCAR graphics. Although this is a cumbersome graphics system, it does everything that we want and has been the de facto standard in meteorology and oceanography for a number of years. Also, NCAR has a fairly large graphics staff devoted to the kinds of graphics problems that we encounter and have been quite responsive to all our graphics questions. NCAR is also public domain and works well on our DECstations. We can easily produce the individual frames for movies we display on DECstations and LCD display systems.

**CLOUD FIELD (slide 8)**

The disadvantage to our present 2-d graphic system is that we would like to understand better the 3 dimensional aspects of the simulation. We are beginning this process with the help of Kochevar and Ahmed at SDSC, but so far we have not been able to progress beyond the making of a few presentation slides.

**SUMMARY (slide 9)**

We need more raw CPU power for both modelling and visualization. We are hopeful that the new alpha workstations will provide this capability. We also need a big storage system to store our data. We are hopeful that bigfoot will provide the capability. We would also like to more easily manipulate and manage these data as well as collaborate more effectively with other scientists. We are hopeful the postgres Dbase will provide this capability.

is used for comparison with GCM climates. This analysis is also used for various diagnostic studies of the large-scale circulation system. The major problem with the analysis is that it changes over the years as the weather prediction models get better. It would be nice to have a more consistent long term climate analysis, and various projects are underway to do just this.

**U.S WEST, ANALYSIS GRID POINTS, METEOROLOGICAL OBS. (slide 4)**

Because this large-scale analysis is fairly low resolution, we only coarsely resolve the topography in a place like the U.S. West. For this reason, we are developing models that take some of the large-scale analysis and dynamically interpolate it on down to smaller sizes. This also allows us to study some of the weather phenomenon of California not well resolved with the large-scale analysis system or the present observational network. We are now running and analyzing a model with 50 km resolution, which has 25 times more grid points than the large-scale analysis. We validate this model with the raw observations at the radiosonde sites, as well as the surface hourly stations. Another observation data set, at which only temperature and precipitation are measured, known as the cooperative station network, is shown in the lower right hand panel.

**CALIFORNIA (slide 5)**

Continuing on down the scale, we are also beginning to develop simulations for a 25 kilometer grid, which has 100 more grid points than the original analysis, only a few radiosonde and hourly stations and still a fair number of cooperative stations. We are also looking at simulating some events over Hawaii as well as the island of Maui at 2.5 kilometer resolution.

**MODEL DATA STORAGE, CPU TIME (slide 6)**

Our data storage for the large scale global analysis, or equivalently GCM output, is adequate but cumbersome. We use 3 or 4 Exabyte tapes to store each year of data. Various derived products from this analysis take up the same or larger amount of space. The regional model simulations tend to have somewhat larger horizontal, vertical, and temporal resolution, but because of the limited domain size and limited simulation time, the regional model output usually has about the same data storage requirements. All these exabyte tapes are stored on our bookshelves.

# Sequoia Presentation to DEC

*J.O. Roads, S.-C. Chen, K. Ueyoshi*
Scripps Institution of Oceanography, UCSD
Picturetel (UCSD, Pasquale Lab)
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**TITLE (slide 1)**

During the past several years, we have been involved in various global and regional climate studies. These studies involve analysis, modelling, and visualization.

Perhaps the most well known analysis is the one that is done every day by NMC when it puts out its global weather forecasts. This analysis involves literally tens of thousands of observations that are gathered worldwide hourly, twice daily, and daily. The most numerous of these are the observations from the surface network. The U.S. weather bureau maintains about 500 of these stations worldwide, and they report on the hour the temperature, dewpoint, precipitation, windspeed, pressure, as well as some weather observations and observations from more specialized weather instruments. Most of these observations are over land. Upper air measurements are also made over land by radiosondes which are balloons which descend to the stratosphere and which have sondes attached to them radioing back meteorological measurements. Some balloons have no instruments, and people just use these balloons to tell them wind velocities. Aircrafts also report along their flight track, as do ocean going ships. Satellites help out a little bit with coarse vertical resolution temperature and cloud drift wind measurements.

**ANALYSIS GRID (slide 2)**

All of these observations are gathered together, along with a short term 6 hour forecast, 4 times a day, to make an analysis which is a combination of all the observations and a global general circulation model forecast, on a regular set of grid points. The NMC analysis is archived on a 2.5 degree grid at NCAR.

**SURFACE WIND CLIMATOLOGY FROM NMC ANALYSIS (slide 3)**

For many purposes, this analysis is perfectly adequate. For example, I show here the surface wind field for 2 months. These winds are derived from the analysis. This analysis