

3-dimensional Modeling and Simulation of Mesoscale Atmospheric Circulation IN VIS5D

Sunny Cabello

Maui High Performance Computing Center

Research Supervisor: Marie Greene

Home Institution: Maui Community College

Vis5D is an open-source program that works on weather models in the form of a 5-dimensional rectangle: three space dimensions (x, y, z), one time dimension, and one dimension for multiple physical variables (humidity, temperature, clouds, rain, etc). To get high-resolution weather models, we use MM5 (Mesoscale Model Version 5), which is downloaded nightly from the National Center for Environmental Prediction, and then processed using MM5 code in parallel with the IBM P4 Supercomputer on 32 processors. The Vis5D program, combined with MM5 data, is used to create a model to simulate and predict mesoscale atmospheric circulation in the region above and around the state of Hawaii for the purpose of assisting in overall missions for telescope operations. Through a Silicon Graphics Workstation, the *tovis5d* tool and the IBM P4 Supercomputer is used to translate the processed MM5 data to a format that can be accurately displayed in the Vis5D program. By modifying the code for the *tovis5d* tool diagnostic variables (wind, pressure, vorticity, etc.) can be created to view additional and custom weather information in 5-D. To orient the user as to where the weather model is located, a mesoscale topographic map of Hawaii was created using *maketopo*, a tool that converts the 2-dimensional array of elevation values into a 3-dimensional topographic map. A Tcl (Tool Command Language) script was coded to set colors for isosurfaces and wind patterns, compute graphics, and make off-line animations. This Tcl script will save a time series of mesoscale atmospheric circulation images with multiple data sets. Finally, an executable was created to run and view the weather model and topography in a context specified by the Tcl script. The result is a 5-dimensional model of the collected weather data that can display isosurfaces, contour and colored slices, volume renderings, and rotation and animation of images in playback or real-time.

Sunny Cabello is majoring in Electronic and Computer Engineering Technology at Maui Community College. She was born in Honolulu, Hawaii.

