COUPLED ATMOSPHERE-WAVE HIGH-RESOLUTION REANALYSES FOR REGIONAL CLIMATE SERVICES

Francois Vandenberghe
National Center for Atmospheric Research, Boulder CO
Gael Descombes
National Center for Atmospheric Research, Boulder CO
Tatiana Burek
National Center for Atmospheric Research, Boulder CO
Michel Aidonidis
Service Hydrographique et Océanographique de la Marine, Brest France

The Climatology of Operational Parameter (CLIMOPS) is a new regional climate analysis toolkit issue from a US-French collaboration that aims at integrating 30 years of atmospheric and oceanic observations into fine scale gridded regional climate variables. The toolkit generates “on demand” large databases of gridded atmospheric parameters at high resolution, tailored to the specific needs for regional climate information by governmental agencies. The system takes advantage of the zooming and relocation capabilities of the embedded domains that is found in the community Weather Research and Forecast (WRF) model. The WRF regional model is applied to dynamically downscale NNRP and ERA40 global reanalyses and to generate long records, up to 30 years, of hourly gridded data over 200km^2 domains at 3km grid increment, for periods ranging from on day to one month.

To insure accuracy, observational data from the NCAR ADP historical database are used in combination with the Four-Dimensional Data Assimilation (FDDA) techniques to constantly nudge the model analysis toward observations. The ADP database is the most comprehensive archive of conventional data publicly available to the community. It is comprised of radiosondings, surface and aircraft reports as well as satellite-derived wind vectors, going back to 1973. ADP has been used in major reanalysis projects, such as NNRP and ERA. Additional satellite data over seas (Altimeter, SAR and Scatterometer) are furthermore assimilated when available. The FDDA technique is a robust method to continuously constraint the WRF model to the observations at a very low computational cost and is well suited for high-resolution reanalysis.

The WRF atmospheric model is coupled to the community regional wave height model WaveWatchIII (WWIII) at 1km grid increment. WWIII is a regional wave model, used operationally at NOAA. The coupling is one way, with hourly surface winds from the atmospheric model being used to force the wave model. The combination of atmospheric and wave models allows the creation of regional climate information that is consistent both with the global circulation and local observations.

The model grids can be relocated anywhere in the world by simple point and click commands through a graphical interface that was developed with input from users of both French and US agencies. Users can, with the same interface visualize, download or print the physical and statistical information derived from the model-based climatologies. The system takes advantage of the high numerical efficiency of the parallel version of WRF and WWIII models and run autonomously on a multi-processor workstation, at a fractional cost of super-computers. One CLIMOPS system has been installed at the French hydrographic agency. Its application and potential benefit for the planning of future aerial and naval missions are currently under evaluation.

Corresponding author:

Name: Francois Vandenberghe
Organization: National Center for Atmospheric Research
Address: PO Box 3000
Boulder, CO 80307-3000
USA
Email Address: vandenb@ucar.edu