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Integration of global climate datasets with mesoscale models through data assimilation for regional climate services

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We present 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 and defense 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 200km2 domains at 3km grid increment. 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 assimilation of long records of satellite observations is particularly efficient in those regions of the world where local in-situ data are sparse or simply inexistent. The WRF atmospheric model is coupled to the community regional wave height model WaveWatchIII (WWIII). The combination of atmospheric and oceanic models allows the creation of regional climate information that is consistent both with global atmospheric and oceanic circulation, as well as 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 such system has been installed at the French agency for hydrography and oceanography. Its application and potential benefit for the planning of future aerial and naval missions are currently under evaluation.