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AN OPERATIONAL MESOSCALE SEA BREEZE FORECASTING SYSTEM

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Range operations at the Kennedy Space Center/Cape Canaveral Air Force Station (KSC/CCAFS) are strongly affected by mesoscale weather systems. While a dense observational network is in place allowing nowcasts for up to 120 minutes into the future, planning for vehicle launches and hazardous materials handling often requires detailed meteorological information for 12 hours or more in advance. Routine synoptic scale guidance products provide little it the way of quantitative information on the complex local flow regimes, such as the land and sea breeze, which dominate the region's weather. Ideally, subjective forecasting techniques should be replaceable by products derived from site-specific mesoscale prognostic models. High performance work stations now can provide operational forecasters with dedicated desk top supercomputing and visualization capabilities. Thus, mesoscale forecasts can be performed locally and at lower cost than by reliance on remote mainframes, and often with faster turn-around times and reliable production schedules. The Regional Atmospheric Modeling System (RAMS) is a versatile, 3-D, non-hydrostatic, primitive equation model employing user-specified domains and multiple grid nests in the horizontal and vertical. It is the core of the prototype operational sea breeze forecasting system being installed at the Kennedy Space Center/Cape Canaveral Air Force Station. The model will be run twice daily, out to 24-hours, on a dedicated IBM RS/6000-550 work station, using a 60 km mesh over the southeastern U.S., nesting to 3 km Δx over east-central Florida. It will be initialized using both local data sets (surface mesonetwork, tall tower, rawinsonde, profilers) and gridded products from NMC. With these new capabilities for mesoscale numerical weather prediction at the local field office level, several key issues emerge. How are forecast and analysis products best generated from the massive model output? What confidence limits can be placed upon locally-produced mesoscale numerical forecasts? Methodologies for extracting and displaying forecast products from the model using visualization systems such as AVS have been developed. The KSC region is a data rich region. In addition, Doppler radar, aircraft, mesonetwork and rawinsonde data from the 1991 Convection and Precipitation/ Electrification (CaPE) field program are available for model evaluation. Using these data, a number of qualitative and statistical measures of model performance were applied. Features such as sea breeze penetration, convergence zone locations, inflow depth and vertical wind profile are compared to model predictions. Parameters such as wind speed, wind direction, temperature, dewpoint and boundary layer depth are compared using a variety of measures including average error, root mean square error, fractional bias, index of agreement, etc. The detailed case studies will be summarized. Previous evaluations of the model's ability to diagnose sea breeze thunderstorm potentials at KSC on a daily basis will be summarized as will future plans to explicitly predict sea breeze-generated thunderstorms. The RAMS output will be available to drive an advanced dispersion model for emergency response to accidental releases of toxic air contaminants as well as the impacts of routine emissions during nominal vehicle launches. The utility of the various model evaluation methods applied will be discussed. The following illustrations show typical displays from the operator console displaying predicted surface wind patterns, vertical motion fields and the dispersal of a pollutant cloud.