VERIFICATION OF NUMERICAL MODEL FORECASTS OF PRECIPITATION AND SATELLITE-DERIVED RAINFALL ESTIMATES OVER THE TROPICS AND THE MID-LATITUDES

Laura Bertolani & Raffaele Salerno

Epson Meteo Centre, Research and Development Division, Milan, Italy

Precipitation is one of the most difficult weather elements to predict. It depends on many physical and dynamical processes, such as large-scale motion of moist air, orographic lifting, convection. Since all these processes are parameterized in NWP models, the quality of the model predicted precipitation is often used as a critical indicator of the overall model skill.

Near real-time satellite-derived estimates of precipitation, which are becoming available these years, provide a valuable tool to the scientific community for analysing and investigating the physical processes associated with the water cycle, due to the availability of data at increasingly higher spatial and temporal resolution over large areas. There are many fields of application of these measurements, and many validation/intercomparison efforts are trying to properly assess the accuracy of the algorithms, and to compare the products with numerical model forecasts over various domains and at different spatial resolutions.

This work presents the preliminary results of a study aimed at evaluating the capabilities of the operational Global Circulation Model (GCM) run at the Epson Meteo Centre (CEM*)* in predicting precipitation under different weather regimes, on a daily basis, in comparison with satellite-derived estimates of precipitation, and during the Phase I of the Coordinated Enhanced Observing Period (CEOP) project.

The CEM-GCM is based on the 1997 National Centers for Environmental Prediction (NCEP)/Experimental Climate Prediction Center (ECPC) Global Spectral Model and runs at T126 (horizontal resolution of about 1°x1°) and with 28 unevenly spaced sigma vertical levels. The model physics includes the Simplified Arakawa-Schubert (SAS) convective scheme. The 2-layer Oregon State University (OSU) Land Surface Model (LSM) is employed, and heterogeneous boundary conditions are used at the surface (14 vegetation classes and 12 soil types).

The satellite precipitation estimates considered for validation are 0.5°x0.5° lat/lon gridded data available every 3 hours, derived from blended Passive Microwave (PMW) and Infrared (IR) data combined with the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center (CPC) Morphing method, the so-called CMORPH.

Both model forecasts and satellite-derived estimates are validated against the NOAA CPC Daily Rain Gauge Analysis available at 0.5°x0.5° lat/lon resolution.

The main recommendations for the verification and intercomparison of quantitative precipitation forecasts from operational NWP models, provided by the World Weather Research Program/Working Group on Numerical Experimentation (WWRP/WGNE) Joint Working Group on Verification (JWGV), are strongly taken into account to carry out this first verification effort.

The study focuses on the 7-months period June-December 2004, investigating precipitation forecasts up to 3 days and satellite-derived rainfall estimates over Europe (36°-56° N; 10°W-25°E) and India (5°-27°N; 70°-90°E). Very different physical and dynamical processes over large domains are thus considered, as deep convection during the Indian summer monsoon, or large-scale synoptic forcing in mid-latitudes approaching the cool season. So, this analysis can provide interesting hints on model physics and precipitation processes.