WEDNESDAY 18 JUNE 2003: USE OF MOISTURE INFORMATION IN NUMERICAL WEATHER PREDICTION AND CLIMATE MONITORING

Richard Renshaw (Met Office)**: The use and impact of moisture observations in NWP**

There is a wealth of information available on moisture in the atmosphere in its various forms – humidity, precipitation, fog and cloud. The physical processes involved are complicated and act on small scales. NWP models have difficulty modelling these important processes. Correspondingly we find problems assimilating this information into NWP. In this talk we look at how NWP models treat moisture. We review what impact the use of humidity information has had on NWP forecast skill. We describe how we currently assimilate cloud information into the Met Office UK mesoscale model, and how we plan to do so in the future.

Brett Candy (Met Office)**: Satellite observations used in moisture analysis**

Satellite sounding data is now routinely used in analyses of operational numerical weather prediction models. In addition to temperature, radiance measurements also contain information on the vertical structure of humidity. In this talk we will review why these observations contain such information and how they are assimilated into NWP models. Recent results of the impact of humidity data in the analyses and forecasts from global and mesoscale models will be summarised.

Peter Bauer (ECMWF)**: Assimilation of precipitation information at ECMWF**

The assimilation of observations related to clouds and precipitation has become a very important issue for most operational weather services including ECMWF. A one-dimensional variational (1D-Var) method was developed by Marécal and Mahfouf (2000) for retrieving profiles of temperature and moisture in rain affected areas using near-surface rain rates obtained from satellite observations. The retrieved total column water vapour is then assimilated in the four-dimensional variational framework. This approach was extended for direct usage of brightness temperatures from microwave radiometers as observations. This paper will present the methodology and a comparison between the results and observations from the TRMM Precipitation Radar. The impact on regional tropical cyclone forecasts and global analyses and forecasts will be evaluated.

Peter Panagi (Reading University)**: Assimilation of surface precipitation data into mesoscale NWP models**

We present an approach to assimilating high resolution radar-derived precipitation into NWP by making a first order link between precipitation and moisture flux convergence, using some basic arguments and assumptions. We show the performance of this assumption statistically using the Meteorological Office's operational non-hydrostatic model at 12km resolution. With some further assumptions, we show how this is linked to

vertical velocity increments. Within the data assimilation scheme we would like the increments to be "balanced", and using a suitable balance approximation, such as the Richardson equation, we are at a stage where we can implement a simple scheme.

Richard P Allan (Reading University)**: Evaluation of moisture in the Hadley Centre climate model using 20 years of satellite measurements**

Water vapour is generally regarded to provide a strong positive feedback to changes in surface temperature. An important stage in improving our understanding of feedback processes involves assessing simulations of the present day climate and its variability using a variety of high quality observational and reanalysis products. Results from the Hadley Centre atmosphere-only climate model over the period 1979-1998 are compared with satellite estimates of column integrated water vapour from SMMR and SSM/I, water vapour channel radiances from HIRS and clear-sky our going long wave radiation from ERBE. Agreement between the simulations and the model suggests that decadal changes in upper tropospheric humidity are small and consistent with a positive water vapour feedback.

Mark Cresswell (Manchester Metropolitan University)**: The role of moisture in tropical disease measurement and modelling**

Moisture is a key environmental variable affecting the ecology of many tropical diseases. The spatial variability of Meningococcal meningitis is thought to be influenced greatly by humidity as well as the life-cycle of the mosquito – responsible for transmitting malaria. Understanding the role of satellites and climate models to quantify, model and perhaps predict atmospheric humidity is crucial to the medical community working with some of the most serious tropical diseases.