4.5.14 The Objective Analysis of Relative Humidity over Indian Region

S.K. Sinha, D.R. Talwalkar and S.G. Narkhedkar
Indian Institute of Tropical Meteorology, Pune, India.

A method of objective analysis of relative humidity (RH) over Indian region is described using the Gandin Optimal analysis scheme. The autocorrelation function and the structure function over India have been computed for the surface relative humidity. These statistical structure functions were used in calculating the weighing function for the observing stations. In order to evaluate the objective analysis quantitatively R.M.S. errors were computed by interpolating the RH field at the observing stations from the objectively analysed field and comparing with actually observed RH field.

The best description of the humidity correlation function is given by a function of the form $a\exp(-b\rho)$, ρ being the distance between two locations. The value of 'b' is 0.179. From the determination of 'a', which is 0.676, one obtains a quantitative impression of the observation error.

4.4.4 Numerical Modelling of Tropical Cyclone Tracks for the Northern and Southern Hemispheres in the Hydrometeorological Centre of the U.S.S.R.

I. Sitnikov, A. Falkovich, A. Pokhil and V. Zlenko
Hydrometeorological Centre of the U.S.S.R., Moscow, U.S.S.R.

During the last 5-year period a technique for numerical forecasting of tropical cyclone (TC) tracks is being developed in the Hydrometeorological Centre of the U.S.S.R. (HMC). Shallow water equations are used. The initial vortex of the TC is axisymmetric, the initial height values being found from the wind field at 500 hPa as a solution of the reverse balance equation. An optimum interpolation scheme developed in the HMC is used for the analysis of the surrounding flow in the Northern Hemisphere. In some cases as well as in the Southern Hemisphere a GRID analysis received from the NMC (Washington) and the ECMWF (Reading) was used.

In the basic version of the model tested in the near-real time in 1986-87 a fixed fine grid with an increment of about 50 km is used. In this version forecasts calculated for the northern West Pacific and the Atlantic were validated separately for the direct (east to west) and reverse (west to east) branches of the track as well as for the recurvature area and the so-called "difficult" tracks. The quality of forecasts is comparable with those based on the models of similar class of complexity being used in other forecasting centres.

Experimental forecasts for the Southern Hemisphere were also issued. In total from December 1986 to April 1987 15 tracks of 11 TC's for the Pacific and Indian Oceans were calculated up to 48h. Values of mean and individual errors of those forecasts allowed us to classify them as "satisfactory". Thus, the stationarity of TC Kay near the western coast of Australia for 14-15 April 1987 was forecasted correctly.

Several modifications of the forecast technique were developed among them are the use of the wind averaged for the layer of 100-1000 hPa, non-polar stereographic projection and moving nested grids. In the last case three grids with increments rated 4:2:1 and the finest grid space of 70 km, were used. The mean errors of 9 forecasts based on FGGE Level IIIb data were shown to be comparable with a control forecast where the finest grid covered the whole integration domain; computer time, however, was 3 times less when nested grids were used. Numerical experiments on interaction of binary TC's were also carried out with idealized and real data.

1.4.3 On the Use of Satellite Data in the Study of Heating by Cloud Disturbances During EMEX

Graeme L. Stephens and Takmeng Wong
Department of Atmospheric Science, Colorado State University, Ft. Collins, CO., U.S.A.

The objective of EMEX was to study the heating mechanisms within mesoscale tropical cloud clusters using a combination of radar, aircraft and satellite observations together with the conventional synoptic observations obtained during the concurrently run AMEX. This talk will specifically focus on discussions of the satellite data which can be used to help achieve the goal of EMEX. The data will be described and analysis will be presented. Emphasis will be especially placed on use of the MSU microwave data and the feasibility of measuring atmospheric moisture including precipitation from these data, GMS cloud data and the airbourne data. Preliminary estimates of the cluster scale radiative heating will be presented which are based on a combination of satellite data analysis and radiative modelling.

5.7.13 ENSO and Summer Fire Danger in Victoria, Australia

H. Stern and M. Williams
Bureau of Meteorology, Melbourne, Victoria.

Fire fighting authorities in Victoria have issued bans against the lighting of fires in the open since the 1945/46 season. Over the 22 seasons 1945/46 to 1986/87 inclusive, the number of such bans imposed have varied from Nil to 27, the median being 8. As bans are only imposed when authorities consider the fire danger potential to be particularly high, the number imposed in a season may be regarded as an overall measure of the fire risk in that season.

The relationship between ENSO and rainfall over Australia has been well documented (McBride and Nicholls, 1983), and is particularly marked in Spring. In Melbourne, the probability of rainfall during that season being below the median during an ENSO event is 86%; while in Springs with a strong anti-ENSO signal, the probability is only 32%. The majority of Jasper and Stern's (1983) synoptic types are associated with a lower probability of rainfall occurrence during ENSO events than during anti-ENSO periods.

The relationship between ENSO and mean circulation parameters over Australia also has been well documented (Williams, 1987). In Melbourne the mean MSL pressure during ENSO is shown to be higher than that during an anti-ENSO event for most times of the year, particularly winter and spring. The mean surface flow also possesses a southwesterly anomaly during ENSO for most times of the year, particularly the summer half. Furthermore, a number of Jasper and Stern's (1983) synoptic types occur with significantly different frequencies during ENSO and anti-ENSO events.

With this background, the relationship between a season's fire danger potential and ENSO is explored and shown to be strong. The probability of the median number of bans being exceeded is found to be 64% during an ENSO event, and to be only 22% when a strong anti-ENSO singal is observed.

Bans may not be entirely determined by the fire risk. A fire risk potential may be regarded as being associated with an observation of dry bulb 30.0°C or more, dew point 10°C or less, wind speed 15 knots or more, and rainfall over the past week 5.0 mm or less. This definition is applied to observations at Melbourne's main airport (Essendon/Tullamarine) over the seasons 1939/40 to 1986/87 and the median number of days when it is satisfied is 6. The relationship between the fire risk and ENSO is shown to be stronger under this definition than when employing the imposition of a ban as an indicator, the median being exceeded on 71% of ENSO cases and only 10% of anti-ENSO cases.