2000 Crafoord Prize

Ravinder N. Maini and Marc Feldmann, of the Kennedy Institute of Rheumatology, London, Great Britain have been awarded the 2000 Crafoord Prize for their research on the mechanisms of importance for the pathogenesis of rheumatoid arthritis which led to the definition of tumour necrosis factor (TNF-α) as a therapeutic target in rheumatoid arthritis.

The Crafoord Prize, consisting of a gold medal to each prizewinner and US$ 500,000 to be divided between them, will be awarded on 18 September 2000 at a ceremony at the Royal Swedish Academy of Sciences.

Rheumatoid arthritis, the commonest and most severe of the inflammatory rheumatic joint diseases (together termed 'polyarthritis'), often leads to permanent handicap and shortened life expectancy. Until the 1980s the development of better methods of treatment was limited by an inadequate knowledge of the mechanisms by which the disease was induced. During the past ten years Ravinder N. Maini and Marc Feldmann have led an innovative development that has yielded the decisive new results, on the details of how the molecules in the immune system attack the organism's own tissue.

Advances in tropical weather prediction*

The workshop on 'Advances in Tropical Weather Prediction' was organized to review the current trends in numerical weather prediction (NWP) in the tropics, exchange ideas and explore possibilities for collaborative research ventures leading to better understanding of the tropical weather systems and their prediction. The deliberations at the workshop covered scientific aspects of global and mesoscale modelling, climate and weather prediction, physics of the weather systems, numerical techniques in NWP, and data assimilation. There were 11 speakers and the meeting concluded with a discussion on future directions and prospects for collaboration.

Scientific aspects apart, in the Indian context, at a pragmatic level, better accuracy in the weather prediction need hardly be emphasized. In particular, the severe weather phenomena like the cyclone that hit the Orissa coast in 1999, remind us time and again of the need to augment our scientific efforts towards understanding the vagaries of atmospheric circulation as a whole. In tune with this, the very first talk by T. N. Krishnamurti (Florida State University) gave a possible route to improve accuracy in weather prediction with the existing models. His approach recognized that every model has its own biases and deficiencies. He showed that instead of just taking a simple ensemble average of the respective multimodel forecasts, resorting to multiple regression coefficients from the multimodel forecasts and the analysis fields greatly improves the forecast accuracy. Separate regressions are computed for each grid point for all the vertical levels of all the meteorological variables during the control run. The statistics obtained from the control run is applied to the forecasts of the test run. His representative results showed successful prediction of global seasonal climate, medium range weather and the hurricane tracks and intensity. His results showed major improvements in the accuracy of regional forecasts. Following this, U. C. Mohanty (Centre for Atmospheric Sciences, IIT, Delhi) focused on the particular problem of monsoon circulation over India and the effect of horizontal resolution of the model and orography in simulating the circulation. He highlighted the results based on running a global weather prediction model at three different horizontal resolutions. The monsoon circulation and the distribution and intensity of rainfall are shown to be highly sensitive to the model resolution and surface topography. The cyclone tracks and intensity are simulated to a better accuracy by high resolution models. However, one major problem with high resolution models is that beyond a reasonable point, limitation arises due to available computing resources.

The results of the simulations reported above are not on a real-time basis. Any forecaster will assure us that, as opposed to working in research mode, operational weather forecasting is a slightly different ball game. This role was played by S. V. Singh (National Centre for Medium Range Weather Forecasting (NCMRWF), New Delhi) whose presentation covered the entire gamut of the work done and his experience with operational forecasting at NCMRWF, where a global spectral model is run and forecasts at 1200 h interval are issued on a daily basis. He showed with specific examples the particular cases which were well predicted by the NCMRWF model and other cases which were not well simulated. He also shared his experience in predicting the weather events of the western Himalayas, which is an onerous task considering that it is a data sparse region. Two other talks in the morning session were devoted to cyclone simulations using the regional models. One important advantage with the regional models is that higher resolutions are possible with the available computing resources. Both the talks pertained to tropical cyclones in the Bay of Bengal, whose accurate track prediction still remains one of the important challenges. Mukul Tewari and Prabir Patra (IBM India Research Laboratory, New Delhi) compared the per-

*A report on the national workshop on 'Advances in Tropical Weather Prediction' organized by the atmospheric sciences group of IBM India Research Laboratory, New Delhi and held at its conference hall on 10 December 1999.

formance of two widely used weather prediction models, namely the Regional Atmospheric Modelling System (RAMS) developed at Colorado State University and Fifth Generation Mesoscale Model (MM5) developed by NCAR/Penn State University group. The test cases were chosen to be three cyclones that originated in the Bay of Bengal. In general, RAMS seems to perform marginally better than MM5. Using Florida State University regional model, they showed that use of synthetic vortex and physical initialization leads to improved cyclone track prediction. The results indicated that the predicted meteorological fields (pressure, temperature, etc.) matched closely with the initial analysis fields rather than with the observations. This underlines the need for better data analysis and assimilation systems. The important problem that many groups around the world are grappling with is how to convert scattered meteorological observations into gridded data without introducing much errors? As a means to partially mitigate this problem, another experiment showed that the introduction of synthetic vortex and physical initialization led to much improved simulation of the track of the cyclone. On the other hand, D. V. Bhaskar Rao (Andhra University, Vishakapatnam), using MM5 and similar cyclone cases, studied the role of latent heat released from the cumulus convection. In this study, he had tested the cumulus convection schemes of Arakawa–Schubert, Grell and Emanuel and the results showed that these schemes produced the essential features of a severe cyclonic storm which agreed with the observations. His work shows that stronger cyclones are expected at higher sea surface temperatures and at lower latitudes.

The afternoon session addressed the issues of data assimilation, numerical and computational techniques. The process of data assimilation basically merges the observational data with the ongoing integration of the numerical weather model. S. R. H. Rizvi (NCMRWF, New Delhi) provided an overview of the recent developments in the Global Data Assimilation System (GDAS) available at NCMRWF. He highlighted the developments that have contributed to the present skill of the operational GDAS at NCMRWF. While the general trend in NWP is to go in for faster and parallel processors, Ravi Nanjudiah (IISc, Bangalore) emphasized on software re-engineering, an aspect much neglected by the meteorological community. As a result of his work with the NAL group, the re-engineered weather code could run on any platform including a PC running Windows. This experiment, done with NCMRWF spectral general circulation model, has the potential to bring the task of modelling within the reach of those who do not have access to powerful computers. He had gone one step further to tailor the hardware for the spectral model for obtaining optimum scalability on message passing systems. A related question is of the parallelization of weather and climate models. S. K. Dash (Centre for Atmospheric Sciences, IIT Delhi) presented the current status of the parallelization efforts that are underway at various leading centres of operational forecasting and research. He outlined various bottlenecks at speedup and means of achieving maximum parallel efficiency.

The last session had talks on three important topics. Clouds play an important role in the weather cycle. Since clouds are sub-grid scale phenomena they need to be appropriately represented in the numerical weather models. Towards this goal, Someshwar Das (NCMRWF, New Delhi) showed a cloud prediction scheme designed for large-scale models and incorporated into a single column model and used it to simulate the cloud cluster properties observed during the Tropical Oceans Global Atmosphere-Coupled Ocean Atmosphere Response Experiment (TOGA-COARE) in December 1992. The results were compared with the simulated profiles obtained from the Goddard cumulus ensemble model. The results showed that large-scale cloud cluster properties and their diurnal variation during various periods of convection are well simulated. Seasonal prediction in India is as much important as the cyclone prediction. The effect of El Nino Southern Oscillation over the Indian monsoon is still being debated. Contributing to this ongoing debate, M. K. Soman (Indian Institute of Tropical Meteorology, Pune) presented detailed analysis of the monsoon circulation over India and its relationship *vis-à-vis* El Nino using the Hadley Centre climate model. He also shared his experience with experimental real-time seasonal forecasting of the Indian monsoon using two different general circulation models. Among many factors which affect the simulation of monsoon rainfall and its variability is the parameterization of soil moisture. This being another subgrid scale factor, is not properly represented in the models owing to lack of observational data. Pradip K. Pal (Space Applications Centre, Ahmedabad) used the microwave data from Oceansat-I launched recently by India to estimate the soil moisture. The estimated soil moisture was assimilated in general circulation models during the initial phase of integration for extended range prediction. This is an important addition of valuable soil moisture data to the modelling efforts that would help in a much more realistic simulation of weather events in the Indian subcontinent.

T. N. Krishnamurti summarized the entire proceedings by providing critical appraisal and directions for future work.

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