

## FLOSOLVER UNIT

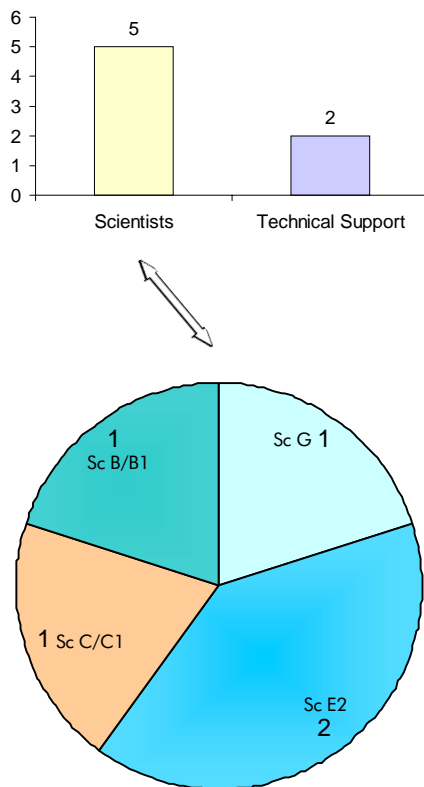
### SUMMARY

**Dr U N Sinha, Head**

The major activity at the Flosolver Lab this year revolved around the New Millennium Indian Technology Leadership Initiative (NMITLI) project titled "Mesoscale modelling for monsoon related predictions", awarded to NAL along with other institutions involving in this field

(CAOS, TIFR, IISc, IIT-Delhi, C-MMACS, IITM-Pune, CUSAT-Cochin) to attain techno-logical leadership in tropical meteorological computing.

The other highlights include R&D studies in grid clustering in a spectral global circulation model (GCM), use



### Mesoscale Modelling Programme

This project is built around a large number of innovative initiatives and formulations. The idea of FloSwitch to achieve scalability for meteorological applications, the focus on software engineered architecture, recognition of the fact that complex codes must possess modularity, clarity and dependability, apart from speed, the grid clustering and wavelet-based formulations offer a novel solution to the difficult problem of seamless resolution of multi-scales, which is so essential for monsoon prediction. The project envisages, for the first time, the use of formulations for the boundary layer and radiation inferred from Indian field studies and experiments such as MONTBLEX.

This project, to be covered over a span of 3-5 years, presents numerous technological challenges in mathematical modelling, algorithm development, object-oriented software architectures, data visualization and management. Hardware technology development, in particular, constitutes a very significant challenge, often with a complexity which is hard to appreciate and comprehend.

Forecasting a complex phenomenon such as the monsoons needs predictions at multiple scales -- ranging from the global [ $10^3$ - $10^4$  km] to the mesoscale [50-100 km] -- with models which take into account the special atmospheric conditions of the tropics, optimized software architectures for these models, a dedicated supercomputing platform, a well-engineered computer code, and associated detailed exercises in data assimilation and data management. Modelling and forecasting of extreme weather events and rainfall in the tropics is very important scientifically, technologically and strategically.

Briefly, therefore, the main objective of the project is "to design and develop a 128 processor parallel supercomputer incorporating the new high speed switch and optimised to run the new monsoon prediction software and other popular mesoscale codes".

of wavelets for the solution of partial differential equations (PDE's) and the development of a mesoscale vortex interaction theory for tropical cyclogenesis.

The development of FloSwitch dominated this year's technology development effort. FloSwitch, which does both message passing and message processing, will

achieve scalability in meteorological applications – something that has not been possible with conventional parallel computers.