

## Preface

The research activities of C-MMACS over the years have crystallized into four major research programmes: Climate and Environmental Modelling Programme (CEMP), Solid Earth Modelling Programme (SEMP), Computational Industrial Mechanics Programme (CIMP) and High Performance Computing and Networking (HPCN). In addition, C-MMACS has now a number of major projects of scientific and societal importance. These scientific programmes are supplemented by three meta-scientific activities: C-MMACS Academic Programmes (CAP), C-MMACS Knowledge Management (CKM) and Computer, Communication and Convergence (CCC). Each of the research programmes is further augmented by collaboration with national and international agencies.

In 2004-05, CEMP has seen a number of major developments. The C-MMACS Long-range, High-resolution Monsoon Forecasting initiative, now supported by a grant from CSIR, has further matured in terms of its scope and outreach. C-MMACS forecasts for 2004 monsoon, downscaled to taluk level and evaluated by the Karnataka State Natural Disaster Monitoring Centre (KSNDMC), shows the model forecasts to have considerable skill except in districts in the western sector characterized by orography, vegetation and sharp land-ocean contrast. The post-forecast evaluation as well as related analyses of these forecasts are available on C-MMACS website. C-MMACS is also a major partner in a national initiative to develop a multi-institutional, multi-model platform for long-range forecasting of monsoon.

In ocean bio-dynamical modelling, several improvements have been made in the coupled model based on MOM4, developed at GFDL, Princeton, USA. The role of the oceans, especially its biology, in the carbon cycle has been quantified robustly by a suite of experiments which explored several processes for primary production and regeneration. An effort to identify and estimate CO<sub>2</sub> sources and sinks, based on simulations by an atmospheric tracer transport model, global CO<sub>2</sub> measurements, and an inversion procedure has begun.

C-MMACS to-day is a leading organization in the country in the areas of GPS Geodesy and Seismology. The year 2004-05 for SEMP has seen a spectrum of activities in the areas of seismic data analysis, study of tectonics in the Himalayan region and applications and analysis of GPS data. C-MMACS had also carried out a quick response analysis of GPS measurements in Andaman Nicobar Islands following the devastating Sumatra earthquake of 26th December, 2004.

The CSIR Network Project on Mathematical Modelling and Computer Simulation, in which C-MMACS is a major participant in Sub-task I (Computational Mechanics for Modelling, Analysis and Design of High Performance Structures, Materials and Process Applications) and the co-ordinator for Sub-task II ( Multi-scale Modelling Platform for Environmental Forecasting and Management), is now a major programme at C-MMACS. Under Sub-task I, the FINEART package has been further tested and evaluated. The Environmental Modeling Platform, under Sub-task II, has now been calibrated and evaluated for a number of processes like cyclone, fog and extreme weather events.

The year 2004-05 has been a year of growth and expansion for HPCN both in terms of computing resource and areas of research. A substantial enhancement of C-MMACS computing platform took place through installation of an ALTIX-350 12-processor system. The two prominent research areas under HPCN: Network Security and Cryptography, provided new results in these important areas.

Multi-institutional, national and international collaborative research programmes have been at the core of C-MMACS overall research. C-MMACS to-day has active collaboration with a number of national and international institutions. The year 2004-05 has also seen a number of developments. An MoU was signed between CSIR and CNRS on establishment of an Indo-French Programme for Research on Weather and Climate (IFPRWaC) with C-MMACS (IPSL) as the nodal organization in India (France); a Review Meeting of the Joint Committee was held at LMD, Paris, during May 16-18, 2005. C-MMACS now has several on-going and new collaborative projects funded by agencies like Indo-US fund, Indo-French Programme on Promotion of Advanced Research (IFCPAR) and Global Opportunities Fund (GOF), UK.

The publication record of C-MMACS continues to be good and compares favourably with the international average. In the year 2004-05, C-MMACS has published 19 articles in SCI journals. C-MMACS scientists had participated in a number of national and international scientific events. And, as usual, C-MMACS had a vibrant year with visitors (30), invited talks (16) and other knowledge activities.

In keeping with its objective of developing skill and expertise in Mathematical Modelling and Computer Simulation in the country, C-MMACS maintains an active academic programme. The year 2004-05 has been a busy year in terms of various academic activities. A number of training and exposure courses were organized for participants cutting across universities, research organizations and industries across the country. The year had also seen, as usual, a large number of students and trainees from various universities and institutions.

A new collaborative research programme under the Global Opportunities Fund, UK was launched in the area of Carbon Cycle Modelling. At the national level, C-MMACS is now a major participant in a national programme on Multi-Institutional Extended Range Monsoon Prediction.

An important feature of C-MMACS research programme is its strengthening outreach programme, be it in the area of monsoon forecasting, post-tsunami analysis, quick-response GPS measurements at Andaman or training; a trend we hope to strengthen and continue in the coming year.

This is an excellent opportunity to thank many institutions and individuals that have helped C-MMACS to play its role effectively. In particular, we thank the Chairman and the members of the C-MMACS Advisory Council for their guidance and the R&D Planning and Development Division of CSIR for excellent support. Finally, I would like to thank Team C-MMACS and the C-MMACS Knowledge Management Group for the efforts to bring out the Annual Report.

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