

Earth System Science Organisation (ESSO)

Dr. Shilesh Nayak

The Earth System Science Organization (ESSO) addresses holistically various aspects relating to earth processes for understanding the variability of earth system and for improving forecast of the weather, climate and hazards. The investigations related to polar regions are carried out to understand the impact of climate change. The ESSO is also responsible for development of technology towards the exploration and exploitation of marine resources in a sustainable way for the socio-economic benefit of the society.

Some of the major accomplishments during the last one year are as follows:

Cyclone Prediction: India, has witnessed a number of tropical cyclones - PHAILIN, HELEN, LEHAR, MAHASEN, MADI, and extreme weather events with heavy rainfall over Uttarakhand and Gujarat. The operational weather forecasts and advisories rendered in respect of these extreme events has received an overwhelming appreciation, and demonstrated quality of such services at par with international agencies or even better in the case of Phailin cyclone. There has been a remarkable improvement in the prediction of track and landfall of cyclones. This has been accomplished by virtue of augmentation of observation, both in situ and satellite, for ocean and atmospheric observations, enhanced computing capability and use of dynamical models. The precise forecast of the track and landfall of cyclone, storm surge, high waves and associated rainfall and wind during the Phailin cyclone, helped the government at all levels to effectively respond to the cyclone to save lives.

Agromet Advisory Services: Extension of biweekly district-level weather forecast and crop specific advisory in local languages to cater to needs of 5.0 million farmers which contributes significantly to the GDP. Dissemination of AAS services to cover all the 600 agricultural districts of India.

Monsoon Prediction: The implementation of the Monsoon Mission and improvement in prediction of forecast of rainfall on different space and time scales. For the first time, dynamic model was employed on experimental basis to predict quantitative precipitation associated with the southwest monsoon. The long range forecast for the season (June-September) rainfall for the country as a whole was 104-108% against actual rainfall of 106% of LPA for the year 2013. The Mission has adopted the NCEP CFSv2.0 model to identify its strength and weakness and incorporate new physics/parameterization schemes to improve the simulations/prediction skill of the monsoon rainfall. Based on this model, an indigenous climate model has been developed for studying variability and predictability of monsoon on seasonal, inter-annual and decadal time scale. As a part of these studies, a cloud-physics laboratory at Mahabaleswar has been made functional.

High Performance Computing: High performance computation facilities have been substantially augmented by upgrading the existing 170 Teraflop to 01 Petaflop, which is ranked at 36th position in the world and first in the country.

International Training Centre for Operational Oceanography: An International Training Centre for Operational Oceanography has been established at the ESSO-INCOIS, Hyderabad for promotion of capacity building in the countries of the Indian Ocean region, in coordination with IOC / UNESCO.

Polar Research: India successfully commenced operations at the 3rd Permanent Station “Bharati”, in the Larsemann Hills, East Antarctica. This will provide a major thrust to studies in the fields of glaciology, atmosphere, paleoclimate and Polar biology. India has been accorded Observe status in the Arctic Council in recognition of India’s scientific contribution and endeavour in Polar research. India successfully deployed Ocean Observing System in the Arctic water in July, 2014.

Ocean Survey and Mineral Exploration: India’s application filed for the allotment of a site (~10,000 sq km) for exploration of Polymetallic Sulphides in the Indian Ocean has been approved during the meeting of the International Seabed Authority, Kingston, Jamaica in July 2014. As a part of exploration of ocean mineral

and survey program, a series of seven major research cruises of 30 days each have been conducted in the central Indian Ocean Basin for acquisition of marine geophysical data. Quantum of data collected to date, in the Central Indian Ridge (CIR) and South West Indian Ridge (SWIR), include Multi-beam Eco Sounder (MBES) surveys of ~65,000 km² (area), Magnetic surveys of ~17,000 km (line) and Gravity surveys of ~9,115 km (line).

National Centre for Earth Science Studies (NCESS): The Centre for Earth Science Studies (CESS), Thiruvananthapuram, Govt. of Kerala, was brought under the administrative control of the ministry with effect from 1.1.2014. The purpose is primarily to strengthen the solid earth research.

Deep bore holes investigations in Koyna Warna region: A Research program in the Koyna-Warna region of Maharashtra has been launched to address major issues pertaining to the occurrence of earthquakes and their mechanism, by drilling a deep borehole of 6-7 km in a continental earthquake zone, enabling study of physical and chemical changes before, during, and after an earthquake. Preparatory activities including drilling of 4 boreholes up to 1.5 km have been completed which provided insights on the Deccan volcanism and stress regime, pore fluid pressure and its variations, heat flow and its variations, orientation of faults etc. There are no sedimentary rocks found below the basaltic rocks. The thickness of basalt rocks at both the sites are about 933 m and 1185 m at Koyna and Warna, respectively, underlining by the granite basement with no sediments in between. The core retrieved from boreholes revealed a flood basalt pile comprising a number of lava flows, each flow being characterized by a vesicular and/or amygdaloidal layer underlain by fine grained massive basalt. Flow top breccias have been identified in some flows.

Coastal Vulnerability: A Coastal Vulnerability Index (CVI) atlas comprising 157 maps on 1:100000 scales was prepared for nine coastal states and Islands for use by various agencies, primarily in responding to various ocean hazards, viz., Tsunami, Cyclones, and Storm Surges.

(Source: PIB Features)