A few fellowships covering to and fro international air travel, domestic air travel in India and living expenses (`16,000 for course period) in India are available from Government of India. However, preferences will be given to the fully self-sponsored candidates or sponsoring organisation candidates bearing cost of international to and fro travel.

Health and Insurance

Medical, Life and disability insurance should be undertaken before leaving their country for India by the participants themselves or on their behalf by their sponsoring institute/organisation for covering entire health and disability risks. No medical expenses will be borne by the Centre. However, participants who receive the Fellowship of the GOI will be paid medical expenses for minor ailments on actual basis (as an out patients only) as and when such expenses are incurred. The Centre will have limited liabilities as far as medical expenses are concerned in such cases. Candidates in sound physical and mental health only need to apply.

Application Procedure

Dully filled application form attached at the end of this document (can also be downloaded from www.cssteap.org) need to be sent on the contact details given below after endorsement by nominating and/or sponsoring agency. The application form along with education certificates needs to be forwarded either through CSSTEAP Governing Board member in your country (please see details on the website) or through Indian Embassy/High Commission in your country or Your Embassy/High Commission in India. For faster processing the advance (scanned) copy may be sent to us directly through email.

About Host Institution - Indian Institute of Remote Sensing, ISRO

ISRO is a premier government organisation in India for space science and technology missions and developments and is also premier agency for the development of Earth Observation and Communication satellites, launch vehicles, interplanetary missions, etc. Moon and Mars mission are noteworthy amongst several achievements. IIRS (est. 1966) is an unit of Indian Space Research organisation, Department of Space, Government of India and is mandated for capacity building by education/training in Remote Sensing, Geoinformation Science and GPS technologies. It is a premier institution in imparting training and education in basic technologies and their applications for natural resource management. The institute has very strong R&D programme. The endeavour of the institute has been to bring young, middle as well as senior thematic experts from user communities to educate/apprise about technology/applications at Post Graduate level with the overall goal of 'technology transfer' and user awareness. The institute has evolved many programmes tuned to the different needs of various target groups. IIRS addresses the cause, awareness and research needs at different levels of management. and therefore, conducts a variety of courses for the different categories of users and fresh students viz., M. Tech., M.Sc., PG Diploma, 4 months Certificate Courses, 2 months National Natural Resource Management System (NNRMS) sponsored courses for University faculty, 2 weeks on demand Special Courses, 1 week duration Overview Course for Decision Makers and tailor-made courses for users departments from India and abroad. IIRS has so far trained more than 10000 scientists/engineers/academician. About 925 foreign students from various countries of Asia, Africa and Latin America have also benefitted under SHARES Fellowship programme of the Department of Space, ITEC, SCAAP fellowship scheme of the Ministry of External Affairs, Government of India, other fellowship schemes, etc. For further details visit http://www.iirs.gov.in

About CSSTEAP (Affil. to UN) and its Activities

The Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) was established in India in November 1995 with its headquarters in Dehradun and is considered as the Centre of Excellence by UN-OOSA. The 1st campus of the centre was established in Dehradun, India at Indian Institute of Remote Sensing (IIRS) which is a unit of Indian Space Research organisation (ISRO), Government of India. For conducting its Remote Sensing & GIS programmes the Centre has arrangements with IIRS as a host institution. The Centre has also arrangements with Space Applications Centre (SAC) Ahmedabad, playing as host-institution for programmes related to Satellite Communications, Satellite Meteorology and Global Climate, Global Navigation Satellite Systems and Physical Research Laboratory (PRL) Ahmedabad for Space and Atmospheric Sciences programmes.

The Centre has been imparting training and education, helping participants in developing research skills through its Master Degree, Post Graduate and Certificate programmes. This is achieved through rigorous class-room (theory and hands on exercises), group discussions, field campaigns and pilot projects in the field of space science and technology. These programmes aim at capacity building for participating countries, in designing and implementing space-based research information and application programmes. The Centre also fosters continuing education to its alumni. About 1524 professionals from 35 countries within and outside the Asia-Pacific region have graduated so far from the Centre (http://www.cssteap.org).

Academic Activities

The Centre organize post Graduate course of 9-months at host institutions of Indian Space Research organisation (ISRO) in the areas of Remote Sensing and Geographic Information System at IIRS, Dehradun; Satellite Communication, Satellite Meteorology and Global Climate and Global Navigation Satellite Systems at Space Applications Centre Ahmedabad and Space and Atmospheric Sciences at Physical Research Laboratory, Ahmedabad. The successful participants also get an opportunity to take up master's programme (Master of Technology degree from Andhra University, Visakhapatanm). The Centre also organizes short courses and on demand special courses for United Nations Agencies like UNSPIDER, UNESCAP, UNDP, etc.

Important Dates

Last date of submission of application:
March 15, 2016

Notification of admission:
By March 20, 2016

Contact details

Course Director, RS&GIS

Centre for Space Science & Technology Education in Asia and the Pacific

(Affiliated to the United Nations)

IIRS Campus, 4, Kalidas Road,

Dehradun 248 001, India

Phone: +91 135 2524226/+91 135 2524181, Fax: +91 135 2740785

Email: cssteap@iirs.gov.in

Website: www.cssteap.org

Short course on

Weather Forecasting using Numerical Weather Prediction Models

Course Duration
April 18 - May 17, 2016

Conducted at
Indian Institute of Remote Sensing
Indian Space Research Organisation
Dept. of Space, Govt. of India
Dehradun - 248 001, U.K.
www.iirs.gov.in

Organised by

Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP)
(Affiliated to the United Nations)
IIRS Campus, Dehradun, INDIA. www.cssteap.org

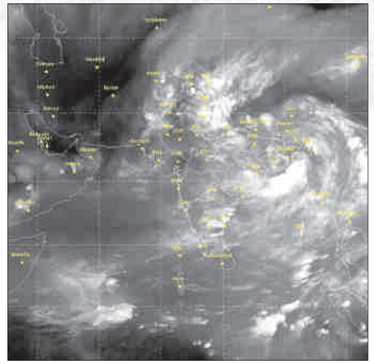
Introduction

Numerical Weather Prediction (NWP) is the quantitative forecast of weather or climate based on a model or a set of models derived from our "best" understanding of the physical processes that govern the atmosphere or the climate. A NWP model is basically a set of partial differential equations (PDEs) that describe the dynamic and thermodynamic processes in the earth's environment. The NWP models require initial and boundary conditions that are integrated forward in time to represent and predict the weather. Thanks to the significant developments during past four decades, the Numerical Weather Prediction is now a well recognized discipline of operational sciences that encompasses the elements from various other disciplines such as the computer science, satellite remote sensing, satellite communication, etc.

Today, the skill of NWP forecasts is significantly superior and unmatchable to the manual forecasts. Still, the science of NWP is constantly evolving with innovations in computer technology, improvements in our understanding of physical processes, and the availability of new observations from terrestrial, airborne and space-based platforms. One of the present day challenges of NWP is to understand the nature of biases and errors in the modeling of physical processes as well as in the observations from various sources, and to obtain the most accurate assessment of the state of the present and future weather or climate.

Large number of activities, such as transportation, agriculture, national planning, warning against extreme weather conditions, solar and wind power sectors, require advance predicted weather information. Since the impacts of the weather are so wide and profound, knowing what the weather is going to be in advance has become an essential aid in many aspects. One of the important roles of weather forecasting is to help society about rare and extreme events, such as tropical cyclones, heavy rainfall, high winds, that can cause severe damage and losses of human lives and property. Under the global warming scenario, the frequency of such extreme weather events is expected to increase. The 1999 Odisha cyclone also known as super cyclone was the most deadliest tropical cyclone in the Indian Ocean and the most destructive storm since 1971. It caused death of almost 15,000 people. Heat wave in Southern India in 2002 killed more than 1000 people. Most of the deaths occurred in the state of Andhra Pradesh. Mumbai, the financial capital of India, was most badly affected, and witnessed one of its worst catastrophes in the history of India, killing at least 5,000 people due to floods in 2005. In June 2013, Kedarnath Valley in Uttarakhand state of India received heavy rainfall, massive landslides occurred due to large flash floods that caused immense damage to houses and structures, killing more than 6000 people. Flash Floods were the most disastrous floods in the history of India. In September 2014, the Kashmir Valley suffered from disastrous floods across many of its districts due to torrential rainfall. Several hundred villages across the state were hit and 390 villages were completely submerged. In November 2015, Chennai and other parts of Tamil Nadu were severely affected by the heavy downpour. The greatest danger from extreme climate events is likely in highly populated and poor regions of the world.

Numerical models have now become essential tools in environmental science, particularly in weather forecasting and climate prediction. NWP uses the power of computers to make a forecast. Complex computer programs, also known as forecast models,



run on supercomputers and provide predictions on many atmospheric variables such as temperature, pressure, wind and rainfall. From theoretical point of view, NWP has to deal with a turbulent fluid whose behavior is governed by a complex set of non-linear, partial differential equations. While from observational point of view, it has the task of facilitating an accurate description of the three-dimensional state of the global atmosphere, which is obtained through the regular and simultaneous observations covering the whole globe from the surface of the earth to upper atmosphere. The NWP models are strongly dependent on the initial state of the atmosphere. Since the availability of the high-speed computer, there has been a growing demand of reliable initial state of atmosphere (temperature, moisture, pressure, and winds) at higher spatial and temporal resolution. Presently, most of the efforts to improve the NWP model's forecast accuracy are inclined towards improving the model initial condition. The improved initial condition of an NWP model is obtained through procedure called data assimilation. The purpose of data assimilation is to combine prior information of the atmospheric state, usually taken from previously made forecast, with observations from different platforms to find out the most accurate initial condition for NWP model. Data assimilation has grown to one of the heaviest investments in NWP. Satellite observations provide global coverage and thus offer invaluable data from areas where no other observations are normally available.

Currently, 90% of the total data used in the operational NWP models comes from space borne observing systems. The increase in the quality and range of satellite observations together with advanced data assimilation techniques and enhanced computational resources have led to the significant forecast improvements. As an example, cyclones Phailin (during October 2013) and Hudhud (during October 2014) roared on East Coast of India shore, flooding towns and villages and destroying tens of thousands of thatch homes. Though every death is tragic, but considering Phailin, the strongest tropical storm to hit India since 1999 Odisha cyclone, the loss of human life was minimal (20 people lost their lives). The last time a storm as powerful as cyclone Phailin struck the eastern coast of India, 15,000 people had died. The minimum loss of human lives in case of cyclones Phailin and Hudhud was because of massive evacuation efforts and improved cyclone track forecast due to the extensive use of the space-based observations in NWP model. Currently, due to the lack of proper training and expertise, space based observations are under-utilized by NWP community, particularly in Asia Pacific region. Therefore, well trained weather forecasters are needed to utilize the vast amount of satellite data in the NWP models for improved prediction of extreme weather events.

Objectives

The overall objective of this training course is to generate awareness amongst users/researchers/professionals/academicians on fundamentals of numerical weather prediction and data assimilation. The participants will be familiarized with the use of numerical weather prediction models, particularly the world's most widely used model for weather prediction, the Weather Research and Forecasting (WRF). The Mesoscale and Microscale Meteorology (MMM) Division of National Center for Atmospheric Research (NCAR) supports the WRF system to the user community. In addition to this, participants will be made aware of assimilation techniques to make the best use of conventional and satellite observations in prediction of extreme weather events.

Eligibility

Master's degree in science or Bachelor's degree in engineering or equivalent qualification relevant in the field of study with at least 5 years of experience in teaching/research or professional experience in the field of Atmospheric sciences, satellite meteorology, climate change and weather forecasting (for candidate with higher qualifications, the minimum experience may be relaxed). High School-level knowledge in mathematics and/or statistics is essential besides the Master degree as the base qualification. Preference will be given to those who have already attended course on satellite meteorology and global climate or space and atmospheric sciences or are working in the weather forecasting. Nominating agencies may kindly ensure this.

Location

The training course will be organized by Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), and conducted by the faculty of Indian Institute of Remote Sensing (IIRS), ISRO, Dehradun and Campus, Dehradun, India from April 18- May 17, 2016.

Language

The medium of the instructions/teaching is English. Proficiency in written and spoken English is the most essential. The candidates who are not proficient in English are advised not to apply. Applicants, who have done their higher studies in a medium (language) other than English, are required to submit TOEFL score or a diploma/certificate of English Language issued by an accredited language institution or by the local UNDP for satisfactory establishment of the applicant's competence in spoken and written English language. Nominating agencies are requested kindly to ensure this.

Course Structure

The course is modular in structure and provides a balanced treatment of theory, application and practical experience as follows:

Module 1 (2 weeks):

History of NWP, weather prediction equations, finite differences, time and space discretization, physical processes and parameterizations, forecasting process, forecast verification, nonlinear dynamics and chaos .

Module 2 (1 week):

Meteorological observations, introduction to data assimilation (optimum interpolation and variational techniques) and ensemble forecasting.

Module 3 (1 week):

Introduction to WRF model, application of WRF model: prediction of extreme weather events (case studies with tropical cyclone, heavy rainfall, and dust storm), data assimilation studies using WRF model (evaluating the impact of different observing networks on the prediction of extreme weather events using WRF model).

Course Implementation/ organisation

The course curriculum will be implemented through a mixture of theory and practical, by using state of the art hardware, software and instrumentation facilities. The core faculty for this course consists of experienced scientists/engineers working at various centres of Indian Space Research organisation/Department of Space, Govt. of India. Each participant will be provided access to high-performance computing (HPC) system equipped with WRF model and its data assimilation package to have hands on experience.

Expected Benefits after the Course

After attending this course, the participants are expected to gain theoretical and practical knowledge on numerical weather prediction, particularly the potentials of WRF modeling system for the prediction of extreme weather events. The participants should be able to use this knowledge in their country for their different applications that will help them set National Disaster Management Centre/Unit based on latest technology and trends.

Training Course Fee and Accommodation

A course fee of `15,000 (equivalent to US$ 300) will be charged which includes course materials and field trips. However, tuition fee will be waived off for the candidates sponsored by CSSTEAP. Accommodation for the participants will be arranged in hostel at IIRS, Dehradun. During the stay in Dehradun, the participants will be charged `50/day towards room rent. The cost of consumables such as cooking gas, eatables, etc. need to be borne by the occupant herself/himself.

Fellowships to Participants

The candidates are required to send their personal details/bio-data to the Course Director, IIRS, Dehradun on the prescribed Application Form, appended to this "Announcement Brochure" (or download from website (www.cssteap.org). Candidates are expected to make their own arrangements for all expenses. Preference will be given to the candidates who are fully or partially financially supported by their organisations/sponsors.