TRAINING ON

GLACIER, CLIMATE CHANGE AND REMOTE SENSING

Divecha Centre for Climate Change
Indian Institute of Science
Bengaluru -560 012

Bengaluru
June 8-19, 2015

Sponsored by

Department of Science and Technology
Government of India, New Delhi

University of Iceland

INTRODUCTION

In the Indian Himalayas, large quantity of water is stored in the form of seasonal snow, ice and glaciers. Melt water from these glaciers and snowfields form an important source into run-off of the North Indian Rivers during critical summer months. This makes these rivers perennial and has helped to sustain and flourish the Indian civilization along the banks of the rivers Ganga and Indus. However runoff from the Himalayan glaciers is not assured because geological history of the Earth indicates that glacial dimensions are constantly changing, as glaciers are highly sensitive to minor variations in climate. Therefore, monitoring of Himalayan glaciers are important to assess future changes in the runoff of the North Indian Rivers. However, Himalaya have very rugged terrain and conventional field based methods are difficult to use. Therefore, remote sensing has emerged as an alternative method for collecting information on glaciers. In India due to lack of trained manpower, it is difficult to generate reliable information. Therefore, proper training for scientists working in the field of glaciology is needed to utilize full potential of this technology.

The training will be organized by faculty of Divecha Centre for Climate Change, Centre for Atmospheric and Oceanic Sciences at Indian Institute of Science and University of Iceland, Reykjavik, Iceland. In addition, well know scientists working in the field of cryosphere and remote sensing will be invited as a guest faculty.

SYLLABUS

1. Distribution of Glaciers and snow cover

Importance of glaciers, general principle of the meteorology of precipitation, formation of snow, physical characteristics of snow crystals, areal distribution of glaciers/snow cover and factors controlling the distribution of snow cover.

2. Climate

General circulation of atmosphere and oceans, climate variability, spatial and time scales, errors and accuracy assessment, feedback mechanism and carbon cycle.

3. Morphology of glaciers

Classification of glaciers, Crevasses and icefall, moraines, dead ice, depositional and erosional landforms of glacier.

4. Transformation of snow to ice

Different types of metamorphism, transformation of snow into ice, Zones in a glacier, effect of metamorphism on albedo of snow and ice, grain growth.

5. Paleoglaciation

Milankovitch cycles and Greenhouse effect, Little ice age (LIA), Glacial and interglacial cycles.

6. Distribution of temperature in glaciers

Thermal parameters of snow/ice, types of glacier based on temperature distribution, temperature profiles, seasonal variation of temperature as function of depth.

7. Flow and sliding of glaciers

Driving and resisting stresses, Vertical profile of flow, simple models of glacier flow, deformation, steady and non steady flow of glacier.

8. Glacier Mass Balance

Summer and winter mass balance, Stake method, Geodetic method, ELA, AAR methods, hydrological method.

9. Ice and Snow ablation

Physics of snow melt, heat budget and radiation. Snow melt runoff model.

10. Glacial lake outburst flood/ Jökulhlaup

Types of Jökulhlaups, jökulhlaup process, hydrograph of jökulhlaup.

11. Fundamentals of remote sensing

Interaction of electromagnetic radiation with common objects on the Earth. Laws governing this interaction. Spectral reflectance characteristics of the common objects as snow, ice and glaciers.

12. Optical properties of snow and ice

Reflectance characteristics of snow in optical regions, effect of mineral dust and black carbon on reflectance of snow and ice.

13. Response of glaciers to climate change

Reaction to change in mass balance and reaction to additional forcing.

PRACTICAL: Runoff Estimate in Himalaya, Depth estimate using different techniques, Climate Change and mass balance, Topographic corrections of reflectance, Heat Transport, Temperature variation in glacier surface layers, phase changes of water, Simple estimates of glacier flow.

FACULTY

- **Dr. Anil Kulkarni**
  Distinguished Visiting Scientist, Divecha Centre for Climate Change, Indian Institute of Science, Bengaluru.
- **Dr. Helgi Björnsson**
  Professor, University of Iceland, Reykjavik, Iceland.
- **Dr. J. Srinivasan**
  Chairman, Divecha Centre for Climate Change
  Indian Institute of Science, Bengaluru.
- **Dr. S. K. Satheesh**
  Professor, Centre for Atmospheric and Oceanic Sciences
  Indian Institute of Science, Bengaluru.
- **Dr. Govindswamy Bala**
  Associate Professor, Centre for Atmospheric and Oceanic Sciences, Indian Institute of Science, Bengaluru.

GUEST LECTURES

Guest Lectures by well known Scientists.

VENUE & DATE

Divecha Centre for Climate Change, Indian Institute of Science, Bengaluru, India

Training Date : June 8 - 19, 2015.

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REGISTRATION FEES

No registration fees for the trainees.

DEADLINES

Last date for submission of application form: April 10, 2015

Intimation to selected candidates: April 17, 2015

ACCOMMODATION

Accommodation will be provided to deserving candidates by Divecha Centre for Climate Change.

ELIGIBILITY

Post Graduate M.Sc., M.Tech., M.E. and Ph.D. students from recognized Institutes/Universities.

COURSE DIRECTOR

Dr. Anil Kulkarni
Distinguished Visiting Scientist
Divecha Centre for Climate Change, Indian Institute of Science, Bengaluru - 560 012, India
glacier.training@caos.iisc.ernet.in

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ABOUT BENGALURU

The capital of Karnataka State, Bengaluru, is renowned as the 'Garden City' by virtue of its many parks, gardens, tree-lined avenues and abundant greenery. The city also has a rich heritage with its historical association with the Wodeyars, Tipu Sultan and the British. Places of tourist interest such as the Lalbagh Botanical Gardens, Cubbon Park, Tipu's Palace, Bull Temple and a range of Museums compete with modern malls and entertainment zones for every visitor's time. The capital of the erstwhile Wodeyar dynasty, Mysore, is no more than 145 kms away and makes for an interesting day-trip.

HOW TO REACH

The IISc campus is conveniently located for those arriving by air as well as those choosing to travel by train. The new Bengaluru International Airport is 35 kms from the campus. The campus is equidistant from the City Railway Station and the Cantonment Railway Station which are both about 7 kms away.The Yeshwanthpura Railway Station is no more than 2 kms.

CONTACT PERSON

Please send the application forms along with a recent passport size photograph to the following address:

Dr. Anil V. Kulkarni
Divecha Centre for Climate Change,
Indian Institute of Science, Bengaluru 560012, India
glacier.training@caos.iisc.ernet.in

APPLICATION FORM

Name: _____

Class: _____

University/Institute: _____

Telephone: _____

Email ID: _____

Academic: Give marks, year and Board/ University from standard 12 on separate sheet

Area of research/ study:

_____

_____

Relevance of training in future research. Give one page write up in separate sheet

Signature of Candidate

_____

If the above student is selected, he/she will be given leave to participate in the training program.

Name and Signature of P.I. / Guide / H.O.D

Seal of Organization

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