



Ministry of Human Resources Development

A Five-day Short Course on Vegetation Phenology to Understand Climate Change Impacts on Terrestrial Ecosystems

3rd – 7th December 2018
Department of Geology
University of Kerala

Call for Participation and Registration

Teaching Faculty
Dr. Oliver Sonnentag
Associate Professor
Canada Research Chair Tier 2
Département de géographie
Université de Montréal
Montréal, QC CANADA

Overview

Vegetation phenology, often defined as “the study of the timing of recurrent biological events, the causes of their timing with regard to biotic and abiotic forces, and the interrelation among phases of the same or different species” has been identified as a key indicator to monitor climate change impacts on terrestrial ecosystems. However, often less appreciated is the influence of vegetation phenology on the global and regional climate systems by regulating land surface-atmosphere interactions. Cutting-edge developments in digital imaging technology and its use in observation networks (e.g., PhenoCam), satellite remote sensing, modelling and data analysis with open source software have helped transform the study of vegetation phenology into a discipline in its own right. These accomplishments to quantify the seemingly simple “rhythm of the season” have been complemented by various coordinated efforts to involve the interested general public in climate change research. The integration of state-of-the-art technologies with citizen science provides exciting new opportunities to better understand climate change impacts on terrestrial ecosystems and their societal consequences and of how altered vegetation phenology impacts the larger climate system through associated feedbacks. The five-day short course is designed for graduate students, postdoctoral scholars, research scientists and faculty members but also practitioners with a general interest in Earth, environmental, atmospheric and climate change sciences. No specific background is required but a basic understanding in any of the above disciplines and some computational literacy will enhance the learning process and appreciation of the presented material.

Course Goal and Objectives

The goal of the proposed five-day short course is to understand vegetation phenology as a key indicator (and factor) of climate change impacts on terrestrial ecosystems and the associated climate system feedbacks. The objectives are to

- ✔ establish the conceptual link between vegetation phenology of terrestrial ecosystems, and the global and regional climate systems,
- ✔ provide a quantitative understanding of climate change impacts on terrestrial ecosystems and how various climate system feedbacks are influenced by vegetation phenology,
- ✔ introduce state-of-the-art observation and modeling techniques to study vegetation phenology at various spatial and temporal scales across biomes,
- ✔ introduce an open source statistical computing environment (R) for data analysis in phenological research, and
- ✔ discuss the role of citizen science for phenological research.

Day 1: Monday, 3rd December 2018

Module A Introduction and Course Fundamentals

Time	Activity
9.30 – 10.30	Inaugural session
10.30 – 11.00	Tea and informal discussion
11.00 – 13.00	Lecture: Terrestrial ecosystem and biogeochemical cycles
13.00 – 14.30	Lunch
14.30 – 15.30	Lecture: Climate change – vegetation phenology, land surface-atmosphere interactions and climate system feedbacks
15.30 – 15.45	Tea and informal discussion
15.45 – 16.45	Lecture: Climate change impacts on terrestrial ecosystems and societal consequences
16.45 – 17.30	Summary and informal discussion

Day 2: Tuesday, 4th December 2018

Time	Activity
9.30 – 10.30	Lecture: Research tools and approaches to study vegetation phenology
10.30 – 11.00	Tea and informal discussion
11.00 – 13.00	Lecture: Introduction to the R statistical computing environment
13.00 – 14.30	Lunch
14.30 – 16.30	Exercise: Hands-on tutorial on R statistical computing environment to study vegetation phenology
16.30 – 17.30	Summary and informal discussion

Module B Vegetation Phenology at Ecosystem Scale

Day 3: Wednesday, 5th December 2018

Time	Activity
9.30 – 10.30	Lecture: Vegetation phenology across ecosystem types
10.30 – 11.00	Tea and informal discussion
11.00 – 13.00	Lecture: Digital imaging technology in phenological research
13.00 – 14.30	Lunch
14.30 – 15.30	Lecture: Phenopix – R package for image-based vegetation phenology
15.30 – 17.00	Exercise: Analyzing and interpreting digital image archives for phenological research using the Phenopix R package
17.00 – 17.30	Summary and informal discussion

Module C Land Surface Phenology

Day 4: Thursday, 6th December 2018

Time	Activity
9.30 – 10.30	Lecture: Characterizing vegetation phenology across biomes: satellite remote sensing and modelling I
10.30 – 11.00	Tea and informal discussion
11.00 – 13.00	Lecture: Characterizing vegetation phenology across biomes: satellite remote sensing and modelling II
13.00 – 14.30	Lunch
14.30 – 16.45	Exercise: Analyzing and interpreting the GIMMS NDVI data product to detect phenological trends
16.45 – 17.30	Summary and informal discussion

Module D Phenological Modelling and Perspectives

Day 5: Friday, 7th December 2018

Time	Activity
9.30 – 10.30	Lecture: Perspectives in Phenological research: modelling and citizen science I
10.30 – 11.00	Tea and informal discussion
11.00 – 13.00	Lecture: Perspectives in Phenological research: modelling and citizen science II
13.00 – 14.30	Lunch
14.30 – 15.00	Discussion: Course review and outlook – research needs and a step forward
15.00 – 16.00	Examination and assessment
16.00 – 16.15	Tea and discussion
16.15 – 17.30	Certificate distribution, feedback and closing ceremony

Teaching Faculty

Dr. Oliver Sonnentag

Sonnentag is an Associate Professor and Canada Research Chair Tier 2 in *Atmospheric Biogeosciences at High Latitudes* at the Université de Montréal. His academic career saw doctoral and postdoctoral appointments in Canada (University of Toronto) and the United States (University of California Berkeley, Harvard University), using biometeorological field and laboratory, modelling and satellite remote sensing techniques to study land surface-atmosphere interactions. His recent publications provide important new insights on the consequences of permafrost thaw-induced boreal forest loss on regional climate and future wetland methane emissions.

Registration

How to register?

Step 1: Web portal registration: Visit <http://www.gian.iitkgp.ac.in/GREGN> and create login user ID and password. Fill up the blank registration form and do web registration by paying Rs 500/- online through net banking/Debit/Credit card. This provides the user with lifetime registration to enroll in any number of GIAN courses.

Step 2: Course registration: Login to the GIAN portal with the user ID and password created in Step 1. Click on registration option at the top of the registration form. Select the course titled 'Vegetation Phenology to Understand Climate Change Impacts on Terrestrial Ecosystems' from the list and click on save option. Confirm your registration by clicking on confirm course.

Step 3: Registration also on Google forms at <https://goo.gl/PzbdQB>
Registration fee details are as follows

Registration Fees

This course is open to graduate students (MSc and PhD), postdoctoral scholars, research scientists, faculty members and practitioners.

Participants from abroad: **US \$150**

Faculty members, research scientists, practitioners: **Rs. 3500**

PhD students and postdoctoral scholars: **Rs. 1000**

MSc students: **Rs. 500**

The above fees include the course material, internet access and working lunch. The participants themselves have to bear travel and accommodation costs, but can be assisted to find modestly priced hotels around the university campus. The number of participants is tentatively fixed at 30, but could be increased if needed. The registration fee includes instructional materials, laboratory use, session tea and working lunch.

Selected candidates will be contacted through email. Details of the bank account into which fees need to be paid will be mentioned in the email.

Venue: Department of Geology, University of Kerala, Kariavattom PO, Thiruvananthapuram - 695 581, Kerala, India

For more details contact

Dr AP Pradeepkumar

Email: geo.pradeep@keralauniversity.ac.in

Mobile: 0091 – 9895 24 5380

Local coordinators

Dr. AP Pradeepkumar (Coordinator)

Pradeepkumar is an Associate Professor and former head of the Department of Geology at University of Kerala, India. His basic interest is in metamorphic petrology and mineralogy. He obtained his PhD from University of Kerala and conducted research at University of Stuttgart, Germany. There he was engaged in developing Clean Development Mechanism and Joint Implementation strategies for Germany through which carbon credits could be earned as part of the Kyoto Protocol. Before moving to his current position, Pradeepkumar was an Associate Professor of Disaster Management at Mahatma Gandhi University. His current publications mainly focus on hard rock geology and disaster management.

Dr Ajit Govind (Deputy Coordinator)

Govind is a broadly trained environmental physicist interested in better understanding various biogeochemical and biogeophysical interactions on the Earth's surface. Govind obtained his PhD at University of Toronto and his MSc at Indian Agricultural Research Institute in New Delhi. Govind is a senior scientist at the French National Institute of Agricultural Research, but is currently is on leave as Associate Professor at the University of Kerala through the University Grants Commission Faculty Recharge Program.

About the University of Kerala

One of the first 16 universities in India, the University of Kerala (currently reaccredited by NAAC with 'A' Grade) was founded in 1937. Situated around 15 km north of Thiruvananthapuram, the capital of the state of Kerala, the University of Kerala comprises 41 departments offering various Masters, MPhil and PhD programs. Research in all key areas of science and arts are undertaken in the university (see <https://www.keralauniversity.ac.in/>)

About the Department of Geology

The Department of Geology, University of Kerala was established in 1963. It has eight faculty members. The department offers MSc, MPhil and PhD programs. Active research programs focus on petrology, planetary geoscience, remote sensing & GIS, hydrogeology and environmental sciences. Infrastructure and operational funding has been obtained from several institutions and organizations including the Department of Science and Technology, University Grants Commission and Indian Space Research Organization, and state agencies such as Kerala State Council for Science Technology and Environment.