An Introduction to Earth Observation Techniques:

Applications to the Land and Atmosphere

Monday 26th March – Wednesday 28th March 2018

Day 1:

- **9.30:** Arrival
- **10.00:** Workshop Overview (S.N Tripathi)
- **10.20:** Introduction to Earth Observation (Hartmut Boesch)
- **10.40: Part I** Land surface remote sensing techniques (Darren Ghent)
- **11.25:** Coffee Break
- **11.50: Part II** Monitoring fires from Space (Martin Wooster)
- **12.45:** Lunch and Coffee
- **14.00: Practical I** EO land Practical (Harjinder Sembhi and Darren Ghent)
    - Introduction to practical (Harjinder Sembhi)
    - Set up of Google Earth Engine
    - Group activity
    - Coffee break(15.15 – 15.30)
- **17.00**: Feedback session and conclusions (Darren Ghent)
- **18.00:** Drinks reception
- **19.00:** Dinner

Day 2

- **10.00:** Introduction to the Atmosphere (S.N. Tripathi)
- **10.20: Part III** Greenhouse gases and atmospheric pollutants (Hartmut Boesch)
- **11.10:** Coffee Break
- **11.45:** Official workshop photo
- **12.00: Part IV** Sensing aerosols and pollution with space-borne and ground based sensors (S.N. Tripathi)
- **12.45:** Lunch
- **14.00**: **Practical II** Atmosphere Practical (Amit Misra, Hartmut Boesch, S.N. Tripathi)
    - GIOVANNI aerosol and GHG analysis
    - AERONET and MPLNET analysis
    - Coffee break (15.15 - 15.30)
- **17.00**: Feedback session and conclusions (S.N. Tripathi)
- **18.00:** Drinks Reception
- **19.00:** Official workshop dinner

Day 3:

- **09.30: Part V** EO workshop poster session
    - Poster presentations by all participants
    - Poster judging by S.N Tripathi, Hartmut Boesch, Harjinder Sembhi, Darren Ghent, Amit Misra, Sumit Sharma
- **11.00:** Coffee Break
- **11.30: Part VI** Field laboratory visit (Amit Misra and Mithun Krishnan)
- **12.30:** Lunch
- **13.15:** Poster prize presentation
- **13.30:** Workshop closing (S.N. Tripathi and Hartmut Boesch)

Additional Information

- All lectures and poster session will take place in Pioneer Batch Continuing Education Centre (PBCEC) Visitor's Hostel, IIT Kanpur
- Posters should be displayed when??
- You will need an account with Google Earth Engine for Practical I, please sign up here https://earthengine.google.com/

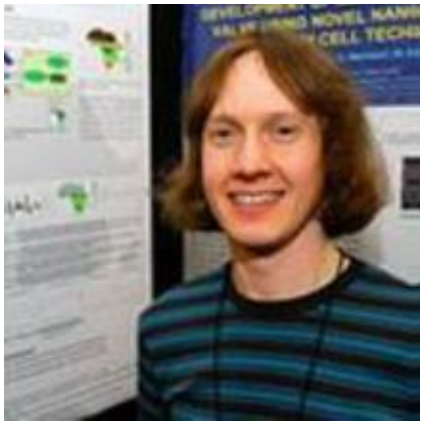
Workshop speakers

Professor S.N. Tripathi is professor in the Department of Civil Engineering, Indian Institute of Technology Kanpur since 2003. In addition, he is Adjunct Professor at the Department of Earth Science, and also associated with the Centre for Environmental Science and Engineering, Indian Institute of Technology Kanpur. He holds a PhD in Environmental Engineering from University of Reading, UK. He is a recipient of numerous national and international awards, most notable among them being the prestigious Shanti Swarup Bhatnagar Prize in Earth, Atmosphere, Ocean and Planetary Sciences. He is an elected fellow of the National Academy of Sciences, India and the Indian National Academy of Engineering. He is Rajeeva and Sangeeta Lahiri Chair Professor, a recipient of NASA Senior Fellowship, and Sir M. Visvesaraya Research Fellowship for excellence in teaching and research.

He conducts laboratory experiments of aerosols to quantify their spectral absorption, hygroscopic and microphysical properties. He also formulates various modelling tools to improve process-level understanding (e.g. role of mixing state, brown carbon) of these properties including new particle formation. In addition, he is conducting comprehensive analyses to improve the understanding of physical and optical properties of aerosols over the Indo-Gangetic Basin. This involves aerosol-related data from various platforms including long-term ground based and satellite, as well as intensive short- term campaign. His ultimate goal is to accurately represent aerosol effects in the regional climate-chemistry models that are used to estimate the climate and health impacts of aerosols over the Indo-Gangetic Basin. He is also interested in the development of new techniques for measurement of aerosol absorption.

Professor Hartmut Boesch is head of the Earth Observation Science group at the University of Leicester, a co-director for the Leicester Institute for Space and Earth Observation and a divisional director of the NERC National Centre for Earth Observation. He joined the University of Leicester in 2007 to work on the analysis of greenhouse gas observations from the Japanese GOSAT mission and on the preparation of future greenhouse gas mission's. Prior to this he held positions at the NASA Jet Propulsion Laboratory JPL working on the Orbiting Carbon Observatory (OCO) satellite mission and a postdoctoral position at Institute of Environmental Physics in Heidelberg. Hartmut holds an MSc in Physics and Astronomy (University of Tuebingen and Heidelberg, Germany) and a PhD in Stratospheric Ozone Chemistry using remote-sensing DOAS (University of Heidelberg, Germany). Hartmut is a Science Team member of the NASA OCO-2 and the CNES MicroCarb missions, a GOSAT RA researcher, and a member of the Mission Advisory Group for the future CO2 Sentinel mission.

Dr Harjinder Sembhi is a senior research scientist in the Earth Observation Science group and a member of the Leicester Institute of Space and Earth Observation. Her expertise is in thermal infrared remote sensing to monitor environmental stresses impacting the land and atmosphere. She has a BSc in Physics and Space Science (University of Leicester), an MSc in Meteorology and Climatology (University of Birmingham) and a PhD in Atmospheric Physics (University of Leicester). She has developed satellite retrieval algorithms for greenhouse gas, volcanic and wildfire pollution detection and performed large-scale validation experiments with global chemical transport models. She was an ESA project scientist for the MIPAS, AATSR, Sentinels 4 and 5 space sensors and has collaborated internationally through NERC, NCEO and HORIZON-2020 funded projects. She has been awarded funding through Newton Researcher Links, Royal Society of Chemistry and RCUK and is currently the principle investigator of a Global Challenges Research Fund (GCRF) project focussing on using thermal infrared technologies to support environmental decision making in climate critical regions.



Dr Darren Ghent is a senior research scientist at the University of Leicester and coordinator of the International Land Surface Temperature and Emissivity Working Group. His expertise is in monitoring of land surface temperature from space and understanding the interactions between land-surface and the atmosphere in terms of surface energy balance, carbon and water cycle. He obtained a BSc in Mathematics (Loughborough University), an MSc in Natural Resource Management (University of Leicester) and a Phd on Land-Surface Modelling and Earth Observation of Fire/Climate Interaction (University of Leicester). Darren was project scientist on the GlobTemperature project under the Data User Element of ESA's 4th Earth Observation envelope programme. He is LST Validation Scientist and Algorithm Manager for Sentinel-3 and AATSR Level 2 LST product. Currently Darren is principle investigator of ESA's Climate Change Initiative (CCI) consortium project for the LST Essential Climate Variable (ECV).

Professor Martin Wooster is Chair of Earth Observation (EO) Science at King's College London, and a Divisional Director of the UK's NERC National Centre for Earth Observation (NCEO). He has a BSc in Physics (Bristol), MSc in Remote Sensing (London), and prior to joining King's Department of Geography he worked as a remote sensing scientist for the UK's overseas aid programme (DfID). His work has a strong focus on the causes and impacts of regional and global biomass burning, and he has led the King's 'Wildfire Research Team' since its inception in 2002. His group have published over 100 international journal papers and are currently responsible for three operational satellite products related to biomass burning, derived from Meteosat SEVIRI, GOES-E/-W and Sentinel-3. In collaboration with other European institutions, Professor Wooster has contributed to the development of the real-time Global Fire Assimilation System (GFAS) 'fire emissions component' of the ECMWF-led Copernicus Atmosphere Monitoring Service. Professor Wooster is co-Chair of the International Fire Implementation Team of GOFC-GOLD, and in 2011 was awarded the UK's Royal Geographical Society Cuthbert Peak Award.

Amit Misra works as Project Scientist in the Department of Civil Engineering, Indian Institute of Technology Kanpur. He has obtained PhD in Physics from Physical Research Laboratory, Ahmedabad, India. His work includes study of atmospheric aerosols from ground and space based remote sensing. Previously he has worked on analysis and validation of MODIS and CALIPSO derived aerosol products. Presently he is working on aerosol climatology over the Indo-Gangetic Basin and retrieval of PM2.5 concentration from space-based sensors. His research interests include atmospheric optics, radiative transfer and satellite based aerosol remote sensing over land.