The British Geological Survey

The British Geological Survey (BGS) is a non-departmental public body, part of UK Research and Innovation (UKRI), which is responsible to the Department for Business, Energy and Industrial Strategy. We are the UK's principal provider of objective and authoritative geoscientific information and knowledge for wealth creation, sustainable use of natural resources, reducing risk and living with the impacts of environmental change. The BGS is a not-for-profit organisation. BGS is Britain's national geological survey and has been in existence since 1835. BGS works for both the public and private sectors and employs around 600 staff, 500 of which are scientists. Our annual budget is in the region of £50 million, a little over half of which comes from the UK government's Science Budget, with the remainder coming from external commissioned research. Further details may be found in our Annual Report. The BGS has a very experienced remote sensing team who provide remote sensing and geodesy expertise to assess all manner of geological issues. Processing and the geological interpretation of satellite and airborne imagery is a core capability along with the development and application of novel processing techniques. The team have experts in hyperspectral image processing, radar interferometry, stereo imagery and DEM extraction, terrestrial laser scanning and GNSS and 3D visualisation.

Speaker Bios

Luke Bateson is the Head of Geodesy and Remote Sensing at BGS. Luke has over 24 years' experience of the processing and interpretation of a range of EO data for a range of different geological applications. Luke has extensive experience in the interpretation of InSAR data and the derivation of products and services from InSAR data. In ESA's Terramfirma project Luke worked on product validation to establish the value of InSAR for the understanding of geological processes. In the FP7 PanGeo project, Luke was the technical lead (and WP lead) and was responsible for designing the geological InSAR interpretation methodology used by the 27 European Geological Surveys to create Geohazard information products for 52 European towns. Luke is now bringing together his understanding of InSAR and its application to geological phenomena to create Risk Profiling services for the insurance industry via the integration of in-situ, InSAR, GNSS and geological data. Luke actively researches the use of InSAR observations for ground motions relating to fluid flows within the UK coalfields, this has offered new insights into the groundwater regime following the cessation of coal mining. He is an invited member of the EU-Ground Motion Service advisory board, where he advises the European Environment Agency on the production of a continent wide InSAR ground motion map. Luke uses drones for geoscience applications and manages the BGS capability in this area. As a qualified drone pilot, he uses different platforms to apply a variety of data to different applications. Luke is the former chair of the Geological Remote Sensing Group (GeolSoc) where he convened three international conferences on geological remote sensing and he is a regular invited speaker on EO.

Alessandro Novellino is a Remote Sensing Geoscientist at BGS. He has >10 years of international academic research experience in mapping, monitoring and modelling geohazards through the use of Earth Observation (EO) data. He has a background in programming and coding skills (python, Matlab) and in using cloud computing system (Google Earth Engine) to exploit large datesets of satellite data. Novellino has >70 peer-reviewed publications, h-Index =17 and ~1,000 citations. Novellino's science has supported Italian local authorities in mitigating the impact of natural hazards in Italy (https://doi.org/10.1016/j.catena.2021.105317) where he has

made a significant contribution to advance landslide research by combining EO and Machine. Novellino is also an authorised member for the International Disaster Charter since 2019 through which he provides support to national and international agencies (e.g., Cabinet Office, FCDO) during disaster response activities: 2022 Tonga eruption. He has delivered in-person and online training courses on the use of satellite data for studying geohazards to scientists in Italy, UK, Vietnam and Indonesia.

Outline program

6th June, day 1 (8,30am – 4pm) - InSAR

Morning session (8,30am – 12pm)

- Introduction to InSAR including basic theory on InSAR, benefits and constraints of InSAR, part I. (1.5hours) [AN]
- Break (30min)
- Introduction to InSAR including basic theory on InSAR, benefits and constraints of InSAR, part II. (1.5hours). Practicality, where InSAR works well and where it does not. [LB]

---------- Lunch break (1 hour) ----------

Afternoon session (1pm – 4pm)

- Example of InSAR for mapping and monitoring natural hazards, History of InSAR in BGS and application in the UK. (1.5hours) [LB]
- Break (30min)
- Accessing, visualising and manipulating InSAR data with practical exercise (1 hour) [AN]

7th June, day 2 (9am – 4pm) – InSAR and Optical

Morning session (8,30am – 12pm)

- InSAR application to landslides and peatlands with interactive training (1 hour). Examples from England (Isle of Wights, Hollin Hill with CRs, soil tips and 'bad' landslides + Hatfield Moors). Some insights on cluster and anomalies detection [AN]
- Break (30min)
- InSAR Q&A (30min)
- Introduction, including basic theory on Multispectral remote sensing, benefits and constraints, different satellite missions, part I (1 hour). [LB]

---------- Lunch break (1 hour) ----------

Afternoon session (1pm – 4pm)

- How to get information from optical imagery: land cover, NDVI, waterlines (1.5hours) [AN]
- Break (30min)
- Accessing, visualising and manipulating optical data with practical exercise (1 hour) [LB]

8th June, day 3 (9am – 4pm)

Morning session (8,30am – 12pm)

- Creating a land cover map on GEE (1.5hours) [AN]
- Break (30min)
- Assessing vegetation health conditions with interactive training and Q&A (1.5hours)

---------- Lunch break (1 hour) ----------

Afternoon session (1pm – 4pm)
Drone/ UAV [LB]

- BGS experience of drones
- Use cases
- Cliff profiles
- Regulations
- TLS
- Integrated surveys

Requirements:

- Creating account in Google Earth Engine at https://earthengine.google.com/new_signup
- Downloading of the latest stable version of QGIS at https://qgis.org/en/site/forusers/download.html#
- Create an account for the Sentinel EO-Browser app: https://apps.sentinel-hub.com/eo-browser/
- https://apps.sentinel-hub.com/sentinel-playground/