

INTERNSHIP 4: USING HIGH RESOLUTION SATELLITE IMAGERY TO DETECT CANOPY PHENOLOGY EVENTS IN TROPICAL FORESTS IN SOUTHEAST ASIA

Supervisors: Beth Raine (UKCEH), Lindsay F. Banin (UKCEH)

Please note that this internship will take place from Monday 7 July – Friday 15 August 2025. It will be one week delayed from the other NC-International internships.

Internship Location: UKCEH Edinburgh, Bush Estate, Penicuik, Midlothian, EH26 0QB

Project Description:

Seasonal and interannual periods of low rainfall (such as the El Niño drought events) strongly affect the ecology of trees in Southeast Asian forests. Dry seasons can trigger leaf fall and leaf flushing cycles and can also initiate synchronised flowering and fruiting events. However, we lack a comprehensive understanding of these key ecosystem processes, and therefore how future changes in frequency and intensity of drought events may impact forest function. The recent availability of higher spatial and temporal resolution satellite data offers the opportunity to detect these events and relate the timing and intensity of them to other interacting environmental change factors, especially forest fragmentation and edge effects.

We invite an intern to co-develop relevant hypotheses, develop and carry out an analysis to test the detection of canopy phenology events in tropical forests at selected sites in SE Asia from satellite imagery. The intern would use open-source high-resolution Planet imagery to develop a workflow to identify flowering, fruiting and foliar change in areas with known historic canopy phenology events, including potential sites in Malaysia and Indonesia. Depending on the outcome of this core piece of work and the intern's interests, they will then extend the work by applying the methods developed to specific questions which may include exploring spatio-temporal patterns in reproductive phenology and relationships between phenology signals and proximity to forest disturbance.

The intern would be supervised in Edinburgh but with additional opportunities to interact with Earth Observation researchers at other sites through virtual meetings.

Tasks:

Core work (weeks 1 - 4):

- Familiarise with the literature on canopy phenology in forests and monitoring these events with remote sensing imagery and hone focus of the internship with supervisors
- Familiarise with accessing and downloading satellite imagery available on Planet labs
- Download and pre-process time series of Planet satellite imagery for a focal landscape that has undergone known historic phenological or drought events (for example, this may include the large-scale flowering in Malaysian tropical forests in April – May 2019)
- Extract features from satellite imagery time series and compare these during and before/after phenological events
- Identify differences in satellite imagery features during and before/after phenological events using e.g. general linear model or random forest approach
- Develop a collaborative, reproducible workflow using version control

Continuation (weeks 5 – 6):

Depending on the outcomes of the core section of the work, the intern could then use the models developed to answer questions about phenological events, their detectability and the wider landscape context. Possible areas include:

- Explore how canopy events occur over space and time and in association with other landscape features
- Explore phenological events in another landscape

Compare detectability of phenological events with other satellite imagery
Reproducible code to process and analyse satellite imagery of phenological events in selected sites in SE Asia (e.g. R scripts, a GitHub repository of code and/or Rmarkdown document)

A report detailing the methodology and results from the analysis, including appropriate figures

Analysis suitable for inclusion in a peer-reviewed publication

Intern develops their knowledge of forest ecology and applied skills in GIS, remote sensing and data analysis

Expected Outcomes:

Required Skills and Background:

Essential:

- Currently in postgraduate education (Masters or PhD) at university or have graduated within the six months prior to the start of the internship (30th June 2025) - studying ecology, biology, geography or a related quantitative field
- Experience using GIS
- Experience coding in R
- Good quantitative skills

Desirable:

- Experience using GitHub for version control
- Experience using satellite imagery, especially PlanetLabs data