Front cover: TerraSAR-x coherence image © DLR, Infoterra Gmbh. Eleven day interferometric coherence and intensity image taken over Indonesia. Areas of low coherence (blue) are likely to be intact forest, areas that are yellow or purple are less intact forest or urban areas.

Back Cover: PALSAR dual polarisation and coherence image composite © JAXA.

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**Vegetation Mapping and Monitoring**

Mapping and monitoring the extent and quality of vegetation covering different parts of the Earth's surface is one of the essential functions of Earth Observation today. Disturbances of forest can result in emissions of greenhouse gases to the atmosphere. Disturbances impacting on forests today are fire, drainage, land conversion to bio-fuel and logging (legal or illegal) activity. In terms of policy there will be reporting requirements for monitoring tropical deforestation rates under the UN REDD (Reducing Emissions from Deforestation and Forest Degradation in Developing Countries). Both biomass and fire disturbance have been recognised as essential climate variables (ECVs) in the Global Climate Observing System (GCOS) ECV programme. There is a great deal of discussion about how the success of REDD will be evaluated and compensation awarded. Currently, there is no independent monitoring system available that ticks all of the boxes (frequency, detail, operational, value added products, low cost). AstroSAR can offer a solution.

**Radar (SAR) Image Analysis**

The University of Leicester has a strong heritage in the processing, analysis and extraction of information from Synthetic Aperture Radar (SAR) data. We hold principal investigator contracts with the German Space Agency (DLR), the European Space Agency (ESA) and the Japanese Space Agency (JAXA) and are actively working on projects focused mainly on Indonesia.

The image above shows a 3m resolution TerraSAR-x image of a forested region in central Kalimantan (southern Borneo). There is a wealth of detail contained within the image on forest structure, distribution of biomass, areas of development and disturbance and clear identification of logging trails.

If fine detail is needed in cloudy regions of the globe, imaging in the radar domain is essential. Currently, we have this imaging capability from radar systems. However, to achieve near real time operational monitoring status, frequent observations, in the order of 3-4 days, is vital. Wide area coverage is also essential, we need to see large expanses of forest to see the big picture on forest disturbance.

**Forest Biomass Mapping**

The University of Leicester have developed new and more accurate methods to map forest timber volume and biomass from radar remote sensing and laser scanning. These methods are highly efficient in providing forest inventory updates whilst minimising the need for field data collection. Depending on the spatial resolution, both space borne (ca. 30-50m) and airborne (1-5m) solutions can be provided. The results can easily be incorporated into a GIS.

**AstroSAR**

EADS Astrium are developing AstroSAR as a new, unique and low cost Space borne Radar Forest Monitoring Service. AstroSAR-Lite uses a constellation of radar satellites in low-inclination orbits to achieve high revisit frequencies (many times per day) within areas of critical global strategic interest. Unlike more traditional radar satellites in polar orbits, which offer lengthy revisit times towards the equator and narrow swath width, AstroSAR-Lite uses a low inclination orbit providing high revisit rates in the tropical Equatorial regions.

A single AstroSAR-Lite can monitor the majority of the worlds at risk tropical rainforest at high resolution within a few weeks enabling preventative action to be taken to forestall illegal clearance. AstroSAR-Lite aims to acquire frequent images at high resolution (3m) over the whole of the tropical rainforests and oil palm plantations. Its SAR technology guarantees image acquisition day and night and through clouds, haze and smoke plumes. Its spatial resolution makes it possible to detect illegal logging roads, forest thinning from selective logging, clear-cuts and drainage ditches.