Locusts & Monkeys

Spatial resolution is a key characteristic in remote sensing, as we've previously discussed. Often the view is that you need an object to be significantly larger than the resolution to be able to see it on an image. However, this is not always the case as often satellites can identify indicators of objects that are much smaller.

We've previously written about satellites identifying phytoplankton in algal blooms, and recently two interesting reports have described how satellites are being used to determine the presence of locusts and monkeys!

Locusts

Desert locusts are a type of grasshopper, and whilst individually they are harmless as a swarm they can cause huge damage to populations in their paths. Between 2003 and 2005 a swarm in West Africa affected eight million people, with reported losses of 100% for cereals, 90% for legumes and 85% for pasture.

Swarms occur when certain conditions are present; namely a drought, followed by rain and vegetation growth. ESA and the UN Food and Agriculture Organization (FAO) have being working together to determine if data from the Soil Moisture and Ocean Salinity (SMOS) satellite can be used to forecast these conditions. SMOS carries a Microwave Imaging Radiometer with Aperture Synthesis (MIRAS) instrument - a 2D interferometric L-band radiometer with 69 antenna receivers distributed on a Y-shaped deployable antenna array. It observes the 'brightness temperature' of the Earth, which indicates the radiation emitted from planet's surface. It has a temporal resolution of three days and a spatial resolution of around 50 km.

By combining the SMOS soil moisture observations with data from NASA's MODIS instrument, the team were able to downscale SMOS to 1km spatial resolution and then use this data to create maps. This approach then predicted favourable locust swarming conditions approximately 70 days ahead of the November 2016 outbreak in Mauritania, giving the potential for an early warning system.

This is interesting for us as we're currently using soil moisture data in a project to provide an early warning system for droughts and floods.

Monkeys

Earlier this month the paper, 'Connecting Earth Observation to High-Throughput Biodiversity Data', was published in the journal Nature Ecology and Evolution. It describes the work of scientists from the Universities of Leicester and East Anglia who have used satellite data to help identify

monkey populations that have declined through hunting.

The team have used a variety of technologies and techniques to pull together indicators of monkey distribution, including:

- Earth observation data to map roads and human settlements.
- Automated recordings of animal sounds to determine what species are in the area.
- Mosquitos have been caught and analysed to determine what they have been feeding on.

Combining these various datasets provides a huge amount of information, and can be used to identify areas where monkey populations are vulnerable.

These projects demonstrate an interesting capability of satellites, which is not always recognised and understood. By using satellites to monitor certain aspects of the planet, the data can be used to infer things happening on a much smaller scale than individual pixels.