Introduction

The European Space Agency’s (ESA) Soil Moisture and Ocean Salinity (SMOS) satellite was successfully launched in 2009 on a potential 10 year mission. Carrying the passive L-Band 2-D Microwave Imaging Radiometer with Aperture Synthesis (MIRAS) instrument, receiving in the 1400-1427-MHz protected wavelengths. SMOS has the ability to relate emitted longwave radiation to moisture content of the first few centimetres of top soil. The high spatial and temporal resolutions allows the production of frequent global maps (every 3 days) of surface soil moisture (SSM) content at a 50 km spatial resolution (Kerr et al., 2001). SMOS gives a unique capability to consistently measure this important aspect of the water cycle.

Methodology

- Synthetic aperture image produced from 69 antennas positioned along three arms, giving observations of long wavelengths, with a useable spatial resolution.
- Microwave response strongly dominated by SSM and vegetation water content (Kerr et al., 2010).

Potential applications

- Warning of flood vulnerability
- Early crop failure, crop yield indicator
- Assimilation into numerical weather prediction, to drive energy/water cycle

Limitations

- Spatial resolution around 50km – Limited application for small scale observations.
- Radio frequency interference (RFI) – antenna system vulnerable to powerful radar systems.

Introducing SMAP

- Launched January 2015
- Physical, rotating passive antenna
- Additional active radar, operating at 3 km spatial resolution
- Reduced vulnerability to RFI

References

3. European Space Agency: http://www.esa.int/ESA

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