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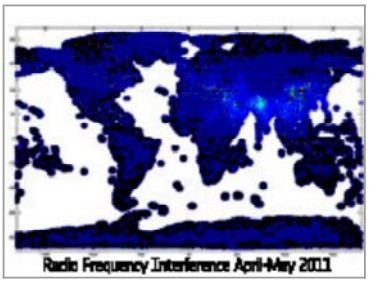
News



Improving situation

SMOS gains clearer view as illegal transmitters shut down

14 June 2011

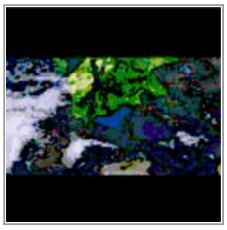
A major international effort to shut down radio signals that have, at times, been blinding the instrument on ESA's SMOS water satellite is producing a marked improvement in the quality of the mission's data.

The Soil Moisture and Ocean Salinity (SMOS) satellite was launched at the end of 2009 to improve our understanding of the water cycle.

The satellite carries a passive radiometer that operates in the 1400–1427 MHz frequency range (L-band) of the electromagnetic spectrum. It captures snapshots of 'brightness temperature' that correspond to microwave radiation emitted from Earth's surface.

From this information, the amount of moisture held in the surface layers of soil and salinity in the surface waters of the oceans can be derived.

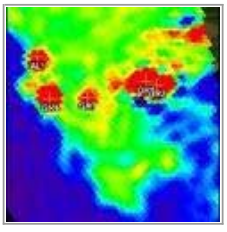
According to radio regulations set by the International Telecommunications Union (ITU), 1400–1427 MHz is allocated to the Earth Exploration Satellite Service, space research and radio astronomy – other transmissions in this band are prohibited.


SMOS

However, soon after SMOS was launched, the data revealed there were many signals being transmitted within this protected passive band, rendering some of the data unusable for scientific purposes.

SMOS is well on the way to meeting its research objectives over areas free of this radio-frequency interference. However, the mission has clearly not been reaching its full potential because significant amounts of data have had to be discarded.

The areas worst affected are in southern Europe, southern and eastern Asia and the Middle East.


SMOS 'seeing' clearer now

To ensure the integrity of the mission, ESA has gone to considerable effort to investigate exactly where the interference comes from and to urge national authorities to take action.

It transpired that interference is due to illegal signals being transmitted within the protected band and other signals from adjacent bands that leak into the protected region.

Investigations have revealed that most of the problems stem from unauthorised transmitters in the protected band such as TV and other radio links and wireless-camera monitoring systems.

SMOS

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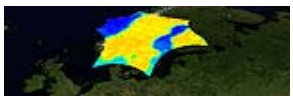

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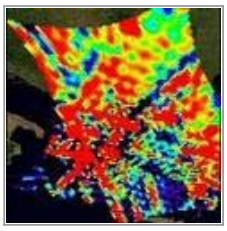
Emissions from air surveillance radar and other radiolocation systems are also common sources of interference.

Through painstaking efforts by ESA teams and their collaboration with various international and national spectrum management authorities, the problem, although far from being completely resolved, is now much improved.

To date, 387 separate sources of interference have been detected worldwide, mostly from Asia and Europe.



Interference over Greece a year ago

This number should be treated with caution because strong signals mask weaker ones, which will only come to light as the stronger ones are turned off.

Types of interference

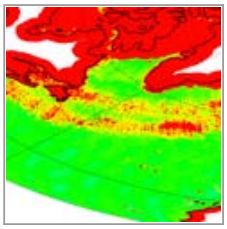
As a result of ESA's strategies, which included developing a way of detecting a source to within just 5 km, 90 of these transmitters have been turned off. Most of these were in Europe but investigations continue in more than 35 countries worldwide.

While illegal transmissions can be resolved through cooperation with national authorities enforcing ITU regulations, the solution to interference caused by unwanted emission from neighbouring services requires further regulatory action.

This issue was addressed at the World Radio Conference in 2007 and recommendations on maximum 'out-of-band' levels were agreed. Furthermore, earlier this year the European Conference of Postal and Telecommunications Administrations adopted the decision to make these limits compulsory its member countries.

The problem of interference has been more of an issue over land, contaminating data on soil moisture. However, there are also problems with ocean salinity retrievals.

For example, radar systems in North America are polluting large swathes of data from the northern oceans. However, the administrations involved are planning to refurbish some of these systems after the summer.



Interference over the ocean

Although there has been a big improvement in the quality of SMOS data, ESA is set to continue its efforts, particularly in the Near and Middle East, China and southern Asia.

The efforts to reduce radio-frequency interference will also benefit other missions carrying L-band radar, such as NASA's new Aquarius satellite, which was launched on 10 June to measure ocean salinity.

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