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Ground based L-band microwave measurements in the Black sea

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Ground based experiments were made in support of SMOS and planned Russian space missions. In Russia two L-band microwave radiometers for small satellite and for Russian segment of International Space Station scheduled for launch in March 2011.

Two experiments with L-band microwave instruments were held in August 2007 and October 2009 in Black Sea on the off-shore marine platform near to Katsiveli, Crimea, Ukraine. The last L-band microwave measurements were held in the Black sea near to Gelendzhik during the field experiment from 20 September till 8 October 2010. In the ground based experiments prototype of the space radiometer was used. During the field experiments microwave radiometers measured the sea surface emission in unchanging direction. Elevation angle in all experiments was about 57 deg. In the two first experiments it was vertically polarized horn antenna. In the last experiment we measured also all 4 Stocks polarization components. To obtain Stocks vector from microwave measurements we used one receiver and 2 orthogonally polarized antennas. Between antennas and radiometer was built-in summation unit providing vector summation of the signals with the possibility to make phase shifts between these signals.

During the experiments it was registered daily variations of the brightness temperatures and Stocks vector in variety of weather conditions especially in a wind speed from 0 to 20 m/s.

One of the most complicated problems of measurements in L-band is RFI. Intensity of RFI varies very high depending on azimuth direction, time of day and so on. We develop special algorithms of data filtration based on statistical characteristics of received signals.

Another external factor influenced our data was reflected and scattered Sun emission that have significant values about 10 K. Model calculations were made using data about Sun emission from Radio Solar Telescope Network (Solar observatories Palehua, Learmonth, Sagamore_Hill and San_Vito). Comparison of model calculations and experimental data shows a good agreement in maximum values, but still has discrepancies caused by another factors.

Our local measurements were compared with general character of sea brightness temperatures obtained by SMOS in wide area near to point of experiment. SMOS data provided by the European Space Agency. The main goal of this comparison was the understanding of possibilities to use our data for calibration/validation purposes in costal zone of internal sea. Formally it is not possible to compare directly our near shore measurements and SMOS data due to low resolution of satellite instrument, but we may suppose that for estimated accuracy, about 3 K, space variations of brightness temperatures should not be high. These variations are mostly due to changes in weather situation.

Our investigations show that regular ground based measurements are useful for model testing and calibration/validation purposes.