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# Ionospheric mapping using L-band microwave Earth Observation instruments

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L-band active (e.g. 1.2GHz for a Synthetic Aperture Radar, or SAR) an passive (e.g. 1.4GHz for a microwave radiometer) microwave signals used by spaceborne Earth observation instruments are sensitive to the ionosphere, mostly through the impact of the electron content present along the propagation path between the sensor and the imaged region of the Earth. Quite often these ionospheric disturbances - such as Faraday rotation – that affect the signal measured at sensor level must be mitigated in order to improve the quality of the imaging or the performance of the retrieval. Symmetrically, one could consider using the data provided by these Earth observation missions in order to derive information on – and even map - the electron content of the ionosphere. The information so extracted would present characteristics such as spatial and temporal resolutions that are in line with those of the instruments / missions from which the data are produced. This could be of interest as the high spatial resolution of SAR and the wide coverage of microwave radiometers could very well complement the other sources of information on the electron content of the ionosphere (e.g. GNSS-based observations). This paper recaps some of the techniques that can be used to extract the Total Electron Content (TEC) from microwave Earth observation products (such as SAR and radiometer data). As other authors already discussed the derivation of the TEC from SAR data this paper focuses on the different approaches that can be followed to extract TEC from L-band radiometer data. Here, polarimetric data from the Soil Moisture and Ocean Salinity (SMOS) mission - which relies on a synthetic aperture L-band radiometer – are used to produce TEC maps, which in turn are compared to coincident sources of information, such as the International GPS Service (IGS) maps. Results point to some good potential for this radiometer-based technique to generate TEC maps of acceptable quality. Potential improvements in the processing techniques are also stressed