Rain rate retrieval using the 183-WSL algorithm

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A new technique to detect precipitating clouds is proposed. The algorithm is based on the features of microwave radiation interactions with large rain drops, particularly at the opaque frequencies where the extinction effect due to the absorption of rainy clouds along the radiation path is more evident. This new passive microwave rain retrieval algorithm is developed using the water vapour strong lines at 183 GHz (183-WSL).

Since the 183 GHz bands are mainly dedicated to the sounding of the atmospheric water vapour amount, the behaviour of these frequencies in cloud-free regions with different temperature and water vapour profiles is explored. It is found that the perturbation on the radiation field induced by precipitation is much larger than that due to the water vapour absorption signals as measured in cloud-free regions. Moreover, since at mid-latitudes the peak of the weighting functions at 183 GHz ranges from 2 km up to the top of the troposphere, these frequencies are less affected by the surface emissivity and the precipitating signature is not masked by the surface-generated effects.

Multi-seasonal tests, carried out using AMSU-B water vapour channels on board the NOAA satellite series, have shown the sensitivity of the algorithm to correctly infer the structure of different precipitating events both over land and sea surfaces. Nevertheless, the application of the method on light and very light precipitation, particularly located at high latitudes, leads to a generally large underestimation of the rainfall rates. Further studies are thus planned to improve rain delineation in the winter season and at latitudes higher than 60 degrees.