ATMOSPHERIC ATTENUATION CORRECTION AND RAIN FLAG AL GORITHMS FOR NASA SCATTEROMETER

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NSCAT is the NASA Scatterometer to be launched on the Japanese ADEOS in 1996 for global ocean wind remote sensing. NSCAT operates at Ku-band with a swath coverage of more than 900 Km, and has a capability of providing more than 90 percent global coverage in 2 days. Each side of the swath with respect to the spacecraft ground track is illuminated by three antenna beams from different azimuth angles. The data collected from these! three antenna beams allow the estimation of wind speed and direct ion based on the azimuth di - versity of observation angles. However, the electromagnetic waves at Ku-band frequency are potentially more susceptible to attenuation from atmospheric cloud water and water vapor than at C-band, the operating frequency of ERS-1 scatterometer. Because there will be no companion microwave radiometers for atmospheric sensing on the ADEOS platform, techniques for estimating the atmospheric attenuation and rain probability for each normalized cross section measurement (σ_0) using other available remote sensing data sources become critical for heavily cloudy or rainy conditions, which are highly expected near tropical regions. The potential data sources include the Special Sensor Microwave/Imager (SSM/I). This paper will present and compare algorithms, which use the SSM/I data to derive the atmospheric conditions. The atmospheric attenuation data derived from one year of SSM /1 data have been analyzed. The geographical variations of attenuation data with or without rain were analyzed by grouping the data in 10 by 1° bins. As expected, the two-way atmospheric attenuation can reach as high as 0.6 dB without rain near tropical areas and become smaller for areas away from the equator. Data Were also averaged 011 a monthly basis to find the seasonal variations with the results indicating strong geographical dependence. The monthly standard deviation of atmospheric attenuation for all 10 by 10 cells were evaluated, indicating a value of 0.1 dB under rain-free conditions and in excess of 0.3 dB with all weather conditions considered. This means that under rain free conditions, the atmospheric attenuation can be effectively reduced to the standard deviation values using the averaged attenuation map derived from the SSM/I data. However, the rain data from the SSM/II indicate that there could be significant residual errors. In this regard, algorithms for the rain flag, which would indicate the presence of rain in the scatterometer footprint are investigated using the colocated SEASAT-A satellite scatterometer (SASS) and scanning multi-frequency microwave radiometer (SMMR). Results indicate that the spatial variation of scatterometer data will allow the detection of meso-scale rain cells.

Suggested Topic: Sensor Calibration (Remote sensing techniques & instrumentation)