A Neural Network Approach for Improving QuikSCAT Winds in Rain

Bryan W. Stiles and R. Scott Dunbar
Jet Propulsion Laboratory, California Institute of Technology

Abstract: We describe a method for retrieving more accurate QuikSCAT winds in rainy conditions. The method utilizes an artificial neural network technique trained using SeaWinds/AMSR data and ECMWF analysis wind fields. The network is trained to estimate AMSR liquid water and ECMWF winds from scatterometer data alone. The accuracy of the resultant wind speeds slightly outperforms the AMSR rain corrected wind speeds available in the SeaWinds product and dramatically improves upon the scatterometer-only wind speeds. In addition to testing on SeaWinds data, one month of QuikSCAT winds were also processed by the network. Despite being trained on ECMWF, the network-retrieved QuikSCAT winds maintained geographical biases between ECMWF and QuikSCAT that were observed in the "rain free" official QuikSCAT data. On the other hand, wind features in the ECMWF fields that were completely obscured in rainy areas of QuikSCAT official wind products were clearly observed in the network processed winds. In addition to improving wind speed accuracy we also use the neural network to retrieve wind direction. Directional retrieval because of its multi-modal error characteristics is more problematic for the neural network. However, when the network is employed as a post processor in which MLE retrieved directions are inputs, significant directional improvement can also be obtained. Both statistical and pictorial evidence indicate that a neural network approach can be used to greatly improve scatterometer winds in the presence of rain.