

IMPACT STUDIES OF AMSR-E OCEAN SURFACE WIND SPEED DATA IN NWP AT JMA

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ABSTRACT

Microwave measurements contain ocean surface information as well as atmospheric moisture information. Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E) is a microwave radiometer developed by Japan Aerospace Exploration Agency (JAXA) and it has been observing radiances from the Earth with dual 6 microwave frequency. JAXA produces ocean surface wind speed data from AMSR-E measurements as a standard level 2 product [1] using 37GHz vertical and horizontal polarized channels in no rainy area. As a research product, all weather ocean surface wind speed data [2] are also produced by additional AMSR-E low frequency (6 and 10 GHz) information. These two kinds of ocean surface wind speed data from AMSR-E were utilized in this study.

In order to make use of the remotely sensed ocean surface wind speed signals in Numerical Weather Prediction (NWP), there are two approaches. The one is direct assimilation of observed radiance by means of a radiative transfer model and the other is assimilation of the wind speed retrievals. The direct radiance assimilation is a major trend in the satellite data assimilation in operational NWP centers and it is well known that the direct radiance assimilation of many other microwave sensors e.g., Advanced Microwave Sounding Unit (AMSU)-A/B and Microwave Humidity Sounder (MHS) which have temperature and moisture sounding information brings large improvement in the analysis and forecast compared with the assimilation of those retrievals. In the radiance assimilation, ocean surface wind speed signals are extracted through a microwave ocean emissivity model in the radiative transfer model. In the introduction of microwave imager data for the data assimilation system of operational NWP centers, impacts on moisture and temperature field have been well investigated. However, clean comparison between radiance assimilation and retrievals assimilation in terms of ocean surface wind speed have not been shown yet. The impacts would depend on the performance of wind speed Jacobian of the radiative transfer model and the retrieval error originated from wind speed retrieval algorithm.

In assimilation experiments, the impacts of AMSR-E level 2 wind speed data in JMA 4D-Var global data assimilation system was investigated by addition of the data to the current JMA operational observation data set. In the current data assimilation system, only vertical polarized channel of microwave imager including AMSR-E are assimilated and the wind speed Jacobian from the radiative transfer calculation are not included in the analysis to obtain atmospheric moisture information mainly [3]. Addition of the ocean surface wind speed information must bring some impacts on the analysis and forecast. In the radiance data assimilation, cloud- and rain- affected data were removed before the assimilation and only clear data were assimilated. Because all weather wind speed data are available under rainy condition, the impact could be larger than the clear radiance assimilation. A case study of cyclone Nargis in Myanmar 2008 was performed to look the impact of all weather wind speed data. Although there were no significant improvements in the cyclone track forecast, it was found that assimilation of all weather wind speed data inside the cyclone strengthened the intensity and the maximum wind speed in the forecast realistically. The details of the impact studies and experimental results will be presented at the conference.

REFERENCES

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