Operational Use of QuikSCAT / SeaWinds Ocean Surface Wind Data in the Meso 4D-Var System

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A satellite-borne scatterometer obtains the surface wind vectors over the ocean by measuring the radar signal returned from the sea surface.

The QuikSCAT/SeaWinds ocean surface wind data have been used in operation since 6 May 2003 in the JMA global data assimilation system.

JMA has been operating a Meso-Scale Model with a 4D-Var data assimilation system. Data assimilation experiments of the SeaWinds ocean surface wind data were conducted using the Meso 4D-Var system. The assimilation experiments using the SeaWinds data were performed for each about two weeks started from 3 June 2003 and 1 February 2004. A quality control system for the SeaWinds data was the same as that in the global 3D-Var system. The data were thinned out to one datum at about 50 km intervals and used in the Meso 4D-Var system. Experiments with and without SeaWinds data are referred to as Test run and Control run, respectively.

Figure 1 shows the threat scores of rainfall forecasts over Japan. The threat scores both in June 2003 and February 2004 showed positive impact in the Test run in many forecast hours especially for heavy rain in summer.

Figure 2 shows an example of the SeaWinds observation and first guess wind field. The wind directions of the first guess were almost south-southwest. On the other hand, SeaWinds observed a shear line apparently over the East China Sea. The surface wind fields were analyzed more correctly by using the SeaWinds data (not shown in the figure). Figure 3 shows the 9 hour forecast field from the initial time 12 UTC 18 July 2003. The SeaWinds data shown in Figure 2 were used in the initial field of the Test run. It is evident that a heavy rain band along the shear line was well predicted in the Test run and showed better correspondence with the Radar-AMeDAS observation than that in the Control run.

Based on the above findings, QuikSCAT/SeaWinds data have been used in operation since 27 July 2004 at JMA.

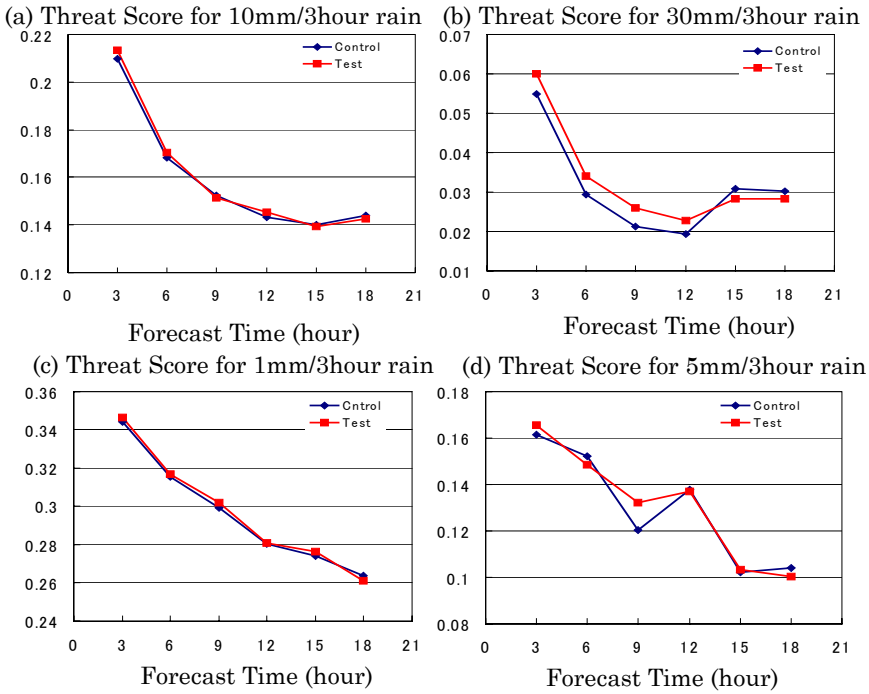

Figure 1. Threat scores for (a) moderate (10mm/3hour) and (b) heavy (30mm/3hour) rain for June 2003, Threat scores for (c) weak (1mm/3hour) and (d) moderate (5mm/3hour) rain for February 2004. Blue line denotes Control run and red line denotes Test run.

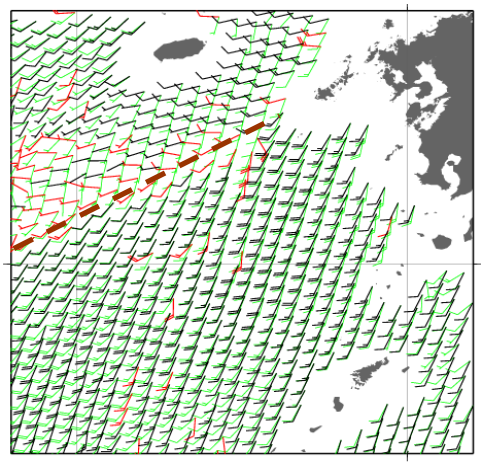

Figure 2. Black barbs denote SeaWinds data and green barbs denote first guess wind. Observation time is about 10 UTC 18 July 2003. Red barbs are the data rejected in quality control. Full barbs and half barbs mean 5 and 10 knots, respectively. A brown dashed line denotes a shear line.

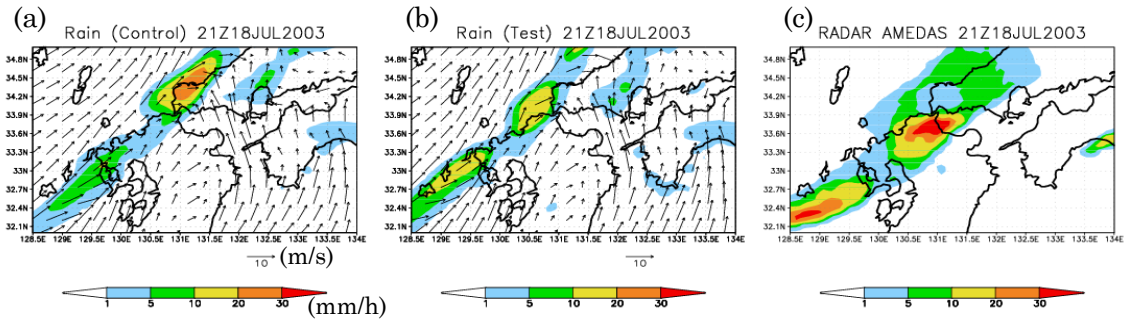

Figure 3. Horizontal distribution of hourly rainfall forecast and surface wind field after 9 hours from the initial time 12 UTC 18 July 2003. (a) Control run, (b) Test run, (c) Radar-AMeDAS rainfall observation at 21 UTC 18 July 2003.