

3.24 REAL-TIME IMPLEMENTATION OF VARIATIONAL 3-D WIND SYNTHESIS TECHNIQUE(WISSDOM) USING WEATHER RADAR NETWORK OF KMA

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Three-dimensional wind fields in high spatiotemporal resolution is essential to enhance an understanding of dynamic evolution of weather phenomena. For last decade, advanced technologies have been proposed to retrieve three-dimensional wind fields based on variational approach which find an optimal wind vector with minimum error between analysed and observation terms by using dynamic constraints such as an anelastic continuity equation, a vertical vorticity equation, a smoothness filter. The WISSDOM, WInd Synthesis System DOppler Measurement, is one of leading techniques for retrieval of 3-D wind fields. The WISSDOM showed significant advantages comparing to conventional wind synthesis method using of multiple-Doppler radar. WISSDOM has a flexibility to select top and bottom boundary conditions for wind fields, and it even yields 3-D wind fields using single radar and along baseline between two radars, as well as over complex terrain by adopting the Immersed Boundary Method. However, WISSDOM has not been utilized for operational weather forecast or monitoring of severe weather over nationwide radar network with rapid update cycle of 5~10 minutes in real time, mainly due to its requirement of huge computational resource for finding an optimal solution among complex equations. For providing a 3-D wind field during PyeongChang 2018 Olympic and Paralympic Winter Games, we have conducted the modularization and optimization tasks for real-time implementation of WISSDOM. On the domain (151 x 151, 20 layers) of the Olympic and Paralympic Games, the computational time of WISSDOM decreases from 71 minutes to 27 minutes after the modulization task and then was dramatically reduced up to 6 minutes by the implementation on super-computer system of KMA. We are also planning to reduce the computation time by additional code parallelization by the end of this year. Its accuracy was evaluated by comparing to wind information from radiosonde and wind profiler, and wind report from commercial aircraft (AMDAR).

Acknowledgements

The research is supported by “Development and application of cross governmental dual-pol radar harmonization (WRC-2013-A-1)” project of the Weather Radar Center, Korea Meteorological Administration.
