Big Data Assimilation: Past 5 Years and Perspectives for the Future

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The Japan's Big Data Assimilation (BDA) project started in October 2013 and ends its 5.5-year period in March 2019. The BDA project aimed to fully take advantage of "big data" from advanced sensors such as the phased array weather radar (PAWR) and Himawari-8 geostationary satellite, which provide two orders of magnitude more data than the previous sensors. We have achieved successful case studies with newly-developed 30-second-update, 100-m-mesh numerical weather prediction (NWP) system based on RIKEN's SCALE model and local ensemble transform Kalman filter (LETKF) to assimilate PAWR in Osaka and Kobe. We achieved less than 20 seconds of the computer time using the Japan's "K" supercomputer for SCALE-LETKF at 250-m resolution, good for real-time 30-second forecast-analysis cycling. Compared with 100-m resolution, we found no clear forecast degradation at 250-m resolution. Also, we succeeded in assimilating Himawari-8 all-sky infrared radiances every 10 minutes effectively for strong typhoon and extreme-rain cases. This project also implemented a near-real-time SCALE-LETKF NWP system at 18-km resolution, producing 5-day forecasts every 4 times a day continuously. There was a record high precipitation event in early July 2018 over a broad area of western Japan, with more than 200 fatalities, the worst in the past 30 some years. The near-real-time prediction predicted well the extreme precipitation in this case. We have been investigating how effective the high-resolution, high-frequency NWP systems developed in the BDA project are for this historic disaster case. In this presentation, we will summarize what we have achieved in the past 5.5 years and will discuss our future perspectives based on the achievements.