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Assimilation of ADM-Aeolus winds in a limited-area model

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ADM-Aeolus is an ESA space mission that will provide the first global observations of wind profiles from space by using the Doppler wind lidar (DWL). Because of its importance, the mission is expected to significantly contribute to the improvements of numerical weather prediction (NWP) in Europe and globally, especially in the tropics where direct wind observations are most needed. The scheduled mission launch is July 2015. During the previous years several studies addressed the potential impact of ADM winds but they exclusively dealt with the global model impact and the variational assimilation framework.

The present study applies the limited-area model WRF and the ensemble adjustment Kalman filter DART over Europe and Atlantic. The central question is the importance of flow dependency in the mid-latitudes for the assimilation of continuous measurements along the line of sight (LOS winds). In its default operation, the ADM-Aeolus wind retrieval software processes around 30 DWL measurements to produce a single wind profile representative for about 90-km path. The observation error is comparable to that of radio-sonde observations. Our goal is to investigate potential for data assimilation of the Aeolus profiles extracted at higher resolutions than currently used. This implies a larger number of wind observations, with potential usefulness especially over the Atlantic, but also with larger observation errors. The cost-benefit effects of various factors are investigated by using observing system assimilation experiments. For this purpose, WRF is coupled into the ECMWF ensemble data. In particular, sensitivity experiments compare the relative importance of the zonal and meridional wind components in compariosn with LOS winds for a case of the baroclinic wave development in northern Atlantic.