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Investigation of a case of rapid cyclogenesis using a potential vorticity modification method

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A method has been developed to manually modify the potential vorticity of KNMI's HIRLAM weather analysis. Satellite-observed water vapour radiances give an indication when modification is appropriate. The modified potential vorticity field is used in the data assimilation scheme (analogous to observations), and by its invertibility the dynamic variables are adapted in a consistent way. In this way a new analysis and forecast are obtained. The modifications are limited to the addition of simple sources, strengthenings, and displacements, in circular regions. This has the advantage that the modification is well quantified and reproducible.

This modification method is tested on a recent case of rapid cyclogenesis over the Atlantic ocean. HIRLAM did not give a good forecast and there was indeed a mismatch between model potential vorticity and water vapour radiance patterns. We have investigated different modifications to obtain a more representative analysis and we studied the effect of these modifications on the forecast of the next 24 hours.