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Application of the adjoint-based Forecast Sensitivity to Observations technique to convective-scale problems

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Following the work of others, the adjoint-based Forecast Sensitivity to Observations (FSO) technique has been successfully applied to synoptic-scale global forecast suites at the Met Office. There is potential for a similar FSO system to be applied to other model configurations. Of particular interest to the Met Office is the impact of observations in our convective-scale UK model, the UKV. Observation impacts in the UKV may differ from global impacts for a number of reasons: 1) the UKV is a limited-area model meaning that the impact of boundary conditions will come into play and that observation quantities will be different; 2) different observation-types are used; 3) observational information about both convective and synoptic-scale processes can be exploited by the data-assimilation system. Understanding how observations are being used in the UKV model would enable us to better make informed decisions about development, maintenance and utilisation of the UK's observing system and to help prioritise development of the data-assimilation system. Application of the adjoint-based FSO method to convective-scale problems is an area in which little prior work has been done by the data-assimilation community and many problems have yet to be overcome.