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Enhanced coupled land-atmosphere data assimilation for reanalysis

Peter Weston, Patricia de Rosnay, Christoph Herbert, and Ewan Pinnington

European Centre for Medium-range Weather Forecasts

The CERISE (CopERNicus climate change Service Evolution) project aims to develop land and coupled land-atmosphere data assimilation systems for the next generation of coupled reanalysis. This encompasses technical enhancements to the system architecture as well as scientific changes to improve the quality of the reanalyses.

Recent work has focussed on developing ensemble perturbation methods for the land-surface. The existing ensemble spread in model variables at and near the land-surface is known to be insufficient which can cause problems when assimilating interface observations in a coupled system. This is because the existing ensemble perturbations are mainly applied to upper air atmospheric variables. One way to increase the spread at the surface is to directly perturb land-surface parameters such as vegetation cover and leaf area index. Results from this approach are encouraging in offline and coupled experiments.

Another part of the project is to enhance the assimilation of passive microwave radiances over land. Currently the use of surface-sensitive passive microwave channels are largely limited to the ocean due to challenges in forward modelling of complex and heterogenous land surfaces. In CERISE, machine learning approaches are being explored to develop an observation operator to enable the use of these observations over land and snow surfaces.

Finally, developing quasi-strongly coupled land-atmosphere assimilation is a key objective of the project. Developments so far have focussed on technical changes to build a framework to allow stronger coupling than the current weakly coupled assimilation strategy. A summary of recent progress in the CERISE project will be presented.