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Modelling the global water cycle with the ECMWF Integrated Forecasting System: Recent progress and outstanding issues

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The representation of the global water cycle in the ECMWF Integrated Forecasting System (IFS) has been revisited in the past few years leading to improvements in weather and seasonal predictions. In particular, revisions of the land surface hydrology (in its soil, vegetation and snow components) have been key parametrisation elements. The relative contributions of the land surface components can be shown to improve the predicted near-surface temperature, surface and root-zone soil moisture, sensible and latent heat fluxes, and river discharges, all quantitatively evaluated against independent observational datasets included in the land surface benchmarking procedure at ECMWF. A significant incremental performance with these updates is obtained both on daily and monthly time-scales. The land data assimilation system has also evolved towards the adoption of optimal-estimation algorithms making better use of modelling information (background and Jacobians) and observations. Recent research activity is dedicated to the introduction of a photosynthesis-based transpiration, sub-grid lakes, and irrigation, affecting the land evaporation and the microwave emission from land for the assimilation of satellite-based radiances. Preliminary results from ongoing work will be also presented and discussed.