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Multi-basin calibration of the ECMWF land-surface model ECLand

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Accurately and efficiently estimating parameters for spatially distributed environmental models is impossible without proper regularization of the parameter space. The Multiscale Parameter Regionalization (MPR, Samaniego et al. 2010) makes use of high-resolution physiographic data (i.e., physiographic data such as soil maps and land cover information) to translate local land surface properties into model parameters. MPR consists of two steps: first, the high-resolution model parameters are derived from physiographic data via transfer functions at the native resolution. Second, the model parameters are upscaled to the target resolution the environmental model is applied on. MPR has already been successfully applied to the mesoscale hydrologic model (mHM, Samaniego et al. 2010, Kumar et al. 2013). An agnostic, stand-alone version implementation of MPR (Schweppe et al., 2022) allows applying this technique to any land-surface model or hydrological model.

In this study, we apply MPR to optimize parameters for the land-surface model ECLand (Boussetta et al. 2021) of the ECMWF Integrated Forecasting System. ECLand is calibrated at multiple locations simultaneously to provide an improved representation of river discharge at a global scale. We demonstrate the flexibility of the MPR approach by optimizing different transfer functions including the default one used in ECLand. In particular, we will discuss how specific choices in the calibration setting (i.e., chosen model parameters and ranges, basin locations, transfer function) affect the obtained ECLand model performance.

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