Coupling ocean & land processes at ECMWF

**Introduction**

Land & Ocean processes in the ECMWF coupled system are represented by a variety of dedicated surface 1D, 2D, and 3D models (ECLand, ECWAM, NEMO). More modular developments are under way that will allow to directly connect the land water cycle to the ocean fresh-water inflow (via the CAMA-Flood river-discharge).

To face future challenges of global kilometre-scale modelling and fully exploit the advantages of representing inland & coastal water gradients, and biosphere/cryosphere heterogeneity / complexity, we analyse how to increase the modularity of the developments, with a few examples.

**Earth System Approach @ECMWF**

- Integrated Forecasting System Data Assimilation schemes
- Coupled Ocean-Land-Airmosphere Ensemble Modelling
- Use of Satellite + In-situ EO data

**Ocean Surface Layer: A modularity call?**

Ocean/water modelling on atmospheric grid and ocean grid.

**ECLand: Offline Model benefits**

Offline modelling capabilities for land surface have driven annual updates of the model components & fostered process understanding

**Summary: why Ocean & Land 1D-scheme?**

- Operationalising coupled model improvements require provision of initial conditions (present/past). What's the 1D benefit & constraint?
- Advantage for faster/more frequent Earth surface reanalysis, reforecast & R2O
- Potential for integration of Coupled Data Assimilation & Ensemble Prediction
- Efficiency for testing new parameterisations for Copernicus / DestinE
- Constraints for the needs of accurate forcing to support offline testing

**Further Reading**