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Coupling ocean & land processes at ECMWF: Differences and similarities and what can we learn from them?

Land & Ocean processes in the ECMWF coupled system are represented by a variety of dedicated surface 1D 2D and 3D models (ECLand, ECWAM, NEMO3.4) that are coupled to the atmosphere with plans to connect also directly the land water cycle to the ocean fresh-water inflow via river-discharges (with the 2D CAMA-Flood scheme, already integrated in ECLand).

Presenting the poster I will illustrate how different land and ocean schemes are coupled in the forecasts and in the 4D-Var inner loops trajectories that are part of the analysis producing initial conditions for all ECMWF forecasts.

Over water surfaces there are low, intermediate and full-3D complexity schemes used for modelling the inland and ocean water mixed-layer and represent the skin temperature that is interacting with the atmosphere.

Over land a set of tiles represent the surface heterogeneity and allow to couple intermediate complexity schemes adapted to provide the surface boundary conditions and fluxes for numerical weather prediction, atmospheric compositions monitoring and climate reanalyses.

The cryosphere is illustrated as an example where intermediate complexity 1D model can be successfully coupled to 3D dynamical ocean model to represent the snow-sea-ice layer in 4D-Var inner and outer loops and in all forecasts.

For future developments moving towards global km-scale with the ECMWF Earth system, the use of intermediate complexity 1D surface schemes (over land and ocean) coupled to the 2D river-discharge and the 3D ocean-dynamics may carry the benefits of (1) modularity and computational efficiency, (2) support augmented state coupled data assimilation, (3) permits generating initial conditions for past re-forecasts using existing reanalyses as forcing data, and (4) a faster uptake of improvements in process representation.

Which theme does your abstract refer to?

Coupled data assimilation (ocean, atmosphere, sea-ice, waves, biogeochemistry, etc)

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