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Combining satellite products and reanalysed atmospheric variables to build long-term forcing for global ocean/sea-ice simulations.

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The DRAKKAR community modelling program aims at better understanding the ocean variability and scale interactions over the last 50 years. A hierarchy of model configurations of the global ocean (at resolution of 2˚, 1/2˚, 1/4˚), based on the NEMO system, is used for simulations of the ocean circulation, sea-ice, 14C and CFC tracers. DRAKKAR models are driven at the surface by momentum, heat and water fluxes partly computed online via bulk formulae, using prognostic model SSTs and atmospheric variables. Improving the surface forcing for high-resolution long-term ocean simulations through the use of satellite products is one of the objectives of the Drakkar project. This is done in three steps. Prior to ocean simulations and given a reference time/space-dependent SST dataset, a stand-alone tool named FOTO is first used to estimate the impact of different surface forcing functions (bulk formulations, atmospheric variables) on air-sea fluxes and on large-scale integrated balances. Coarse-resolution global simulations (DRAKKAR model at 2˚ resolution) are then performed, using these forcing functions. This second step extends the results of the first step by representing the feedback of large-scale ocean dynamics on SST and air-sea interactions (e.g. advection/subduction of forced buoyancy anomalies). The third step investigates the impact of the surface forcing in 50-year full-resolution (1/4˚) global simulations, in which additional degrees of freedom related to the ocean mesoscale are at work. The first two steps of this approach are illustrated in this study. The air-sea fluxes and the oceanic response to CORE and ERA40 surface forcing functions are compared via FOTO and from the 2˚ global simulations. An third forcing function has been constructed by combining long- and short-wave downwelling radiation fields from the ISCCP satellite-derived dataset into the ERA40 function. FOTO shows that this observation/reanalysis merging procedure reduces the global imbalance of air-sea fluxes. The simulated large-scale response of the ocean to these three forcings functions is also presented.