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Implementation of a downscaling oceanic model in the gulf of Guinae during the EGEE experiment

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An oceanic model has been developed to easily perform cheap and realistic mesoscale simulations in equatorial and tropical regions. This model is based on the primitive equation system in which the barotropic current function is continuously nudged toward a referenced barotropic current function (Psi_r). A time sequence of Psi_r (called guide) is provided by an OGCM, an analysis/reanalysis or a climatology and is used as a low resolution and low frequency interpolator. This technique avoids the spurious shocks induced by sequential assimilation data and is thus well adapted to perform downscaling over long periods and limited areas, processes studies and mixed-layer heat/salt/momentum budgets. This model was implemented in the Gulf of Guinea and was integrated during June 2006 that corresponds to the cold-tongue set-up during the EGEE experiment (EGEE3 was the oceanic component of the AMMA experiment devoted to the study of the African monsoon during 2006). Weekly analysis barotropic current functions provided by the large scale operational MERCATOR oceanic system were assimilated into the model in order to downscale the MERCATOR fields. ECMWF fluxes were used to force the surface of the model. Results show that the month-long simulation does not drift and compares well to the satellite and in-situ observations (Pirata buoys, CTD, ADCP, etc ...). A mixed-layer heat budget is presented in order to estimate the relative importance of the various processes at play in the equatorial cold tongue set-up. Between 10W-6W the cold tongue is set up by the turbulent entrainment at the mixed-layer base in association with equatorial undercurrent whereas it is the vertical advection between 0W-6E. Between 6W-2W there is an overlapping of these two processes.