Development of a water level forecasting system in the Río de la Plata estuary

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The study presents the main components of the water level forecasting system recently developed for the Río de la Plata and the Maritime Front (RPMF), a complex water body with micro-tidal estuarine characteristics located between Argentina and Uruguay. The RP has the second largest catchment area of South America, with an annual mean flow of 22.000 m^3/s. Flow dynamics in the RPMF are very complex due to the topographic variation of its bottom and the influence of continental flows, astronomical and meteorological tides coming from the ocean and the local winds.

The hydrodynamic finite elements model TELEMAC2D was implemented for the study area. Its non-structured mesh has a variable spatial resolution ranging from 3Km at the ocean border, up to 100m at the inner estuary zone. At the oceanic boundary water levels are imposed by combining the sea level anomalies forecast from the Global Model RTOFS-HYCOM (NOAA/NCEP with 1/12° grid resolution) and the astronomical tides extracted from FES2014 Global Tidal Model. At the free surface the wind and atmospheric pressure coming from GFS/NOAA forecasts (1/4° resolution) are imposed. As a first approach, a stationary fluvial discharge condition corresponding to the annual mean is imposed in the continental boundary condition.

The forecast quality assessment is done comparing the predicted water levels against all the real time available data in the RPMF: two outer stations (Mar del Plata and La Paloma), three mean estuary stations (Isla de Flores, Montevideo harbor and Torre Oyarvide) and one inner station (Buenos Aires). In a later instance, water level heights from altimeters and other tidal gauge stations (not available in real time) are used in a hindcast way in order to automatically re-calibrate the main model parameters.