Geophysical Research Abstracts
Vol. 18, EGU2016-5168, 2016
EGU General Assembly 2016

Modelling the water exchanges between an estuary and its underlying aquifer units

Fulvia Baratelli (1), Nicolas Flipo (1), Pierre-Yann David (2), Didier Pennequin (2), Jean Philippe Lemoine (3), Nicolas Bacq (3), and Jean-Paul Dupont (4)

(1) Geosciences Department, MINES ParisTech, Fontainebleau, France (fulvia.baratelli@mines-paristech.fr), (2) Direction régionale Haute-Normandie du BRGM, Mont-Saint-Aignan, France, (3) Groupement d'Intérêt Public Seine-Aval, Rouen, France, (4) University of Rouen, M2C, UMR 6143, Mont-Saint-Aignan, France

This work aims at developing a coupled hydrological surface-subsurface model of estuarine processes. The exchanges between surface water and subsurface water affect the hydro-sedimentary and biogeochemical processes in estuarine environments. The thickness and the hydrodynamic properties of the sediments in an estuary are often characterized by significant spatial variations which influence the exchanges with the subsurface water. A methodology based on the conductance approach is proposed to quantify the water exchanges between an estuary and its underlying aquifer units. An application to the case of the Seine estuary (France) is presented.
To this aim, an integrated distributed physically-based hydrological-hydrogeological model (CAWAQS) is used to simulate the surface and groundwater flows in a 9 500 km2 watershed representing the downstream part of the regional Seine River basin (80 000 km2) including its estuary.
At the bottom of the estuary, a layer of low-permeability Holocene sediments overlays the aquifer formations (mainly Pleistocene alluvial sediments and Cretaceous chalk). The conductance coefficient is estimated by assuming a vertical flow in series through the low-permeability sediments and the aquifer. Moreover, the low-permeability sediments have been partially dredged to create a navigation channel, were the estuary water is in direct contact with the aquifer. These specificities are taken into account in the model.
The water fluxes in the estuary are simulated at a resolution ranging from 100 m to 800 m and daily time step. As a preliminary result, the distribution of the average water fluxes over a 17 year period (1997-2014) has been calculated using an average distribution of water elevation in the estuary. The navigation channel is shown to drain the aquifer system as a consequence of the removal of the low-permeability sediments.