

Title:

Influence of groundwater-surface water interactions on groundwater salinity in the Senegal River Delta

Session:

T6 Groundwater and Surface Water: an Integrated View

T6.1 Groundwater-surface water interaction

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Abstract (300 words maximum):

The Senegal River Delta is a strategic region for the development of irrigated agriculture. However, the existence of a shallow saline aquifer, in conjunction with intensification of irrigated agriculture, has led to degradation of cultivated soils. At the end of the XXth Century, the construction of dams on the river has secured water availability throughout the year and induced a rise in surface water levels, inducing a lateral recharge of groundwater in the alluvial aquifer. Because of these major environmental changes, groundwater freshening was expected to occur. Using a combination of regional piezometric and hydrogeochemical surveys as well as local geophysical and hydrogeochemical surveys, groundwater–surface water interactions were characterized to identify the impact of artificial river management and agricultural intensification (among other rice cultivation) on the evolution of groundwater dynamics and chemistry.

Results show that groundwater-surface water interactions are mainly visible near rivers where freshwater lenses have developed, with a groundwater salinity that is lower than seawater and groundwater mineralization that seems to evolve in the direction of softening through cationic exchanges related to permanent contact with fresh water. Groundwater far away from rivers and outside irrigated plots has evolved from marine water to brines under the influence of evapotranspiration. In the cultivated parcels, despite large volumes of water used for rice cultivation, groundwater does not show real softening trend.

In general, mechanisms that contribute to repel salt water from the sediments correspond to a lateral flush near permanent surface water streams and not to vertical drainage and dilution with rainfall or irrigation water. It is however difficult to estimate the time required to return to more favorable conditions of groundwater salinity.

Keywords (5 maximum):

Senegal River Delta, Surface water-groundwater interactions, Salinity, Hydrogeochemistry, Geophysical survey.