Groundwater nutrient fluxes in a tropical karstic coastal area (southern Java, Indonesia)

[1]OEHLER, T.; [2]EICHE, E.; [3]PUTRA, D.; [1]ADYASARI, D.; [4]MALLAST, U.; [1]MOOSDORF, N.

[1]Leibniz Centre for Tropical Marine Research (ZMT)
Fahrenheitstraße 6, 28359 Bremen, Germany
Till.Oehler@leibniz-zmt.de

[2]Karlsruher Institut für Technologie (KIT)
Adenauerring 20b, 76131 Karlsruhe, Germany
elisabeth.eiche@kit.edu

[3]Universitas Gadjah Mada (UGM)
Jl. Grafika 2, 55281, Yogyakarta, Indonesia
putra_dpe@yahoo.com

[4]Helmholtz Centre for Environmental Research GmbH (UFZ)
Theodor-Lieser-Strasse 4, 06120 Halle, Germany
ulf.mallast@ufz.de

In tropical karstic regions freshwater and associated nutrient fluxes from land towards the coastal ocean can be fast, due to conduit flow. As a consequence, seasonal variability of groundwater nutrient concentrations in the catchment area (e.g. due to fertilization during ceratin times in the year) might control nutrient availability in the coastal ocean due to groundwater discharge. We measured the seasonal variability of nutrient fluxes from land to the coastal ocean in the tropical karstic region of Gunung Kidul (Southern Central Java, Indonesia) from November 2015 until December 2016. Groundwater nutrient concentrations in the catchment area and the coastal ocean were compared with discharge rates measured at an underground river dam, precipitation rates and stable isotopes of water.

Our results show lower groundwater DSi concentrations during the monsoon, which indicates a dilution effect due to a higher admixture of freshwater during the rainy season. In contrast, groundwater and coastal water nitrate concentrations correlate directly to patterns of anthropogenic activity, i.e. fertilization of fields within the catchment area at the beginning of the rainy season.

Our study indicates a strong link between the catchment area and the coastal ocean. In tropical karstic regions, the anthropogenic activity in the hinterland can thus have a direct effect on the coastal seawater via fast groundwater discharge.