

Characterization and interaction of precipitation, river water and groundwater in the Vietnamese Mekong Delta - A case study in the Plain of Reeds

Le Duy Nguyen (1,2), Ingo Heidebüchel (1), Bruno Merz (1), and Heiko Apel (1)

(1) GFZ German Research Centre for Geoscience, Section 5.4 – Hydrology, Potsdam, Germany (duy@gfz-potsdam.de), (2) SIWRR Southern Institute of Water Resources Research, Hochiminh City, Vietnam

An understanding of the interactions between surface water and groundwater systems in the Vietnamese Mekong Delta (VMD) is important not only for water resources planning and management, but also for the livelihood of the majority of the population in the delta. Precipitation and ground water, but also river water is used as drinking water in the communes of the Delta. Particularly the ground water is increasingly exploited, but the important processes like river – aquifer interaction and ground water recharge rates are largely unknown. This study thus aims at the characterization of processes between the different water resources. For this the different water sources were sampled over longer time periods and analysed for isotopic composition ($2H$, $18O$). Additionally surface and ground water levels were recorded, as well as the temperature profile at and under the river bed in order to identify the river-ground water interaction. First results indicate that the isotopic composition and the local meteoric water line of the precipitation is very similar to the GNIP data for Bangkok, indicating similar isotopic sequestration and origin of the rainfall in the region (near ocean areas of SE-Asia). The isotopic composition of precipitation and river water exhibits a strong seasonal signal indicating the monsoonal influence. During the monsoon season both precipitation and river water is depleted in stable isotopes, while the dry season shows an enriched composition. This also indicates the different composition of the river water over the seasons. During the rainy season the portion of rain water, i.e. surface runoff stemming from the Mekong basin but also direct rainfall contribution in the Mekong Delta is considerably larger, as expected. The enriched composition during the dry season indicates a larger ground water, i.e. base flow portion, but also a generally higher evaporation due to the lower atmospheric moisture. The isotopic composition of the ground water differs depending on the depth of the well. The deep wells (>200m depth) have a different signature compared to the shallow wells (10-20m), and do not show seasonal variations indicating that the deep aquifer has no connection to the shallow aquifer and the surface water. The isotopic compositions as well as the water tables of the shallow GW wells show a seasonal signal, which, however, differ from well to well depending on the location of the wells. The isotopic composition of the wells differs considerably from the river water, but is similar to the mean precipitation signal. This indicates that the ground water recharge possible stems mainly from rainfall, not from seepage from the river bed. The ground water data also indicate that the dynamics and likely also the GW recharge are heterogeneous. Possible factors influencing the interaction of surface to ground water are the distance to the river, but also the small scale variability of physical aquifer properties. The identification of the causes of the differences between the ground water wells will be subject to further studies.