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Estimation of groundwater recharge using the cumulative rainfall departure method for Bac Lieu province, Mekong Delta, Vietnam

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Abstract. Estimation of the groundwater (GW) recharge from rainfall is important for determining GW resources in water resources development and management. GW is currently extensively exploited and is an important source of freshwater for people in the Mekong Delta, Vietnam, especially during dry seasons. To achieve sustainable utilization of GW resources in the delta, it is essential to determine the annual renewable GW reserve from the rainfall recharge. The study provides evidence for the application of the cumulative rainfall departure (CRD) method for the GW recharge estimation for deep aquifers. The monitored rainfall data and GW levels of the aquifers in Bac Lieu province are used. The results of the analysis by the CRD method show that the fractions of cumulative rainfall departure for Holocene (*qh*), Upper Pleistocene (qp_3), Middle-Upper Pleistocene (qp_{2-3}), and Lower Pleistocene (qp_1) aquifers are 0.08 %, 0.18 %, 0.55 %, and 0.50 %, respectively, which only equals 1.31 % of the total rainfall. The Pearson correlation between the observed and model water levels is high, from 0.898 to 0.925. The total GW annual recharge from the rainfall over the province is estimated to be 74.07 million m^3, equivalent to 203 000 m^3/day, i.e., which is 16 % lower than the current water abstraction of 23 600 m^3/day. The obtained results are important for subsequent comparison with the Red River basin in northern Vietnam, where it is necessary to keep track of the groundwater inflow along with its volume/resource, including the inflow from the geothermal system of the rift zone of the Red River.

Keywords:

Mekong Delta, groundwater monitoring, Pleistocene, Holocene,

Pearson correlation, net recharge

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