

Application of a combined hydrochemical and stable isotope approach to the study of the interaction between irrigation canal water and groundwater in southern Sri Lanka

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Abstract

A combined approach was used to assess the interaction between surface water from irrigation canals and an aquifer system in the Uda Walawe irrigation scheme, southern Sri Lanka. Surface water in reservoirs and irrigation canals and groundwater from shallow and deep wells were sampled and analyzed for chloride, fluoride and water stable isotopes (oxygen 18, $\delta^{18}\text{O}$ and deuterium, $\delta^2\text{H}$). The investigation of water stable isotopes provided conclusive evidence for the contribution of irrigation water to the upper parts of the aquifer, with implications for freshwater quality and availability in the region. The stable isotope chemistry also showed additional evidence for strong evaporation influencing both surface water and shallow groundwater, as well as the effects of dilution in affecting fluoride concentrations. The degree of interaction between the surface water from irrigation canals and the shallow groundwater, expected to be derived from the stable isotope study, could not be quantified, most probably due to limitations in the field approach.

Key words: stable isotopes, hydrochemistry, irrigation canals, groundwater/surface water relations, Sri Lanka