



## Using stable isotopes to identify water sources for rice paddy field in Suphanburi, Thailand

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Analysis of  $^{18}\text{O}$  and  $^2\text{H}$  isotopes and major ions in precipitation, irrigation canal, shallow groundwater and pond water were carried out to document the chemical and isotopic characters and to identify water sources for rice paddy field in Suphanburi, Thailand. The surface and shallow groundwater in the area had similar major ions and showed relatively seasonal variations which were high concentrations in the dry season and low in the wet season. Precipitation isotopes resulted in a meteoric water line of  $\delta^2\text{H} = 7.615\delta^{18}\text{O} + 4.517$  for Suphanburi and annual weighted mean of  $\delta^2\text{H} = -32.072\text{‰}$  and  $\delta^{18}\text{O} = -5.264\text{‰}$ . The isotopic signatures of surface water including  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  were in the range of  $-8.55$  to  $8.41\text{‰}$  and  $-60.83$  to  $30.51\text{‰}$ , respectively and the regression line equation was  $\delta^2\text{H} = 5.358\delta^{18}\text{O} - 10.810$ . Shallow groundwater revealed lighter isotopes than irrigation canal; however, pond water samples were isotopically synchronous with irrigation water. These revealed that canal and pond water behaved as a single well-mixed hydrologic unit. Isotopic data of most of canal and pond water except shallow groundwater fall along the evaporation line in the  $\delta^2\text{H}$  vs.  $\delta^{18}\text{O}$  plot. The isotopic ranges of both irrigation and pond water seasonally varied with more enriched in dry season and gradually depleted in wet season. However, it was observed that in wet season the isotopic signatures of  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  in irrigation and pond water were relatively enriched than rainwater in the area. These two phenomena indicated that the rainfall events in the area were insignificant filled in the irrigation canal; instead, rainwater from far distances likely mixed in.

**Keywords** Irrigation water; Paddy field; Precipitation; Stable isotopes; Water sources; Isotopic fingerprint