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Characterization of temporal variation in hyporheic zone using temperature data

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Groundwater and surface water have been frequently treated as independent components of the hydrological cycle. In many cases, however, groundwater and surface water are hydraulically connected, and a continuous exchange of water and solute occurs across the hyporheic zone leading to the change in water quantity and quality. Also, climate change induces the change of groundwater and surface water flux. The hyporheic zone depths are one of the extraordinarily sensitive indicators for the climate change. Therefore, delineating the hyporheic zone is of vital importance for an integrated management of groundwater and surface water resources and a mitigation of the impacts by the climate change.

In this study, we compared the hyporheic zone depths of wet and dry seasons using heat transfer analysis for streambed temperature in an intensive agricultural area. The hyporheic zone depth of the dry season was deeper than that of the wet season. The calculated depths ranged from 0.09 to 0.15 m in the wet season and from 0.42 to 0.76 m in the dry season. Temporal variation in the hyporheic zone depths with the seasons was caused by the decreased groundwater and stream water levels through the decreased precipitation and water consumption in the agricultural area. As the hyporheic zone deepens, the vulnerability of groundwater contamination would increase in the dry season.

Keywords: Hyporheic zone depth, Heat transfer analysis, Streambed temperature, Vulnerability