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Groundwater flow and transport modeling: A case study of alluvial aquifer in the Tuul River Basin, Mongolia

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The Tuul River basin is located northern Mongolia. It includes Ulaanbaatar city, which hosts 48% of Mongolian population. Water supply to the city relies exclusively on groundwater withdrawn from alluvial aquifers along the Tuul River Basin. Water demand of the city has increased recently as a result of rapid industrial development and population growth due to migration from rural areas. The aim of this study is to characterize the aquifer by integrating existing data in a flow model. Unfortunately, existing data are not sufficient for unequivocal identification of model parameters (groundwater recharge, permeability, lateral inflow, etc.). Fluctuations of water temperature have been recognized as a natural tracer that may be used for hydrogeological characterization and model calibration. Temperatures within the aquifer are affected by the temperature of inflowing water as well as by conduction from the soil surface, which we suspect may control aquifer temperatures. Properly acknowledging these fluctuations would require a three dimensional model. Instead, we propose a semianalytical solution based on the use of memory and influence functions.