

Evaluation of streamflow depletion induced by groundwater withdrawals and irrigation reservoirs

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Abstract. Groundwater withdrawals can lead to a reduction in streamflow when groundwater and surface-water systems are hydraulically well connected. Groundwater pumping reduces the amount of groundwater discharge to streams and, in some cases, can induce inflow of stream water to the aquifer. Irrigation reservoirs that store surpluses of water and release water into networks of canals for use in farmlands during the dry seasons can also reduce streamflow at the downstream. Therefore streamflow depletion caused by groundwater withdrawals and irrigation reservoirs should be assessed for effective water resources management. In this study, a watershed-based surface-water and groundwater integrated model, SWAT-MODFLOW was used to evaluate streamflow depletion induced by groundwater withdrawals and reservoirs for a small watershed with drainage area of about 50 km² in South Korea. The streamflow responses to groundwater pumping and irrigation reservoirs were simulated under four scenarios. The simulated results indicated that the groundwater withdrawals with irrigation reservoirs at current status have induced the decrease of more than 20% in drought flow against the natural condition at the outlet of the watershed. The simulated results also showed that that the groundwater pumping wells have an influence on the entire watershed, but the irrigation reservoirs on the upper area.

Acknowledgements. This research was supported by the Regional Innovative Technology Project 2B from KICTTEP.

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