

On the thresholds of withdrawal-to-availability ratio: a perspective from a global hydrological simulation including groundwater

*Naota Hanasaki¹

1. NIES National Institute of Environmental Studies

Withdrawal to availability ratio (WTA) is a widely accepted empirical index to express water stress in the world. It accompanies two empirical thresholds or the regions where WTA exceeds 0.2 and 0.4 are categorized as medium and high water stress respectively, but the rationale of these thresholds has been little explained. Here we show these thresholds are linked with physical water scarcity using a state of the art global hydrological model. The model enables us to simulate global water supply and demand at the spatial resolution of $0.5^{\circ} \times 0.5^{\circ}$ at a daily temporal interval with distinction of seven water sources including groundwater. From the simulation results, we obtained the relationship between WTA and the fraction of water abstraction from local and renewable sources to all (FLRE). We found that when WTA exceeds 0.2 and 0.4, FLRE shows a sudden drop in FLRE or the regions require additional non-local and/or nonrenewable water sources. The results support the general validity of WTA and the threshold as an index to assess water scarcity. At the same time, they also call the users attention that considerable spread between WTA and FLRE: WTA could be a surrogate of FLRE in limited extent

Keywords: water resources