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## Corrections to Global Gridded Irrigation Efficiency Datasets in Groundwater-Dependent Croplands

Fatemeh Karandish<sup>1</sup>, Sida Liu<sup>1</sup>, David Hyndman<sup>2,3</sup>, Oleksandr Mialyk<sup>4</sup>, Yi Yao<sup>5,6</sup>, and Inge de graaf<sup>1</sup>

<sup>1</sup>Wageningen University, WSG, Netherlands (fatemeh.karandish@wur.nl)

<sup>2</sup>Department of Earth and Environmental Sciences, Michigan State University, East Lansing, MI 48824, USA

<sup>3</sup>Department of Geosciences, The University of Texas at Dallas, Richardson, TX 75080, USA

<sup>4</sup>Multidisciplinary Water Management, University of Twente, Enschede, the Netherlands

<sup>5</sup>Department of Water and Climate, Vrije Universiteit Brussel, Brussels, Belgium

<sup>6</sup>Institute for Atmospheric and Climate Science, Eidgenössische Technische Hochschule Zürich, Zurich, Switzerland

Irrigation efficiency improvements have been recognized as a key strategy to increase the 'crop per drop' ratio of water allocated to the agricultural sector, yet at the same time, there is a lack of comprehensive irrigation efficiency datasets at the global scale. Most of the currently available data are either outdated, or fail to account for the groundwater dimension of this indicator. Aiming to determine multiple dimensions of irrigation efficiency within an intertwined surface water and groundwater irrigation scheme, we try to modify the currently available datasets. Here, we provide a global dynamic irrigation efficiency dataset at a 5×5 arc-minute resolution, corrected for groundwater contributions in each grid cell. We add a new dynamic layer to the available irrigation efficiency datasets, called groundwater irrigation efficiency, which varies across the globe and throughout the year based on multiple factors. These factors include pumping system properties, groundwater table, surface water and irrigation water demand, and climatic and environmental conditions. Our work improves the understanding of the role of groundwater contributions in supplying irrigation water and helps to minimize biases in the estimated irrigation efficiencies, consequently leading to more accurate evaluations of agro-hydrological flows.

**Keywords:** irrigation efficiency, groundwater-led irrigation, pumping energy, groundwater scarcity.

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