Utrecht University

Faculty of Geosciences
Department of Physical Geography

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Continental mapping of groundwater-dependent ecosystems based on a high-resolution global groundwater model

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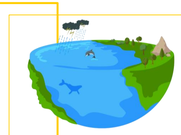
Background and Problem

- **Population growth** has led to an increase in the **dependency** on groundwater resources.
- **Increase** in demand alongside a **decrease** in recharge rates can lead to water storage deficits and affect Groundwater dependent ecosystems (GDEs)

Why care about GDEs?



- Hotspot for **biodiversity** (Flora and Fauna)
- Provision of valuable **ecosystem services**

Knowledge gaps

- Lack of **global inventory** on Groundwater Dependent Ecosystems (GDEs)
- Using **global hydrological** models to map GDEs

THE AIM

To **map** groundwater-dependent ecosystems (GDEs) worldwide using a global hydrology model

Methodology

Classification based on typology and hydrology

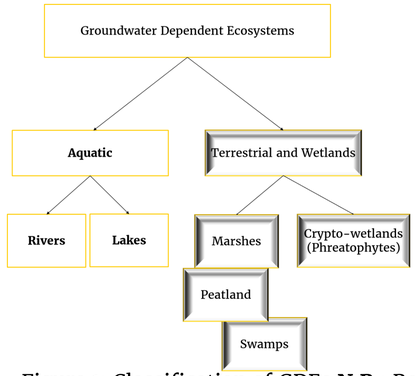


Figure 1: Classification of GDEs **N.B** : Results based on aquatic GDEs.

Model run (Australia) using the PCR GLOBWB 2.0

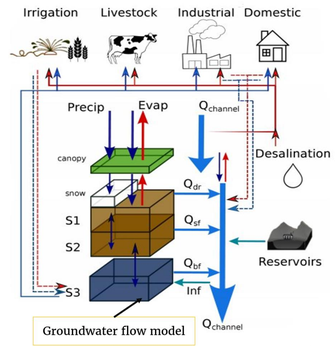


Figure 2: Schematic overview of PCR 2.0 (Sutanudjaja *et al.* 2018). GLOGM *v*1.0 (Verkaik *et al.* 2022)

Validations

- **Hit rate** (Similarity index)
- **False alarm**
- **Miss**
- **CSI**: Critical success index of the model run

Preliminary Results

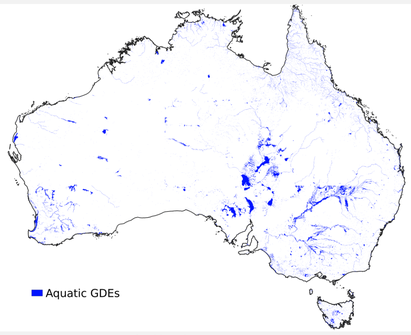


Figure 2a : Modelled Aquatic GDEs (River width threshold>100m)

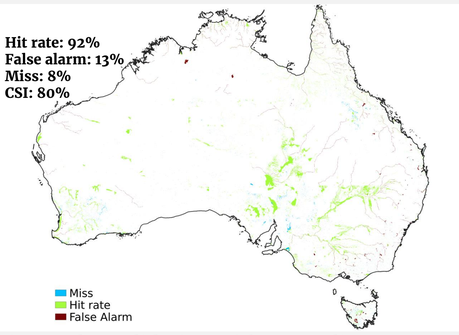


Figure 2b : Validation with Australian GDE Atlas (River width threshold>100m)

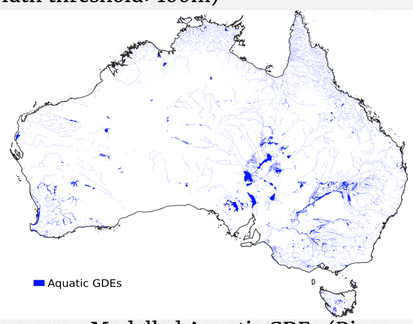


Figure 3a : Modelled Aquatic GDEs (River width threshold>30m)

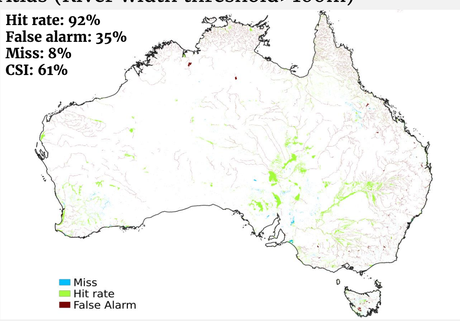


Figure 3b : Validation with Australian GDE Atlas (River width threshold>30m)

Conclusions and Outlook

- Global hydrological models are **effective** for mapping GDEs
- The next step is a **global run** for mapping the aquatic and terrestrial GDEs and make **future projections.**

References

1. Sutanudjaja, E. H., Van Beek, R., Wanders, N., Wada, Y., Bosmans, J. H., Drost, N., ... & Bierkens, M. F. (2018). PCR-GLOBWB 2: a 5 arcmin global hydrological and water resources model. *Geoscientific Model Development*, *11*(6), 2429-2453.
2. Verkaik, J., Sutanudjaja, E. H., Oude Essink, G. H., Lin, H. X., & Bierkens, M. F. (2022). GLOBGM v1. 0: a parallel implementation of a 30 arcsec PCR-GLOBWB-MODFLOW global-scale groundwater model. *Geoscientific Model Development Discussions*, 1-27.

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