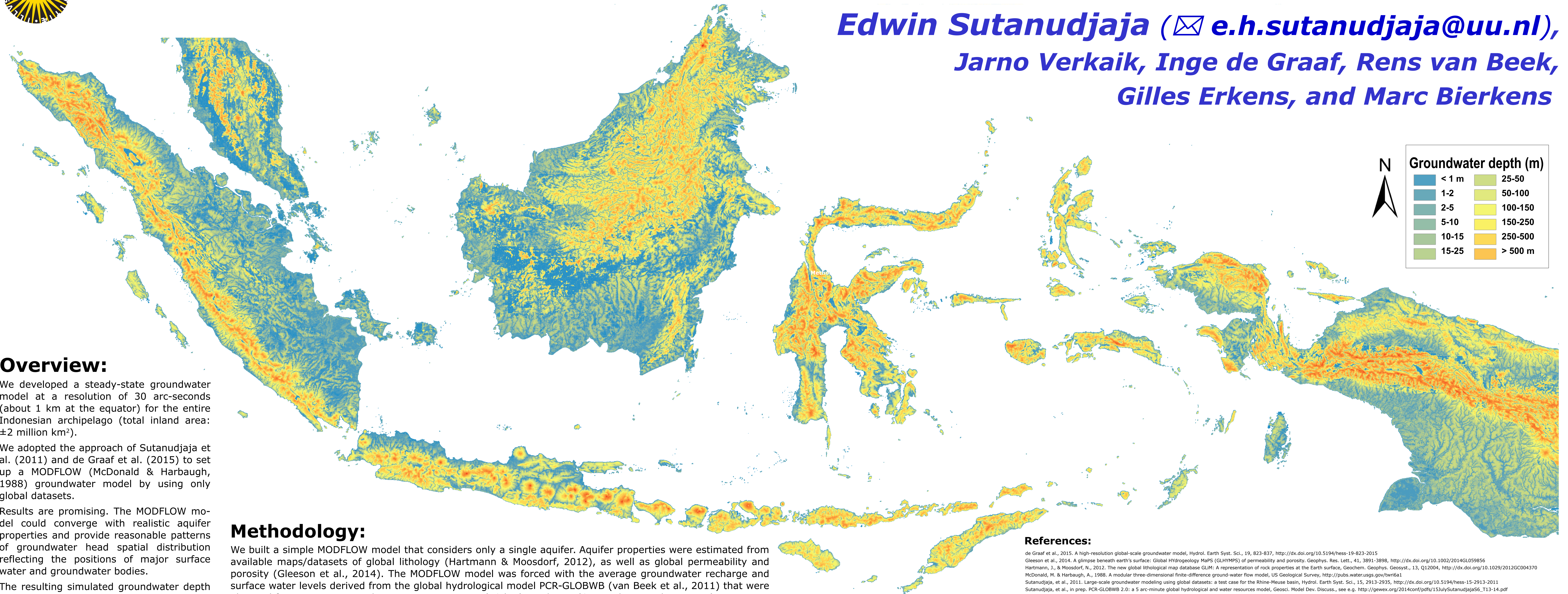




Universiteit Utrecht

A high resolution [~1km] groundwater model for Indonesia

*Edwin Sutanudjaja (✉ e.h.sutanudjaja@uu.nl),
Jarno Verkaik, Inge de Graaf, Rens van Beek,
Gilles Erkens, and Marc Bierkens*



Overview:
We developed a steady-state groundwater model at a resolution of 30 arc-seconds (about 1 km at the equator) for the entire Indonesian archipelago (total inland area: ± 2 million km²).
We adopted the approach of Sutanudjaja et al. (2011) and de Graaf et al. (2015) to set up a MODFLOW (McDonald & Harbaugh, 1988) groundwater model by using only global datasets.
Results are promising. The MODFLOW model could converge with realistic aquifer properties and provide reasonable patterns of groundwater head spatial distribution reflecting the positions of major surface water and groundwater bodies.
The resulting simulated groundwater depth map is shown on this poster.

Methodology:
We built a simple MODFLOW model that considers only a single aquifer. Aquifer properties were estimated from available maps/datasets of global lithology (Hartmann & Moosdorf, 2012), as well as global permeability and porosity (Gleeson et al., 2014). The MODFLOW model was forced with the average groundwater recharge and surface water levels derived from the global hydrological model PCR-GLOBWB (van Beek et al., 2011) that were obtained from its recent simulation at 5 arc-minutes (10 km) resolution (Sutanudjaja et al., in prep.).

References:
de Graaf et al., 2015. A high-resolution global-scale groundwater model, *Hydrol. Earth Syst. Sci.*, 19, 823-837, <http://dx.doi.org/10.5194/hess-19-823-2015>
Gleeson et al., 2014. A glimpse beneath earth's surface: Global HYdrogeology MaPS (GLHYMPS) of permeability and porosity, *Geophys. Res. Lett.*, 41, 3891-3898, <http://dx.doi.org/10.1002/2014GL059856>
Hartmann, J., & Moosdorf, N., 2012. The new global lithological map database GLIM: A representation of rock properties at the Earth surface, *Geochim. Geophys. Geosyst.*, 13, Q12004, <http://dx.doi.org/10.1029/2012GC004370>
McDonald, M. & Harbaugh, A., 1988. A modular three-dimensional finite-difference ground-water flow model, US Geological Survey, <http://pubs.water.usgs.gov/twri6a1>
Sutanudjaja, et al., 2011. Large-scale groundwater modeling using global datasets: a test case for the Rhine-Meuse basin, *Hydrol. Earth Syst. Sci.*, 15, 2913-2935, <http://dx.doi.org/10.5194/hess-15-2913-2011>
Sutanudjaja, et al., in prep. PCR-GLOBWB 2.0: a 5 arc-minute global hydrological and water resources model, *Geosci. Model Dev. Discuss.*, see e.g. http://gewex.org/2014conf/pdfs/15JulySutanudjajaS6_T13-14.pdf
van Beek et al., 2011. Global monthly water stress: 1. Water balance and water availability, *Water Resour. Res.* 47, W07517, <http://dx.doi.org/10.1029/2010WR009791>