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Setting up a hydrological model based on global data for the Ayeyarwady basin in Myanmar

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The use of global datasets in local hydrological modelling can be of great value. It opens up the possibility to include data for areas where local data is not or only sparsely available. In hydrological modelling the existence of both static physical data such as elevation and land use, and dynamic meteorological data such as precipitation and temperature, is essential for setting up a hydrological model, but often such data is difficult to obtain at the local level.

For the Ayeyarwady catchment in Myanmar a distributed hydrological model (Wflow: https://github.com/openstreams/wflow) was set up with only global datasets, as part of a water resources study. Myanmar is an emerging economy, which has only recently become more receptive to foreign influences. It has a very limited hydrometeorological measurement network, with large spatial and temporal gaps, and data that are of uncertain quality and difficult to obtain. The hydrological model was thus set up based on resampled versions of the SRTM digital elevation model, the GlobCover land cover dataset and the HWSD soil dataset. Three global meteorological datasets were assessed and compared for use in the hydrological model: TRMM, WFDEI and MSWEP. The meteorological datasets were assessed based on their conformity with several precipitation station measurements, and the overall model performance was assessed by calculating the NSE and RVE based on discharge measurements of several gauging stations.

The model was run for the period 1979-2012 on a daily time step, and the results show an acceptable applicability of the used global datasets in the hydrological model. The WFDEI forcing dataset gave the best results, with a NSE of 0.55 at the outlet of the model and a RVE of 8.5%, calculated over the calibration period 2006-2012. As a general trend the modelled discharge at the upstream stations tends to be underestimated, and at the downstream stations slightly overestimated. The quality of the discharge measurements that form the basis for the performance calculations is uncertain; data analysis suggests that rating curves are not frequently updated. The modelling results are not perfect and there is ample room for improvement, but the results are reasonable given the notion that setting up a hydrological model for this area would not have been possible without the use of global datasets due to the lack of available local data. The resulting hydrological model then enabled the set-up of the RIBASIM water allocation model for the Ayeyarwady basin in order to assess its water resources. The study discussed here is a first step; ideally this is followed up by a more thorough calibration and validation with the limited local measurements available, e.g. a precipitation correction based on the available rainfall measurements, to ensure the integration of global and local data.