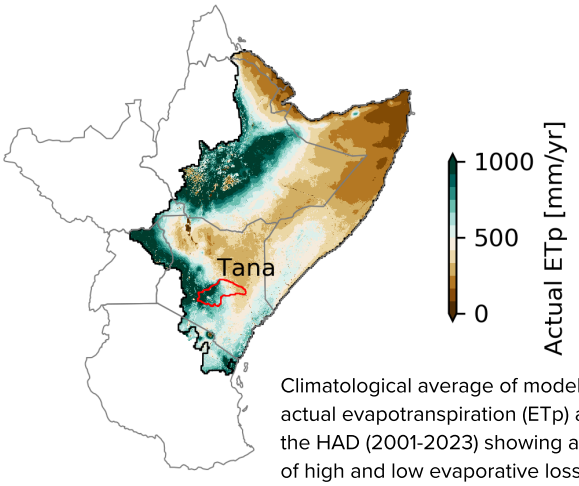
CUWALID MODEL

Are you looking for a tool to allow you to explore the impact of seasonal rainfall forecasts or future climate change projections on streamflow, soil moisture, groundwater, and vegetation?

The EU-funded ***DOWN2EARTH*** project has created **Climate into Useful Water And Land Information in Drylands (CUWALID)**, a modelling system to support a range of decision makers in evaluating how climate is translated into hydrology across the Horn of Africa drylands (HAD), where seasonal climatic hazards have a major impact on people's lives and livelihoods, especially in rural communities.

REGIONAL MODEL

CUWALID currently runs over ~2 million square kilometers of the drylands of Ethiopia, Somalia, and Kenya and provides output at monthly, seasonal, annual or decadal resolutions, which can feature as part of early warning systems or impact assessments. CUWALID is underpinned by DRYP, a calibrated regional hydrological model for the HAD that includes key processes occurring in drylands, which other models fail to capture (e.g., flow in dry channels, surface runoff, surface water-groundwater interactions). It runs at 1-km spatial and 1-hr temporal resolution. This unique modeling capability is desgined to capture the hydrological responses of drylands to spatially and temporally variable rainstorms, which is not possible with existing hydrology models.



Climatological average of modelled actual evapotranspiration (ETp) across the HAD (2001-2023) showing areas of high and low evaporative losses

OPEN-SOURCE

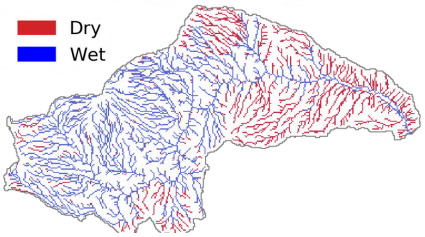
CUWALID is an open-source Python-based code that can run on any platform (Linux, Windows, Mac). It has been designed for easy implementation and is optimized for computational efficiency. It includes additional tools to support tailored outputs for specific geographical locations and time periods. It also includes free training materials that sit alongside a week-long training course we have developed for users.

CLIMATE INPUTS

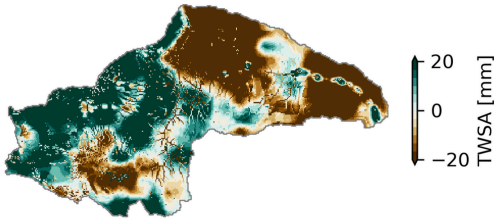
The modeling system includes a choice of climate inputs to drive the hydrological model including historical data used for model set up and two built-in stochastic climate drivers: 1. STORM generates realistic rainstorms and 2. stoPET generates patterns of evaporative demand. These stochastic models can be used to simulate potential impacts of seasonal climate forecasts or multi-decadal climate projections.

OUTPUTS

Numerous outputs can be generated for different applications and interventions, espcially as part of seasonal forecasting workflows. CUWALID can be used, for example, for explicitly assessing the availability of groundwater, surface water, and pasture, as well as for understanding potential agricultural impacts of climatic conditions. Output can be in the form of summary maps or time series plots. Some examples are shown here.



Mapped ephemeral (red) and perennial (blue) streams within the Tana basin, Kenya, resulting from long-term water balance simulations



Climatological average total water storage anomalies (TSWA) for the Tana, showing areas of groundwater recharge (+) and depletion (-)

DOWN 2 EARTH

HORIZON 2020

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If you think CUWALID could be useful to your organizational workflow, please get in touch with us, so we can help you get trained and set up to run this modeling system.