Using Meteorological Satellite Data in a Hydrological Model to Achieve Full Space-Time Coverage in the Poorly Surveyed Awash Catchment (Central Ethiopia)

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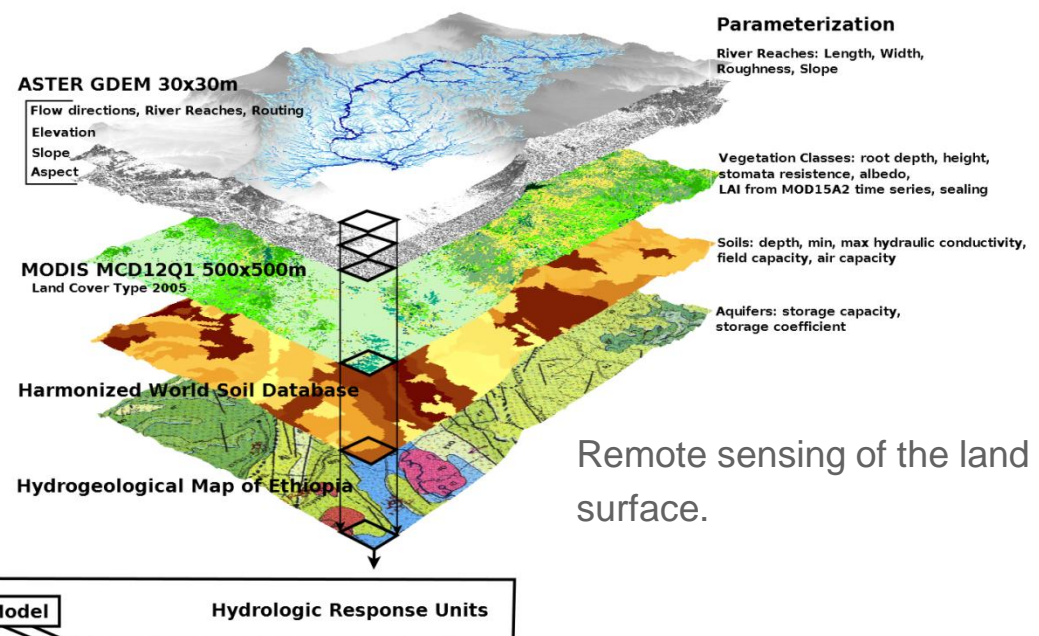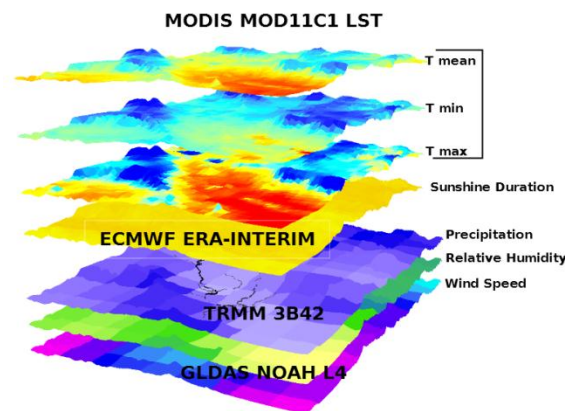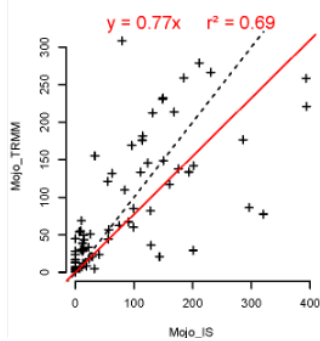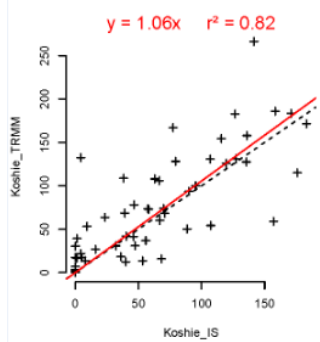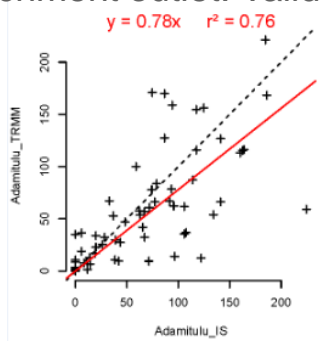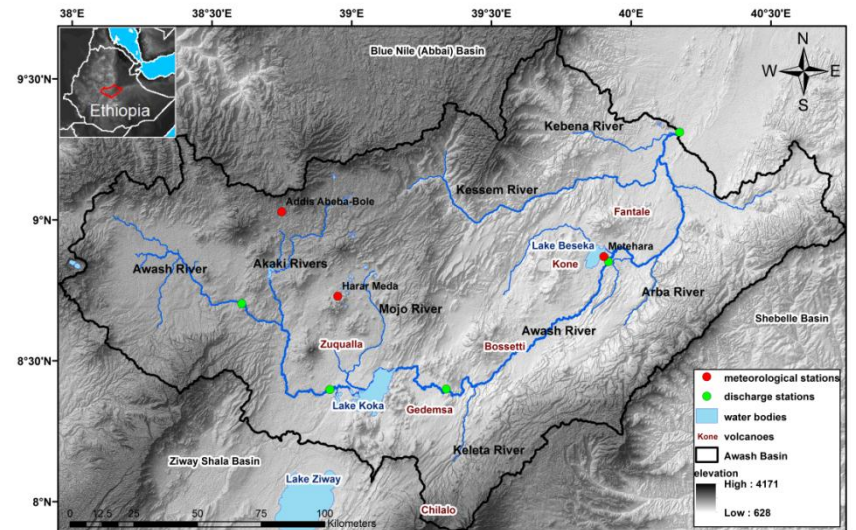[2] Friedrich-Schiller-University Jena, Department of Geoinformatics, Hydrology and Modelling
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What is the most efficient strategy to model the hydrology of a semi-arid catchment over a complex topography and subsurface?
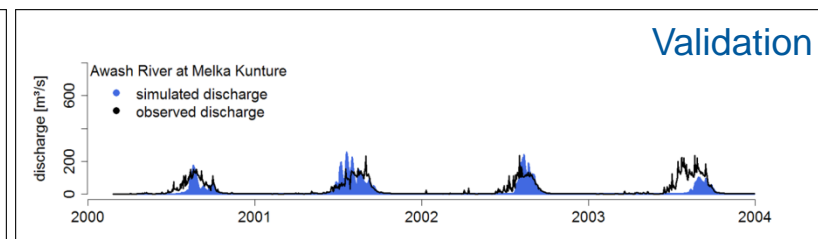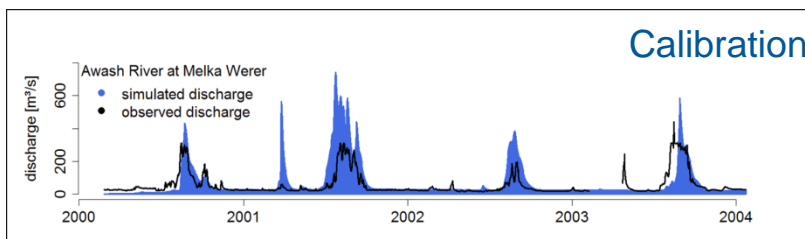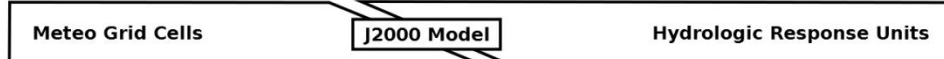
Study Area

Remote sensing and reanalyses data are used as meteorological input. Raster datasets are validated with station data. Calibration at the catchment outlet. Validation inside the catchment .

MODIS MOD11C1 LST
ECMWF ERA-INTERIM
TRMM 3B42
GLDAS NOAH L4

T mean
T min
T max
Sunshine Duration
Precipitation
Relative Humidity
Wind Speed

Parameterization

ASTER GDEM 30x30m
Flow directions, River Reaches, Routing
Elevation
Slope
Aspect

MODIS MCD12Q1 500x500m
Land Cover Type 2005

Harmonized World Soil Database

Hydrogeological Map of Ethiopia

River Reaches: Length, Width, Roughness, Slope

Vegetation Classes: root depth, height, stomata resistence, albedo, LAI from MOD15A2 time series, sealing

Soils: depth, min, max hydraulic conductivity, field capacity, air capacity

Aquifers: storage capacity, storage coefficient

Remote sensing of the land surface.

Meteo Grid Cells → J2000 Model → Hydrologic Response Units

Calibration
Validation

Distributed output

The results indicate, that (1) a hydrological model can be driven by remote sensing and reanalyses data exclusively. (2) 0.25 degree resolved meteorological inputs (TRMM, GLDAS) are sufficient to recognize local recharge zones. (3) High resolution temperature data does not improve model performance.

The results are in line with recent hydro-isotopic studies: Bretzler et al.(2010), Osenbrück et al.(2011)
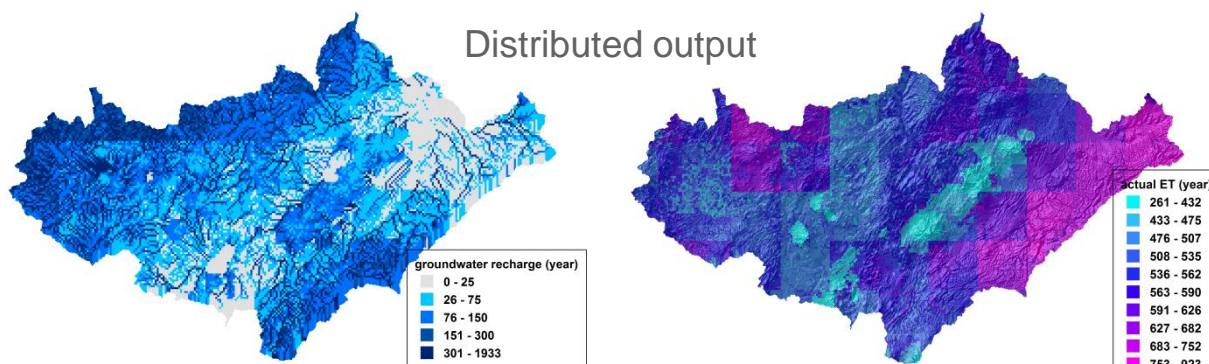
Outlook:

Does CMORPH high resolution precipitation data improve the model performance and reduce the foot print significantly?

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