



Evaluation of Satellite Rainfall Products for Streamflow Simulation and Prediction of Vector-Borne Diseases

Menberu M. Bitew and Mekonnen Gebremichael
Civil & Environmental Engineering Department, University of Connecticut, Storrs, CT 06269-2037, USA

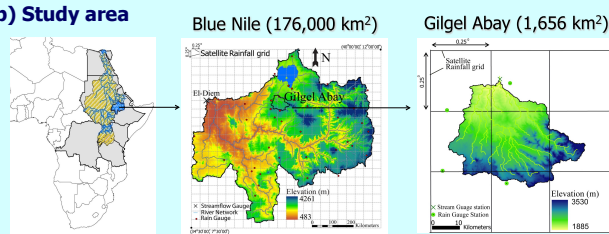


I. Hydrological Application

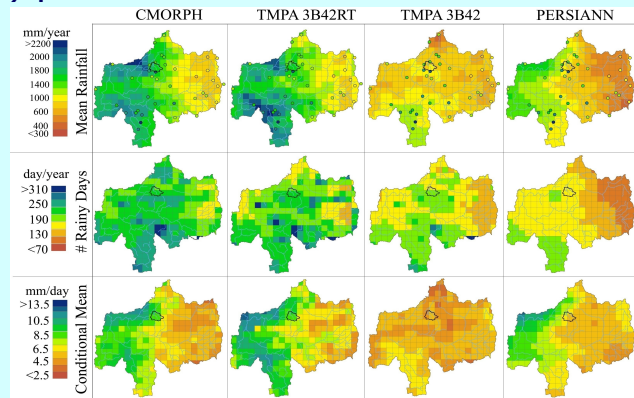
a) Research questions

- How good are satellite rainfall estimates for streamflow simulations? How does this depend on watershed area and hydrologic model complexity?

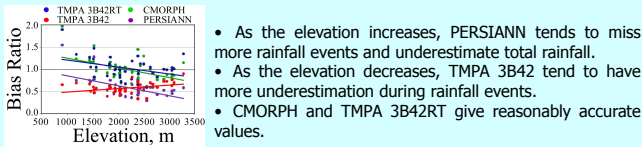
b) Study area



c) Spatial statistics



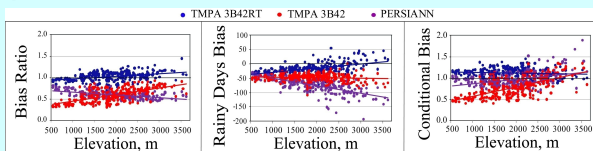
d) Performance relative to rain gauge rainfall



- As the elevation increases, PERSIANN tends to miss more rainfall events and underestimate total rainfall.
- As the elevation decreases, TMPA 3B42 tend to have more underestimation during rainfall events.
- CMORPH and TMPA 3B42RT give reasonably accurate values.

$$\text{Bias Ratio} = \frac{\text{Mean Rainfall (Satellite)}}{\text{Mean Rainfall (Rain gauge)}}$$

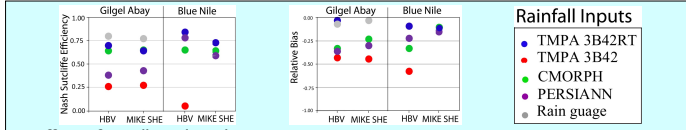
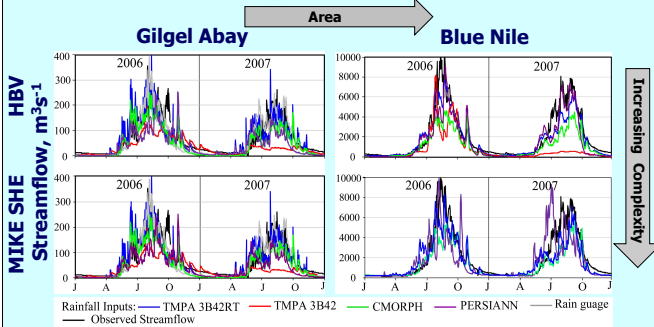
e) Performance relative to CMORPH rainfall



$$\text{Rainy days Bias} = \frac{\# \text{ of Rainy days (Satellite)}}{\# \text{ of Rainy days (CMORPH)}}$$

$$\text{Conditional Bias} = \frac{\text{Mean Positive Rainfall (Satellite)}}{\text{Mean Positive Rainfall (CMORPH)}}$$

f) Hydrologic simulations (performance relative to streamflow)

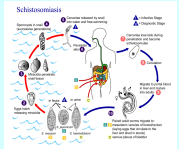


- Effect of satellite algorithm:** TMPA 3B42RT and CMORPH produce better streamflow simulation compared to PERSIANN and 3B42.
- Effect of watershed area:** PERSIANN exhibits better performance in large watersheds, which may be attributed to large low-elevation areas in the bigger watershed.
- Effect of model complexity:** Model complexity does not play major role.

II. Health Application

a) Background

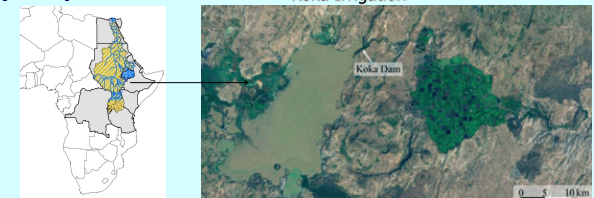
- Schistosomiasis (Bilharziasis) is a major public health problem in Ethiopia.
- The spread of schistosomiasis is sensitive to weather.
- Schistosomiasis epidemic early warning system is based on surveying transmission of risks related to abnormal rainfall or temperature.



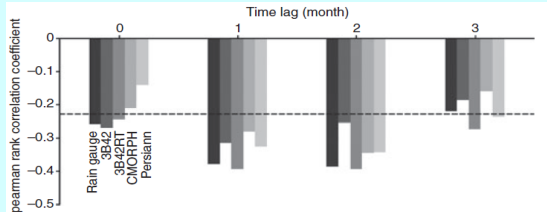
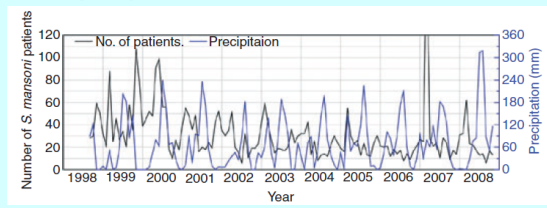
b) Research question

- How good are satellite precipitation and temperature estimates for predicting schistosomiasis incidence?

c) Study area

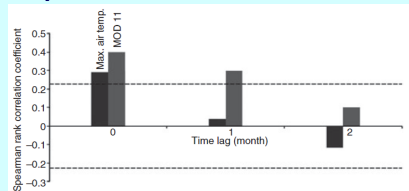


d) Effect of precipitation



- There is negative correlation between monthly rainfall and number of patients at lags of 1 and 2 months.
- TMPA 3B42RT yields results similar to those obtained from rain gauge stations.

e) Effect of temperature



- The maximum air temperature (from weather station) has a positive correlation with the number of patients at lag 0. The correlation decreases for lag 1 month and is no longer statistically significant.
- The monthly average land surface temperature derived from the MOD 11 MODIS product yields similar relationship with the number of patients.

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