Assessment of Reanalysis Precipitation Datasets for Hydrological Applications in Kenya

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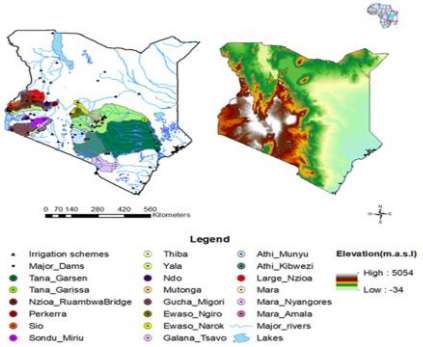
Background & Context

- Reanalysis vary in **quality** yet are used as **substitutes** in data scarce regions
- Ground validation is key but very challenging, in sparse rainfall gauge networks regions
- Assess different reanalysis datasets & identify which are the most suitable in simulating streamflow when coupling both the performance statistics and sensitivity analysis

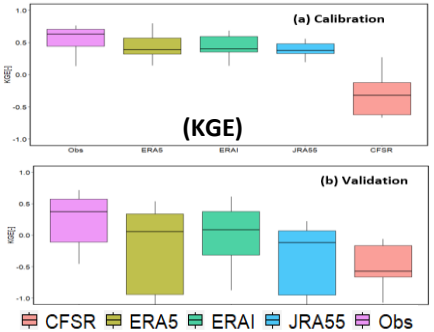
Study Area

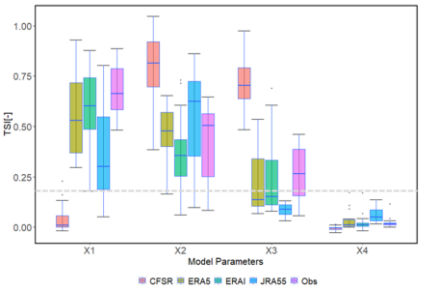


Data and Methods

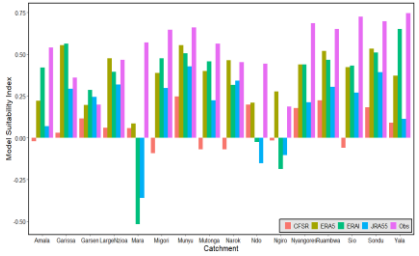
- ERA 5, ERA-Interim, NCEP/NCAR-CFSR, and JRA-55), and CHIRPS & observed river discharge data (1981-2016)
- A lumped bucket-style hydrological model (GR4J, Perrin et al. 2003), assess the model performance via the KGE criterion and parameter uncertainty via Sobol's Sensitivity Analysis
- Correlation Coeffient (CC), Root Mean Square Error (RMSE),BIAS, Kling Gupta Efficiency (KGE), Sobol Total Sensitivity Index(TSI),ModelSuitability Index(MSI)

Key Results and Conclusion





Total Sensitivity Index(TSI)



Model Suitability Index (MSI)

Summary & Conclusion

- **Hydrological model performance**: ERA5, ERAI, & JRA55 obtained better KGE scores whereas CFSR had lower scores in both calibration and validation
- The 3 best performing datasets give similar scores to observations in calibration, but more variable and less robust results in validation (especially ERA5 and JRA55)
- **Sensitivity analysis**: ERA5 show similar Sobol's **sensitivity indices** for all model parameters compared to observations, whereas CFSR has highest **uncertainty**
- The MSI aggregates both **sensitivity indices & performance statistics**, providing a clear index to judge the **superiority** (or inferiority) of a reanalysis with respect to observations
- On average ERA5, ERAI (& JRA55) have better MSI scores across most of the Kenyan catchments: ERAI & ERA5 perform better than JRA55 & CFSR, and lead to more robust model parameters