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Integrated Systems Ecology

Project 1 – Presentation

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HIMALA BASINS

Utah State University [UEB], United States Geological Survey [GeoSFM] & Environmental Protection Agency [BASINS] Executable http://hspf.com/pub/HIMALA_BASINS/

OBJECTIVE

HIMALA BASINS integrates the Utah Energy Balance Model (***UEB***) and Geospatial Streamflow Model (***GeoSFM***) within the Environmental Protection Agency's Better Assessment Science Integrating point and Nonpoint Sources (***BASINS***) modelling system in order to take advantage of NASA data products. The UEB and GeoSFM are two independent models that are integrated under the BASINS framework in order to determine the contribution of snow and glacier melt in data limited regions and an open source fashion.

KEY ASSUMPTIONS/ LIMITATIONS

Permafrost melt = 0. Glacier melt under debris cover = 0. Static surface albedo, limitations in spatial frequency, temporal resolution, and satellite accuracy.

TEMPORAL/SPATIAL SCALE

Data Dependent – Decadal, Annual, Hourly. The most dynamic data are collected with the highest frequency.

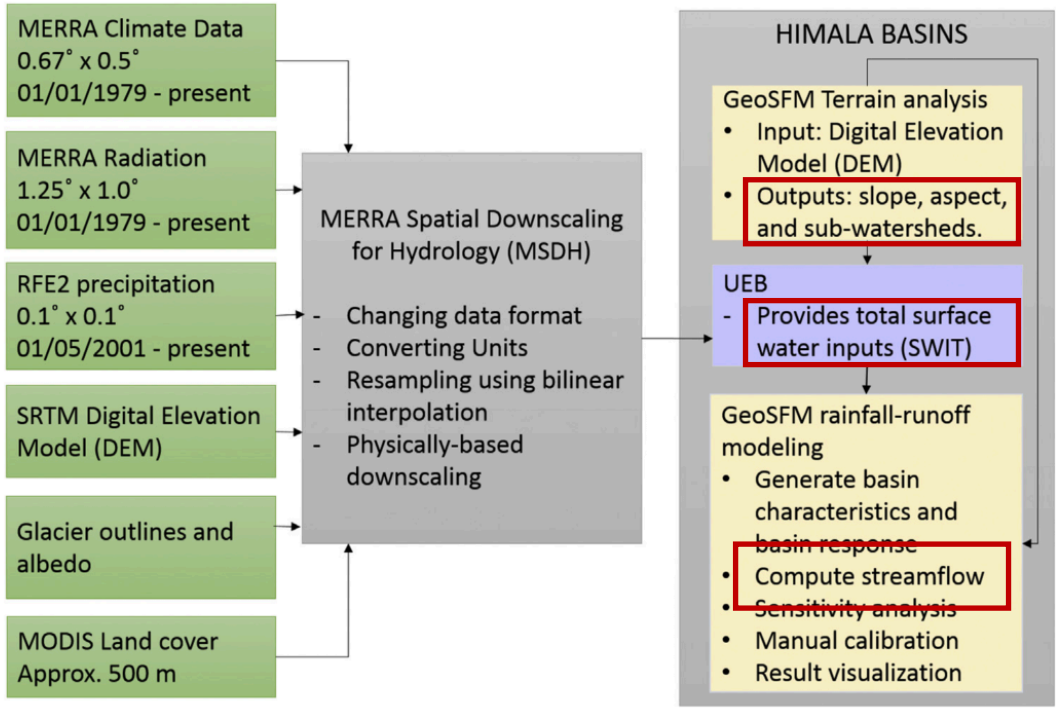

Fig. 6. Data workflow of input preprocessing and coupled UEB and GeoSFM modeling system in EPA BASINS for Langtang Khola case study.

1° ≈ 110 km

Table 2
UEBgrid model inputs, outputs, and state variables. The inputs include static distributed parameters and dynamic meteorological data.

Dynamic inputs	Static inputs	Output fluxes	State variables
Incoming shortwave radiation	Elevation	Latent heat flux	Snow energy content
Incoming longwave radiation	Vegetation cover	Sensible heat flux	Snow water content
Air temperature	Vegetation height	Ground heat flux	Snow age
Average wind speed	Soil bulk density	Snow temperature	
Precipitation		Melt advected energy	
Relative humidity		Melt outflow flux	
Atmospheric pressure			

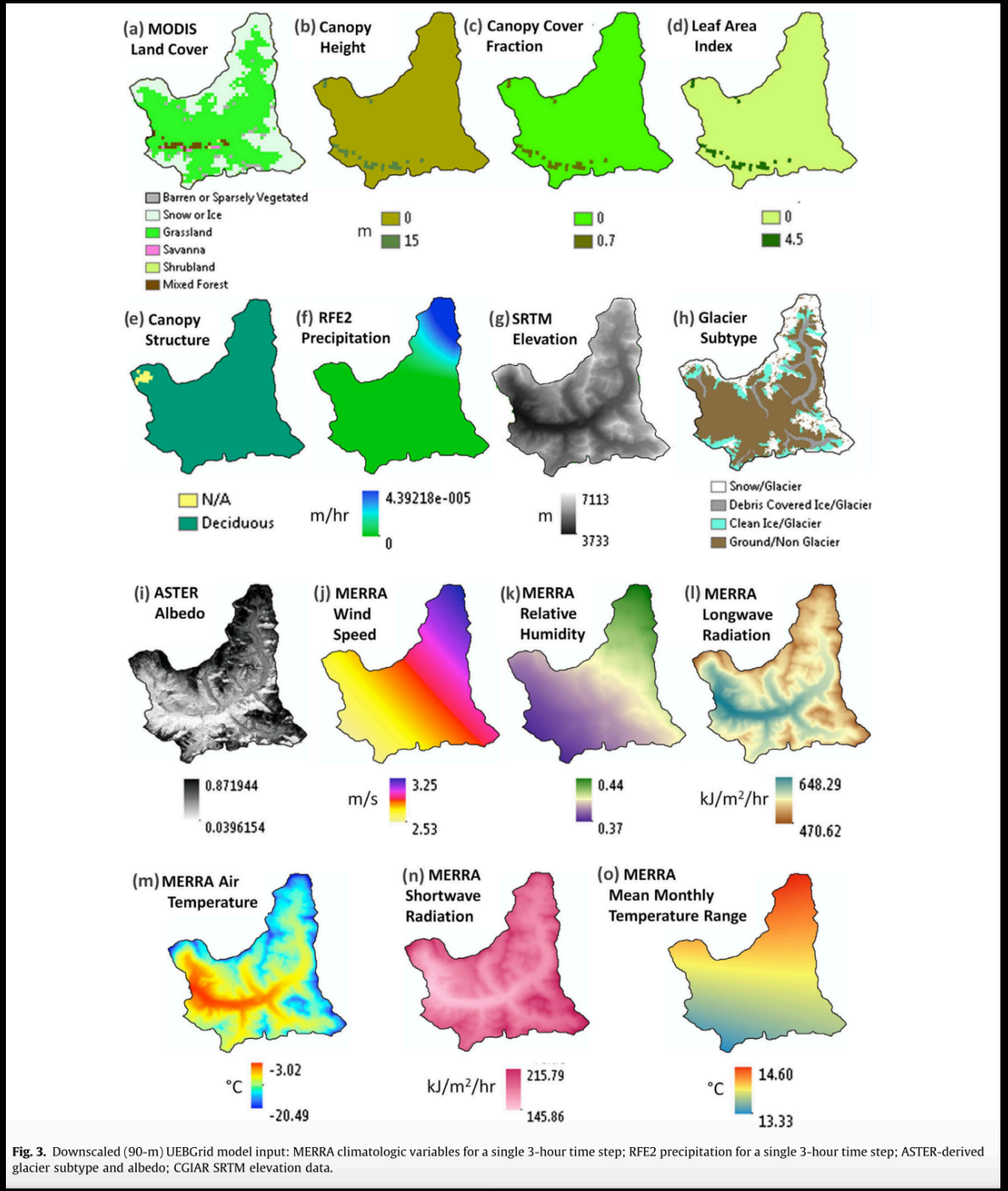

Fig. 3. Downscaled (90-m) UEBGrid model input: MERRA climatologic variables for a single 3-hour time step; RFE2 precipitation for a single 3-hour time step; ASTER-derived glacier subtype and albedo; CGIAR SRTM elevation data.

Testing/Results

Total Surface Water Input are derived from UEB and are used to drive the GeoSFM.

Nash-Sutcliffe Efficiency [NSE] .84 and .76

Correlation between observed and simulated (r) = 0.93 and 0.90

References

Brown, M.E, and 17 others. (2014). An integraded modeling system for estimating glacier and snow melt driven streamflow from remote sensing and earth system data products. *Journal of Hydrology* (519) 1859-1869.

Gupta, A. S., Tarboton, D.G., Hummel, P., Brown, M.E,, Habib, S. (2015). Integration of an energy balance snowmelt model into an open source modeling framework. *Environmental Modelling & Software* (68) 205 – 218.

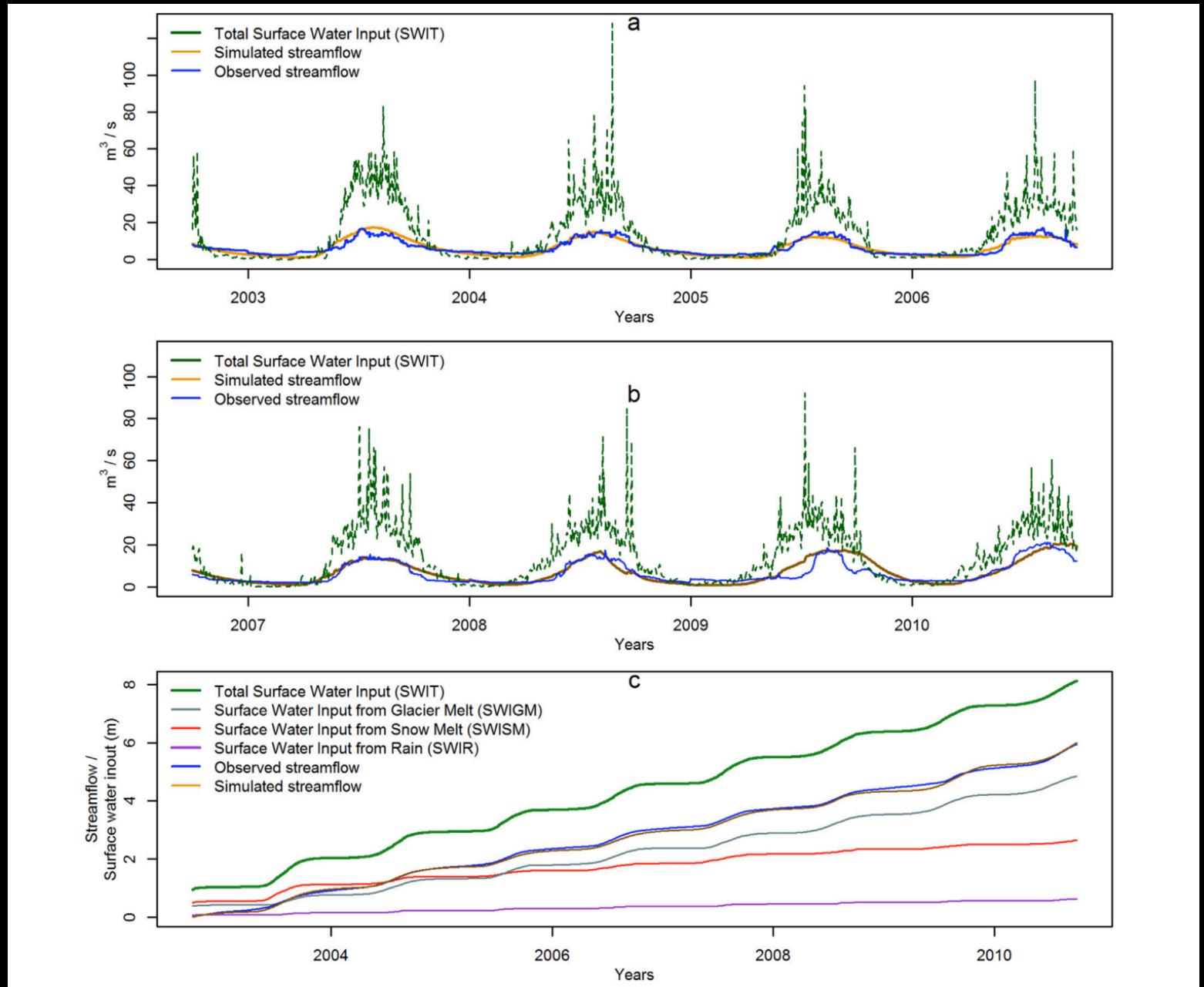

Fig. 8. (a) Daily streamflow simulation for the calibration period (Oct 2003–Sep 2007) and (b) daily streamflow simulation for the validation period (Oct 2007–Sep 2010) and (c) cumulative time series of UEB simulated surface water input components, streamflow measured at the Kyangin station and streamflow simulated by GeoSFM for the entire simulation period (Oct 2003–Sep 2010).