Remote Sensing

Supplementary Information for

A pathway to the automated global gauging of reservoirs with Synthetic Aperture Radar (SAR)

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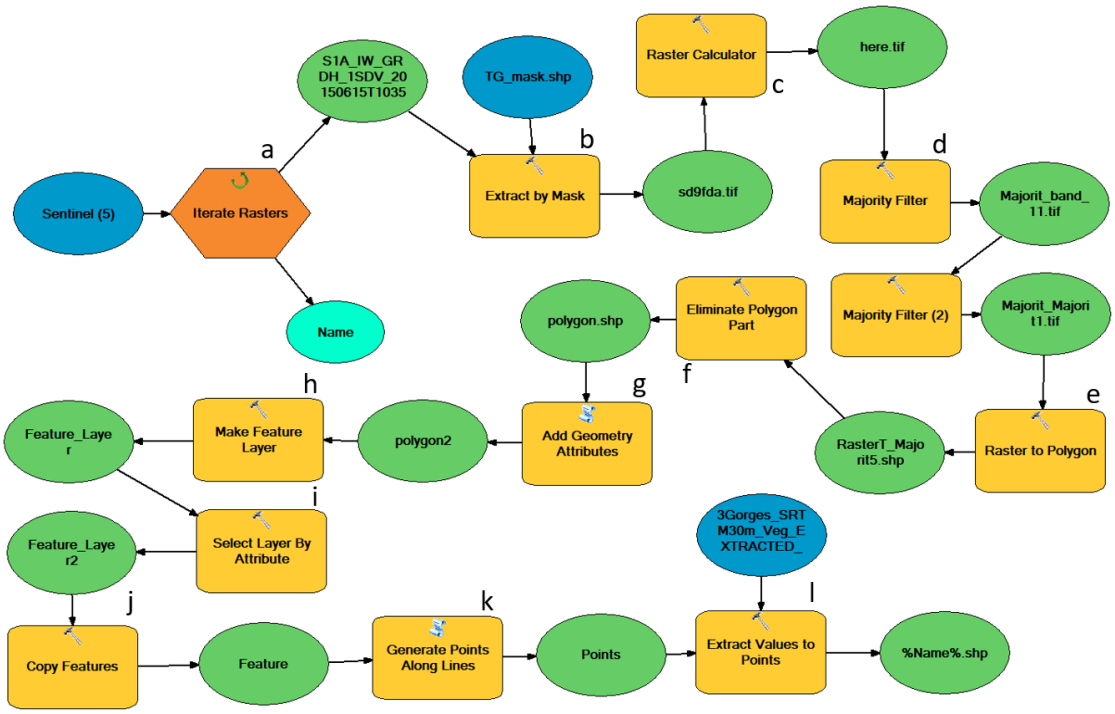
Supplementary Information (SI) Figures 1 to 3

Figure SI1. ArcGIS Model builder developed to extract water level (*WL*) from Sentinel-A and SRTM DEM



a: Prepare time series of Sentinel data in a folder and Iterate Rasters within that folder, so the model can loop over the series.

b: Extract portion of raster by a polygon mask of the maximum extent of the reservoir.

c: Use conditional statement as "Con("rast_ext.tif"<=0.036, 1)" to leave only the water pixels, here defined as the Sentinel amplitude smaller than 0.036.

d: Majority filter is used to filter out speckles. We used twice the eight neighbours, which we found sufficient for filtering.

e: Convert raster to polygon.

f: Eliminate Polygon Part function was used to filter out resulting polygons smaller than 15,000 sqm^2. We simulated and used different area values for different reservoir cases to arrive at this number.

g: Add Geometry Attributes function was used to generate "LENGTH" geometry property in meters.

h: The resulting polygon was converted to a feature layer.

i: Within the feature layer, only features with "LENGTH" greater than 1,000 m were selected. We simulated and used different values of LENGTH for different reservoir cases to arrive at this number.

j: Copy Features function was then used to export the selected features in the previous step. Steps **d-j** are noise filtering processes. After this step, most of the resulting feature classes are sufficiently trimmed to have a shoreline from the Sentinel-1 image.

k: Points along the line are generated at every 60 m interval, and l: was used to extract elevation values from the vegetation-removed SRTM (30 m). Then, the Attribute table of each %Name%.shp was copied to a spreadsheet to retrieve the histogram.

Figure SI2. Site map of the studied reservoirs. Location of the reservoirs (as lat/long) is provided in Table 1. High-resolution images are downloaded from Planet.com.

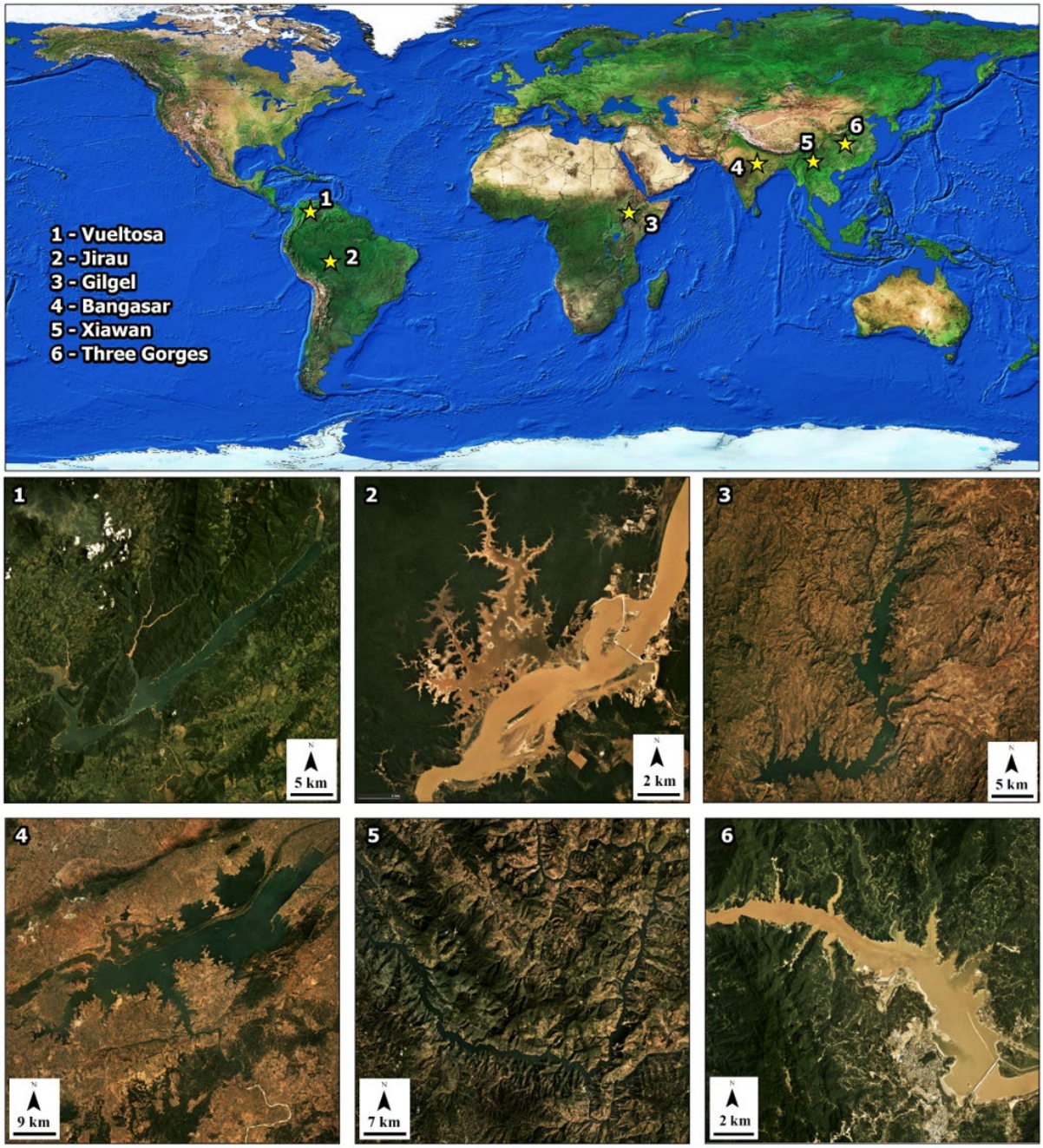
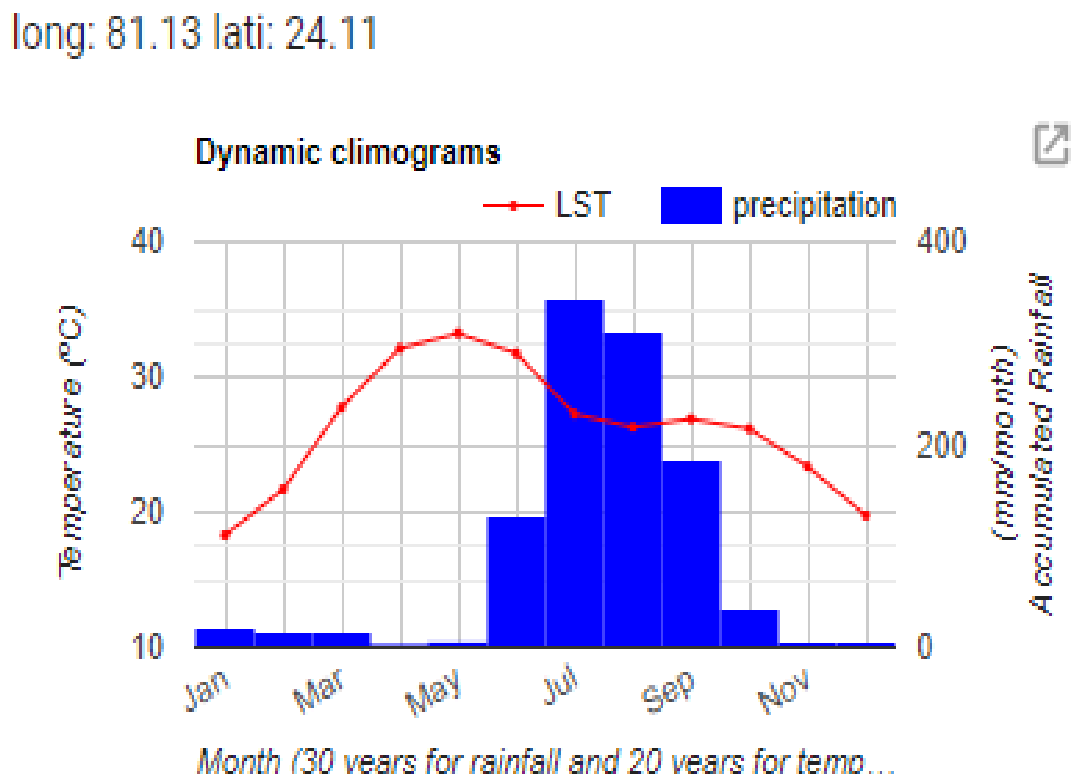


Figure SI3. Climograph (rainfall rate) processed from the Google Earth Engine over the Bansagar reservoir (Funk et al. 2015).



References

Planet Team (2017). Planet Application Program Interface: In Space for Life on Earth. San Francisco, CA. https://api.planet.com.

Funk, Chris, Pete Peterson, Martin Landsfeld, Diego Pedreros, James Verdin, Shraddhanand Shukla, Gregory Husak, James Rowland, Laura Harrison, Andrew Hoell & Joel Michaelsen. "The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes". Scientific Data 2, 150066. doi:10.1038/sdata.2015.66 2015.