Developing a Global Network of River Reaches in Preparation for SWOT

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Study Goals

- Examine global river slope distribution
- Build an a priori dataset for the SWOT mission: mean width, slope, discharge
- Quantify SWOT coverage

Estimate the slopes

- Gaussian filter on the elevations (standard deviation of 3km)
- Reaches of 10km: fixed, not crossing lakes, dams and tributaries
- Theil-Sen estimator and linear regression: pick result with higher coefficient of determination

Merging the datasets

- Global River Widths from Landsat (GRWL) [1] 30m resolution → width and centerline
- DEM from SRTM 90m resolution → height
- HydroSHEDs 90m resolution → river location in SRTM using flow accumulation estimated by Beighley

Limiting information

- Determine upstream and downstream height and flow accumulation
- Find in SRTM/HydroSHEDs corresponding nodes at beginning and end of river section
- Nearest neighbor: flow accumulation as control

Validation of merging

- ICESat derived inland water surface spot heights IWSH [2]
- Good agreement between SRTM and IWSH, $R^2 = 0.996$, RMSE = 19.8 m
- Bias of ~3.7m between SRTM and ICESat

Conclusions

- Generate a database of 220 924 reaches combining: river center line, connectivity, width, elevation and slope estimations
- SWOT will cover ~95% of the rivers wider than 100m
- ~81% of rivers wider than 100m of the dataset have a slope within accuracy
- Need to extend dataset over 60N: need of hydrologically conditioned DEM

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References


