

README

This directory contains data supporting the development of a relation between satellite altimetry water-surface elevation data and streamflow for the **Susitna River at Sunshine, Alaska**

Files in this directory

susitna_sunshine_Zone 2_008092_Susitna_TPJOJ_2_5_1_altim_DSWE_relation_DATA.csv

Comma-delimited data used to develop the relation between satellite altimetry water-surface elevations and reach-averaged river width derived from Landsat data. See metadata file for entity descriptions and processing steps.

shp.zip

Zipped shapefile for use in a geographic information system (GIS) software showing the reach boundary used to compute the reach-averaged river width data

susitna_sunshine_zone 2.kml

Keyhole Markup Language file showing the reach boundary used to compute the reach-averaged river width data

susitna_sunshine_Zone 2_008092_Susitna_TPJOJ_2_5_1_RSQ_DATA.csv

Comma-delimited data used to develop the relation between satellite altimetry water-surface elevations and streamflow. See metadata file for entity descriptions and processing steps.

susitna_sunshine_Zone 2_008092_Susitna_TPJOJ_2_5_1_RATING_TABLE.csv

Comma-delimited data table that defines the relation between observed satellite altimetry water-surface elevations and streamflow. See metadata file for entity descriptions and processing steps.

Relation between satellite altimetry water-surface elevations and reach-averaged river widths

Line of organic correlation:

$$W^2 = mE + b \quad \text{[Equation 1]}$$

Where,

W^2 = reach-averaged width, in meters, squared

m = **181854**, in meters

E = altimeter elevation, in meters

b = **-10727594**, in square meters

Relation between satellite altimetry water-surface elevations and streamflow

Modified Manning's equation adapted from Bjerklie et al. (2018) equation 1

$$Q_i = \frac{\left[W_i * \left((h_i - B) * \left(1 - \left(\frac{1}{1+r} \right) \right) \right)^{1.67} * S^{0.5} \right]}{n_i} \quad \text{[Equation 2]}$$

Where,

Q_i = streamflow, in cubic meters per second, for the i th observation of altimetry elevation

W_i = reach-averaged width, in meters, derived from Equation 1 using i th observed altimetry elevation if reach-averaged width is not directly observed

h_i = i th observed altimetry elevation of water surface, in meters

$r = 2$ (parabolic channel shape assumption)

$B = 56.19$ m, the thalweg elevation (elevation of zero flow), in meters, relative to altimeter datum

$S = 0.000907$, static slope value

Equation for n_i adapted from Bjerklie et al. 2018 equation 15:

$$n_i = n_b \left(\frac{(H-B)}{(h_i-B)} \right)^x \quad \text{[Equation 3]}$$

$n_b = 0.037$, bankfull base Manning's n value

$H = 63.20$ m, maximum flood stage, in meters, relative to altimeter datum

$x = 0.51$, exponent of stage varying n -value relation

Streamflows are computed for the location **USGS gage 15292780 SUSITNA R AT SUNSHINE AK, Latitude 62°10'31.3", Longitude 150°10'13.5" NAD27**

Calibration metrics

Number of values = **32**

Normalized root mean square error = **25.8** percent

Bias = **0.0** percent

Kling-Gupta Efficiency = **0.64**

Evaluation metrics

Number of values = **36**

Normalized root mean square error = **30.8** percent

Bias = **6.7** percent

Kling-Gupta Efficiency = **0.67**

References

Bjerkile, D.M., Birkett, C.M., Jones, J.W., Carabajal, C., Rover, J.A., Fulton, J.W., and Garambois, P., 2018, Satellite remote sensing estimation of river discharge—Application to the Yukon River Alaska: *Journal of Hydrology*, 561, p. 1000-1018, <https://doi.org/10.1016/j.jhydrol.2018.04.005>