README

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

Files in this directory

nushagak_ekwok_Zone 11_008140_Nushagak_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

nushagak_ekwok _zone_11.kml

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

nushagak_ekwok_Zone 11_008140_Nushagak _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.

nushagak_ekwok_Zone 11_008140_Nushagak _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:

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

Where,

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

m = **52045**, in meters

E = altimeter elevation, in meters

b = **-2129524**, in square meters

Relation between satellite altimetry water-surface elevations and streamflow

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

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

Where,

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

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

h_i = ith observed altimetry elevation of water surface, in meters

r = **2** (parabolic channel shape assumption)

B = **37.63** m, the thalweg elevation (elevation of zero flow), in meters, relative to altimeter datum

S = **0.000490**, static slope value

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

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

n_b = **0.042,** bankfull base Manning's n value

H = **43.77** m, maximum flood stage, in meters, relative to altimeter datum

x = **0.083**, exponent of stage varying n-value relation

Streamflows are computed for the location **USGS gage 15302500 NUSHAGAK R AT EKWOK AK, Latitude 59°20'57", Longitude 157°28'23" NAD27**

Calibration metrics

Values used = **10**

Normalized root mean square error = 1.5 percent

Bias = **0.8** percent

Kling-Gupta Efficiency = **0.98**

Evaluation metrics

Values used = **8**

Normalized root mean square error = **1.4** percent

Bias = **1.0** percent

Kling-Gupta Efficiency = **0.97**

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