README

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

Files in this directory

knik_palmer_Zone 3_008100_Knik_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

knik_palmer _zone_3.kml

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

knik_palmer_Zone 3_008100_Knik_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.

knik_palmer_Zone 3_008100_Knik_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:

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

Where,

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

m = **1301327**, in meters

E = altimeter elevation, in meters

b = **-18300729**, 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 = **13.97** m, the thalweg elevation (elevation of zero flow), in meters, relative to altimeter datum

S = **0.000489**, 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 = **0.029,** bankfull base Manning's n value

H = **18.47** m, maximum flood stage, in meters, relative to altimeter datum

x = **0.33**, exponent of stage varying n-value relation

Streamflows are computed for the location **USGS gage 15281000 KNIK R NR PALMER AK, Latitude 61°30'18", Longitude 149°01'50" NAD27**

Calibration metrics

Values used = **44**

Normalized root mean square error = **33.3** percent

Bias = **-0.2** percent

Kling-Gupta Efficiency = **0.75**

Evaluation metrics

Values used = **38**

Normalized root mean square error = **34.6** percent

Bias = **1.4** percent

Kling-Gupta Efficiency = **0.63**

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