

## README

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

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### Files in this directory

**yukon\_stevensvillage\_Zone 4\_008000\_Yukon\_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

**yukon\_stevensvillage\_zone\_4.kml**

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

**yukon\_stevensvillage\_Zone 4\_008000\_Yukon\_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.

**yukon\_stevensvillage\_Zone 4\_008000\_Yukon\_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

$m$  = **41500**, in meters

$E$  = altimeter elevation, in meters

$b$  = **-2987603**, 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)

$B = 64.80$  m, the thalweg elevation (elevation of zero flow), in meters, relative to altimeter datum

$S = 0.0000104$ , static slope value

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

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

$n_b = 0.020$ , bankfull base Manning's  $n$  value

$H = 90.22$  m, maximum flood stage, in meters, relative to altimeter datum

$x = 1.97$ , exponent of stage varying  $n$ -value relation

Streamflows are computed for the location **USGS gage 15453500 YUKON R NR STEVENS VILLAGE AK, Latitude 65°52'32", Longitude 149°43'04", NAD27**

### Calibration metrics

Number of values = **80**

Normalized root mean square error = **3.63** percent

Bias = **-0.7** percent

Kling-Gupta Efficiency = **0.97**

### Evaluation metrics

Number of values = **84**

Normalized root mean square error = **3.82** percent

Bias = **-0.1** percent

Kling-Gupta Efficiency = **0.96**

## 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>