**Processing of profiles for fluvial experiments 1 to 4 to get bedform height (*H*) and width (*W*) using the SWT code**

Citation: Hillier, J. K., (2008) Seamount (submarine volcano) detection and isolation with a modified wavelet transform, *Basin Research* 20, 555-573, doi:10.1111/j.1365-2117.2008.00382.x

Limited to 20,000 input data points, so not all data used for Exp 3.

Please contact Hillier for access to the code - j.hillier@lboro.ac.uk

**Illustration of the output using Experiment 1** - highlighting that SWT works for other forms in addition to submarine volcanoes.

In the figure

* On both panels *x*-axis is distance along profile (for fluvial data time is a proxy for distance); top panel *y*-axis is height in cm, bottom panel *y*-axis is scale (i.e., width)
* **Black line** is the measured data. Only the first 400 seconds are shown.
* Thin grey line are lines ‘underneath the bedforms’; the intention to mimic how one might do this manually 'by hand'.
* **Thick grey lines** are from quantifying the bedforms by fitting flat-topped cones [also called frustums] (grey) to the features (i.e. bedforms) found.
* Red dots are best estimates (location, scale) for the features, and black-white colouration is an estimate (the SWT wavelet coefficient) of how far the middle of the feature is above the edges.
* OR, maximum distance above the baseline might be what you want, but you can easily calculate this, or perhaps more robustly you could fit a flat-topped cone and take the top of this (see below)
* Clearly, the distance and height of any of the lines is known.

Chart, line chart

Description automatically generated

**Output files**

**P\_ALL.stats** - Summary statistics for each profile. For only the calculation of these properties, thresholds for the smallest features to be included need to be set. Currently Wmin = 5, Hmin = 1.

# $1 = Profile number

# $2 = Equiv. Sand Thickness, $3 = number of features > Hmin

# $4-6 = mean, median and modal separation between features with inclusion based on height

# $7 = number of features > Wmin

# $8-10 = mean, median and modal separation with inclusion based on width

# $11 = Mean H, for those above min H.

# $12 = Mean Area - measured not frustum.

# $13 = Mean slope of sides.

# $14 = Asymmetry of slopes - positive values is tilting top to the left

**P1.dzf** - d is distance, z is depth, f is filtered depth. This is the black and thin grey lines from the figure.

**P1.properties** - Output text file with bedform-by-bedform descriptive statistics; this contains the following columns (e.g. $1 is column 1). However, since all information about the corners of each frustum is provided, derived quantities (e.g. asymmetry and slopes) can be modified or checked.

# An output file, which with the selection of output options below contains

# $1 -No - Object number

# $2 - $6 -Ma - Distance to shallowest point (m)

# - Distance to first and last points in object (m)

# - Long and Lat of the shallowest point (m)

# $7 - $14 -Ad - Dist (m) and depth (m) of four points [in d,z pairs] of the

# frustum: 0 = bottom left, 1 = top left

# 2 = top right, 3 = bottom right

# $15 - $16 -Ar - Basal radius and top radius of the frustum

# (calculated as along track diameter/2.0)

# $17 -As - Slope (degrees) - av of 2 sides of frustum

# $18 - $20 -Ah - Depth to top and base of frustum (av of corners)

# and pedestal height (difference between the two)

# $21 -Md - No. of data points in feature

# $22 -Am - Misfit of best fitting frustum

# $23 - $30 -Al - as Ad but longs and lats (decimal degrees)

# $31 - $32 -Ac - Long and lat of centre of frustum top

# (av of points 1 and 2)

# $33 - $36 -Av - Measured Area (Trapezium approx from measured data)

# Frustum Area (calculated from top/base radius and pedestal height)

# Frustum Vol (calculated from top/base radius and pedestal height)

# percent (Frustum Area/Measured Area)

# $37 and $38 - Angle (degrees) of the slope of the side of the frustrum, left hand side, then right hand side.