1. Testing flow velocity using range of flow pathways

Flow velocity is calculated based on straight line distance between moorings. This is the distance between each incremental point used to draw the thalweg. Imagine a right triangle created between each pair of points, straight line distance is perpendicular to the vertical portion while distance along topography is along the hypotenuse. The distances are summed along the thalweg, not a straight line from one piece of equipment to the next.

A 10% increase in flow pathway (implying that the flow moves toward or up the bend of the canyon curves) increases the flow velocity between moorings.

A 10% decrease in flow pathway (implying that the flow cuts the corners) decreases the flow velocity between moorings.

Table 1. January 15th 2016 event – Testing flow velocity / thalweg distance variations

Mooring	Elapsed time between flow fronts (s)	Dist. Between mooring (m)	Calculated speed of flow between moorings (m/s)	DISTANCE + 10% Calculated speed of flow between moorings (m/s)	DISTANCE -10% Calculated speed of flow between moorings (m/s)
MS1					
MS2	1548	9100.979	5.88	6.47	5.78
MS3	1409	10229.512	7.26	7.99	7.16
MS4	2126[5]	14044.860	6.61[5]	7.27	6.51
MS5	749[5]	2769.313	3.70[5]	4.07	3.6
BIN-300	2432	8994.454	3.70	4.07	3.6
BIN-600					
BIN-1200					
MS7	125	305.425	2.44	2.69	2.34

Table 2. September 1st 2016 event - Testing flow velocity / thalweg distance variations

Mooring	Elapsed time between flow fronts (s)	Dist. Between mooring (m)	Calculated speed of flow between moorings (m/s)	DISTANCE + 10% Calculated speed of flow between moorings (m/s)	DISTANCE -10% Calculated speed of flow between moorings (m/s)
MS1					
MS2	2490	9100.979	3.66	4.02	3.56
MS3	2041	10229.512	5.01	5.51	4.91
MS5	3630	16814.174	4.63	5.10	4.53
BIN-600	2746	8994.454	3.28	3.6	3.18
BIN-1200					
MS7	157	305.425	1.95	2.14	1.85

2. Taking into account vertical motion of ADCPs [vertical / horizontal velocity error]

The vertical and horizontal velocity of the ADCP during the swing of the mooring and/or if mooring moves down-slope needs to be taken into account. This is calculated from the change in pressure / depth data from the ADCP.

For the January 15th event, the mooring appears to be swinging considerably at MS2 and MS3 at the start of the flow. When vertical / horizontal velocity is taken into account (*Calculated velocity during change in height / distance (m/s)),* the calculated velocities in Table 1 are in greater agreement.

Table 3. January 15th 2016 event

Mooring	Change in pressure before / after event (kPa)	Maximum change in pressure (kPa)	Measured change in height before / after event (m)	Measured maximum change in height (m)	Calculated change in distance down-slope (m)[1]	Time taken for change in pressure / height (s)	Calculated velocity during change in height / distance (m/s)[2]	ADCP swing?
MS1								
MS2	1.7	9.7	1.5	9.5	47.7	1120	0.04	Yes
MS3	16.5	55	18	56	572.8	272	2.12	Yes
MS4	11.5	11.5	11	11	350.0	310	1.13	No
MS5								
BIN-300								
BIN-600								
BIN-1200								
MS7								

[1] change in distance = change in height / tan(slope angle of 1.8 degrees)

Blanks indicate no pressure data or no significant change in data.

[2] Velocity = distance (m)/ time (s)

Table 4. September 1st 2016 event

Mooring	Change in pressure before / after event (kPa)	Maximum change in pressure (kPa)	Measured change in height before / after event (m)	Measured maximum change in height (m)	Calculated change in distance down-slope (m)[1]	Time taken for change in pressure / height (s)	Calculated velocity during change in height / distance (m/s)	ADCP swing?
MS1								
MS2								
MS3	6	6	5	5	159.1	125	1.27	No
MS5								
BIN-600								
BIN-1200								
MS7								

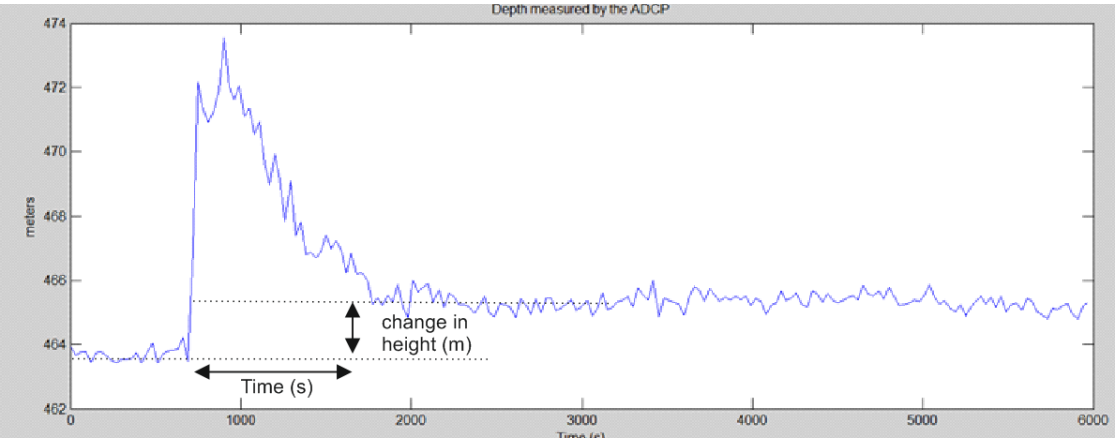

Figure 1. Parameters used in vertical and horizontal flow velocity calculations.