



National
Oceanography
Centre

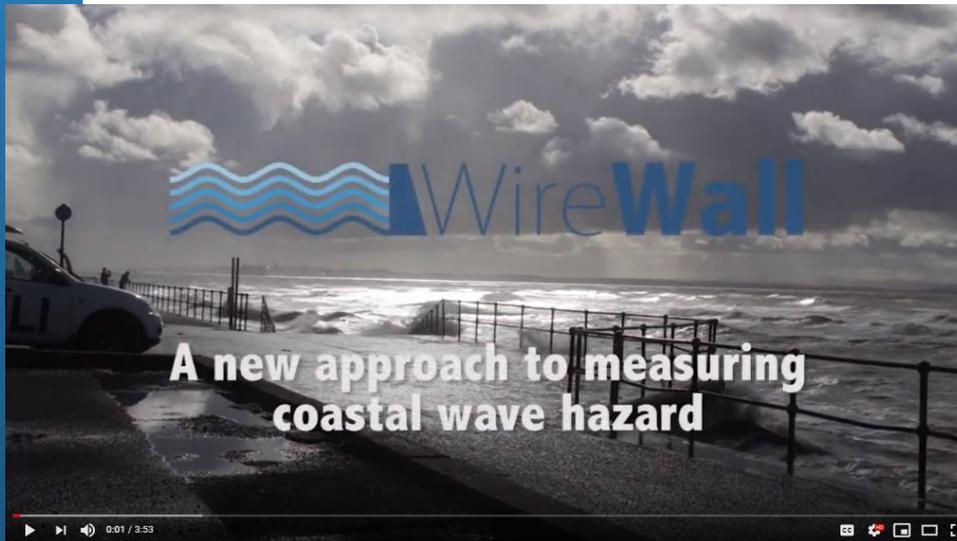
New field measurements of coastal wave overtopping

 WireWall

The logo for the WireWall project, consisting of a blue graphic of three wavy lines representing water, followed by the text 'WireWall' in a bold, blue, sans-serif font.

J.M. Brown, M.J. Yelland, R.W. Pascal, T. Pullen, C.L. Cardwell, D.S. Jones, R.C. Pinnell, E. Silva, C. Balfour,
G. Hargreaves, B. Martin, P.S. Bell, T.D. Prime, A. Martin, I. Gold, C. Bird, C. Thompson & B. Farrington

Watch our clips

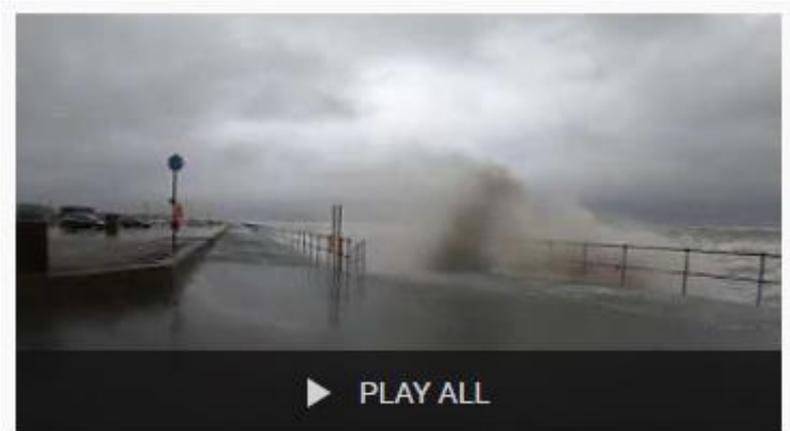


WireWall – The Movie
Only 4 mins!

<https://youtu.be/a5Y33SWdNU4>

Channel Coastal Observatory play list:
17 clips ranging from 7 – 49 seconds

https://www.youtube.com/playlist?list=PLEG2kTxO5bksR1bhXXbE_Id-wFQ7vOmf



Wave Overtopping Clips
collected in Cell Eleven of the
regional monitoring
programme

Great uncertainty in overtopping estimates

Overtopping estimates are at best within a factor of 3

3 orders of magnitude in uncertainty in safety thresholds developed from numerical estimates

Large safety margins being factored into the design of new schemes

Costly overdesign of sea defences



Source: NOC

Previous site-specific field measurements

Use of tanks:

- Cumbersome and costly.
- Large surfaces potential impact damage.



The seawall at Anchorholme, and the overtopping tank in position

Source: Pullen, T.A., Tozer, N.P., Hawkes, P.J., Bruce, T. (2009) A Comparison of field and laboratory overtopping measurements with empirical, numerical and probabilistic predictions. In: ICE Coasts, Marine Structures and Breakwaters 2009, 16-18 September 2009, EICC, Scotland.

Transfer of technology & understanding from ocean to coast & flume to field to create a low cost measurement system

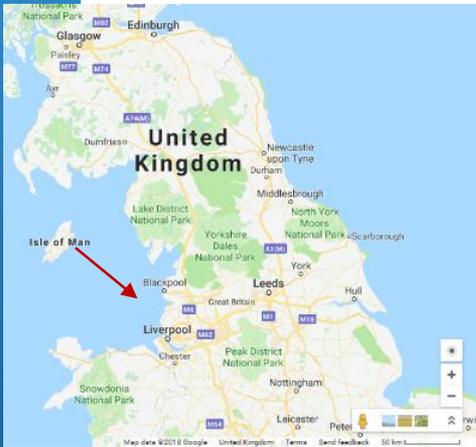


Pascal, Yelland, et al. (2011) Journal of Atmospheric and Ocean Tech.



Richardson, Pullen & Clarke (2002) ICCE

Case study site: Crosby NW England



- New coastal scheme in planning
- Large tidal range (>10 m springs)
- Fetch limited waves (< 5.5 m, W-NW)
- 'Flat beach' (Foreshore slope < 0.01)
- Available coastal monitoring

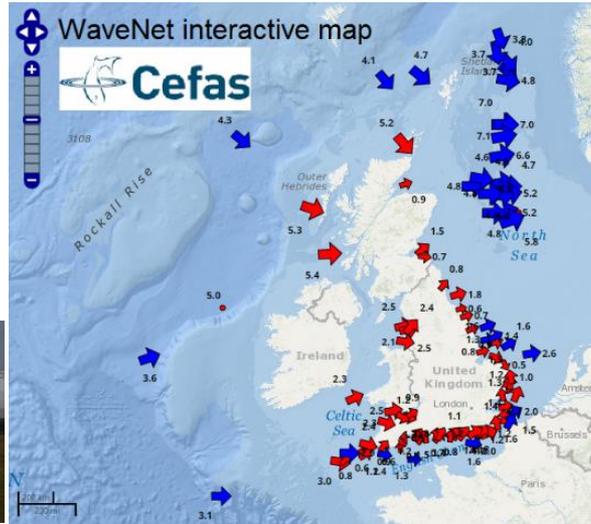
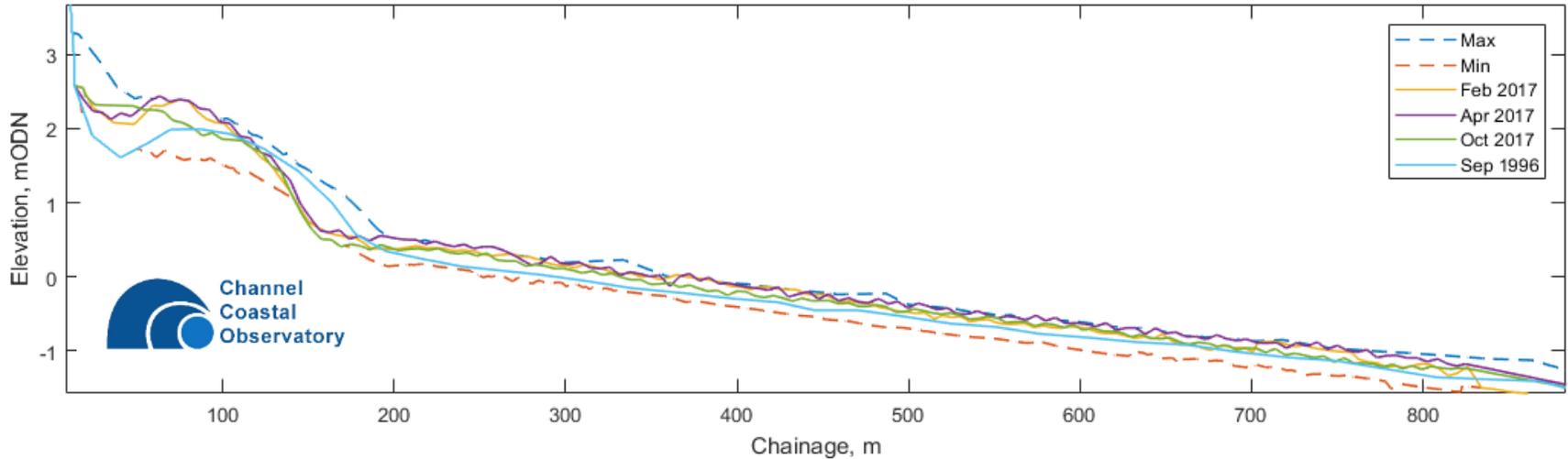


Source: NOC



Source: Sefton Council

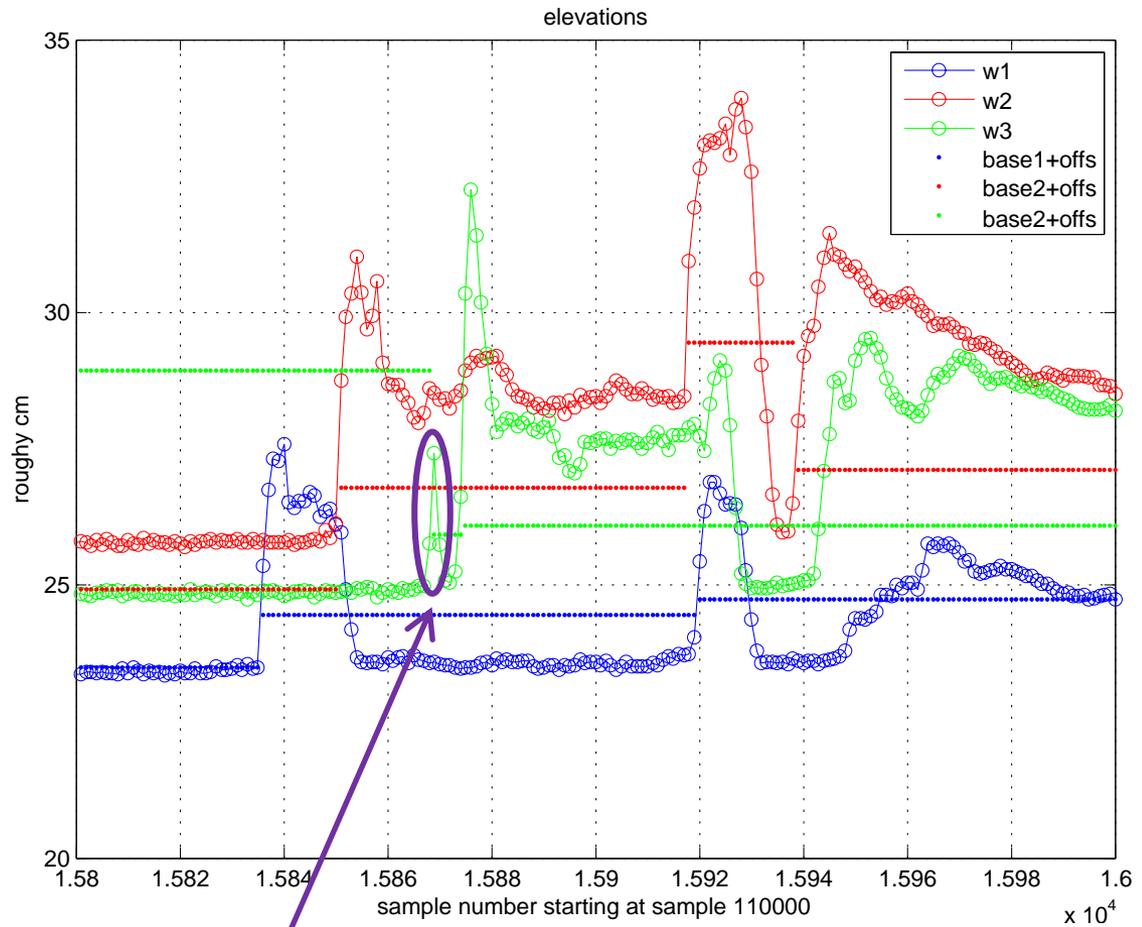
Crosby: an ageing sea wall & available monitoring for numerical assessment



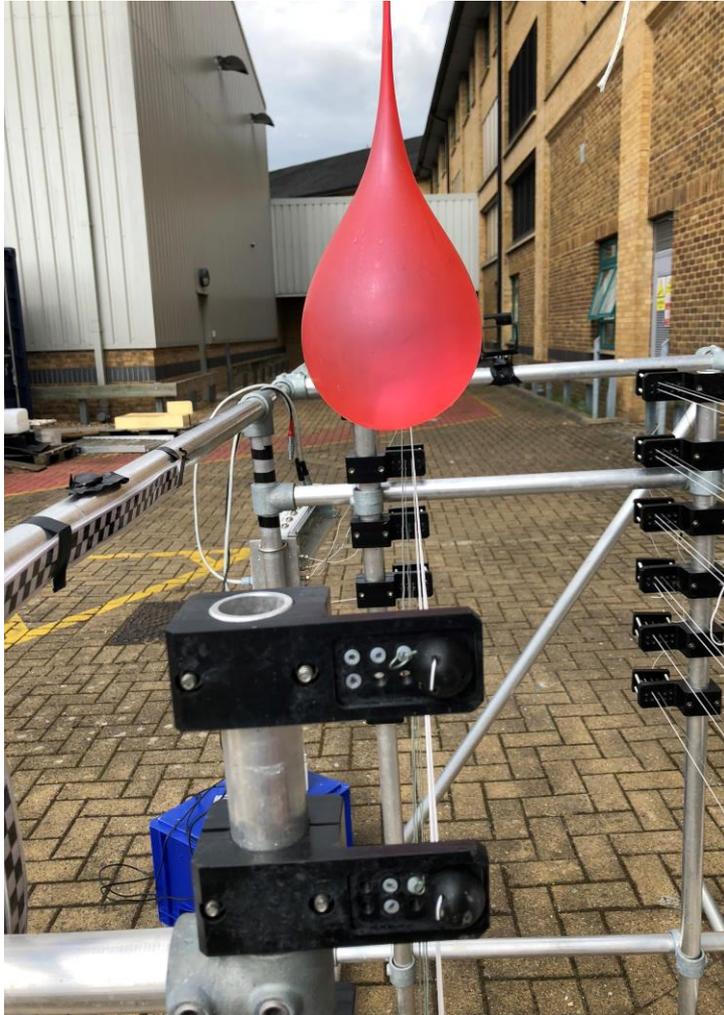
Dockside tests

EurOtop estimates inform wire configuration.

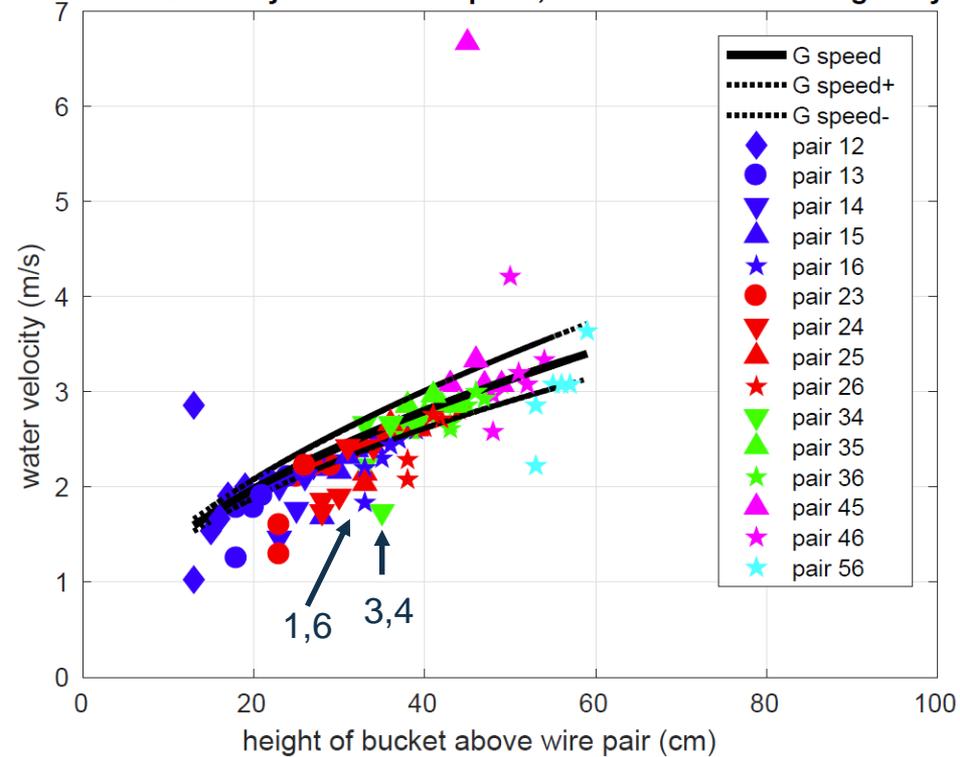
'Bucket' tests inform data processing requirements.



Accelerating jet tests

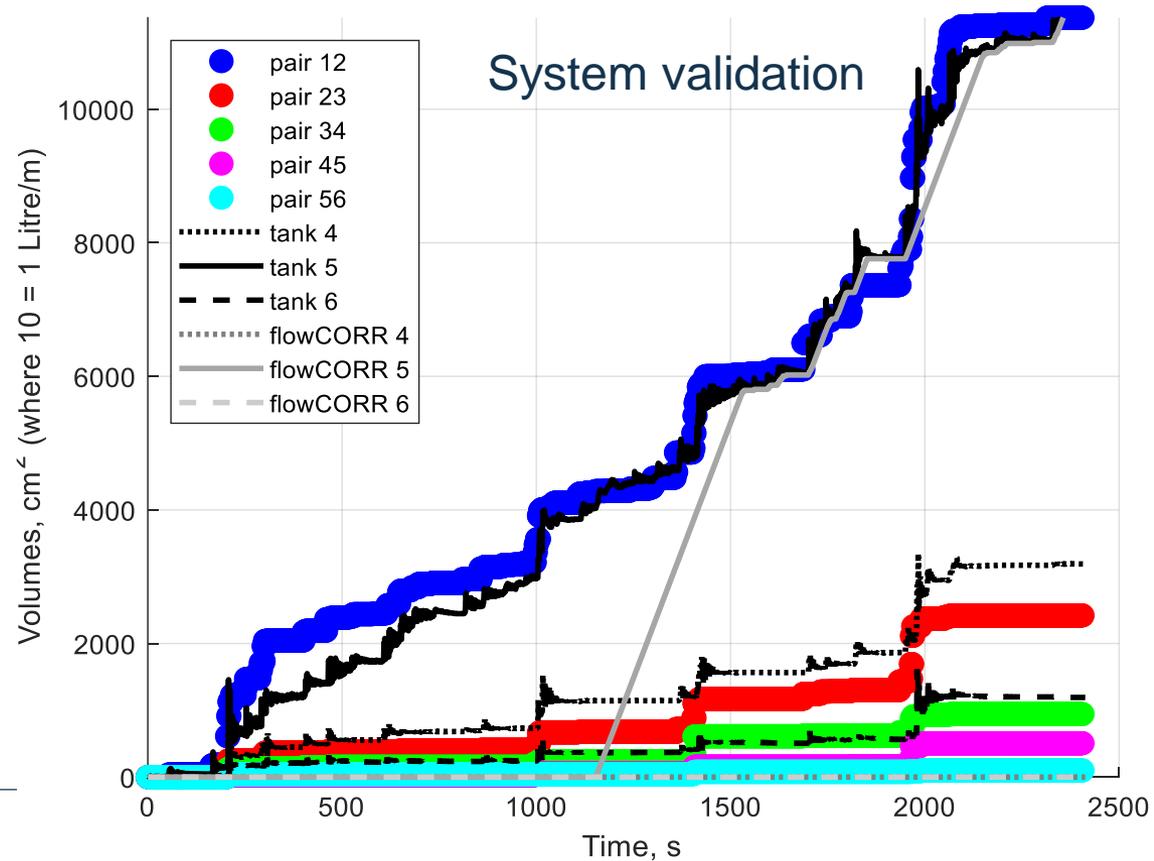
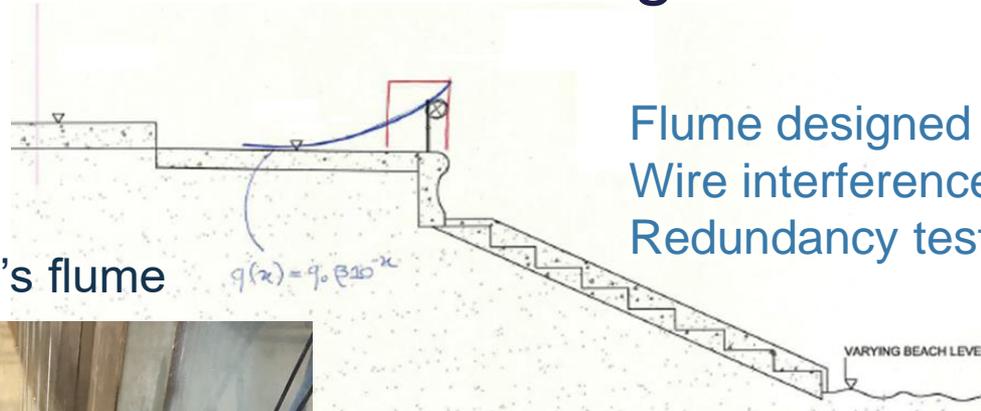


Velocities measured by various wire pairs, and estimated due to gravity



Instrument design & testing

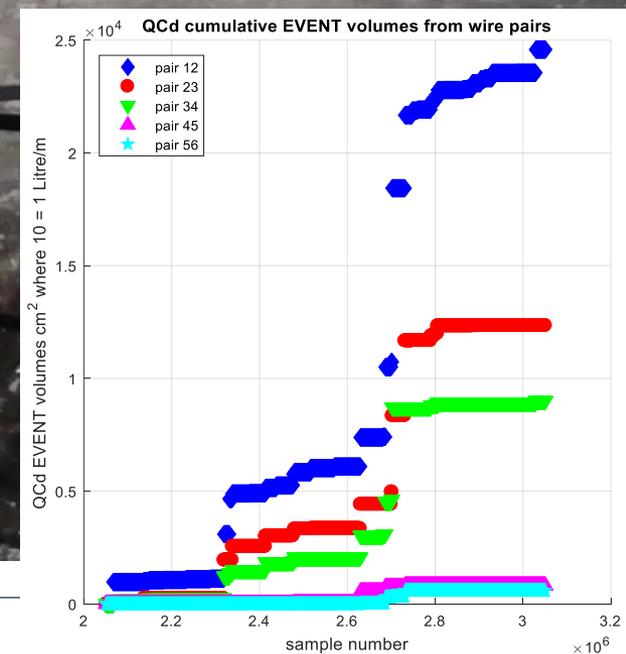
HR Wallingford's flume



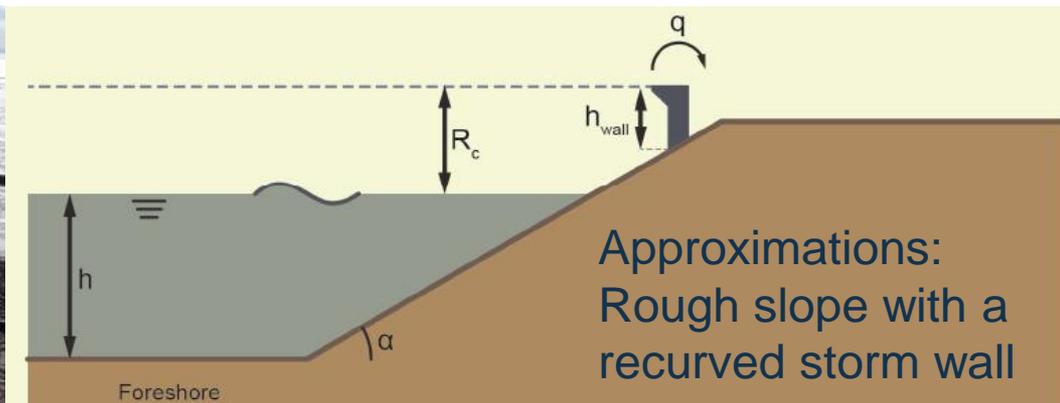
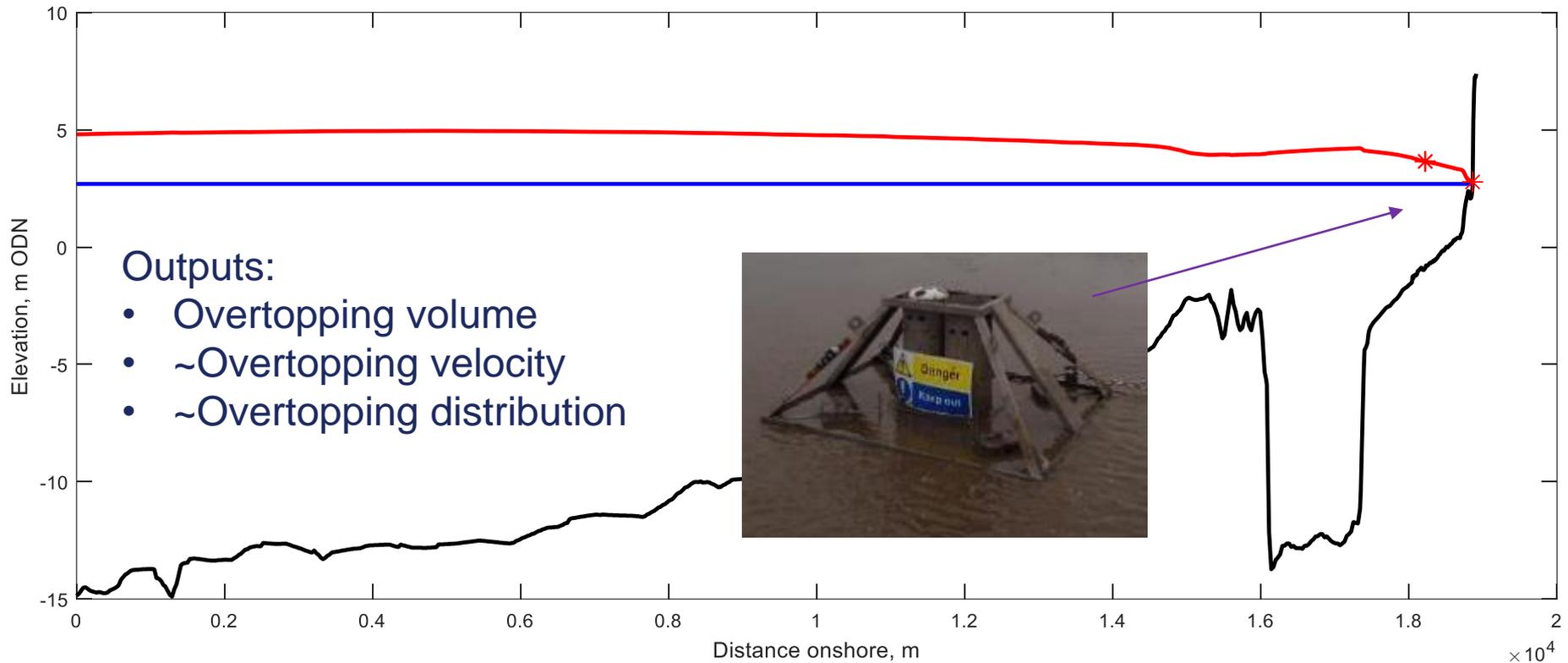
First field results, 26th October 2018



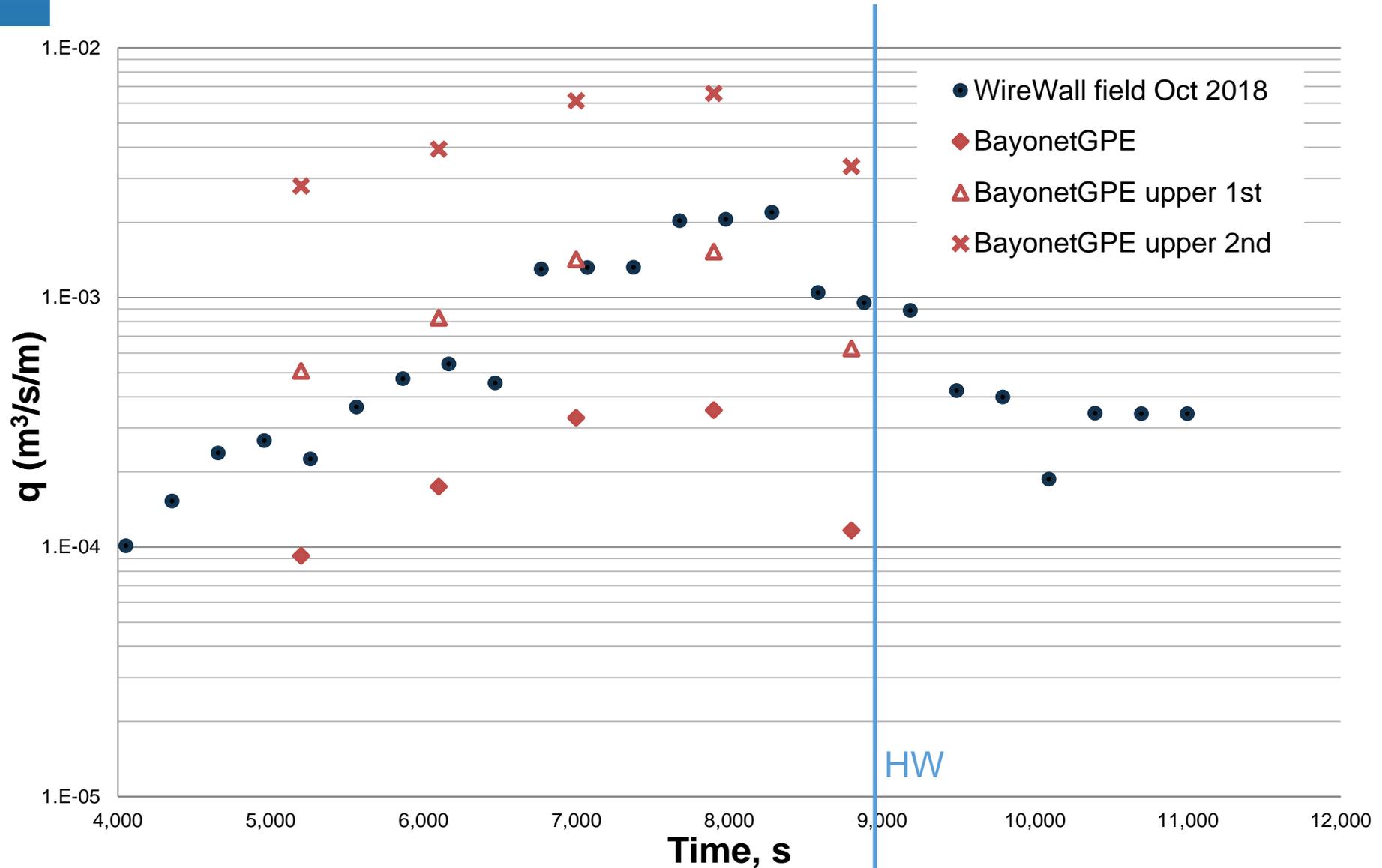
Cumulative volume distribution



Numerical approach: SWAN \longrightarrow EurOtop



WireWall – Bayonet (EurOtop) validation



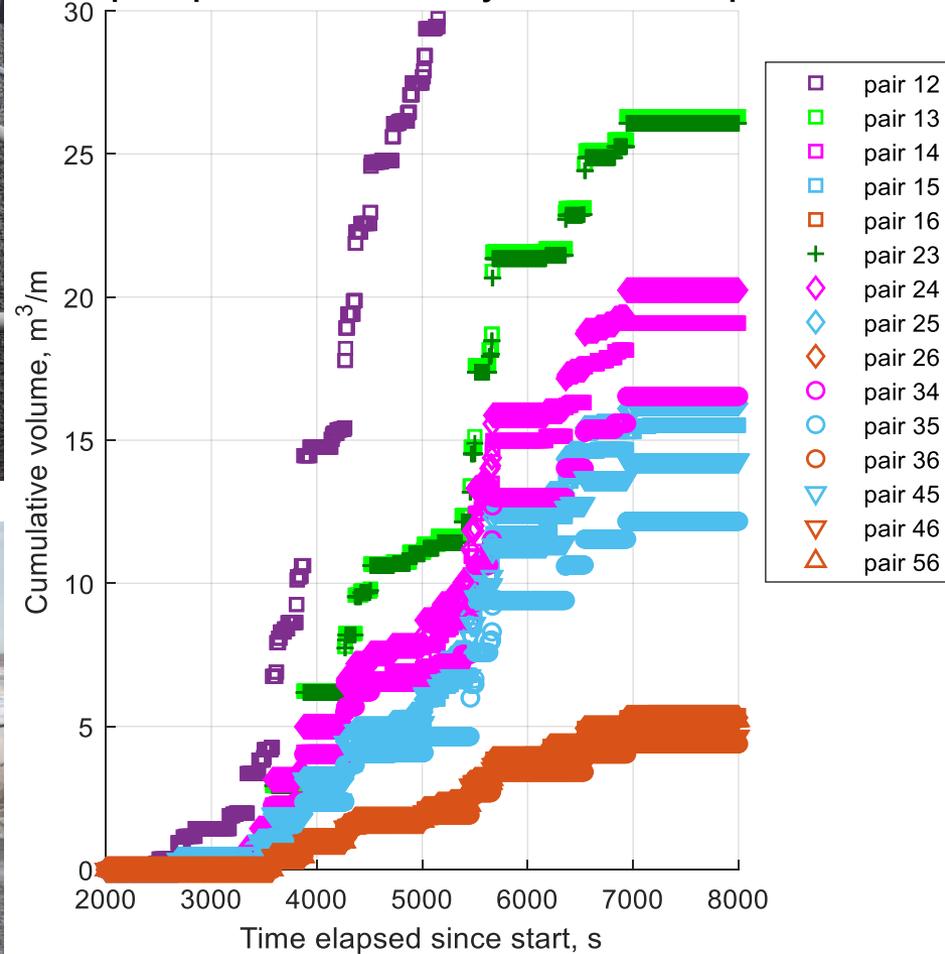
Which wires to use for validation?



Date and time of first sample is 25-Jan-2019 12:28:46

Events start on wire number(s) 1 2

ALL pair speeds substituted by event median speed

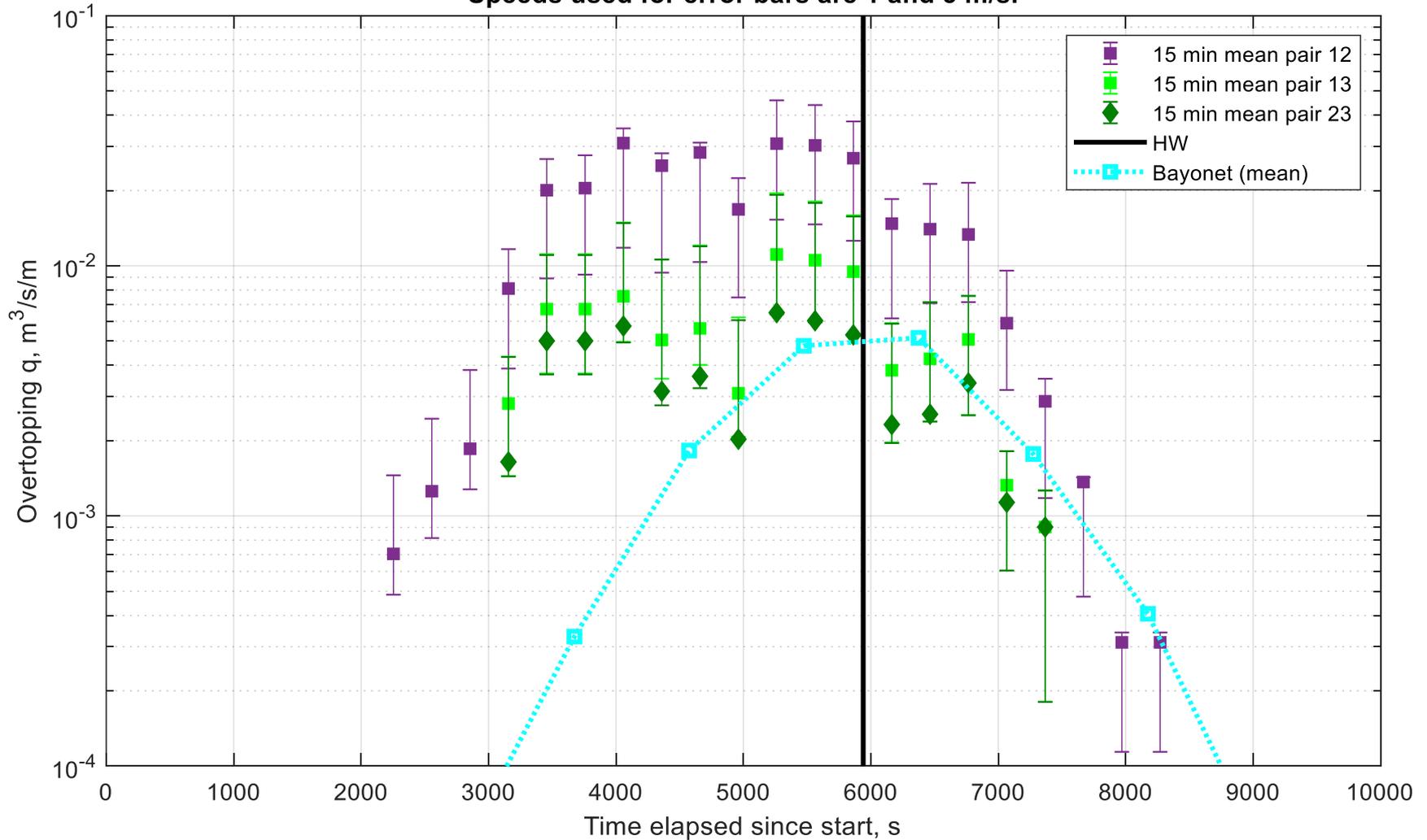


Time series data (validation)

Date and time of first sample is 25-Jan-2019 12:28:46

Events start on wire number(s) 1 2

Speeds used for error bars are 1 and 3 m/s.

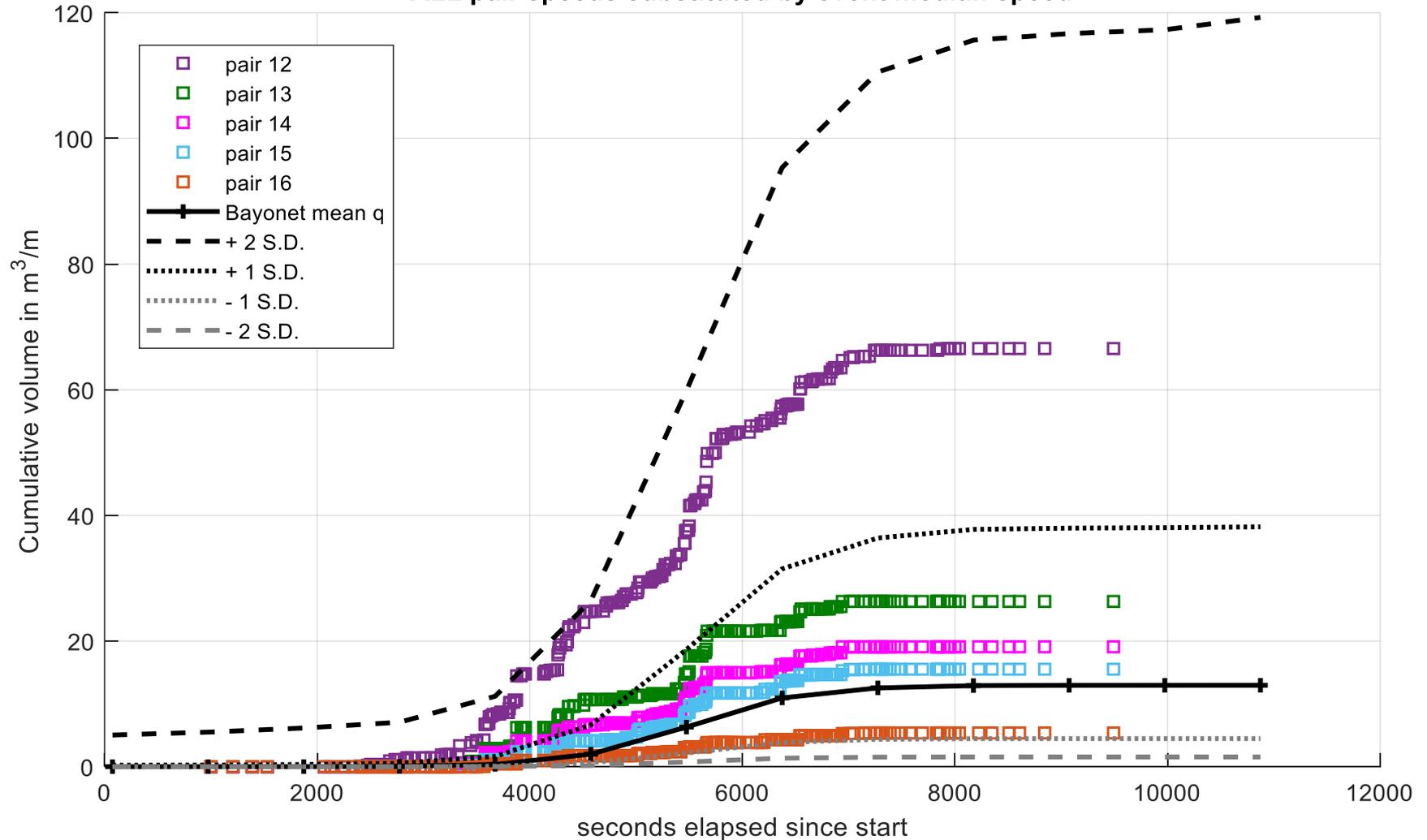


Cumulative volume 25th Jan 2019

Date and time of first sample is 25-Jan-2019 12:28:46

Events start on wire number(s) 1 2

ALL pair speeds substituted by event median speed





Summary

- We have a new instrument that can measure wave-by-wave overtopping volume and horizontal speed in the flume or field.
- It can provide a time-varying description of overtopping conditions and information about the landward distribution.

Thanks for listening

For more information please contact Jenny Brown jebro@noc.ac.uk

 [@Wirewall_NOC](https://twitter.com/Wirewall_NOC) [#WireWall](https://twitter.com/WireWall).