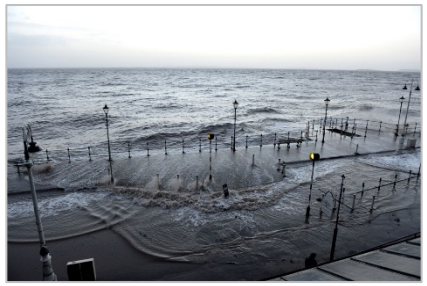
UNIVERSITY OF LIVERPOOL

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL



Spatial variability in extreme water levels in a hyper-tidal estuary

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Coastal flood risk

Penarth, Wales

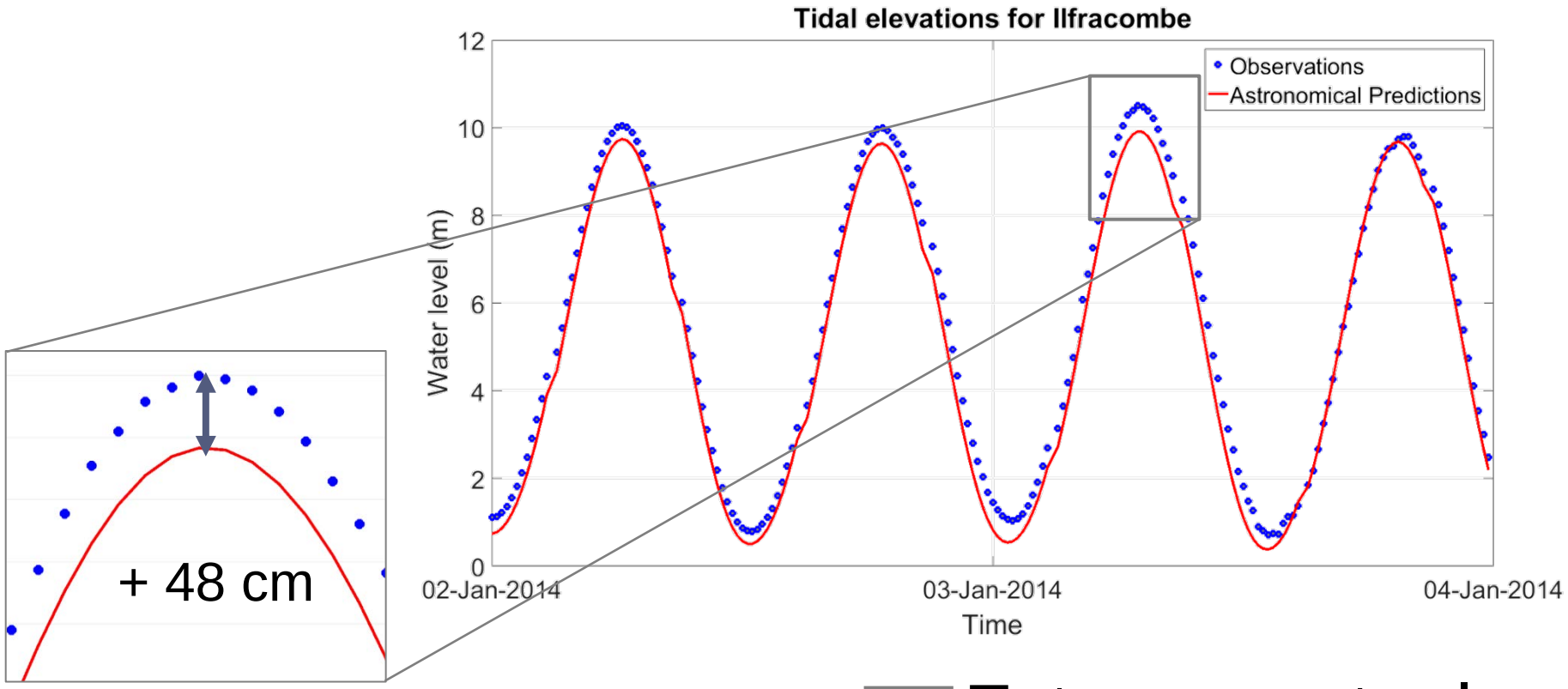
Ilfracombe, Devon

Bridgwater, Somerset

Porthcawl, Wales

Extreme water level, 3 January 2014

Tide + Storm surge + Interaction



Extreme water level

Horsburgh and Wilson, 2007
Data source: NTSLF, 2016

Aim

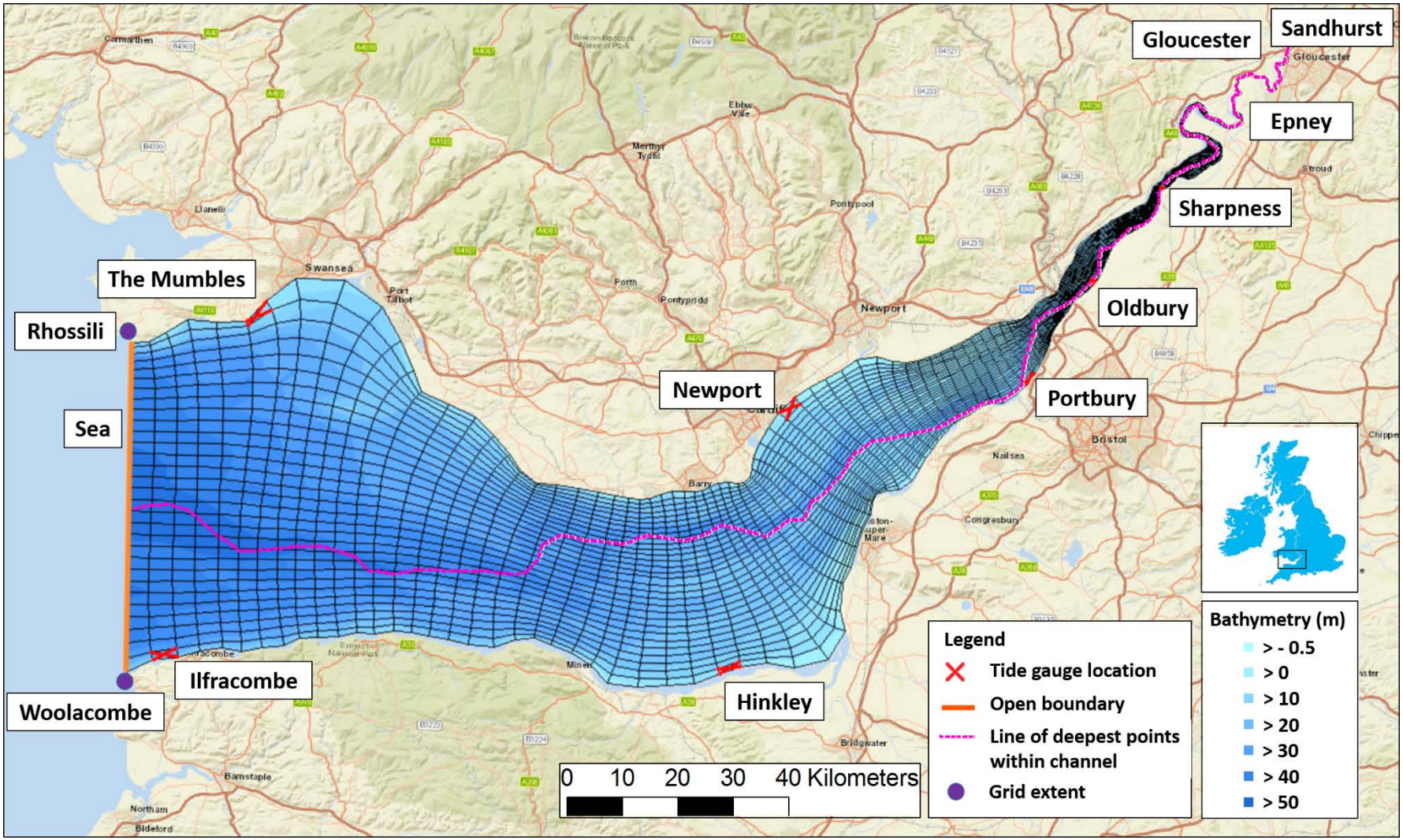
- Accurate prediction of extreme water level and its timing is essential in heavily populated and industrialized estuaries
  - Essential for storm hazard mitigation
- Incorporate spatial and temporal variability of the combined flood hazard in flood risk assessments

Oldbury-on-Severn, U.K

Gloucester, U.K

Royal Portbury Dock, U.K.

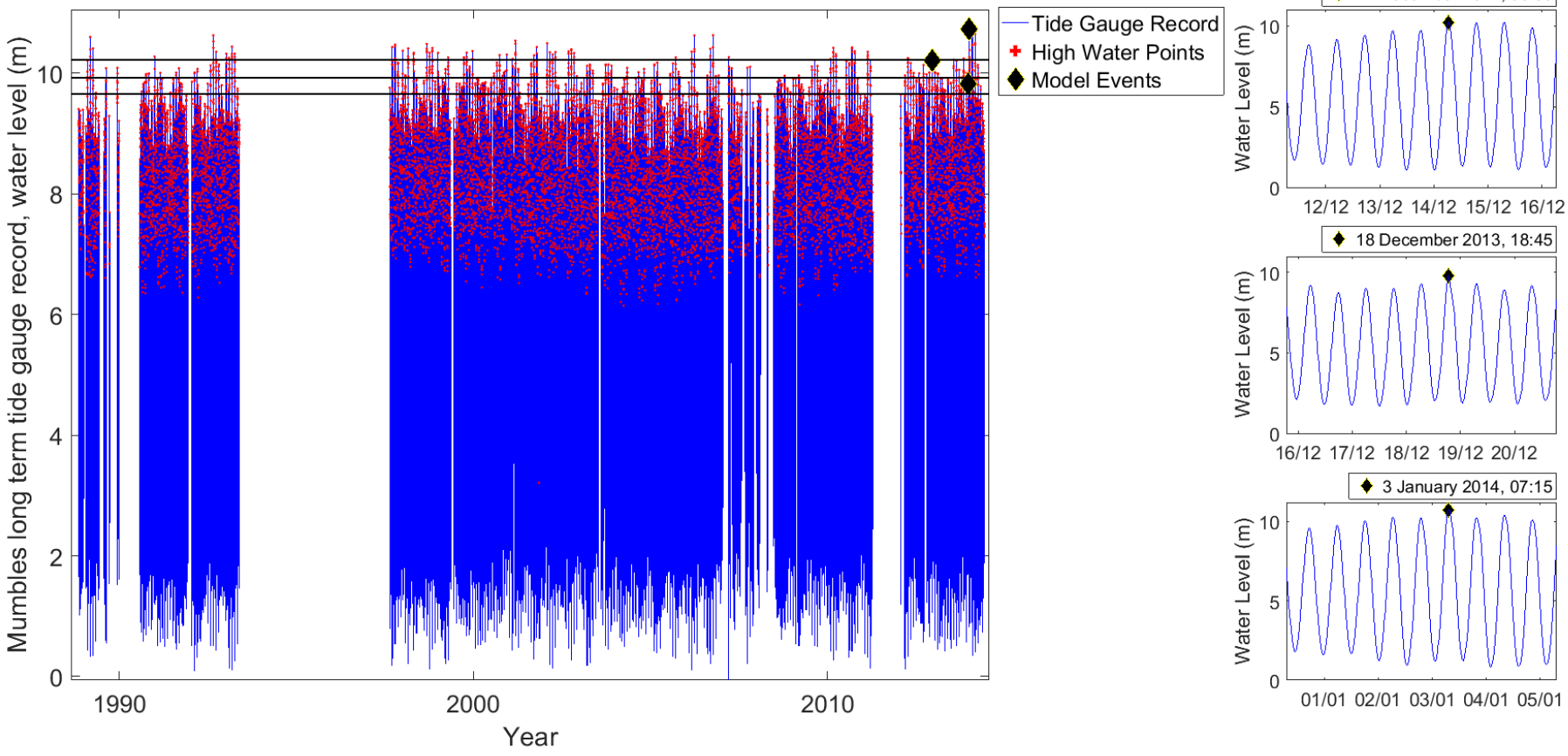
Model setup - Delft3D-FLOW



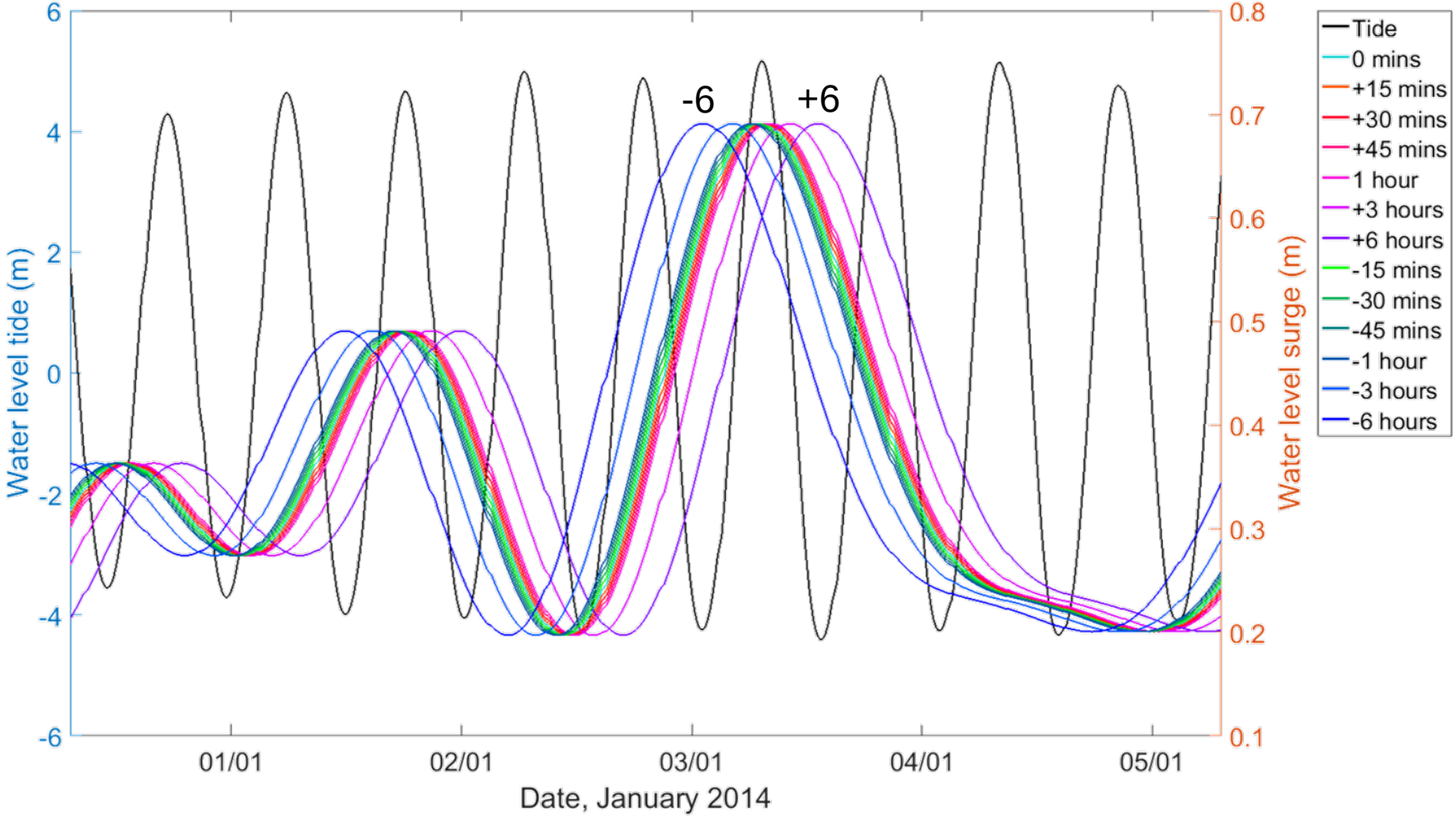
Severn Estuary tidal bore

SWNS TV, 2012

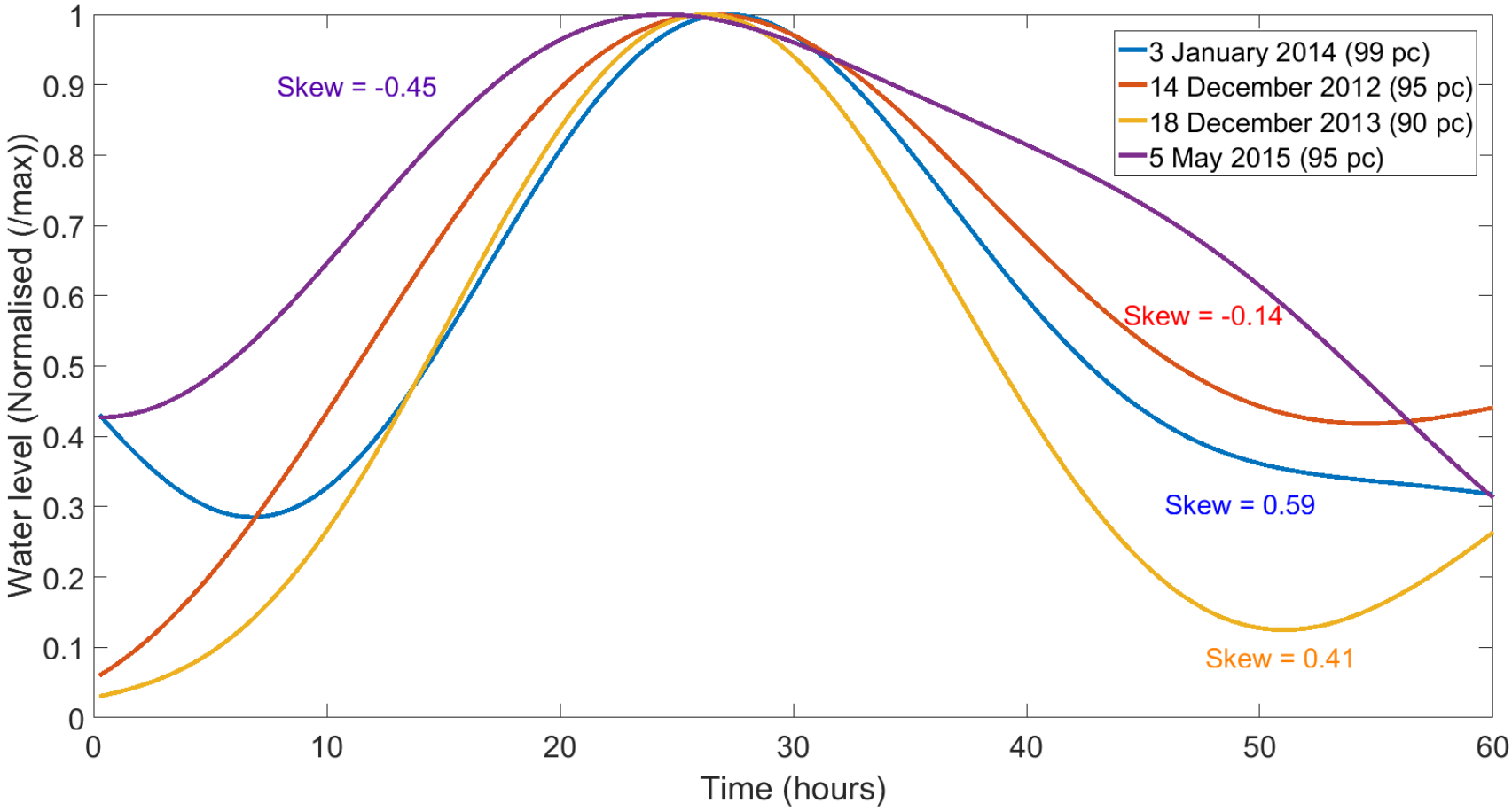
Long term tide gauge record



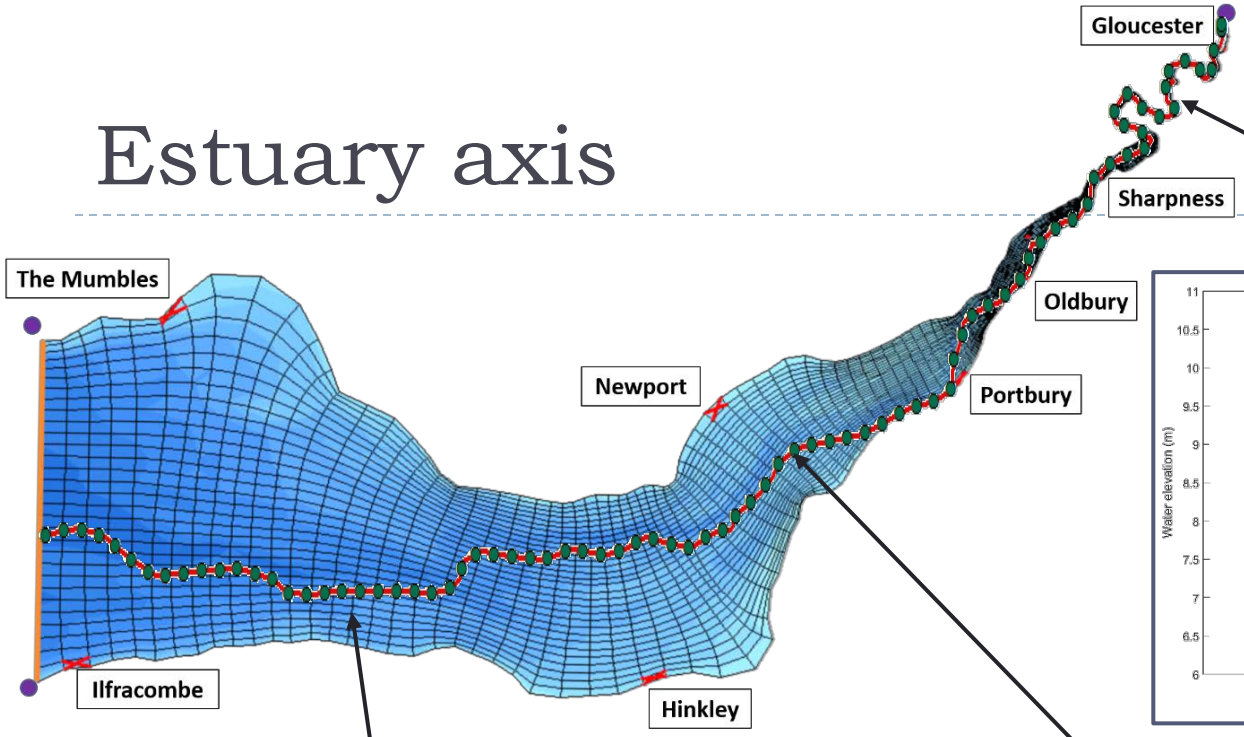
Timing of surge – 3 January 2014

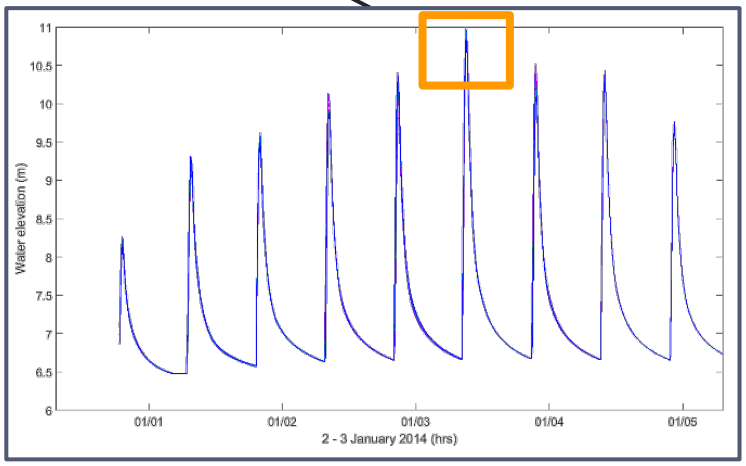


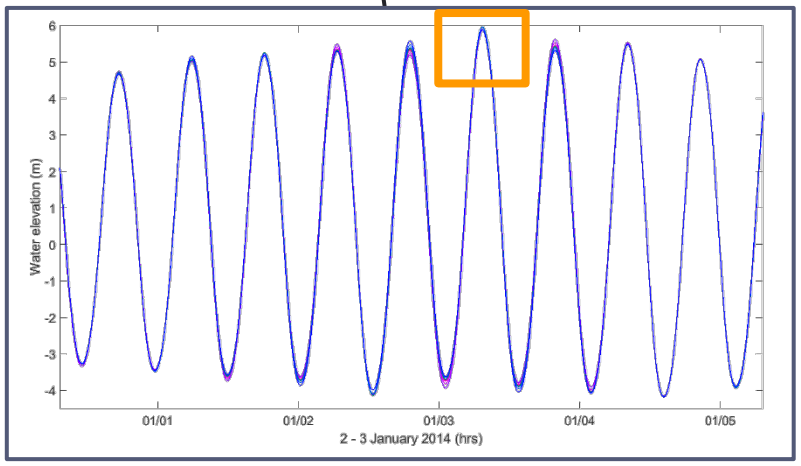
Surge characteristic - skewness

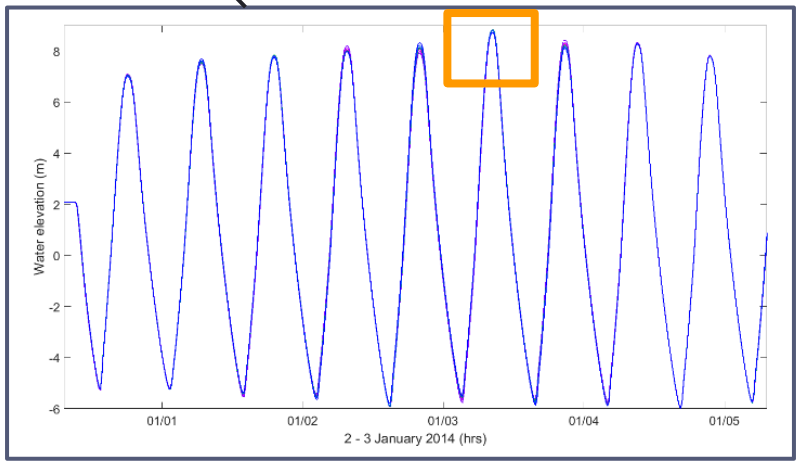


Estuary axis

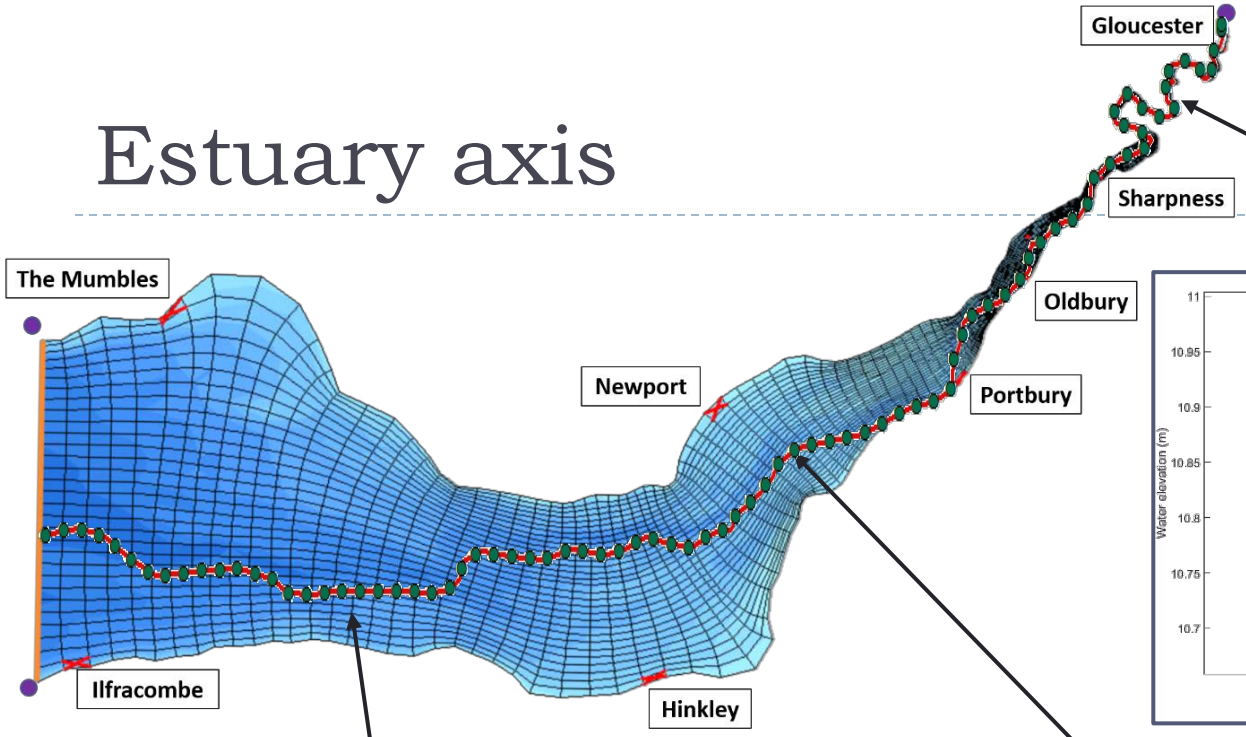


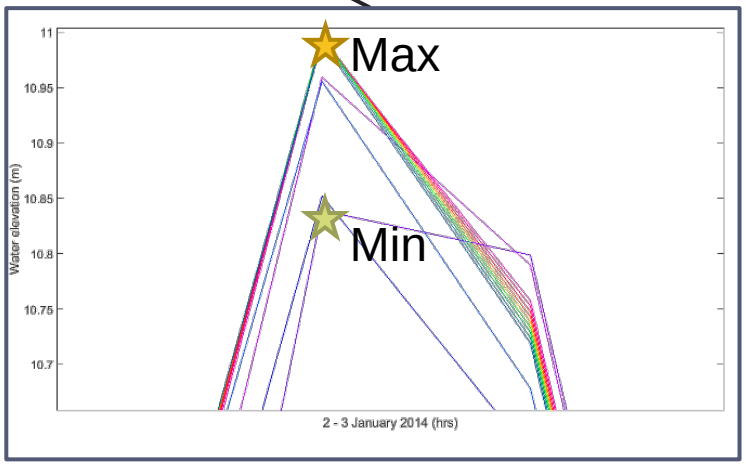


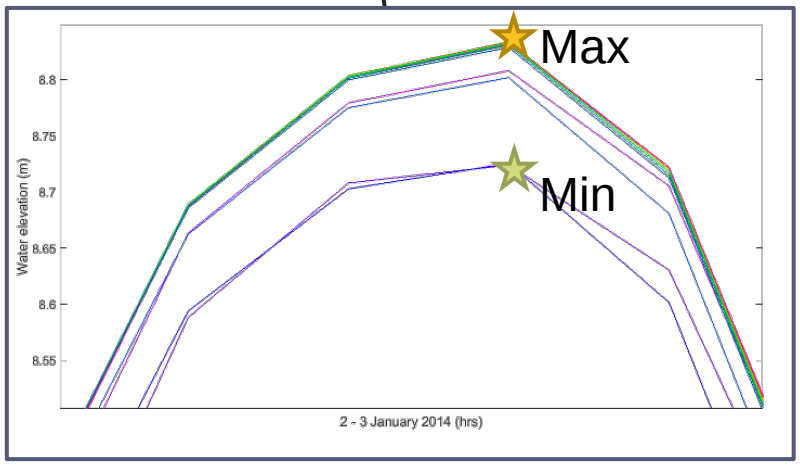


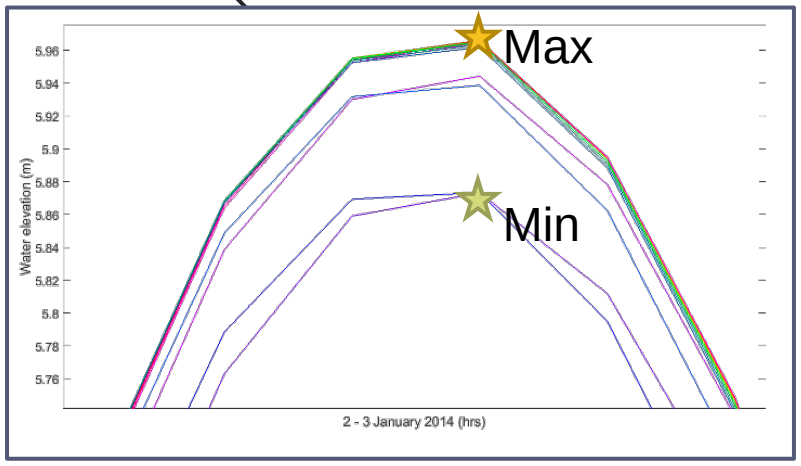


Estuary axis

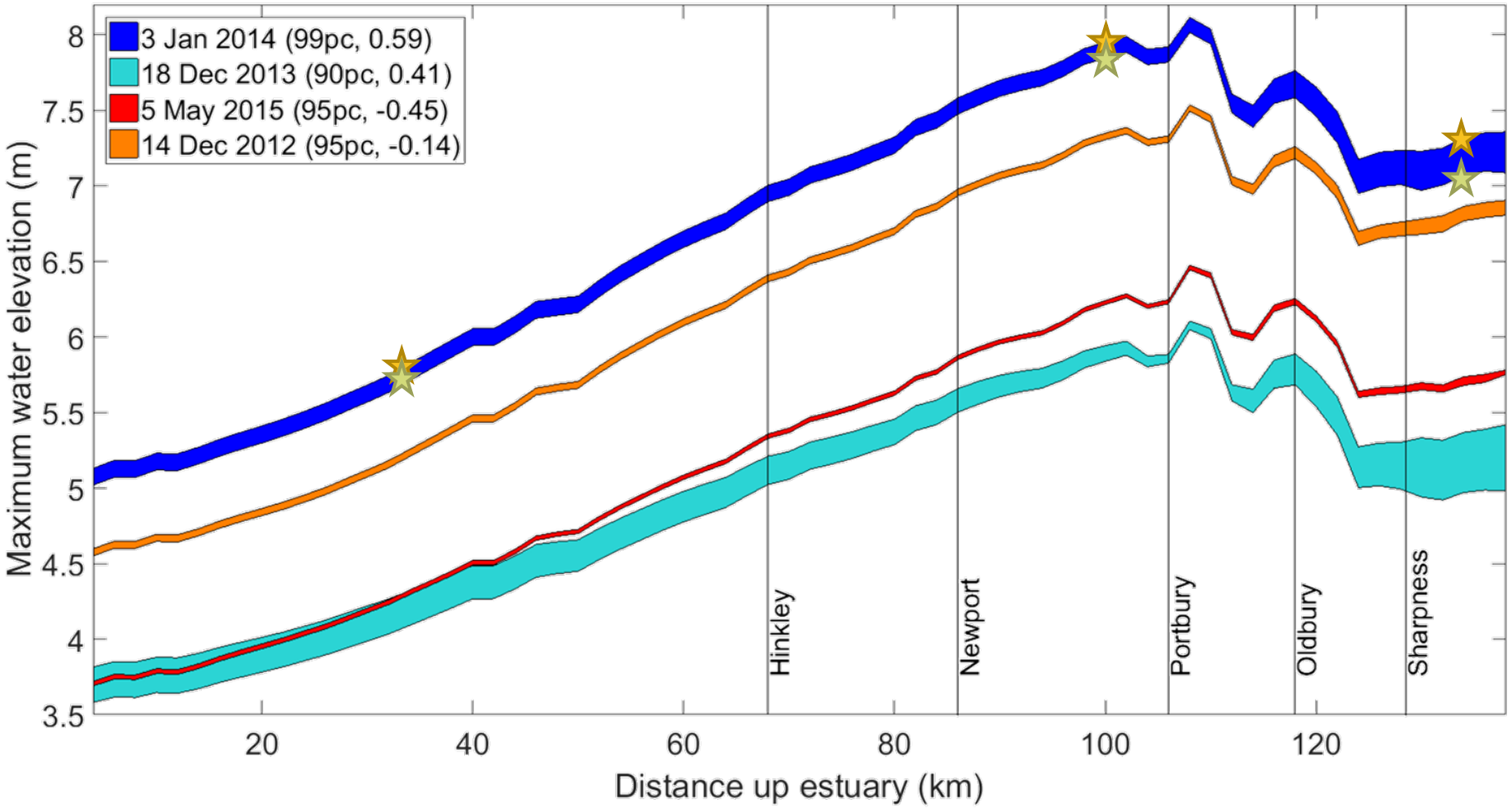




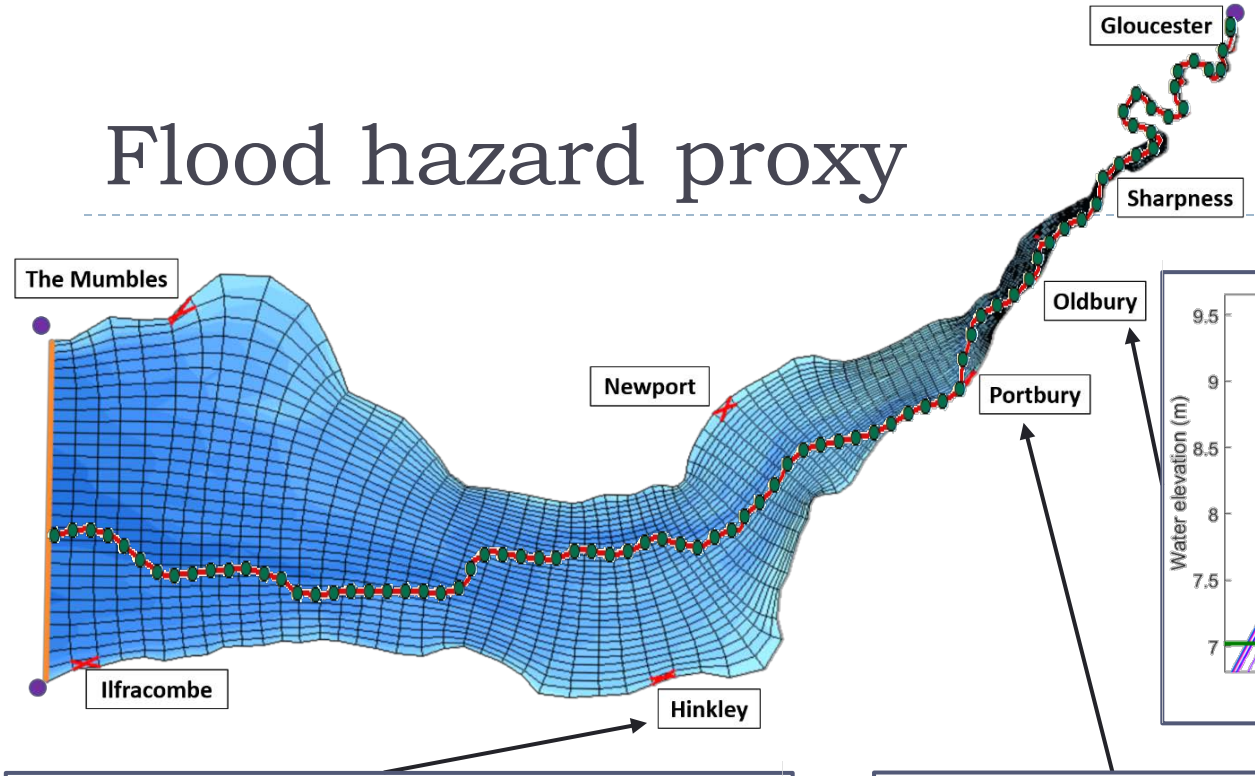


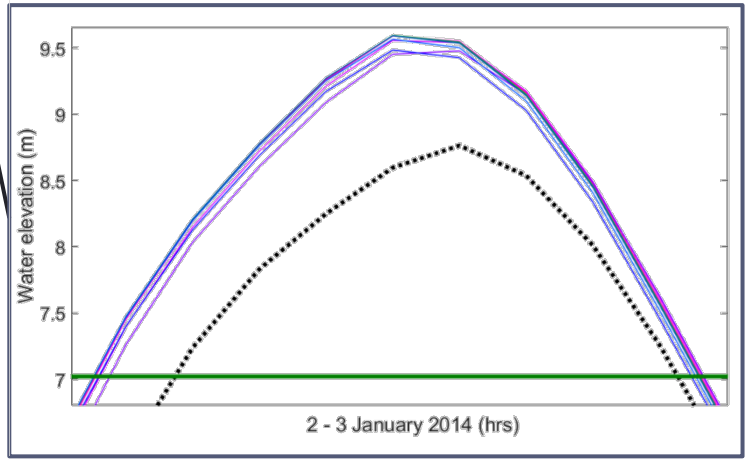


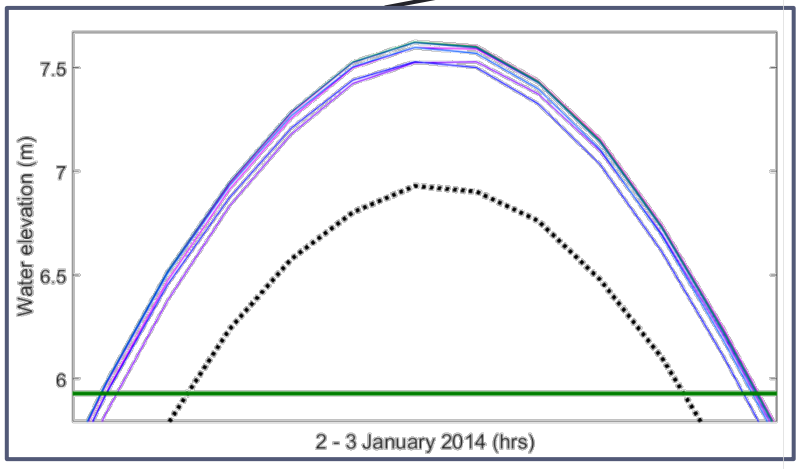
Maximum water elevation along estuary axis

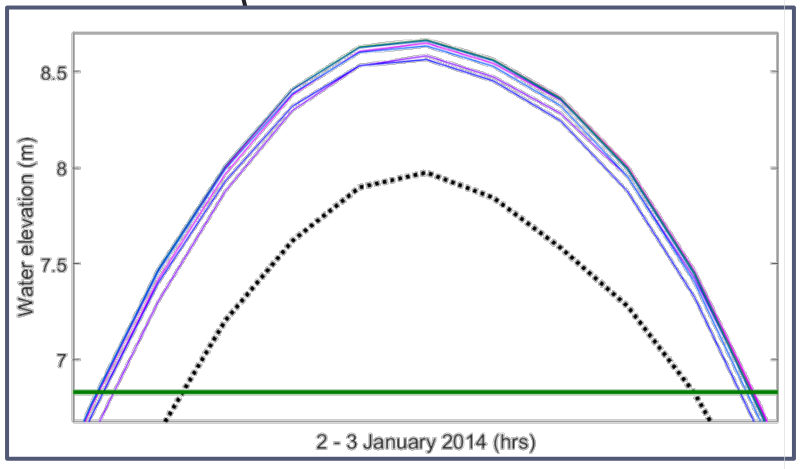


Flood hazard proxy



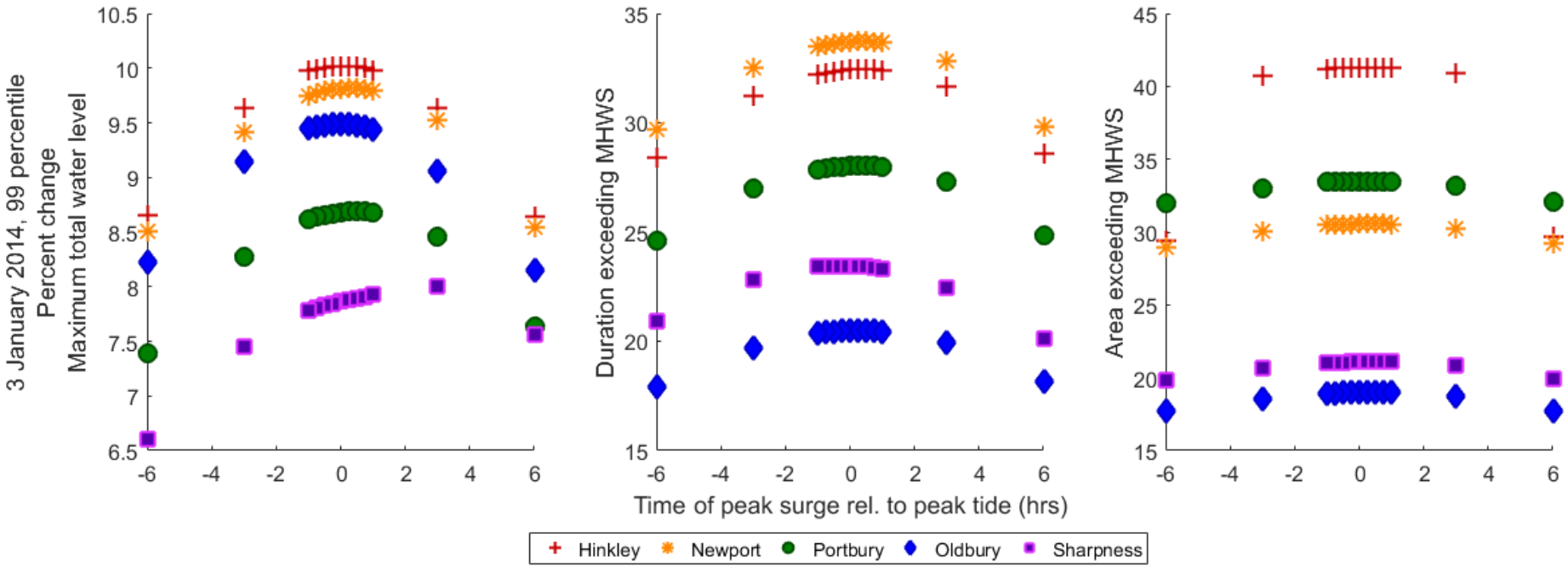






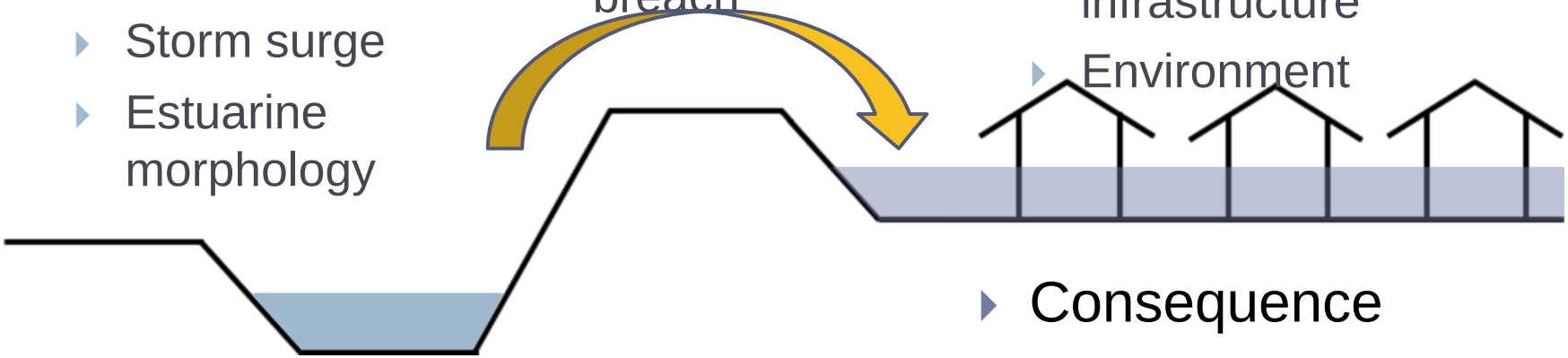
MHWST

Flood hazard proxy 3 January 2014



Source-Pathway-Receptor-Consequence

- Source
  - Storm surge
  - Estuarine morphology
- Pathway
  - Estuarine morphology
  - Floodplain
  - Defence breach
- Receptor
  - Communities
  - Industries & infrastructure
  - Environment
- Consequence
  - Material damage
  - Environmental degradation



HR Wallingford, 2001

Summary

- Severity of an event is most important when assessing hazard.
  - Plus a combination of storm surge asymmetry, timing of surge peak and estuary geometry.
- Site specific results can address local management needs.
- M ed t
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Severn Estuary, U.K

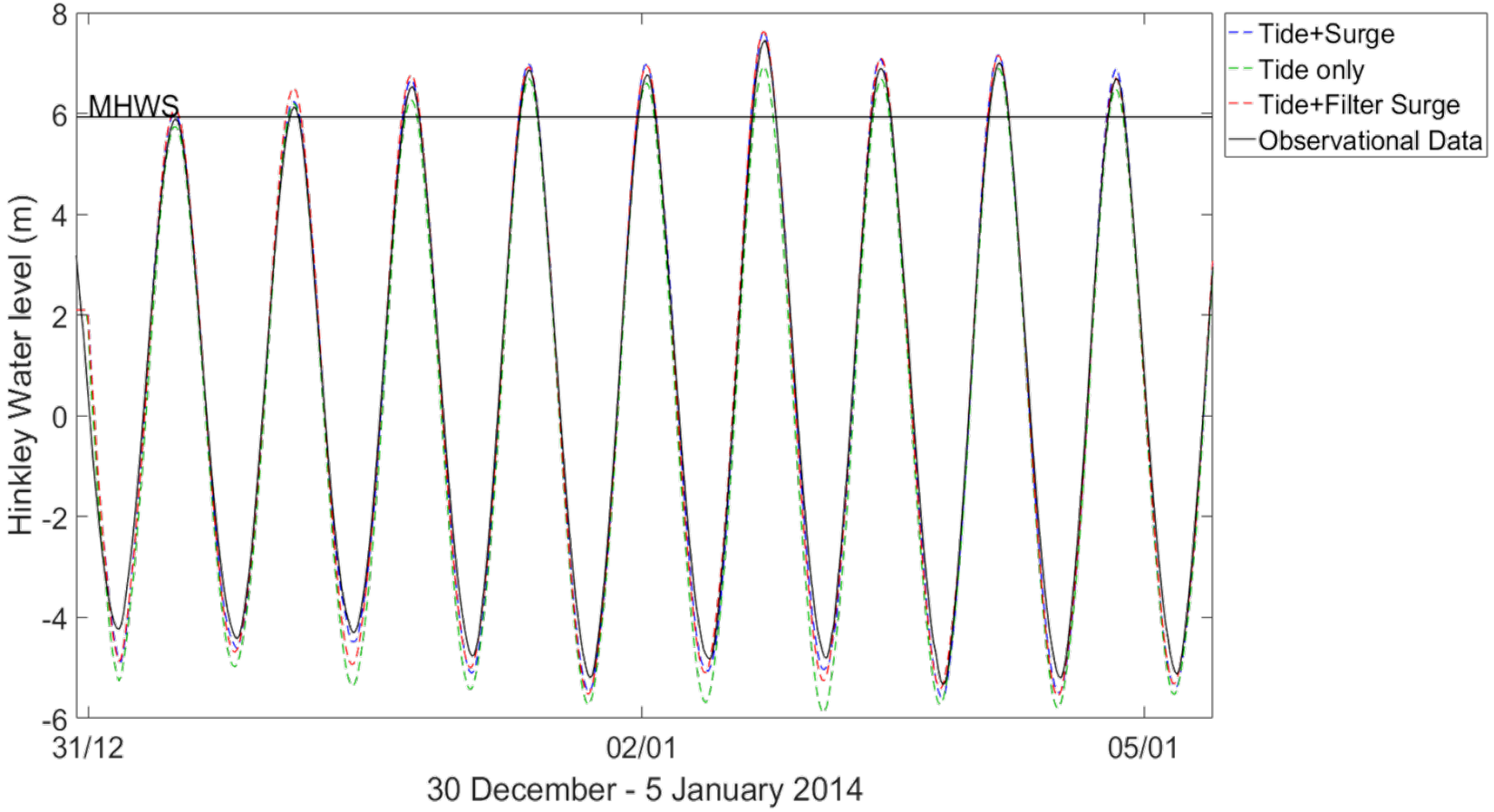
Oldbury-on-Severn, U.K

Thank you for listening

- Questions?

- Email: C.E.Lyddon@liverpool.ac.uk

Model validation – 3 January 2014



	Tide + Surge	Tide only	Tide + Filter Surge
R squared	0.99	0.91	0.95
Wilmott Index of Agreement	0.97	0.91	0.95

Low pass filter – 3 January 2014