

Towards a digital twin of the Salish Sea

Reduced-order modeling through machine learning

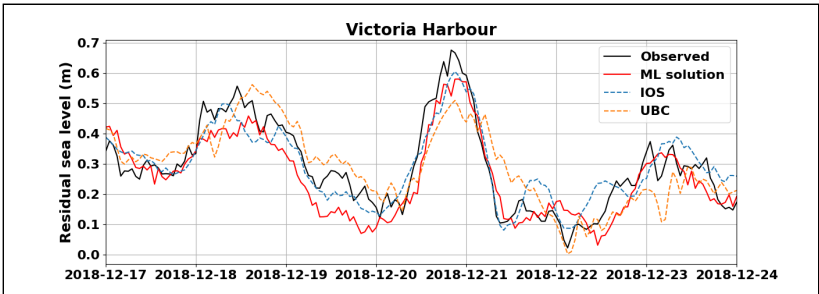
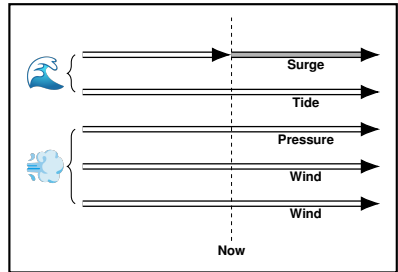
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Chatou, France

16 July 2025

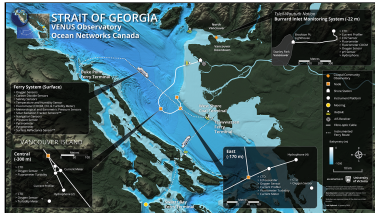
Storm surge prediction

Can we make useful predictions with machine learning?

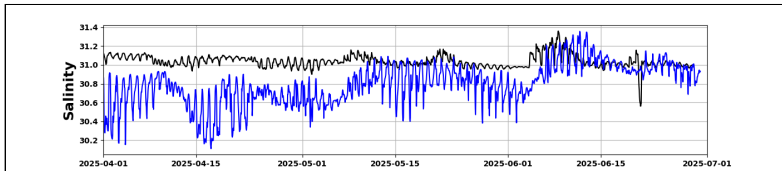
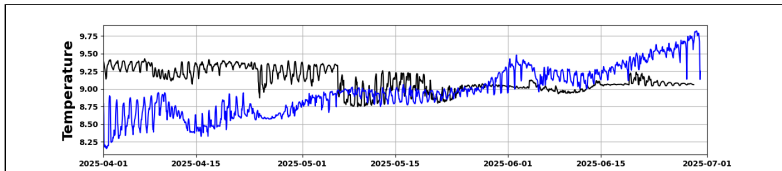


VENUS observations

Is there much spatial variability?

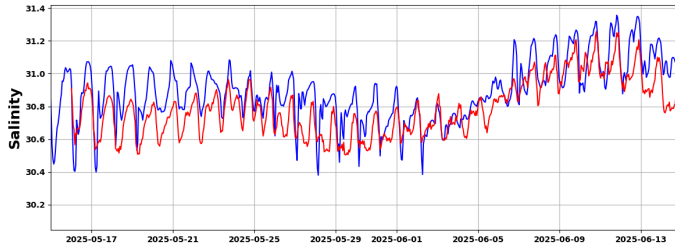
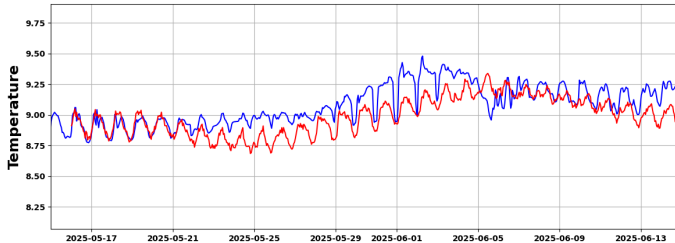


- VENUS Central
- VENUS East
- Prediction from T/S and current



Temperature and salinity

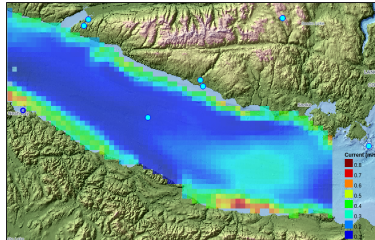
Do these reconstructions work for other properties?



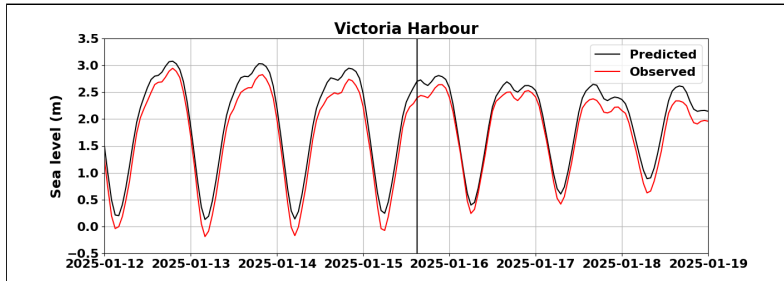
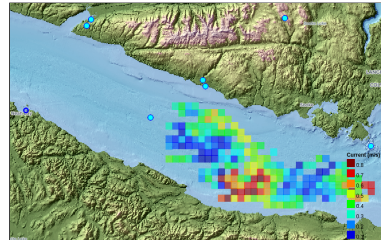
HF Radar

How accurate is this kind of reconstruction, or are more sensors needed?

ML approximation

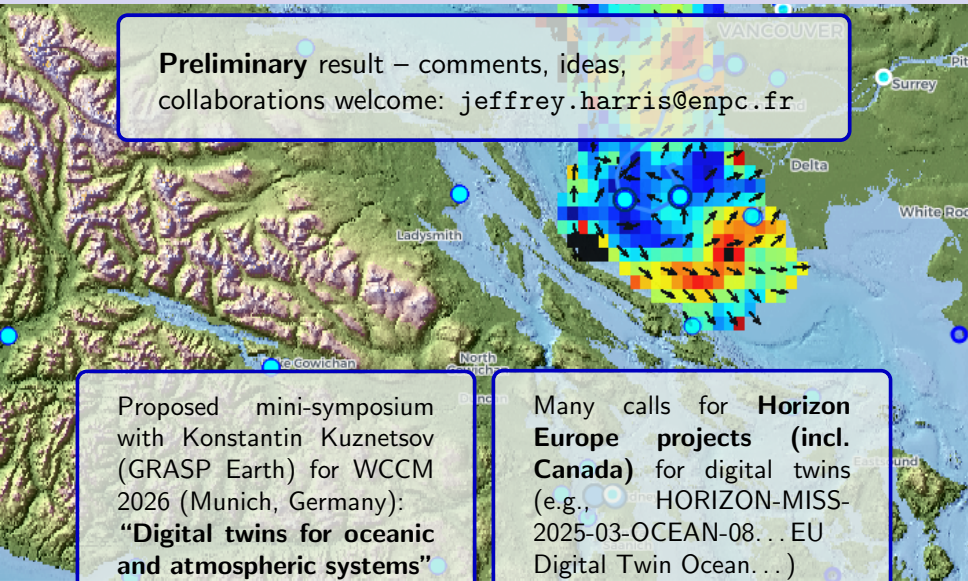


Observed



Online interactive demo

Can this contribute to a lightweight version of a digital twin?

A map of the Fraser River delta region, showing the river flowing from the mountains on the left into the Pacific Ocean on the right. Overlaid on the map is a heatmap with a color gradient from blue (low) to red (high), and a vector field of black arrows indicating flow direction. Several blue circular markers are placed on the map. The map includes labels for 'VANCOUVER', 'Surrey', 'Delta', 'White Rock', 'Ladysmith', 'North Cowichan', 'Gowichan', and 'Duncan'.

Preliminary result – comments, ideas,
collaborations welcome: jeffrey.harris@enpc.fr

Proposed mini-symposium
with Konstantin Kuznetsov
(GRASP Earth) for WCCM
2026 (Munich, Germany):
“**Digital twins for oceanic
and atmospheric systems**”

Many calls for **Horizon
Europe** projects (incl.
Canada) for digital twins
(e.g., HORIZON-MISS-
2025-03-OCEAN-08... EU
Digital Twin Ocean...)