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Regionalizing the Sea-level Budget Using a Neural Network Approach

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TU Delft

NIOZ Sea Level Centre

NWO

The Sea-level Budget

Manometric change

Barystatic → GMSL
GRD → regional

Observed sea-level change

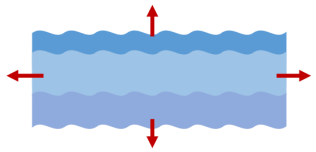
Satellite Altimetry

Tide gauge

=

Steric Change

Temperature Salinity



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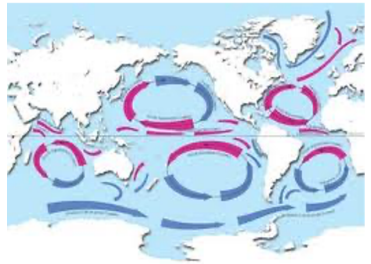
Dynamic Change



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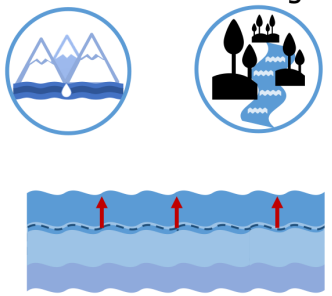
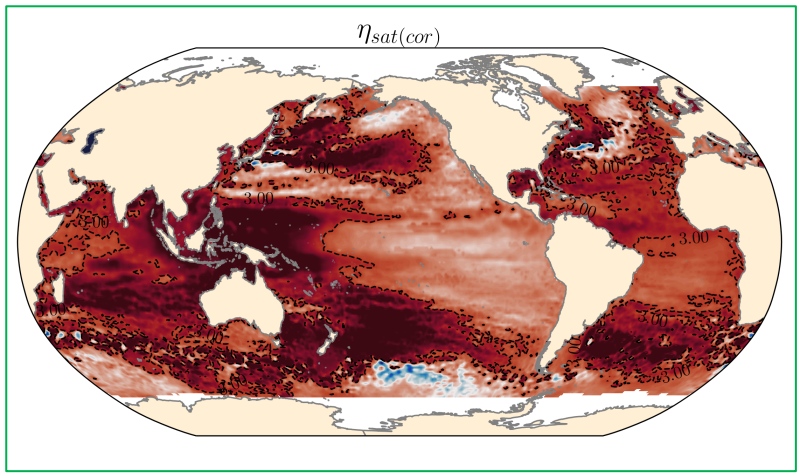
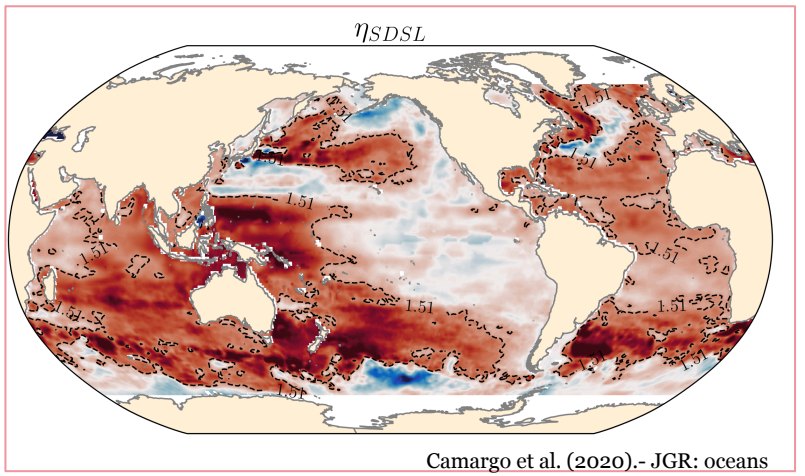
Mass Change

Melting Ice | Terrestrial Water Storage

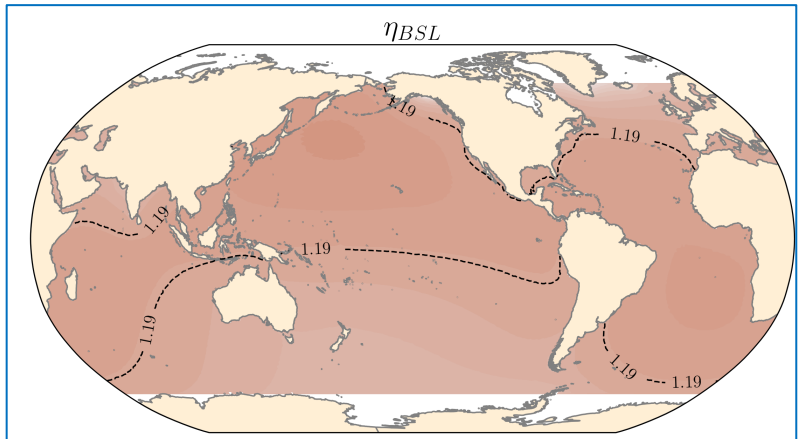


Sterodynamic change





Camargo et al. (2020).- JGR: oceans



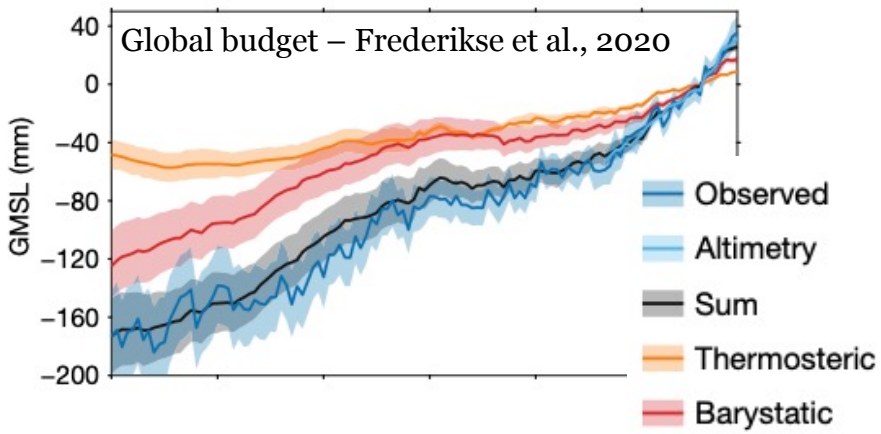
Camargo et al. (2021).- ESD

−4.4 −3.3 −2.2 −1.1 0.0 1.1 2.2 3.3 4.4

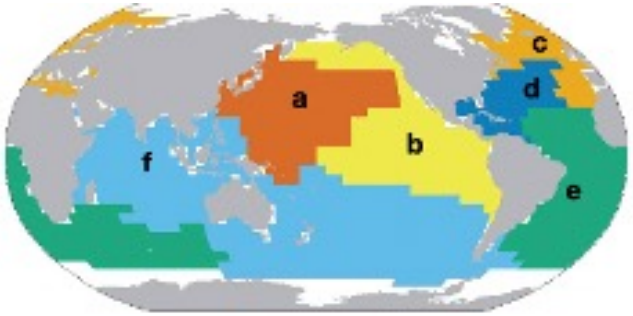
Trend 1993-2017 (mm/yr)

Can we close the sea-level budget?

Global ✓

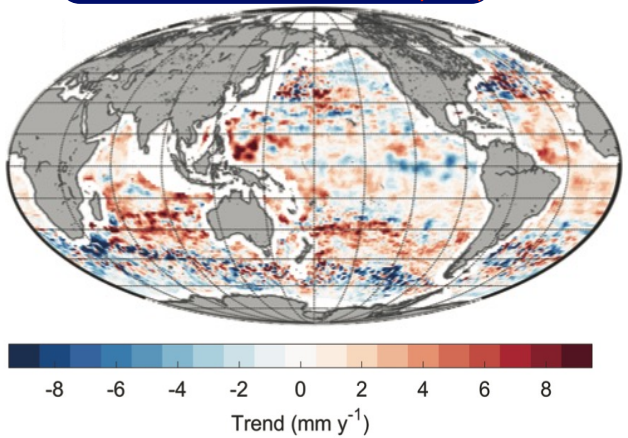


Basins ✓



Regional budget – Frederikse et al., 2020

1 degree ✗

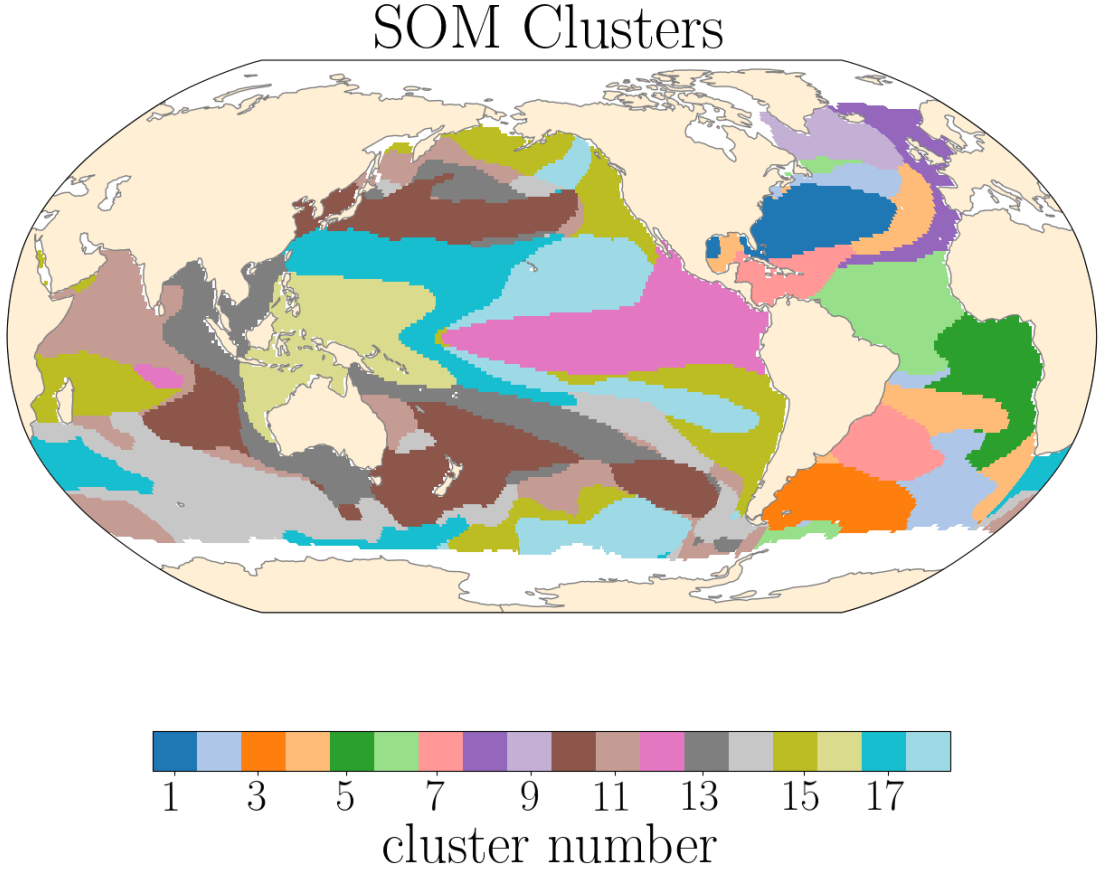


Regional budget – Royston et al., 2020

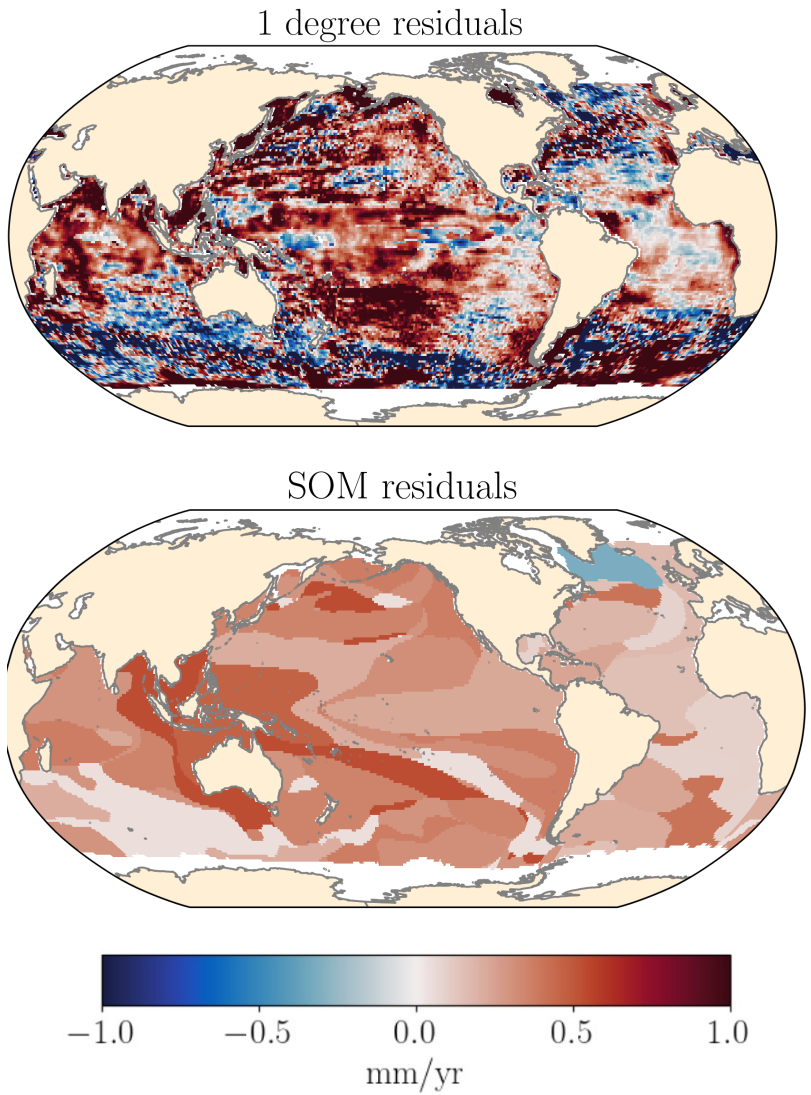
Can we find something in between?

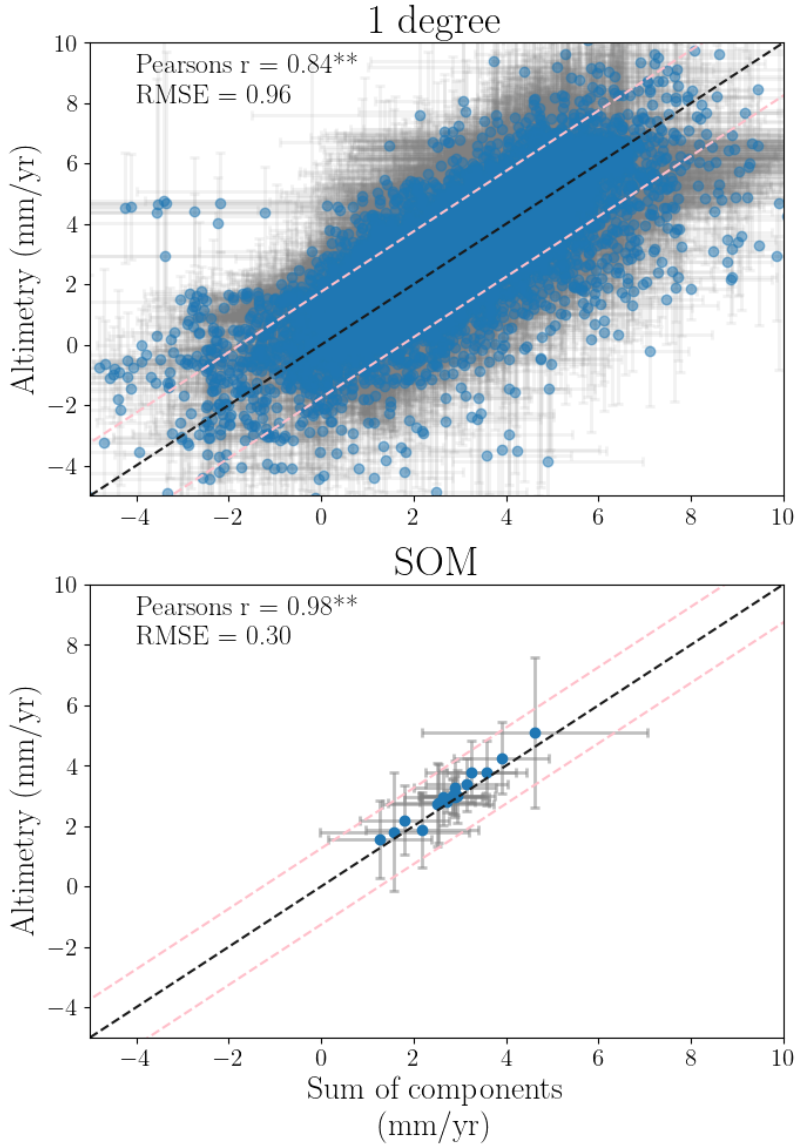
Self-Organizing Maps (SOM)

- Unsupervised learning neural network
- Feature extraction and pattern recognition
- **Regions of coherent sea-level variability**
- Input data: sea-surface height (SSH) from Altimetry (detrended, deseasonalised, filtered at 300km)
- Number of clusters (18) as input parameter

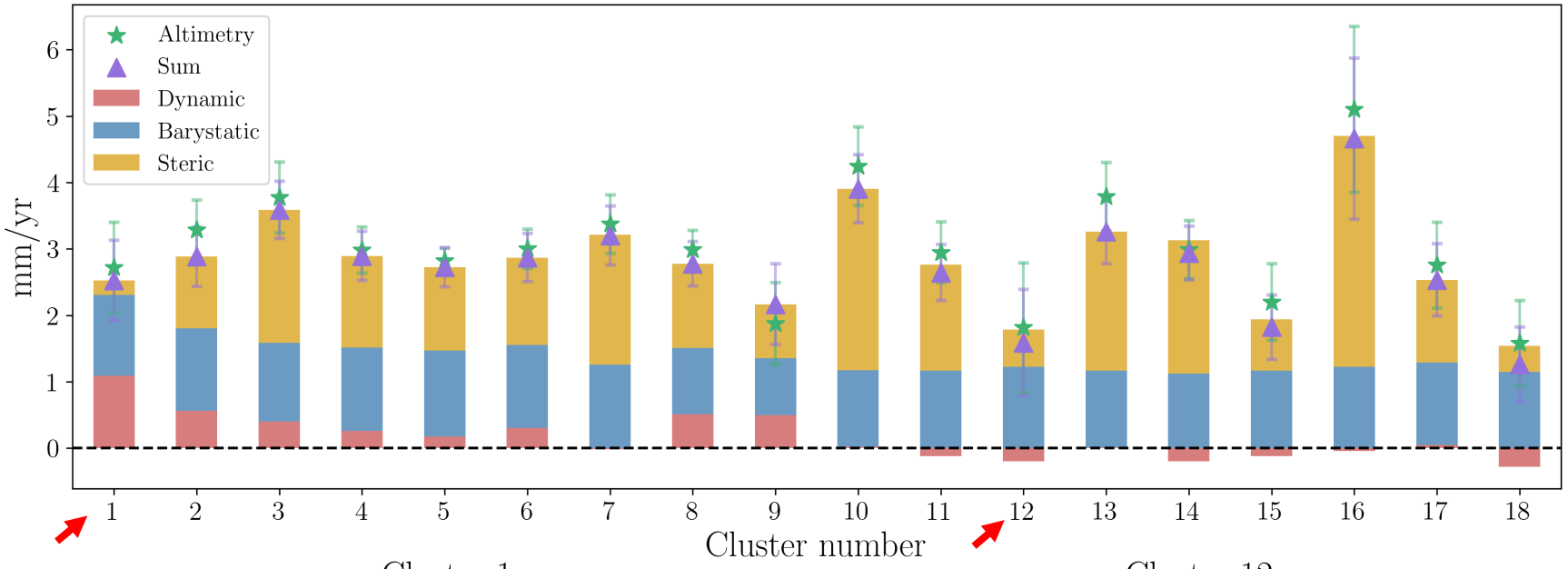


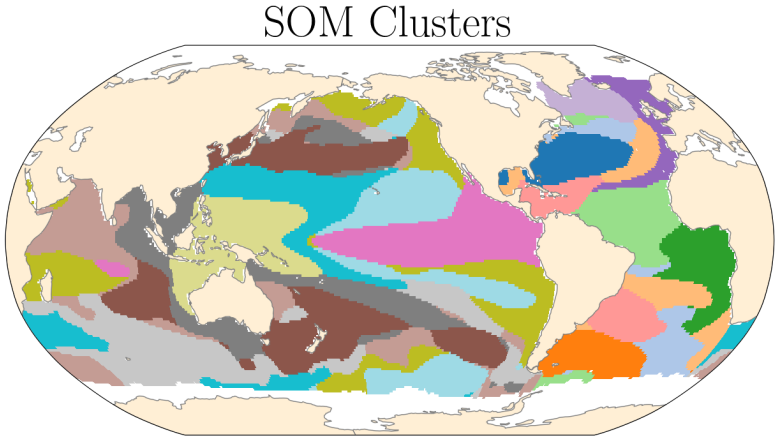
Closing the Regional Sea-level Budget

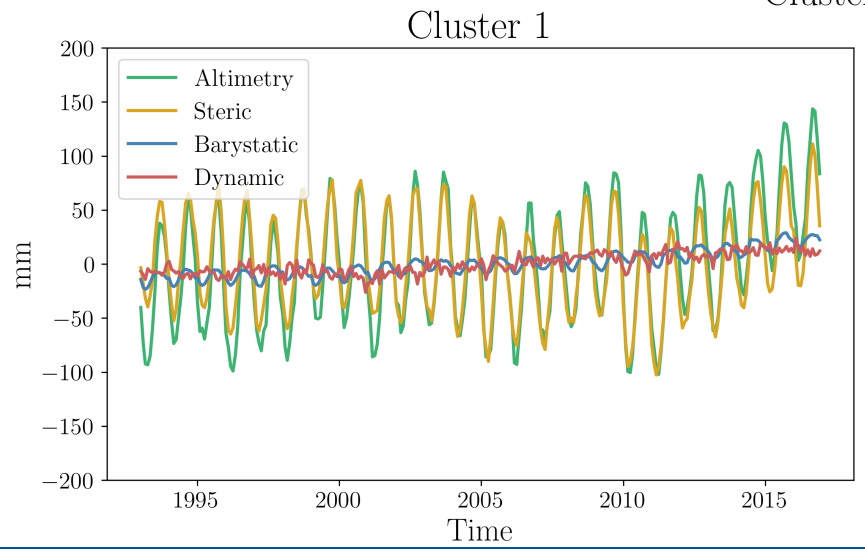


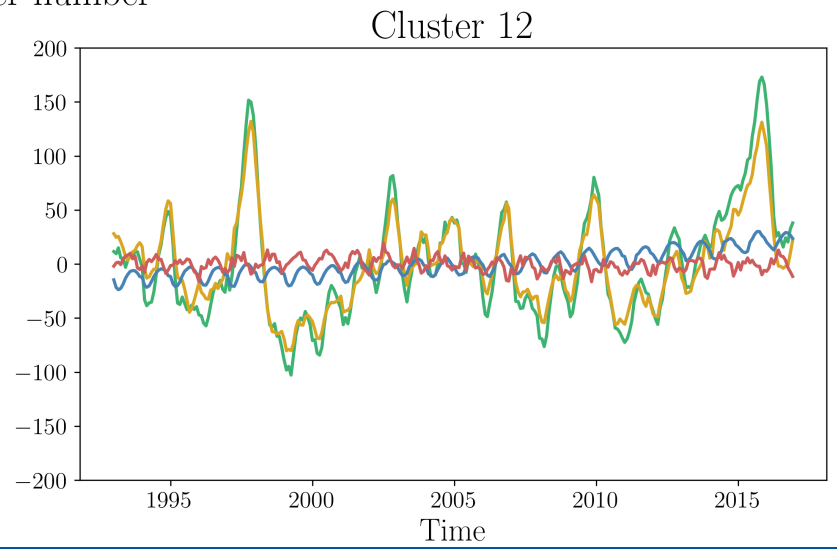


Dominant Drivers of the Budget



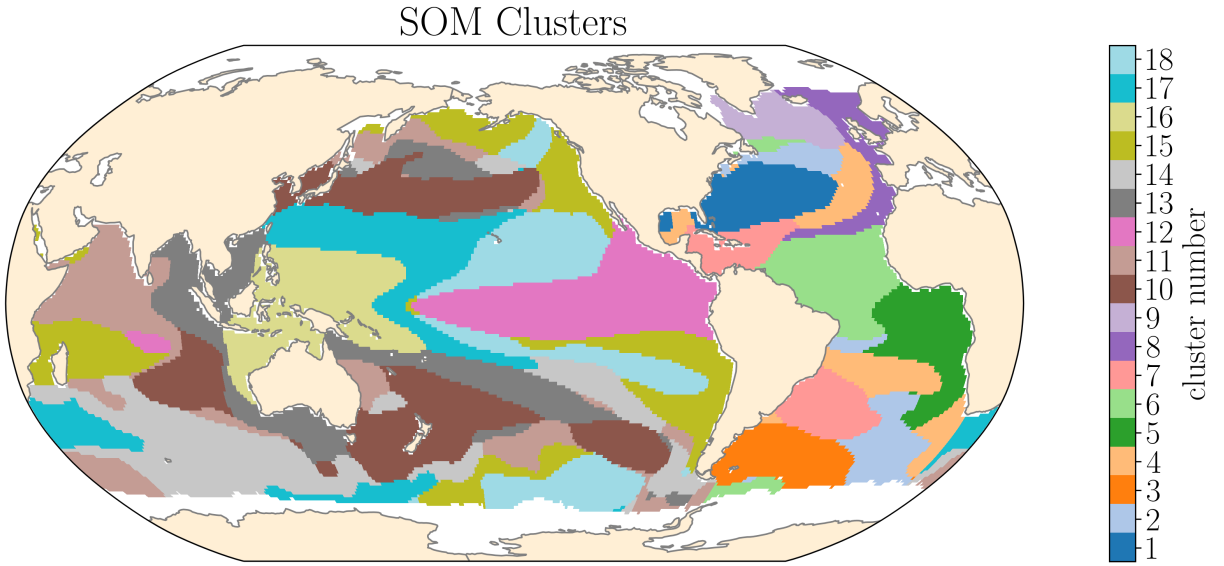






Take Home Messages

- Neural networks (SOM) identify regions of coherent sea-level variability
- These regions allow us to close the sea-level budget on a regional to local scale.



- Questions or want to know more?

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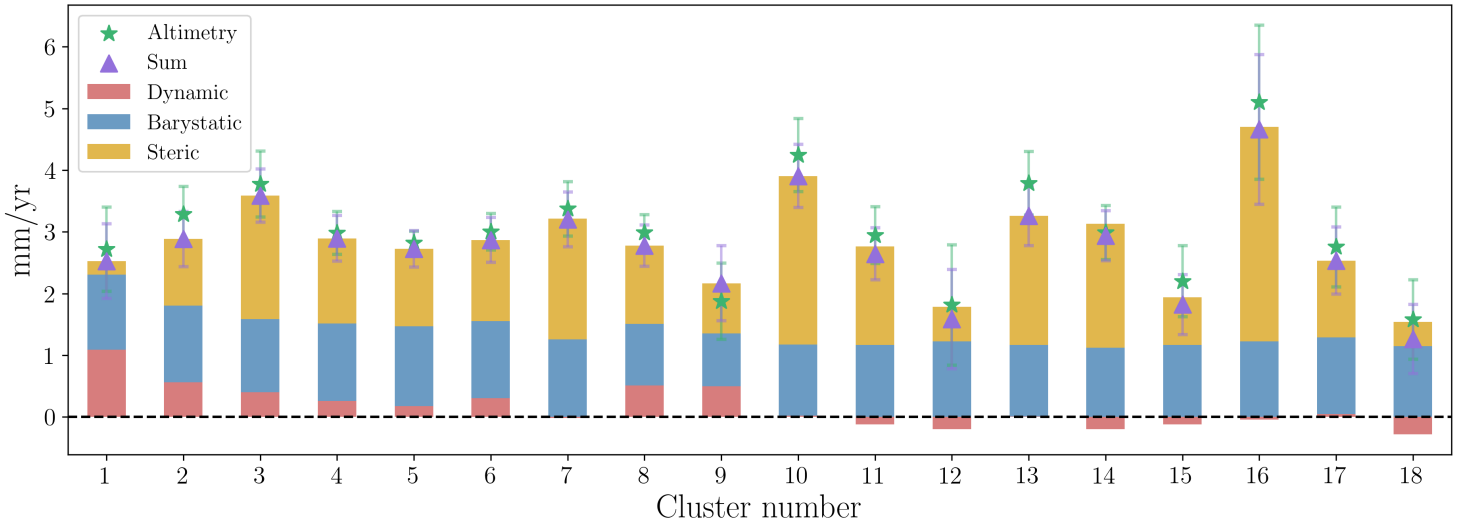

References

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