



National
Oceanography
Centre

Reliable Climate Projections in the Global Coastal Ocean

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Why worry about climate change in coastal-ocean?

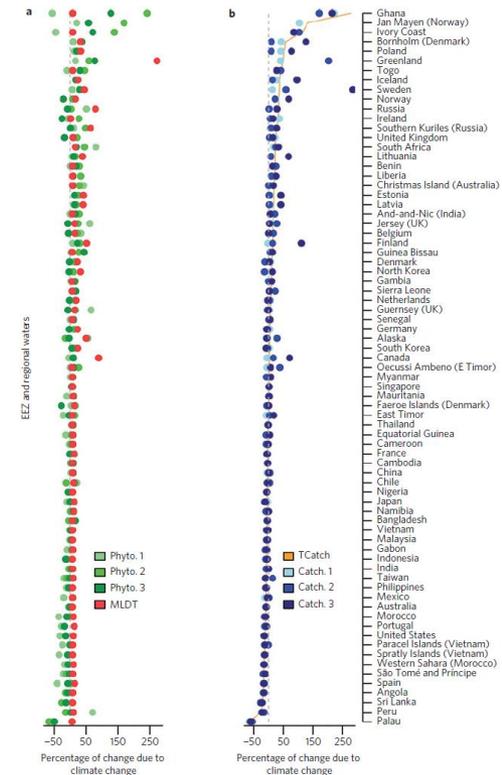
- A central question for planning and management in the coastal zone are what are the possible conditions 30-100 years into the future. Relating to:

- All aspects of the Blue Economy
 - Fisheries, tourism, renewable energy
- Ecosystem health and biodiversity
 - Ecosystem services
- Coastal hazards, resilience and adaptation
 - Coastal flooding, erosion
 - Sea level rise, surges, waves
- The expectation is that current global CMIP models behave (very) poorly in the coastal-ocean



NATURE CLIMATE CHANGE DOI: 10.1038/NCLIMATE2119

LETTERS



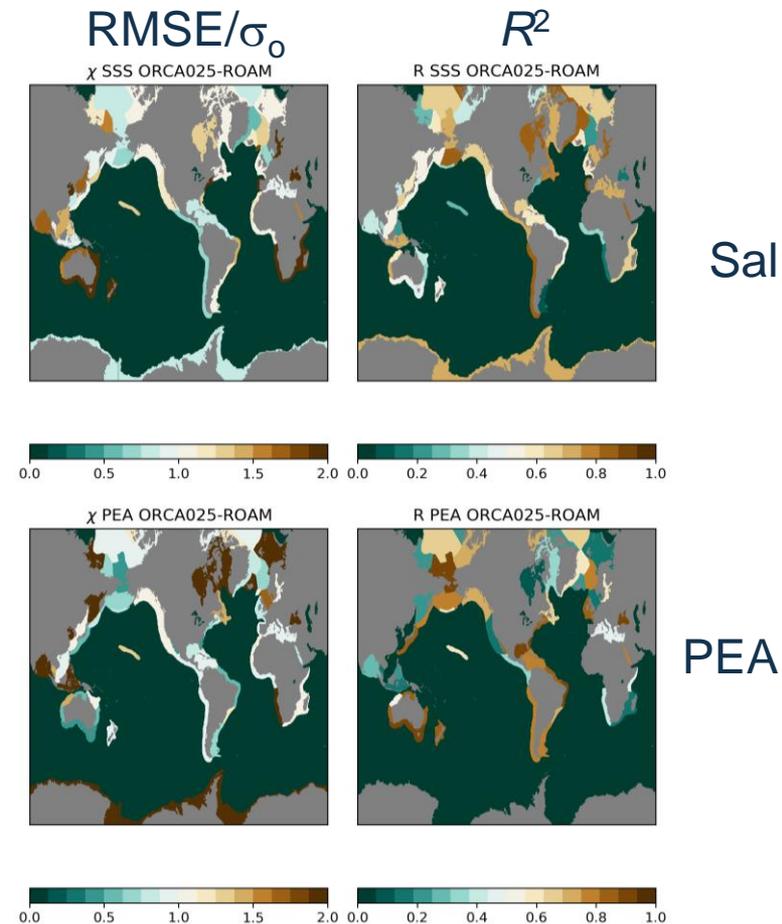
Barange et al 2014 <https://doi-org/10.1038/nclimate2119>

Solutions: Global Models

- Often the only available data
 - Where bespoke studies are not available (where vulnerabilities are highest)
- Understanding the behaviour of global models in the Global Coastal Ocean
 - Bespoke metrics relevant to shallow seas
 - Statistical/Data Science downscaling
- Improving global models in the GCO
 - Process representation
 - Tides, Rivers, Mixing/boundary layers
 - Resolution
 - Multi-scale approaches

Holt et al 2017 doi:10.5194/gmd-10-499-2017

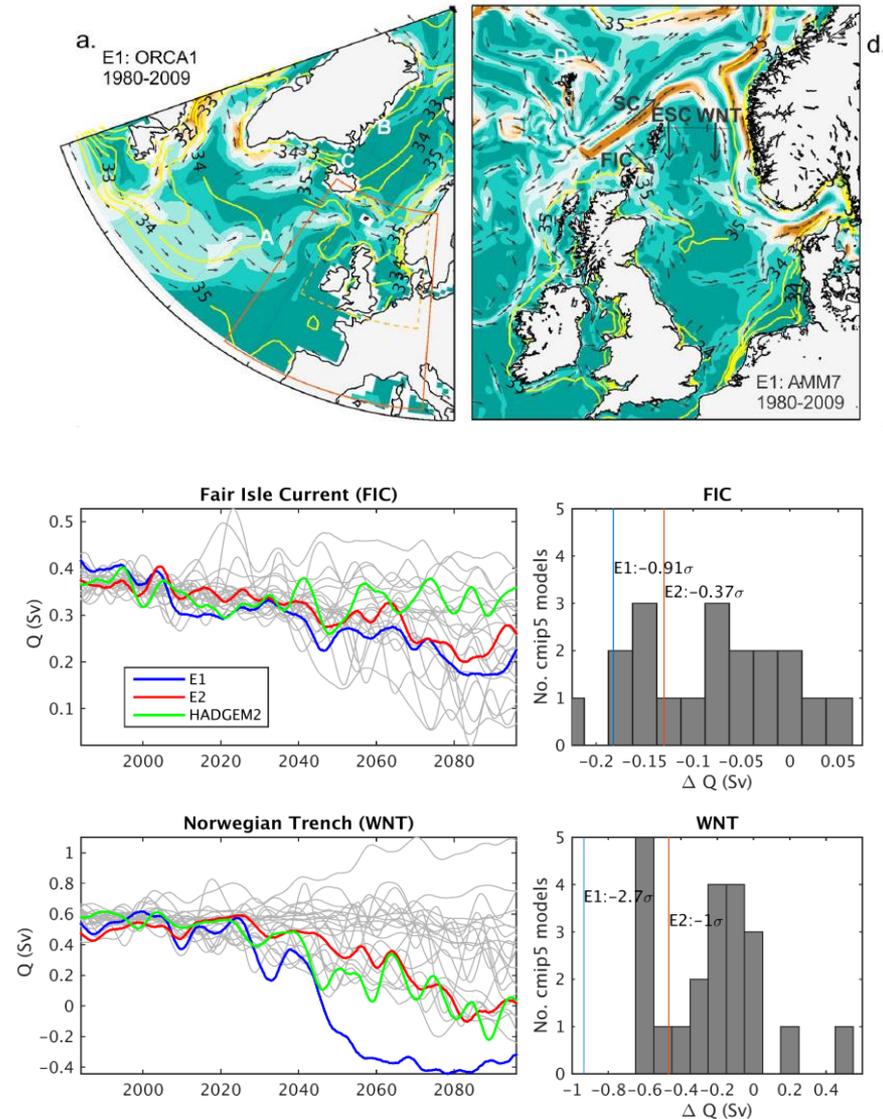
Global Model Assessment by LME



NEMO-ORCA025 v's EN4 profiles

Solutions: Downscaling

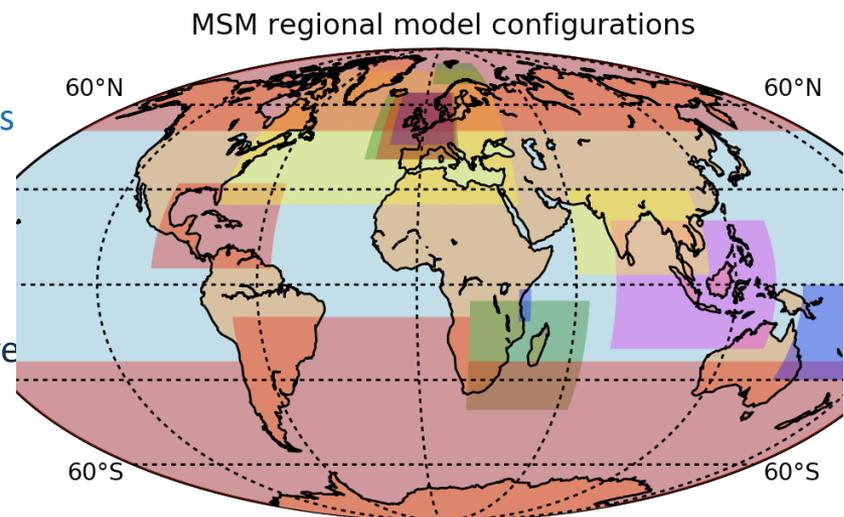
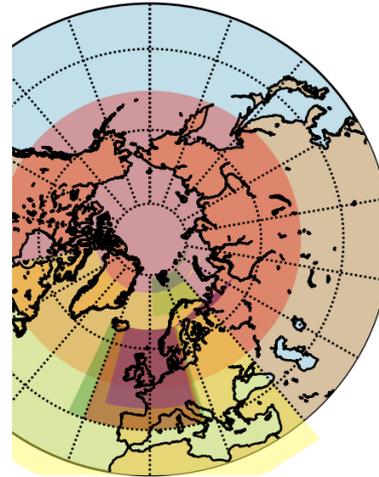
- Experiment design and uncertainty
 - Multiple layers of model uncertainty
 - Emissions uncertainty
 - Natural variability
 - Mixed dynamical-statistical approaches
- Regional-Systems Models
 - Air-Land-Sea-Waves coupling
- Process understanding
 - Vectors of change: atmosphere v's ocean
v's land
 - Climate surprises
- The human dimension
 - Disentangling direct human versus climatic drivers and impacts



Holt et al 2018 <https://doi.org/10.1029/2018GL078878>

Outcomes

1. Understanding the performance of coastal ocean future climate projections
 - Global/CMIP
 - Downscaled and RESM models
 - Driver-response interactions
2. Protocols for using of global models in the coastal ocean
 - Sources of uncertainty and how to mitigate
 - Sharing experiment design and analysis tools
 - Capacity building (e.g. light-weight approaches)
3. An engaged community of coastal-ocean future climate model practitioners
 - towards a Coastal-Ocean MIP



Thank you for listening