Over the past decade, scientific and societal interest in the relationship between AMOC and USEC sea level have been addressed by a wealth of research studies, both model- and observationally-based. This poster highlights some of the conclusions of a recently-submitted review paper.

### Motivation

United States east coast (USEC) sea level rise is already having adverse environmental, societal, and economic consequences. Looking forward through the 21st century, regional ocean dynamics related to the Atlantic Meridional Overturning Circulation (AMOC) have the potential to drive disproportionately high rates of coastal sea level rise along the US east coast relative to other locations (i.e., “sea-level rise hotspots”).

### The AMOC-sea level relationship in CMIP5 RCP 4.5 simulations

- **Figure a**: Change in maximum AMOC strength for a 25-CMIP5 model, RCP4.5, 50% ensemble.*** Results 1970-2000 to 2070-2100, as calculated by Osei et al. (2015). Values are for December, January, and February (DJF) change against the 1975-1999 reference period. The 95% pathwise credible intervals are determined by a Dirichlet process mixture of normals distribution.

- **Figure b**: Schematic of key AMOC-related components of the North Atlantic Ocean (adapted from Gl Açius-Kidston et al., 2019). Abbreviations are as follows: NAC = North Atlantic Current; IC = Irminger Current; LC = Labrador Current; NAC = North Atlantic Current; DWBC = Deep Western Boundary Current. Three source areas for M2 are noted: LSD=Large-Scale Water; OSN=Northern Subtropical Overflow Water; OSM=Southern Midscale Overflow Water. Box indicates the USEC region.

### Conclusions

- **Numerical models and theoretical considerations support an anti-phase relationship between AMOC strength and dynamic sea level along the US east coast.**
- **However, the amplitude and pattern of sea-level variability associated with AMOC variations is forcing-, timescale-, location-, and model-dependent.**
- **Observational analyses focusing on shorter (generally less than decadal) timescales show robust relationships between some components of the North Atlantic large-scale circulation and coastal sea-level variability, but the causal relationships between different observational metrics, AMOC, and sea level are often unclear.**

### Ways forward

New research, and the incorporation of existing research, that seeks to understand:

- Relationships between AMOC and its component currents
- The role of ageostrophic processes near the coast
- The interplay of local (continental-shelf) and remote forcing
- Causal drivers of AMOC changes (e.g. wind vs. buoyancy forcing)

### Observations

- **OSNAP array: perspective on AMOC's meridional coherence (Lezuler et al. 2017)**
- **New campaigns over the USEC shelf and slope (Gawarkiewicz et al. 2018)**

### Models

- **Broadening metrics of ocean circulation beyond the maximum AMOC strength**
- **High-resolution simulations**
- **Assessment of momentum budgets**

### The AMOC-sea level relationship in observations

**Direct AMOC monitoring only available since 2004**

- **Guido et al. (2015) find a relationship with interannual AMOC anomalies.**
- **Pacan et al. 2015 and Panchuk et al. 2016 show this is largely due to local atmospheric forcing;** Pacan et al. (in press) show that correlation arises from local atmospheric mechanisms (of spatially correlated interannual AMOC anomalies). We shall refer to this local atmospheric mechanism as a "sea-level-generating anomaly" (SLG) as opposed to an AMOC-driven component of sea-level variability.
- **Indirect evidence ("proxy")**
  - Florida current/Gulf Stream strength (e.g. Park and Sweet 2013; Euer 2013)
  - Gulf Stream North Wall (e.g. Kopf et al. 2013, McCourt et al. 2015)
  - SPC heat content and density differences (McCarty et al. 2015; Freidman et al. 2017)
- **All indirect evidence relies on a (generally model-derived) relationship between AMOC proxies and AMOC strength**

### References

[Insert references here]