**Research Question**
- Mesoscale eddies detected by sea surface height (SSH) fields have been observed to display coherent temperature (SST) structures, which lead to the term of *SSH-SST coherent eddies*. For example,
  - AEs -> SSHA+ -> SSTA+
  - CEs -> SSHA- -> SSTA-

- However, recent statistics have shown that ~20% eddies are unconventionally warm CEs and cold AEs (e.g., Moschos et al., 2022), which refer to the definition of *SSH-SST incoherent eddies*. For example,
  - AEs -> SSHA+ -> SSTA-
  - CEs -> SSHA- -> SSTA+

- In this study, we focus on proportions and mechanisms of both eddy types in the North Indian Ocean to understand air-sea coupling induced by eddies.

**Signature of mesoscale eddies on air-sea heat fluxes: strong compensation between SSH-SST coherent and incoherent eddies**

Yanxu Chen and Lisan Yu
Woods Hole Oceanographic Institution
Contact: yanxu.chen@whoi.edu

**Data and methods**

- **Data:**
  - The air-sea flux datasets are sourced from OAFlux2, the second generation of OAFlux sponsored by NASA’s MEaSUREs program (Yu, 2023). These datasets consist of 1/4 degree gridded satellite-derived products, including turbulent heat fluxes, wind and wind stress etc.

- **Procedure:**
  1. For time: apply a band-pass Butterworth window to preserve 7-90 days.
  2. For space: employ a moving average Hann window to filter spatial scales larger than 600 km.
  3. Subtract the large scale from time-filtered maps to obtain anomaly signals of the mesoscale.

**Conclusions**


- Semi-annual reversal of monsoon winds influences the proportion of coherent and incoherent eddies.

- The combination of coherent and incoherent eddies leads to:
  1. monopolar structure similar to coherent eddies;
  2. compensation resulting in null net flux;
  3. dipolar pattern known as eddy-stirring effect.

- Mechanisms of incoherent eddies might include:
  1. continuous air-sea heat exchange along eddy pathways;
  2. subsurface diffusion below the mixed layer;
  3. interior mode waters resulted from water mass subduction.

This study is supported by NOAA Ocean Observing and Monitoring Division and NASA MEaSUREs (the Making Earth Science Data Records for Use in Research Environments) program.

**References:**
Chen and Yu, 2023: Signature of mesoscale eddies on air-sea heat fluxes in the North Indian Ocean (in prep).