Investigating the Impact of Tropical Cyclones on the Ocean Surface Mixed Layer

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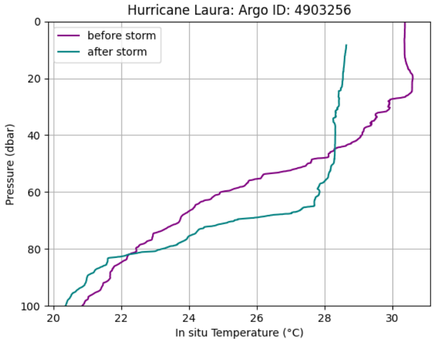
Objectives

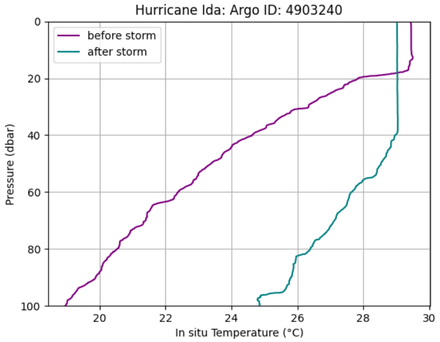
- Analyze ocean subsurface temperature and structure changes due to the passage of tropical cyclones using in situ ocean data from Argo floats.
- Evaluate the skill of different mixed layer identification algorithms for identifying the true ocean mixed layer depth in ocean profile data.

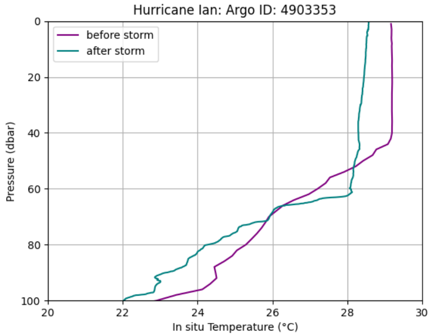
Ocean heat content = amount of heat energy stored in the ocean

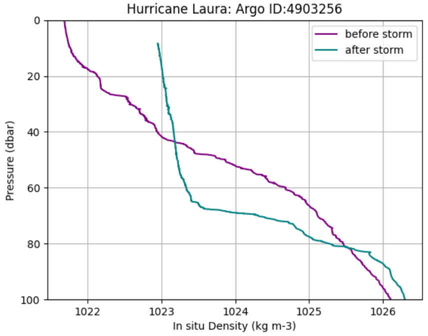
$$Ocean\ Heat\ Content = c_p \int_{Mixed\ Layer\ Depth}^{Ocean\ Surface} \rho(z)T(z)dz$$

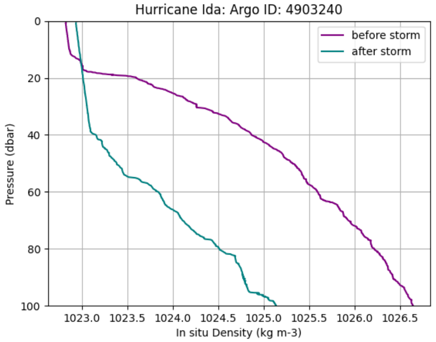
OHC in Mixed Layer:	Before Storm	After Storm
Hurricane Laura (2020)	2.96×10^9 J m^{-2}	6.50×10^9 J m^{-2}
Hurricane Ida (2021)	1.64×10^9 J m^{-2}	4.73×10^9 J m^{-2}
Hurricane Ian (2022)	4.62×10^9 J m^{-2}	6.79×10^9 J m^{-2}

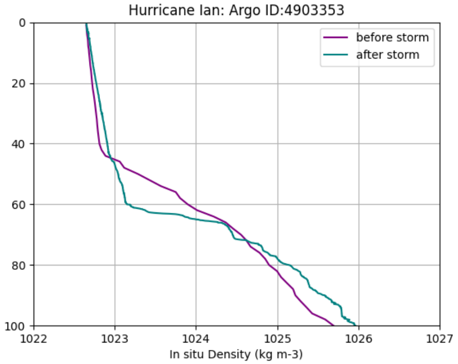












Results

- **For all storms:** 1) Mixed layer (ML) is deeper after storm due to wind-driven mixing.
  2) Best-performing MLD identification method switches after storm.
  3) ML OHC increased substantially due to the storm despite surface waters cooling.
- **Hurricane Laura profiles:** ML salinity increased after storm (likely due to wind-driven mixing)
- **Hurricane Ida/Ian profiles**: ML salinity decreased after storm (likely due to precipitation)