

AS205:Ocean Dynamics(Assignment 3)

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Introduction

We describe the seasonal mixed layer depth of North Indian Ocean using two criterias: Temperature and Density. The difference of the two mixed layer calculated by both the criterias gives us the barrier layer thickness.

Datasets

The datasets used in this analysis is as follows:

- **Potential temperature** : WOA18(World Ocean Atlas) data.
- **Density** : WOA18(World Ocean Atlas) data.

Methodology

The datasets are choosen for the domain of $40^{\circ}E$ to $100^{\circ}E$ and $0^{\circ}N$ to $25^{\circ}N$. This covers the North Indian ocean. We then calculate the seasonal mean with the following seasons:

- **Summer Monsoon** : June, July, August, September(JJAS)
- **Winter Monsoon** : November, December, January, February(NDJF)

The temperature criteria gives us a mixed layer depth called isothermal layer depth(ILD). This is determined as the depth at which the temperature difference from the 10m depth is greater than 0.2° .

The density criteria gives us a depth that is such that the density is $0.125kg/m^3$ more than that at 10m depth. The difference in the mixed layer calculated by above two criterias gives us the barrier layer thickness.

Summer

- The seasonal mean mixed layer calculated for summer by both criterias is shown in Figure 1,2.
- We see that the mixed layer depth given by both criterias is greater in Arabian Sea than Bay of Bengal.
- The barrier layer thickness is greater in Bay of Bengal than the Arabian sea in line with observations.

Winter

- The seasonal mean mixed layer calculated for winter by both criterias is shown in Figure 4,5.
- We see that the mixed layer depth given by density criteria is greater in Arabian Sea as compared to Bay of Bengal.
- The temperature criteria gives a deeper isothermal layer in Bay of Bengal.
- The barrier layer thickness is greater in Bay of Bengal as compared to Arabian Sea.

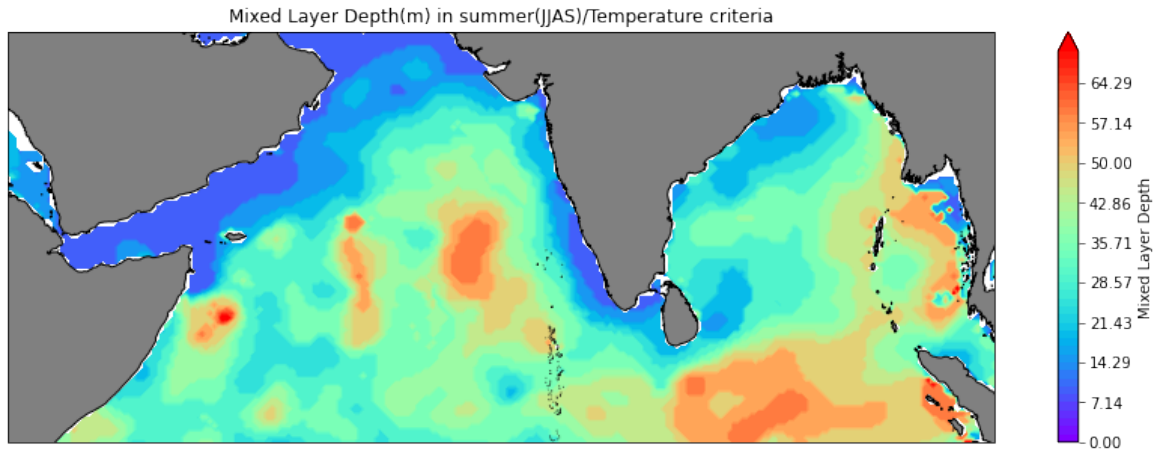


Figure 1: Mixed layer depth(temperature criteria) in summer in m

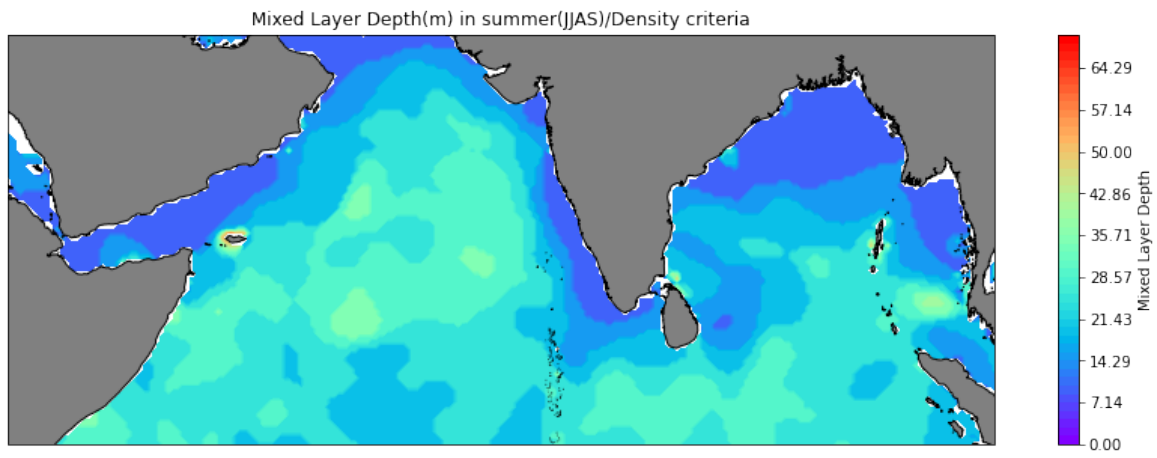


Figure 2: Mixed layer depth(density criteria) in summer in m

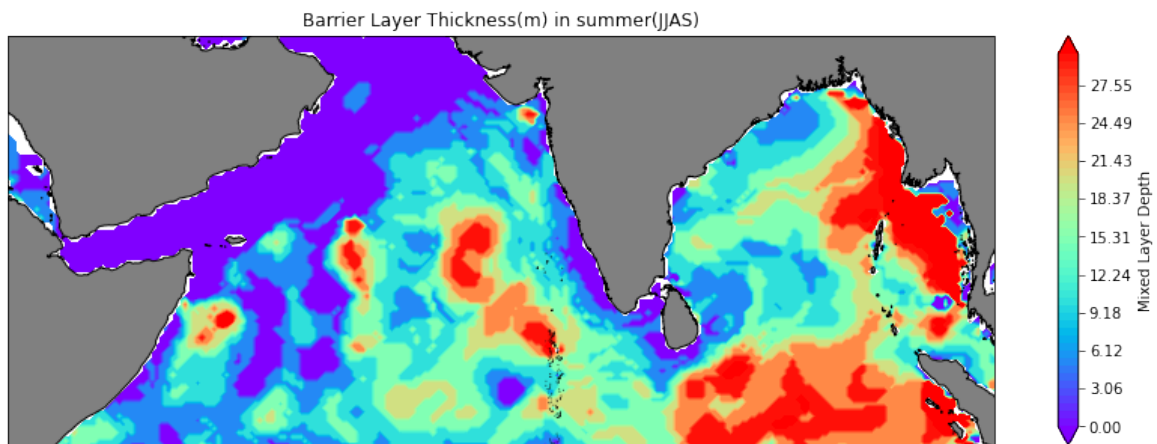


Figure 3: Barrier layer thickness in summer in m

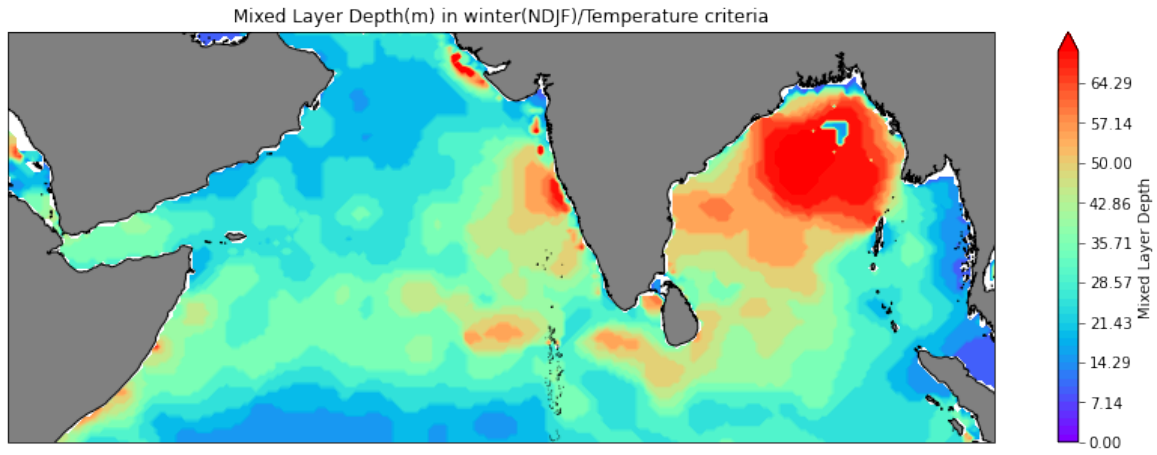


Figure 4: Mixed layer depth(temperature criteria) in winter in m

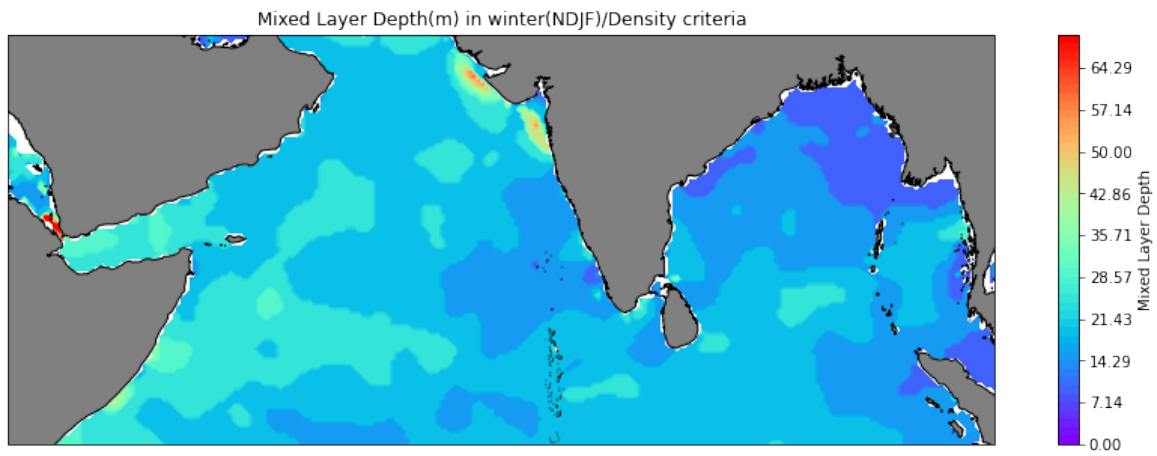


Figure 5: Mixed layer depth(density criteria) in winter in m

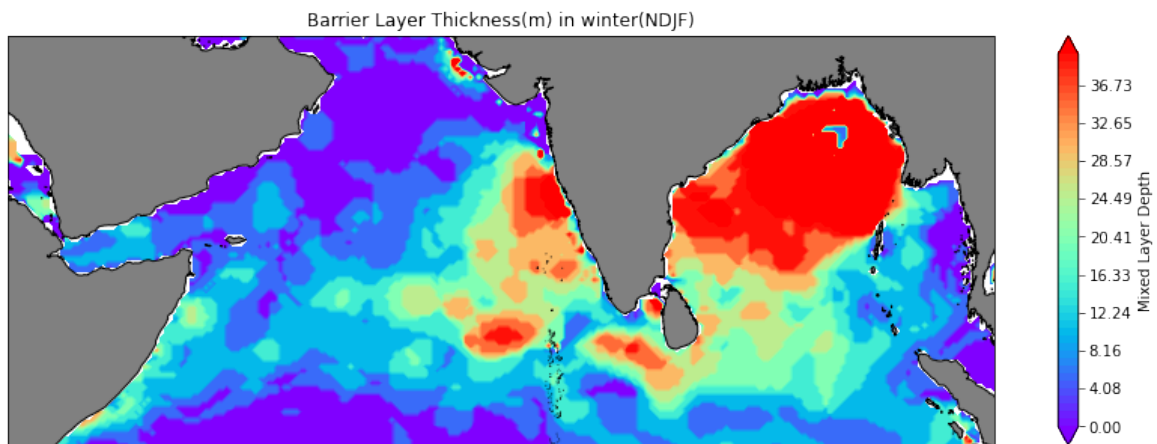


Figure 6: Barrier layer thickness in winter in m

Conclusions

- We compared the seasonal means of mixed layer depth of North Indian Ocean by two different criterias.
- The calculations match the observations.