March 22, 2024

I08S 2024, weekly update #4: “Indian Ocean Dodgeball”

As you might recall from last week’s update, weather was not kind to us as we approached the furious 50s on our way out of the Kerguelen plateau. From March 8 to 14, we were pinned down by three storms in a row and were unable to work for four days out of this seven-day period (Fig. 1). We were knocked out cold with a strong uppercut from the first storm on March 8-9. The second storm threw a good jab at us again on March 11, stirring seas that were still elevated from the previous storm. Having learned our lesson, we “rope-a-doped” the third storm, ducking under it on a southward track to do four casts on its southeastern flank and going safely around its western backside on March 14, not losing time compared to another head-to-head confrontation.

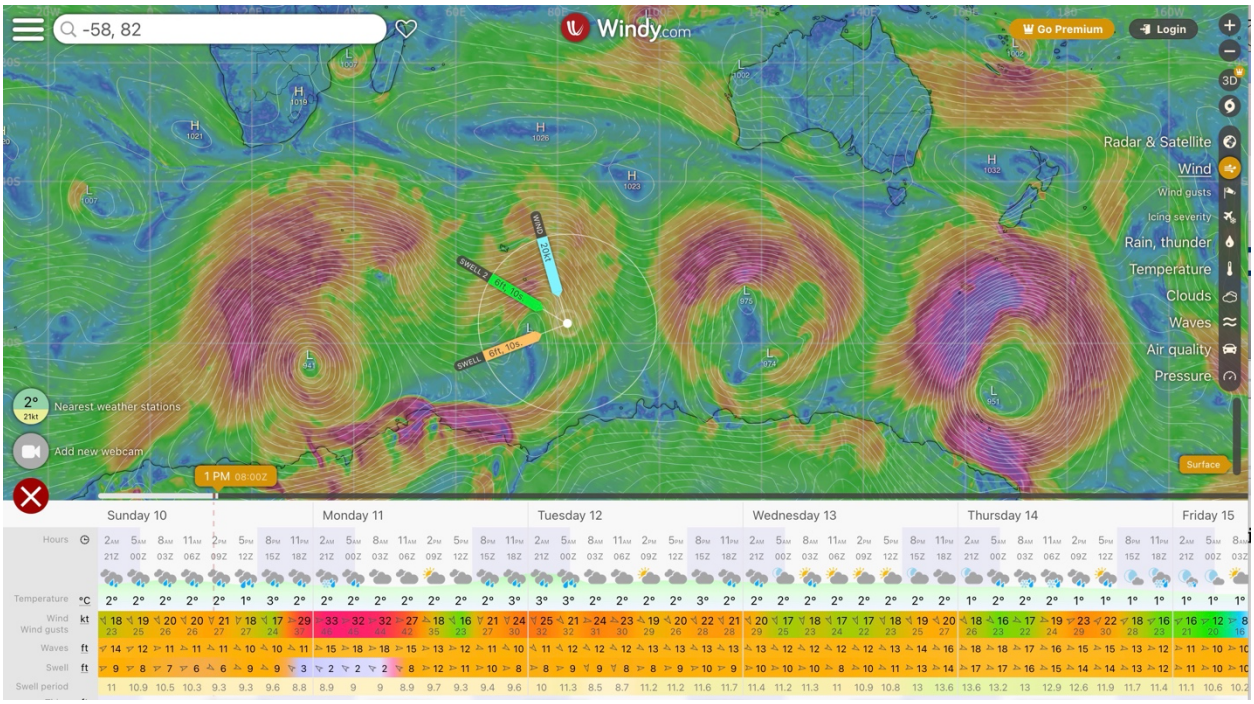

Fig. 1. Weather map from Windy.com on March 10. The white dot shows the location of *R/V Thompson.* The March 8-9 storm had passed us and moved to the east. The second storm on March 11 is about to move on us, and the March 14 storm is yet to come, lurking in the west.

On March 15, as soon as seas came down, we resumed our work with station 29, which, without these weather delays would have been station 46. During deployment, when the rosette came back to the surface after the soak time, a wave picked it up and dropped it suddenly creating a snap load of 4,500 lbs. This was a good reminder that this kind of operation is always risky, especially at night when the winch operator cannot see waves coming. On station 31, the ship’s heading caused the winch wire to come in contact with the ship's hull. After an all stop, the ship came out of dynamic positioning (DP) and changed its heading, then started to drift so the winch wire would have a better angle. Sea state and ship rolls mandated that the wire speed be reduced as the rosette went down, which increased the duration of our casts. So, even when weather did not stop our CTD work, it did slow us down and complicated our deployments. To make up for lost time caused by weather, we were forced to skip the dedicated Bio casts and increased the spacing between stations from 30 nm to 45 nm.

Other vicissitudes of work at sea also occurred. As stations numbers entered the 30s, a few lanyards started to fail due to repeated rubbing at the bottom of the Niskins, so new ones were installed. The total alkalinity lab started to have issues with the stability of power supplied to their Dosimat machine. After multiple attempts to troubleshoot, they moved to the Bio lab forward port side where the DIC group is already working and are now working normally again. On the bright side, Noble gases were sampled on station 32, our final surface drifter was deployed, and a deep Argo float as well.

On March 17, as we were moving northeast, going up the southern flank of the South Indian Ridge, weather deteriorated again. At the time our track was squeezing through two storms again on our east and west (Fig. 2). Unfortunately, a patch of high winds trailing behind the eastern storm slowed us down, preventing us from working for another 17 hours. At this point the captain warned us that following these two storms, the whole ocean basin would fill up with high wind and seas that would become dangerous and prevent any work for five days. We scrutinized weather forecasts to find good weather pockets that would allow us the best chances of deploying the CTD, with relatively weaker winds below 30 kn and sea states below 4 m so that the DP could be used for the deployments and to avoid shock loads on the CTD wire. We also looked at the previous I08S line occupation to identify where the important fronts were so we could target them for sampling. To meet all these goals, we eventually had to skip some stations, which effectively increased spacing between stations 33 and 36 from 45 nm to 100 nm.

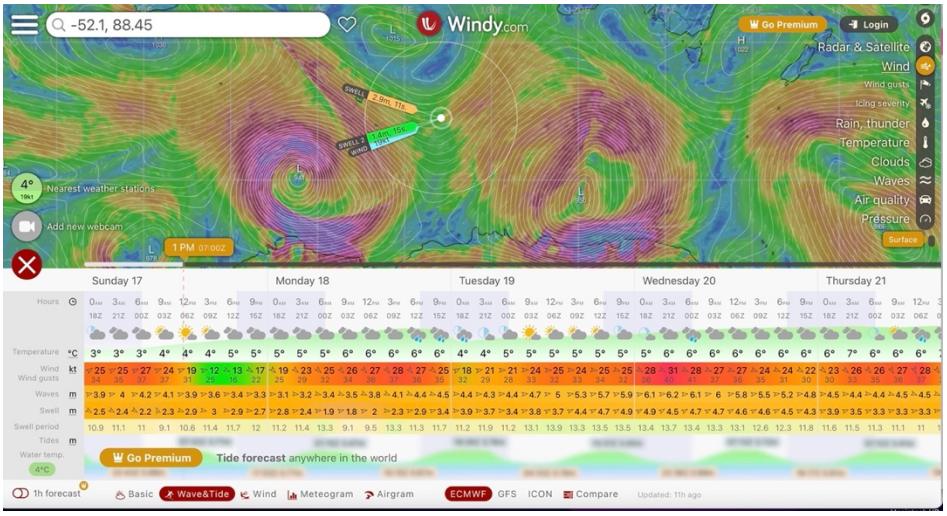

Fig. 2. Wind forecast for mid-day on March 17. The white dot is target location for station 34 that would allow continuous sampling along the IO8S line while staying ahead of storm coming from the west.

The drastic station spacing near 50 S allowed us to get out of the storms and the large sea states that have covered the basin for the past five days (Fig. 3). Staying ahead of this system has allowed us to continue the line to the north. We have now entered our third basin and are going down the northern side of the South Indian Ridge, on the final stretch of the I08S line. Although the 100 nm occurred near frontal regions, it seems we captured the large-scale expression of the polar front (Fig. 4).

Fig. 3. Wave height (m) forecast for mid-day on March 20. Areas in red denote sea states that are too high for CTD work. Blue dots show locations of completed stations and the ones to be completed. Note the increased spacing between stations near 50 S.

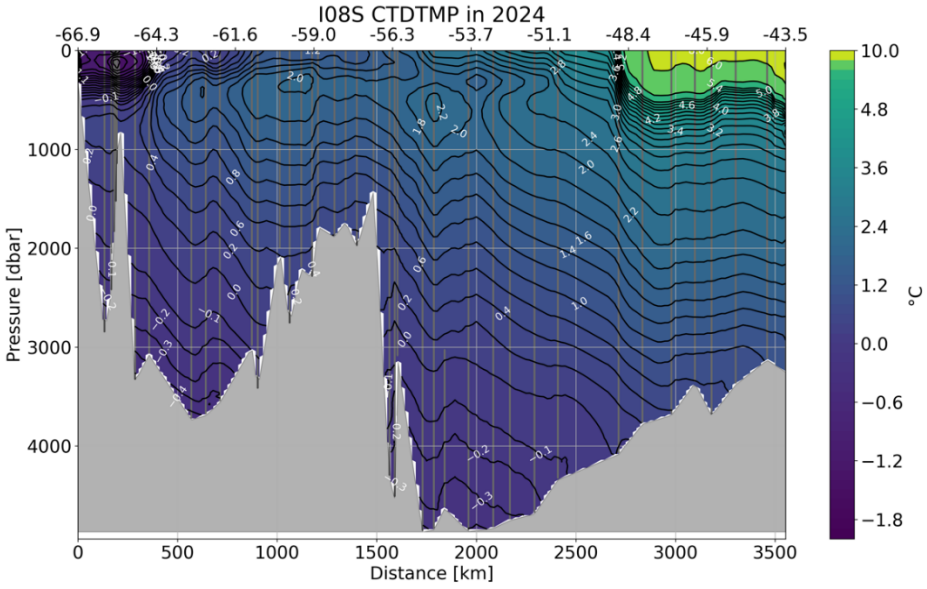

Fig. 4. Mapping of potential temperature from CTD stations during I08S 2024. The polar front is visible near 50 S. (preliminary figure from Laura Cimoli)

As you can see, we've had quite a challenging cruise up to this point. Thankfully, the weather has improved throughout the last couple days, which has been very well received by everyone onboard. The staging bay doors are finally open for sampling and the weather decks are no longer secured. Here's hoping that our last week of science is our smoothest week yet.

From Station 50,

Seb and Katelyn