

Do Thermal Data Sources agree when monitoring Coral Bleaching?

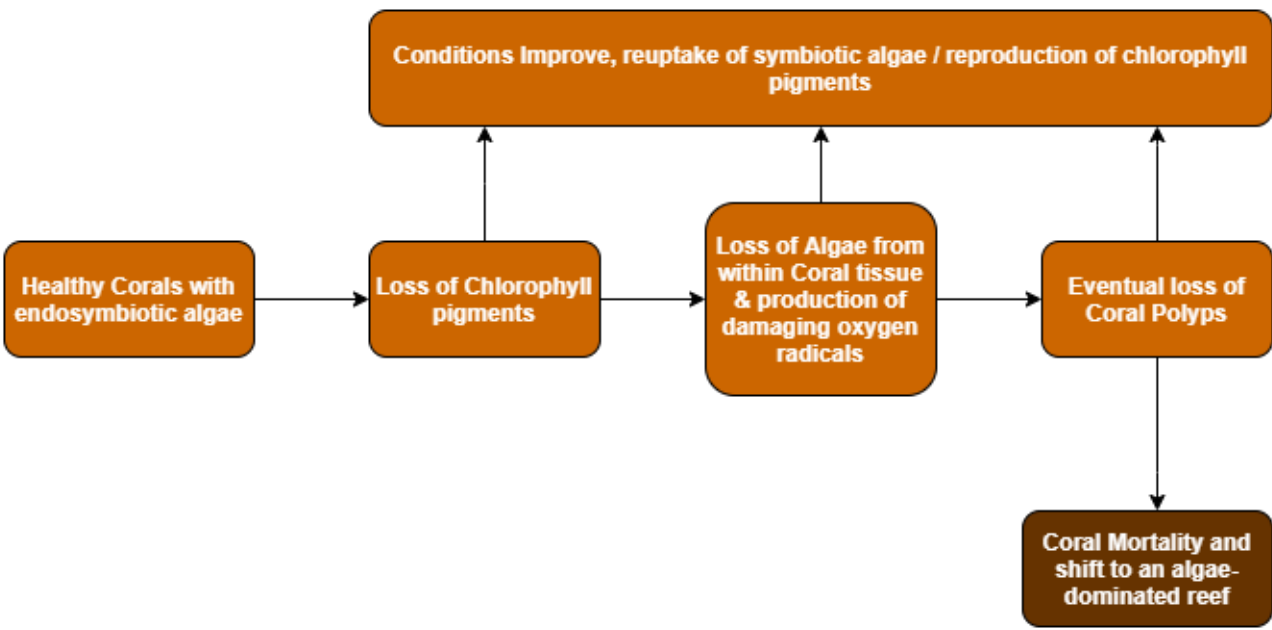
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Introduction



- Thermal stress is a major cause of this process towards coral mortality [1].
- Climate change and rising sea surface temperatures (SST) have resulted in mass global coral bleaching events.
- Monitoring changes in coral bleaching SST warning metrics known as Degree Heating Weeks (DHWs) or Degree Heating Months (DHMs), is crucial for predicting reef health for appropriate conservation actions.
- Different limitations exist for different SST data sources, but are often used without understanding the difference. Hence, there is a need to compare how they agree with each other.

Does the SST source used to predict if coral reefs will bleach matters?

Objectives

Compare the consistency between coral bleaching thermal metrics derived from satellites, coral SST proxies and global climate models.

Methods

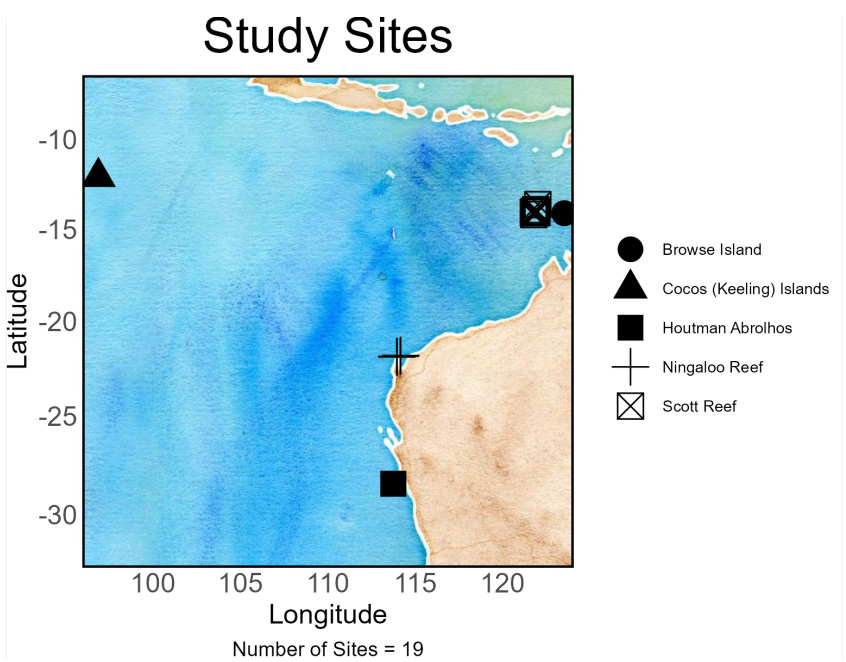


Figure 1: Western Australia Study Sites

Four data sources:

- 1) NOAA Coral Reef Watch 5km *daily* SST.
- 2) CCI 5km *daily* SST.
- 3) ACCESS Model *daily* SST for Australia (GCM).
- 4) Coral Core *monthly* SST Proxy Ratio.

Then, calibrating Sr/Ca to SST values using long-term satellite data

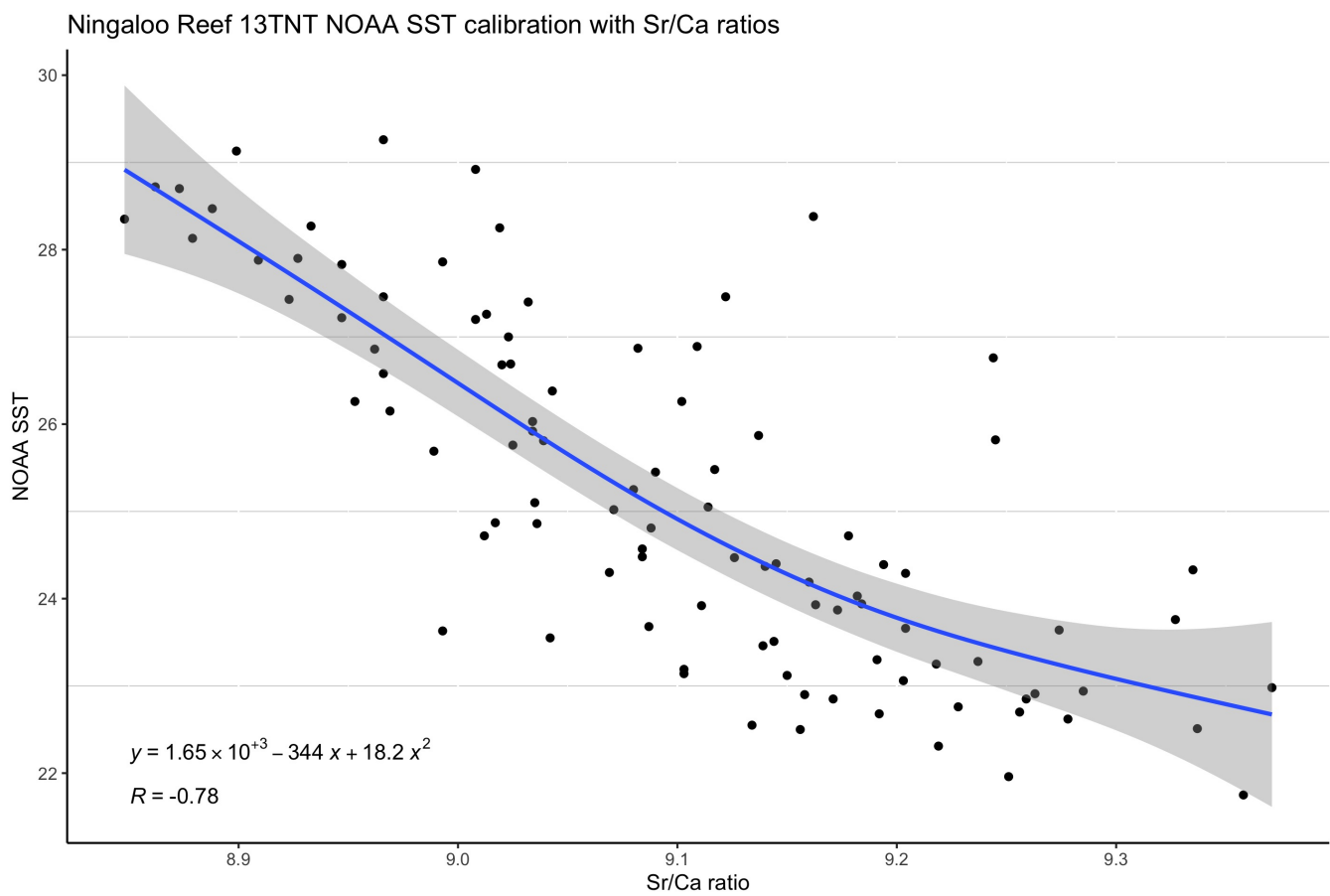


Figure 2: Calibration of Coral Core Thermal Proxy Sr/Ca with satellite data

and SST values to DHW and DHM values

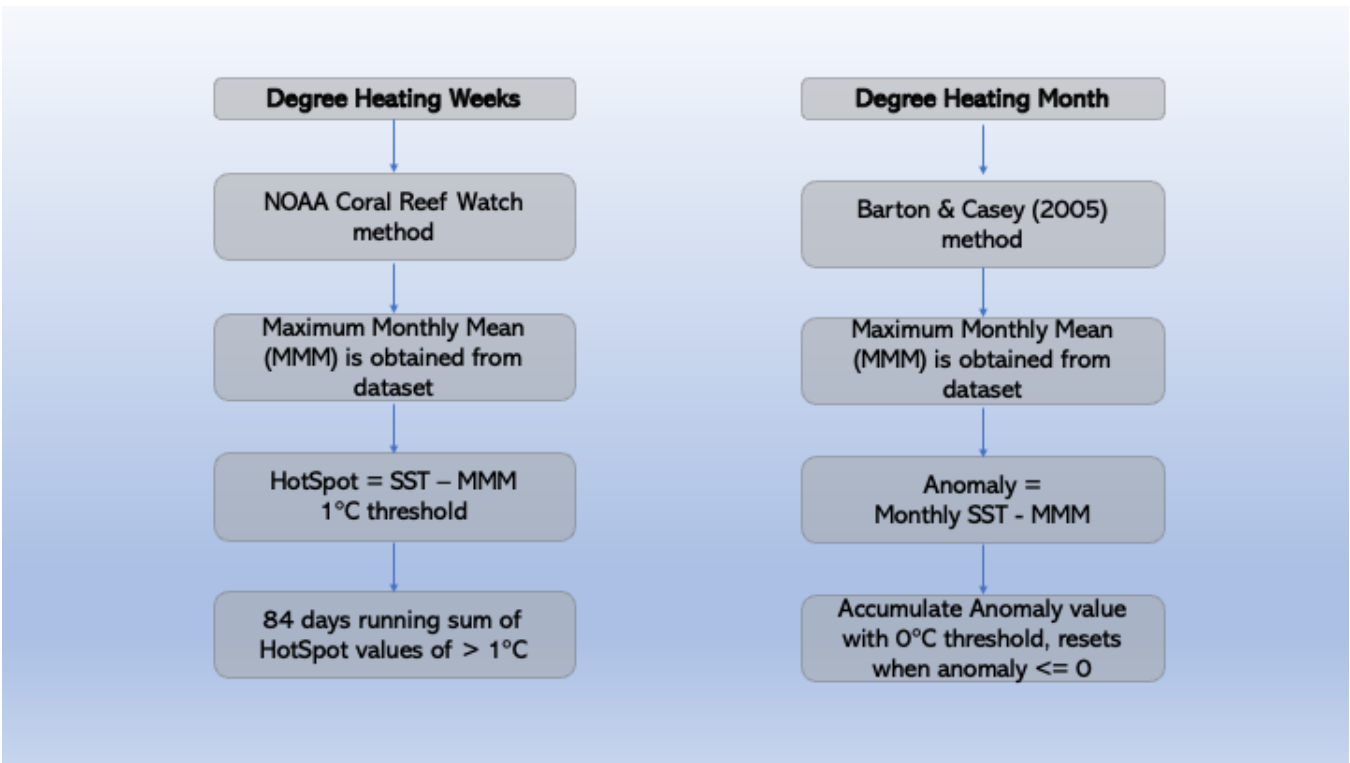


Figure 3: DHW and DHM Calculation Method [2], [3]

Results

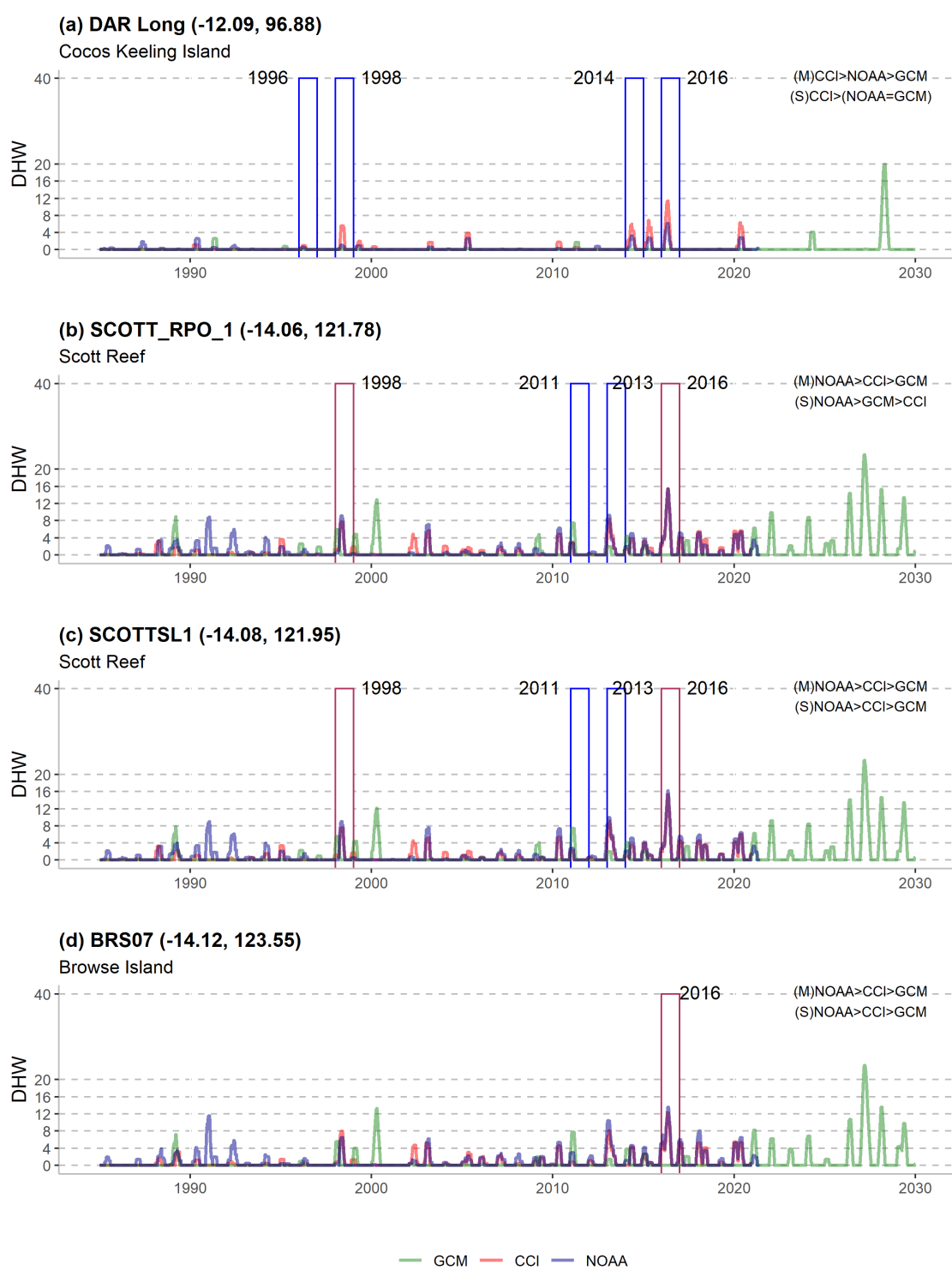


Figure 4: Degree Heating Weeks Time Series with known bleaching events in Cocos Keeling Island, Scott Reef and Browse Island. Red and Blue boxes represent known severe and moderate coral bleaching events respectively [4]

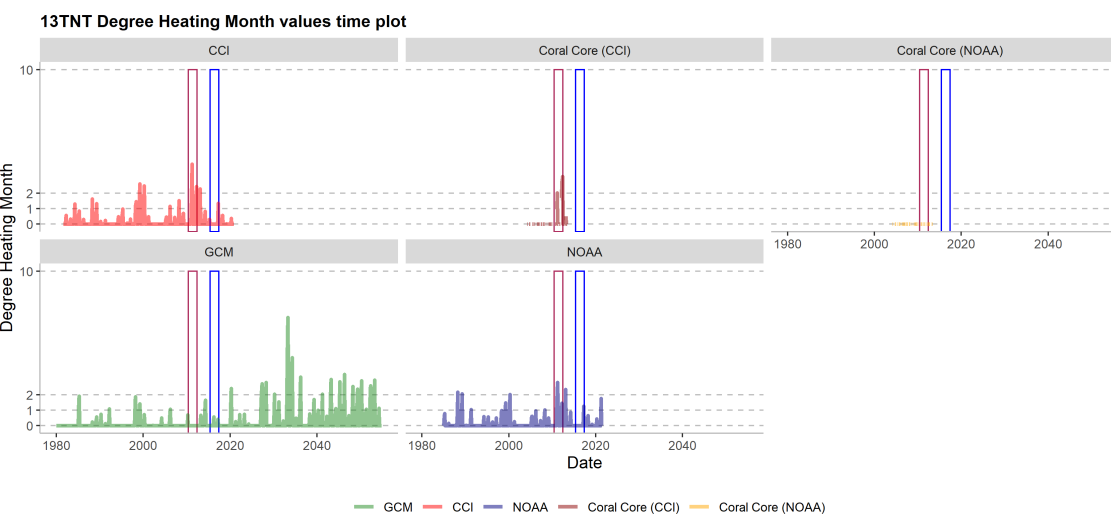


Figure 5: Degree Heating Months Time Series with known bleaching events in Ningaloo Reef. [4]

Takeaways

SST data **differs** in coral bleaching metrics and event prediction

References

[1] Ainsworth, T. D., & Brown, B. E. (2021). Coral bleaching. Curr Biol, 31(1), R5-R6.
[2] Liu, G., ... & Strong, A. E. (2018) Predicting Heat Stress to Inform Reef Management: NOAA Coral Reef Watch's 4-Month Coral Bleaching Outlook. Front. Mar. Sci, 5(57).
[3] Barton, A. D., & Casey, K. S. (2005). Climatological context for large-scale coral bleaching. Coral Reefs, 24, 536-554.
[4] Hughes, T. P., ... & Wilson, S. K. (2018). Spatial and temporal patterns of mass bleaching of corals in the Anthropocene. Science, 359(6371), 80-83.



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