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Supplement of

Investigating the long-term variability of the Red Sea marine heatwaves and their relationship to different climate modes: focus on 2010 events in the northern basin

Manal Hamdeno et al.

Correspondence to: Manal Hamdeno (mh.elawady@uliege.be)

Supplementary

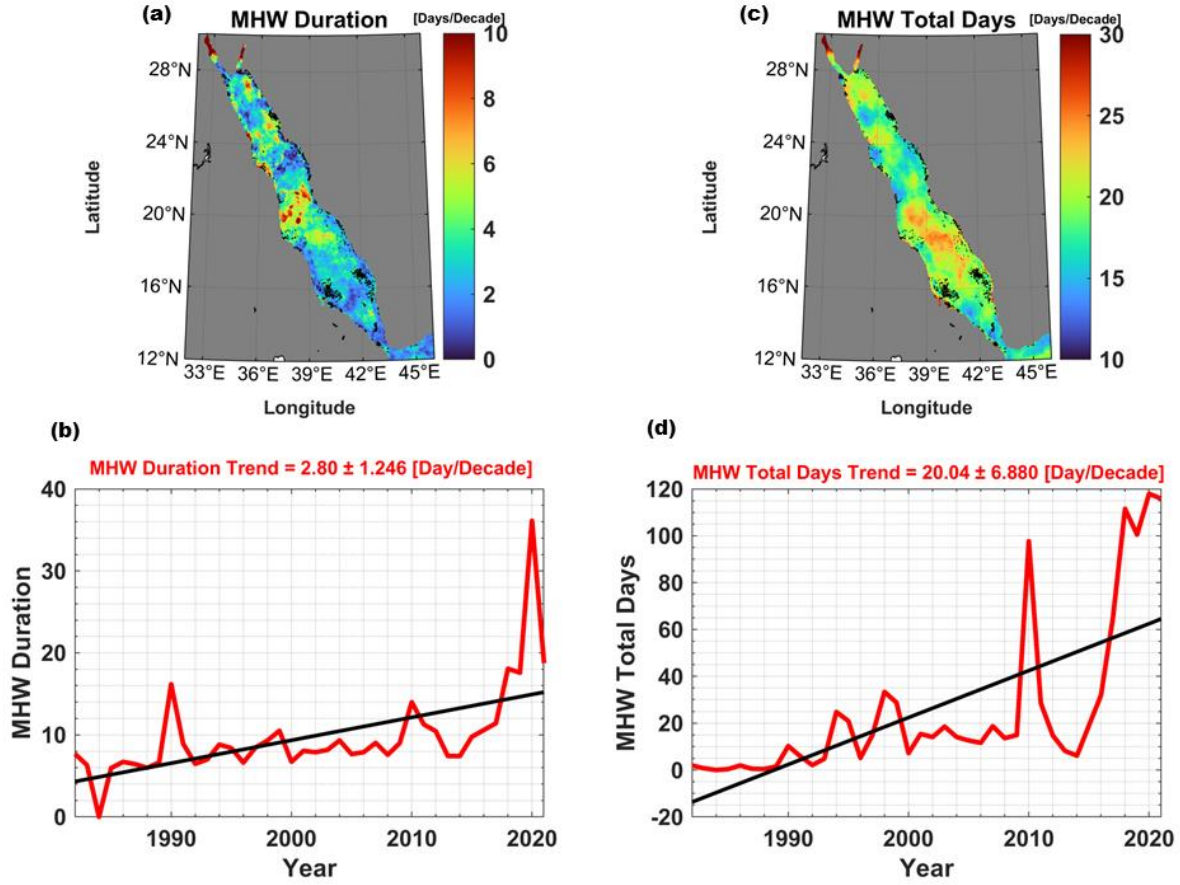

Figure S1. Spatial and temporal trends of marine heatwave duration (a, b) and total days (c, d) in the Red Sea from 1982-2021.

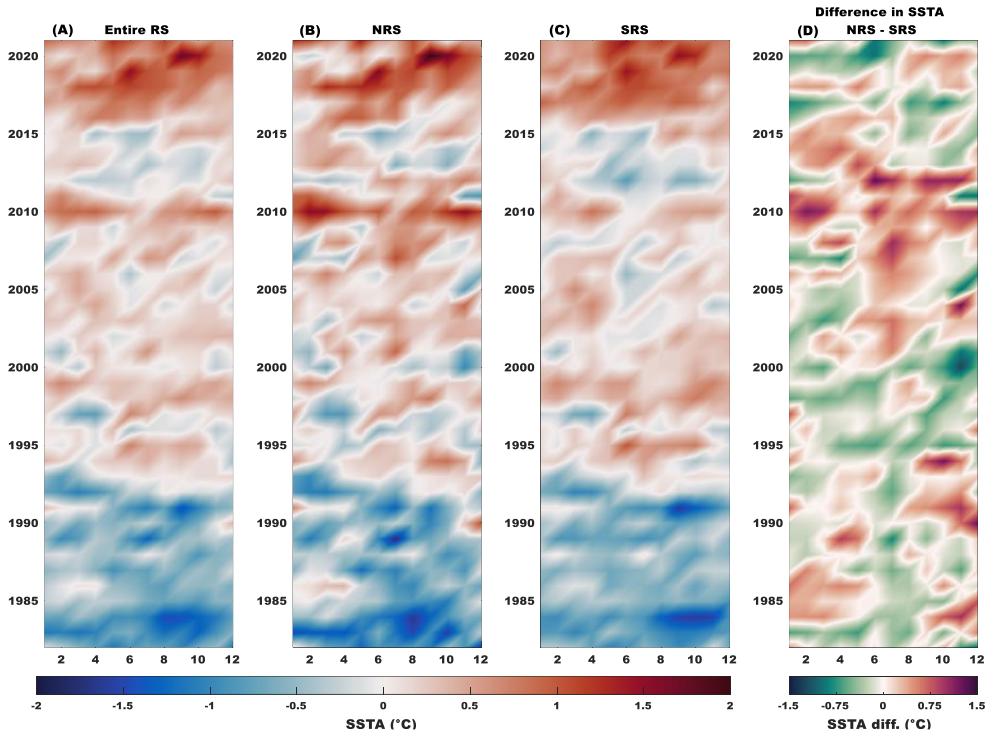

Figure S2. Monthly sea surface temperature anomaly patterns from 1982 to 2021. (A-C) Monthly SSTA time series for the entire Red Sea (RS), northern Red Sea (NRS), and southern Red Sea (SRS), respectively. (D) Monthly SSTA difference between NRS and SRS, where red indicates periods when SSTA was higher in NRS than in SRS, and green indicates periods when SSTA was higher in SRS than in NRS.

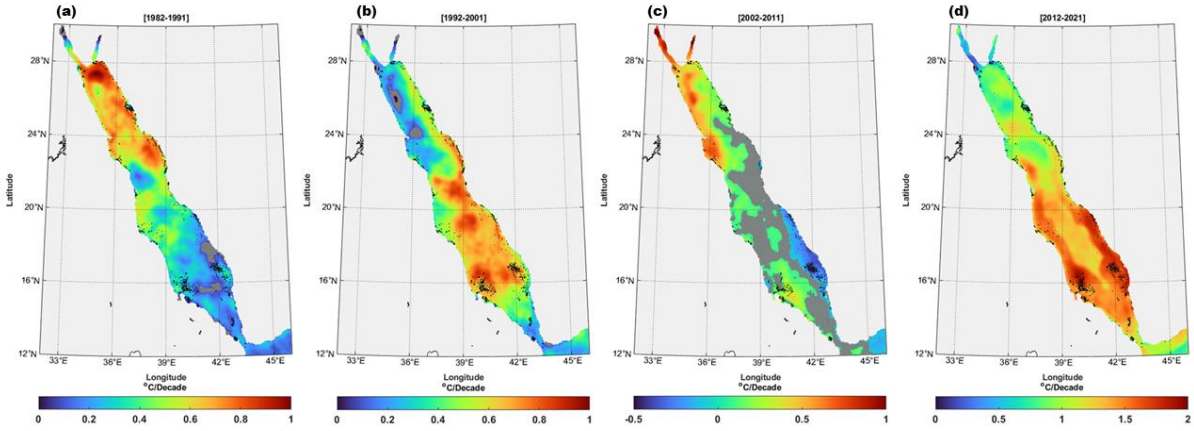

Figure S3. Decadal spatial trends in sea surface temperature (°C/decade) in the Red Sea. (a) 1982 - 1991, (b) 1992 - 2001, (c) 2002 - 2011, and (d) 2012 - 2021.

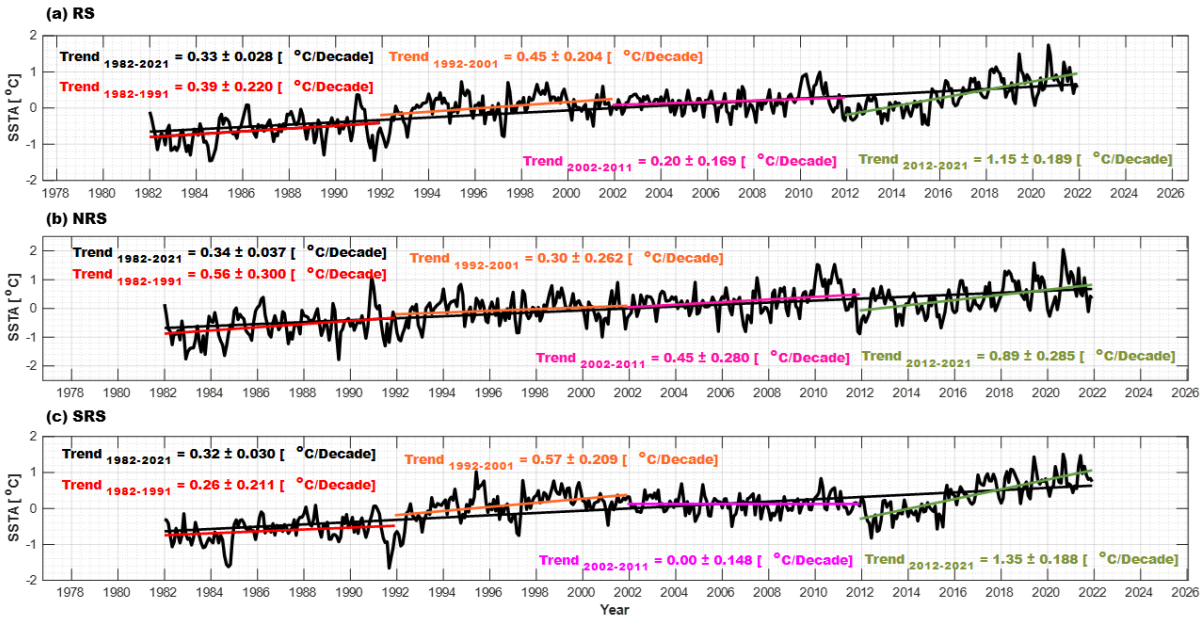

Figure S4. Temporal evolution and decadal trends of sea surface temperature anomalies (°C) in the entire Red Sea (a), northern Red Sea (b), and southern Red Sea (c) from 1982 to 2021.

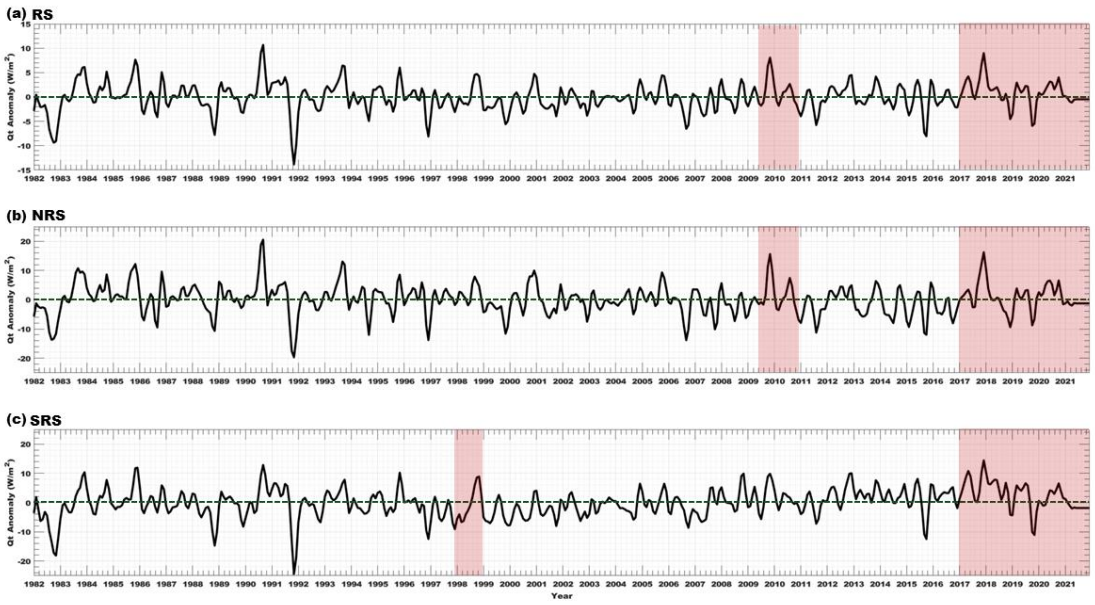

Figure S5. Temporal evolution of total heat flux anomalies (in W/m²) in the entire Red Sea (A), northern Red Sea (B), and southern Red Sea (C) between 1982 and 2021. The red shaded areas indicate the years with the highest marine heatwave (MHW) frequency in each basin.

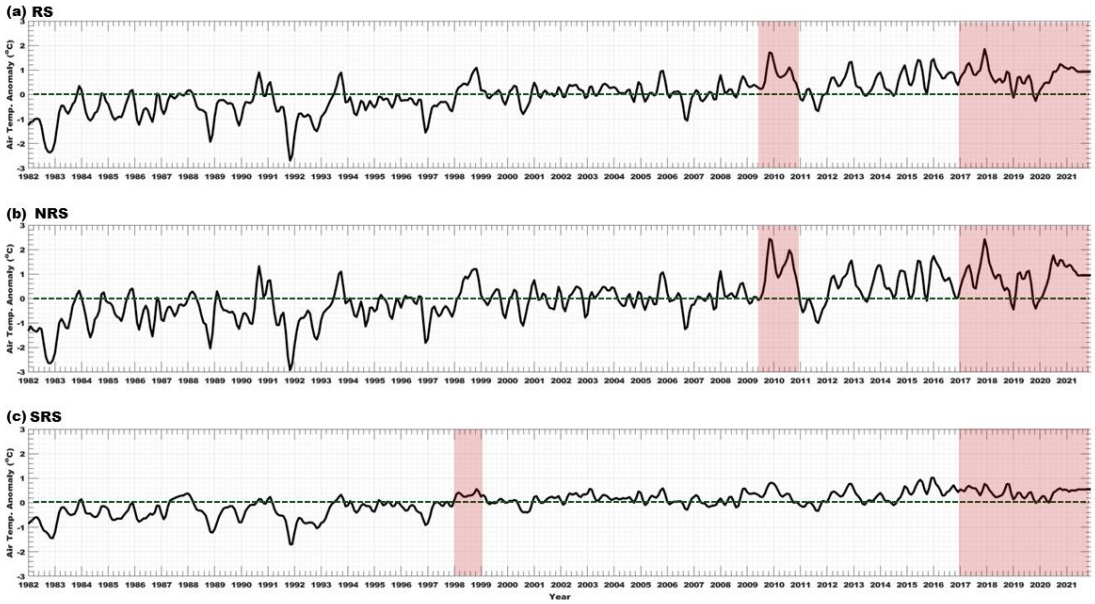

Figure S6. Temporal evolution of the atmospheric temperature anomalies (in oC) in the entire Red Sea (A), northern Red Sea (B), and southern Red Sea (C) between 1982 and 2021. The red shaded areas indicate the years with the highest marine heatwave (MHW) frequency in each basin.

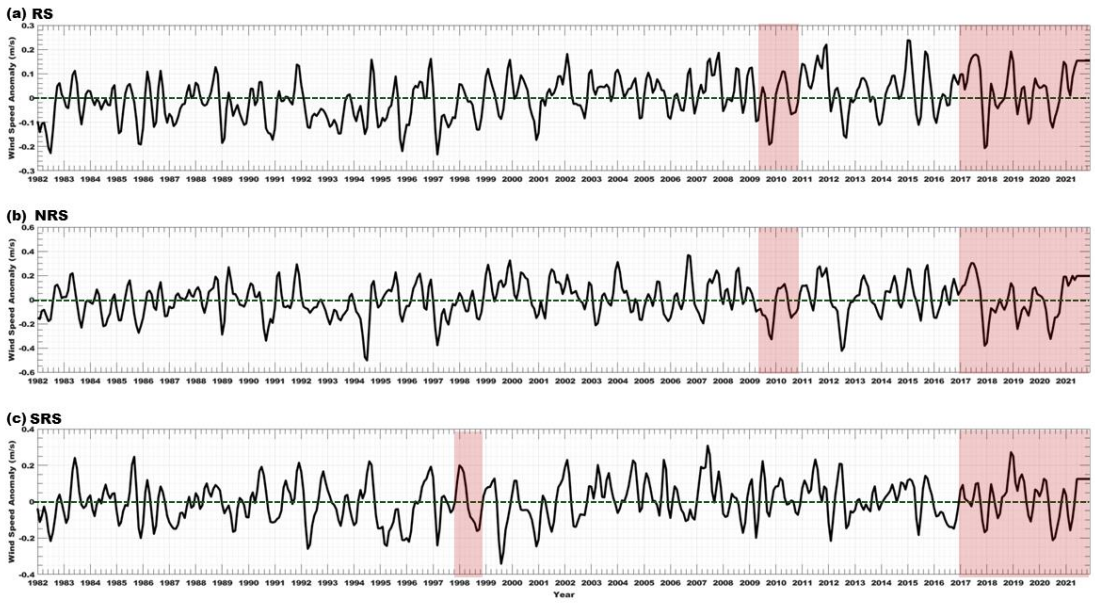

Figure S7. Temporal evolution of the wind speed anomalies (in m/s) in the entire Red Sea (A), northern Red Sea (B), and southern Red Sea (C) between 1982 and 2021. The red shaded areas indicate the years with the highest marine heatwave (MHW) frequency in each basin.

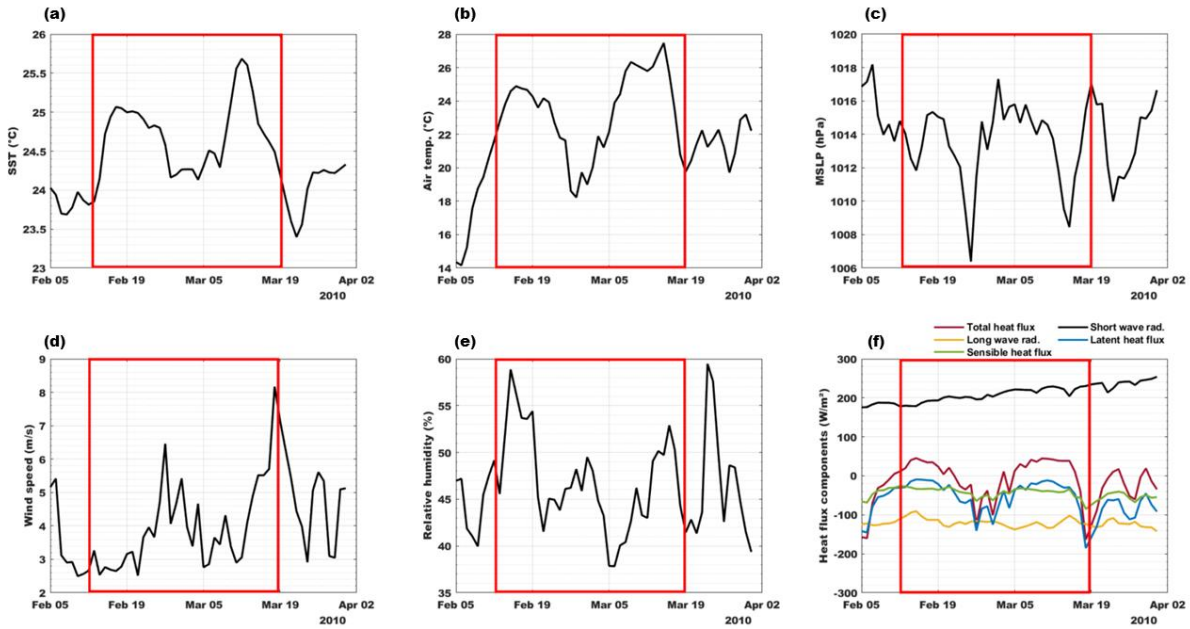

Figure S8. The time series of different atmospheric covering the period of the 2010 MHW event in the NRS. The panels display (a) sea surface temperature (°C), (b) air temperature (°C), (c) mean sea level pressure (hPa), (d) wind speed (m/s), (e) relative humidity (%), and (f) heat flux components (W/m²). The MHW event period is highlighted with a red box.