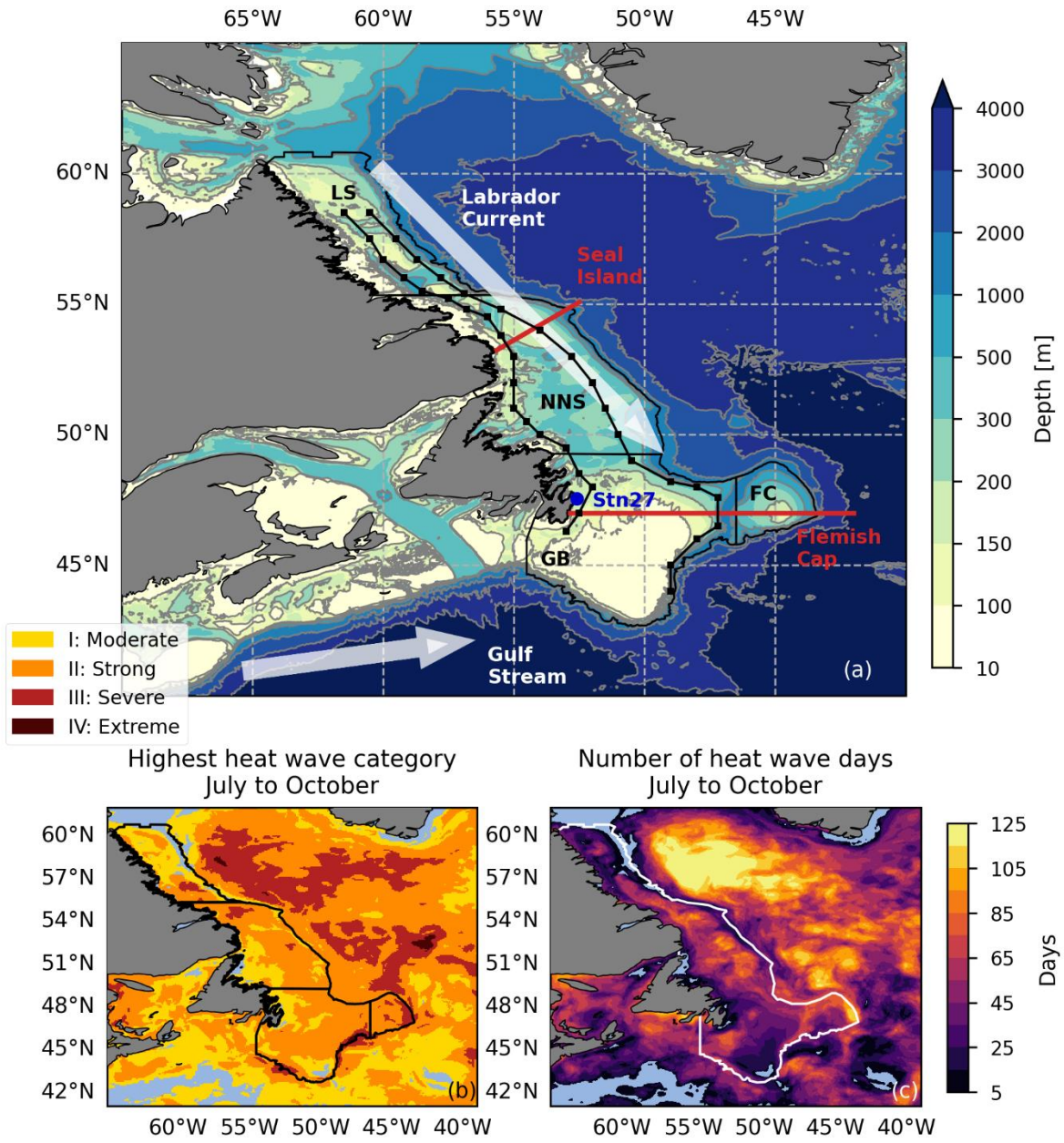


*Figure 1: (a) Bathymetry from ETOPO 2022 (product ref. no. 4) in the study region. The thin black lines represent the regions over which MHW statistics are calculated: Labrador Shelf (LS), Northeast Newfoundland Shelf (NNS), Grand Banks (GB), and Flemish Cap (FC). Standard AZMP transects Seal Island and Flemish Cap are represented by the red lines. The dark blue dot is the location of Station 27 (Stn27). Light coloured arrows represent schematics of the Labrador Current and Gulf Stream. Black line segments with dots represent the Outer and Inner Shelf transects. (b) Spatial map of highest heat wave categories in July through October 2023 calculated from GLORYS12V1 (product ref. no. 1). Subregion polygons are shown for reference in black. (c) Total number of heat wave days July through October 2023 (maximum 122 days), also calculated from GLORYS12V1 (product ref. no. 1). The white line represents the polygon used to define the entire NL Shelf. The region definitions are derived from Ecosystem Production Units (Pepin et al., 2014) and contain information licensed under the Open Government Canada Licence - Canada.*

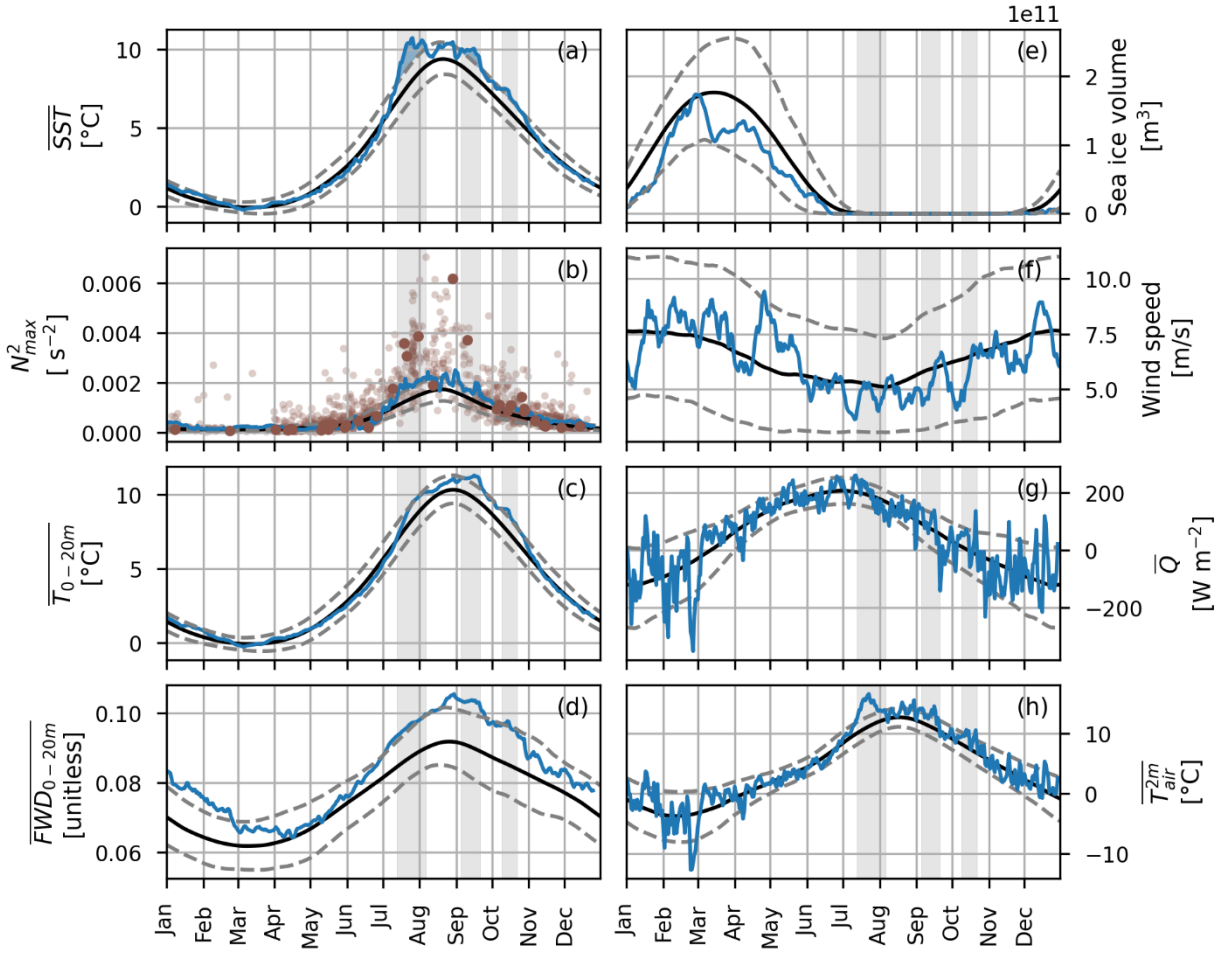


*Figure 4: (a) Time series of GLORYS12V1 (product ref. no. 1) sea surface temperature averaged over the NL Shelf for 2023 (blue), the 1993-2022 climatology (black), and the 1993-2022 10th and 90th percentile (grey dashed). Heat wave periods are indicated by the grey shading. (b) As in (a) but for the maximum squared-buoyancy frequency at Station 27. Large dark brown dots represent observations from AZMP (product ref. no. 2) during 2023 while small light brown dots represent all observations (product ref. no. 2) in the 1993-2022 reference period. (c) As in (a) but for GLORSY12V1 (product ref. no. 1) depth-averaged temperature from 0-20 m spatially averaged over the NL Shelf. (d) As in (c) but for freshwater density from 0-20m. As in (a) but the sea ice volume over the NL Shelf. (f) As in (a) but for the ERA5 10-metre wind speed (product ref. no. 3) at Station 27. (g) As in (f) but for the ERA5 net surface heat flux averaged over the NL Shelf. The heat flux is positive downwards and represents a daily average. (h) As in (g) but for the ERA5 2-metre air temperature averaged over the NL Shelf.*

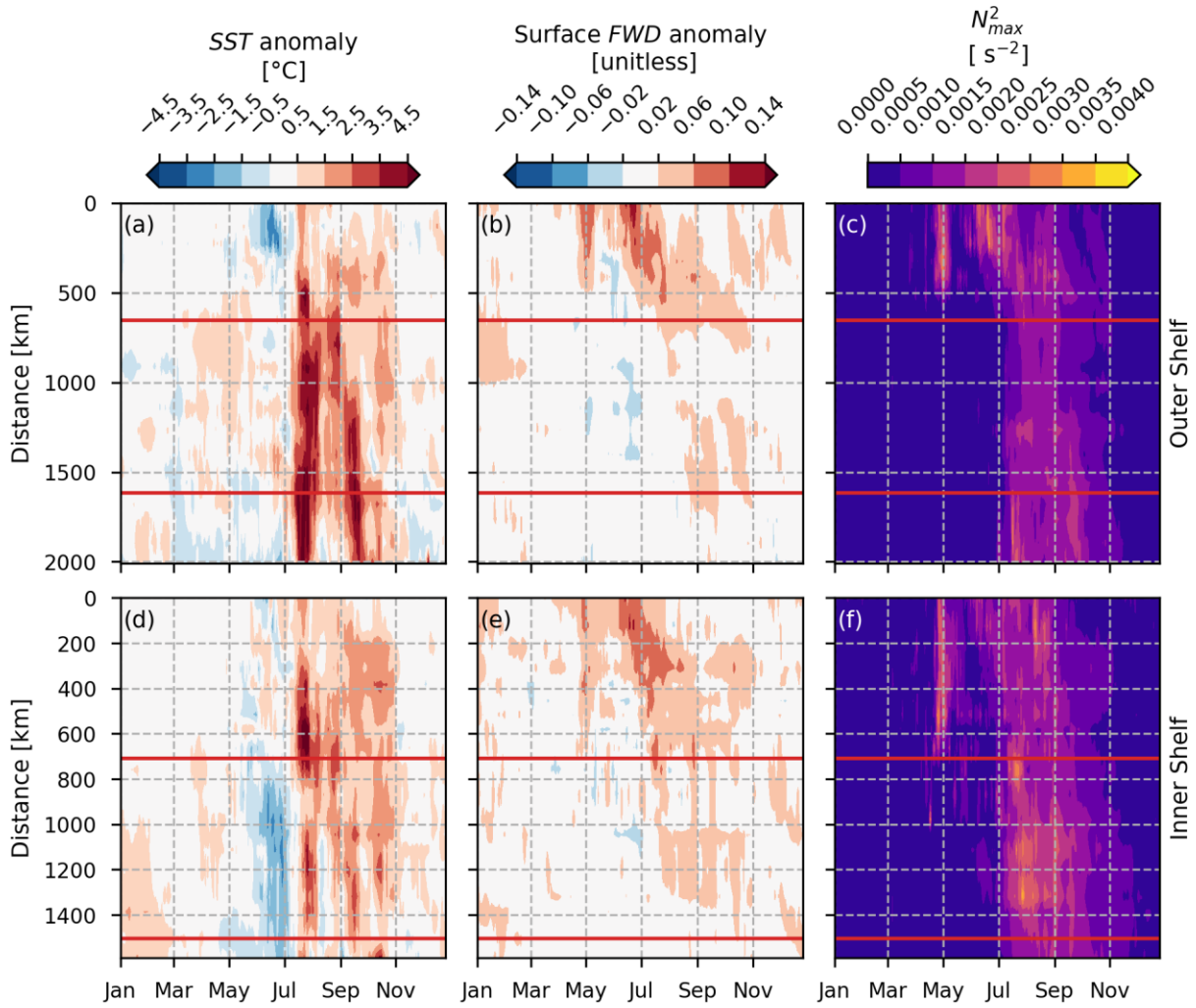


*Figure 5: Time series of GLORYS12V1 (product ref. no 1) sea surface temperature anomaly (left), surface freshwater density anomaly (middle), and vertical maximum of the squared-buoyancy frequency (right) along the Outer Shelf (top) and Inner Shelf (bottom) transects for year 2023. See Fig. 1 (a) for Outer Shelf and Inner Shelf transect definitions. Distance is measured along each transect starting from the most upstream station. The red horizontal lines represent the along-shelf locations of the Seal Island (upper) and Flemish Cap (lower) transects. A reference period of 1993-2022 is used to calculate the climatology used to determine the anomalies.*

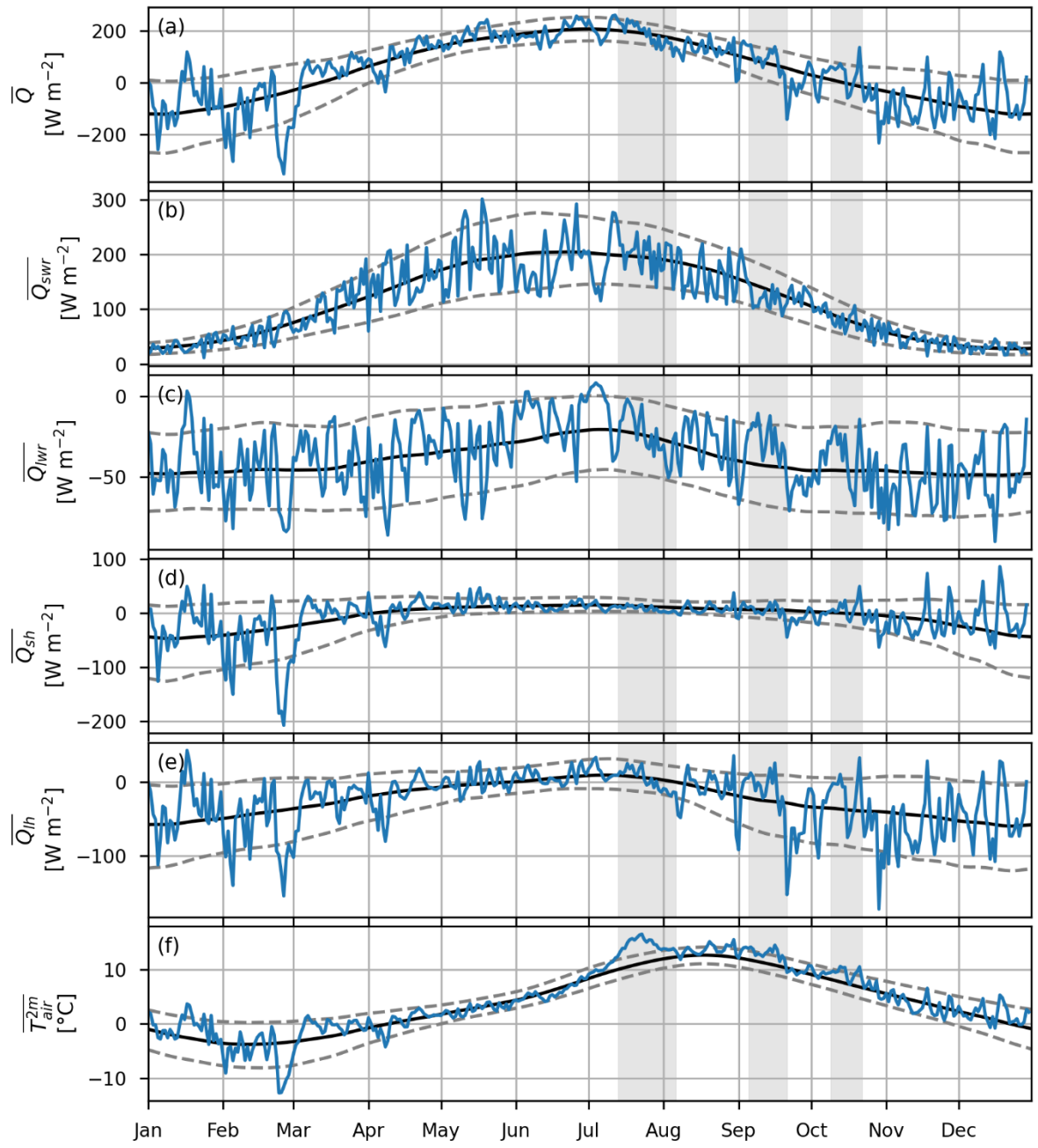


*Figure S2: Time series of the ERA5 (product ref. no 2) (a) net surface heat flux, (b) net surface short-wave radiation, (c) net surface long-wave radiation, (d) surface sensible heat flux, (e) surface latent heat flux, and (f) 2-metre air temperature. All fluxes are positive downward, represent a daily average, and are spatially averaged over the NL Shelf region. Only grid cells entirely over ocean are used in the spatial average. The 2023 time series is shown in blue, the 1993-2022 climatologies in black, and the 10$^{th}$ and 90$^{th}$ percentiles in grey dashed. The NL Shelf MHW periods are represented by the grey shading.*

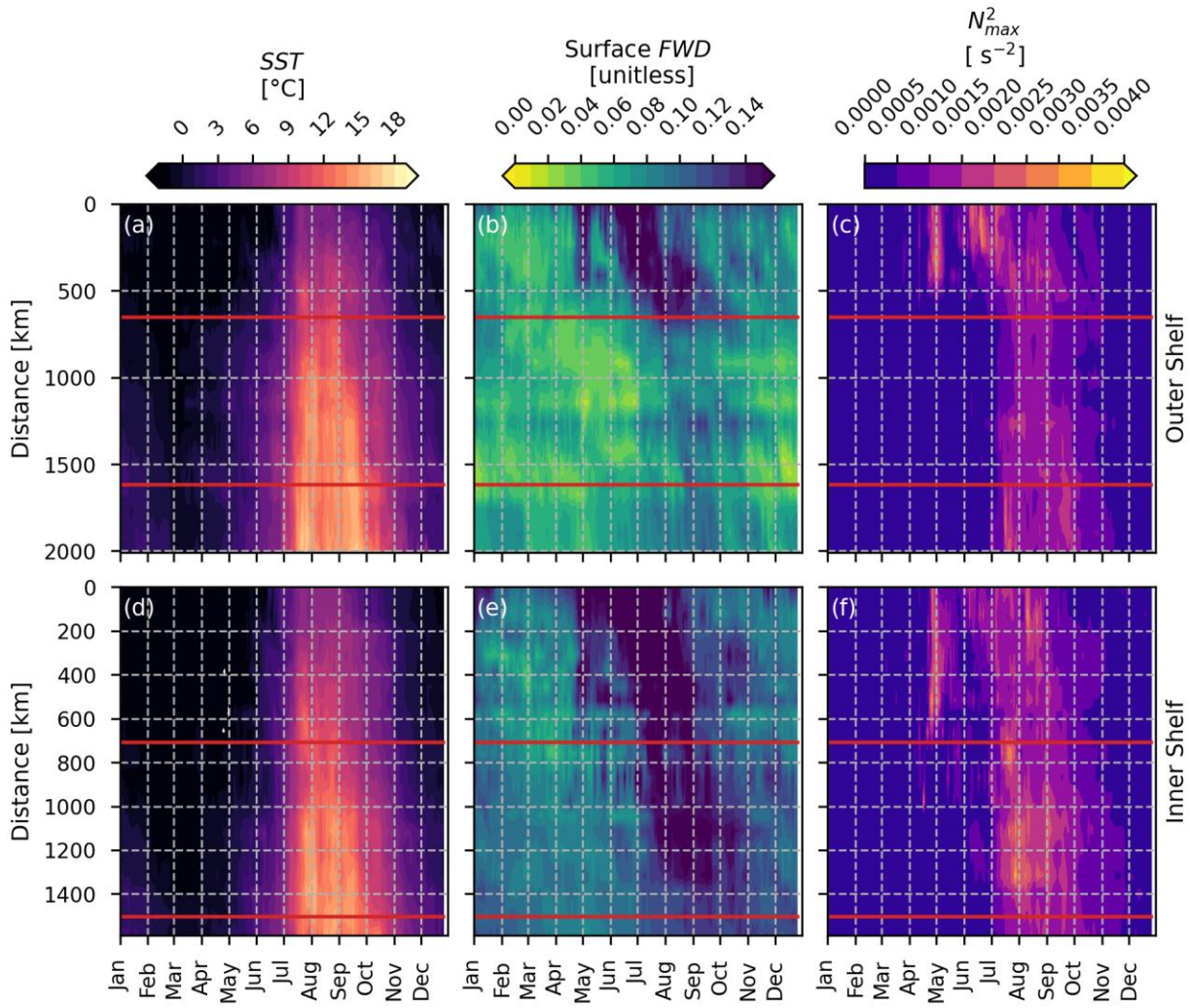


*Figure S3: Time series of the GLORYS12V1 (product ref. no. 1) sea surface temperature (left), surface freshwater density (middle), and vertical maximum of the squared-buoyancy frequency (right) for year 2023 along the Outer Shelf (top) and Inner Shelf (bottom) transects (black dotted line in Fig. 1; 0 km here corresponding to the northern limit). The red lines represent the along-shelf locations of the Seal Island (upper) and Flemish Cap (lower) transects.*

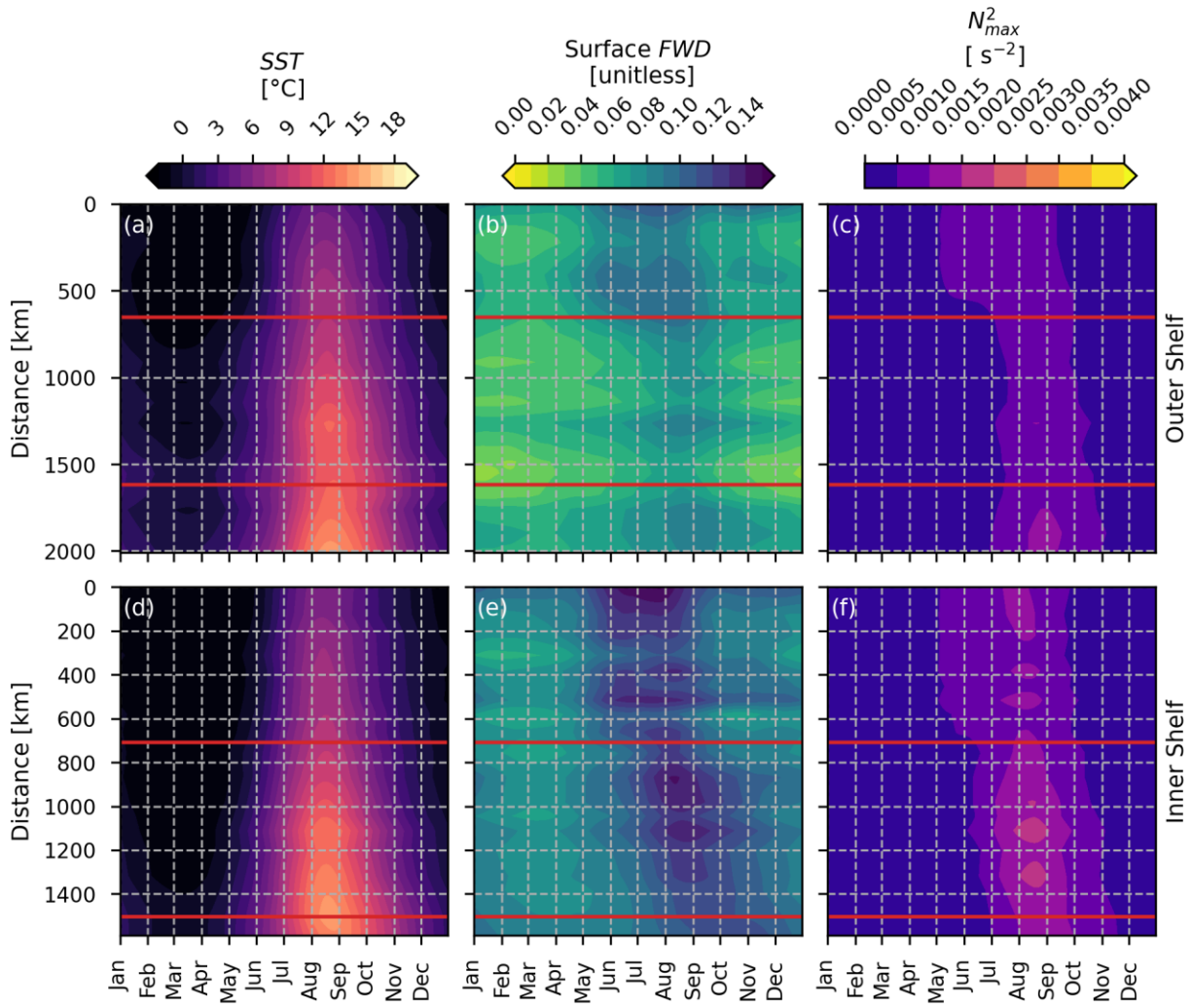


*Figure S4: As in Figure S3 but for the 1993-2022 climatological fields.*