Supplementary materials

Nonlinearity component maps

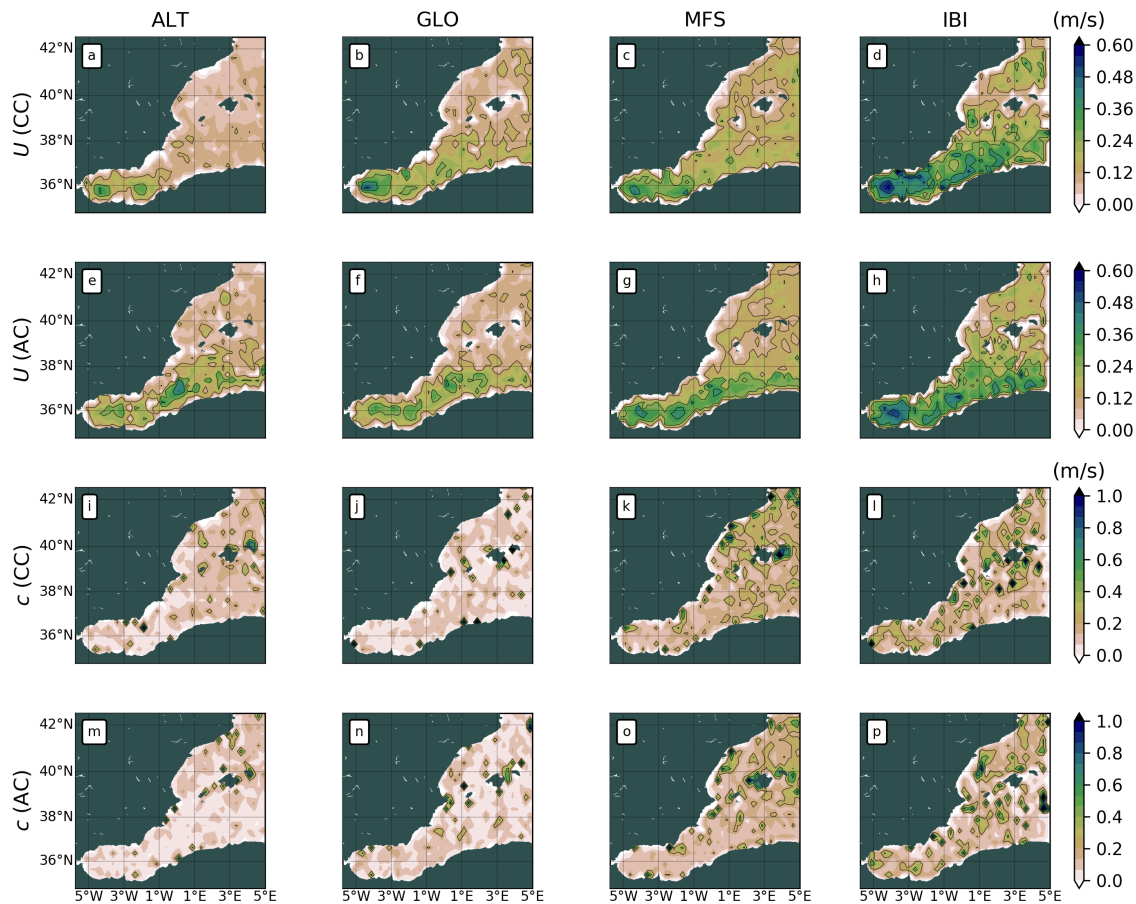



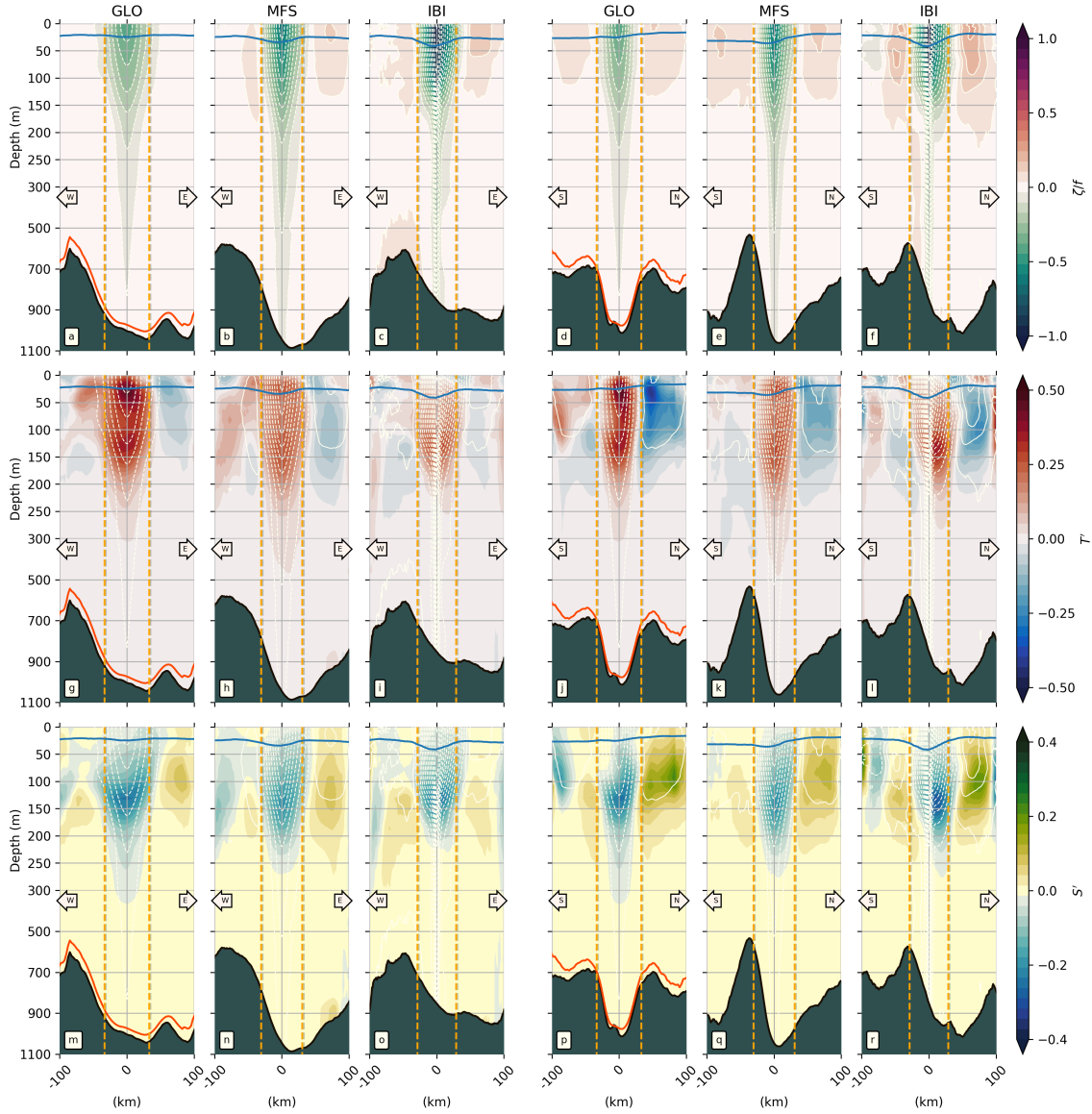
Figure S1. Maps of mean eddy swirl speed (a-h) and celerity (i-p) over the western Mediterranean. Columns for *ALT*, *GLO*, *MFS* and *IBI*. Paired rows for cyclones (CC) and anticyclones (AC).

Tilt correction

Figure S2. Eddy composite sections with the tilt correction described in Sec. 2.5 from *GLO*, *MFS* and *IBI* in the western Alboran gyre. Compare the zonal and meridional sections with those of Fig. 3.5. Vertical orange dashed lines indicate the boundaries of each composite eddy based on its mean radius estimate from Tab. 2. Composite topographic profiles in black from SRTM, and in red from, respectively *GLO* and *IBI*. Note change of vertical scale at 300 m.

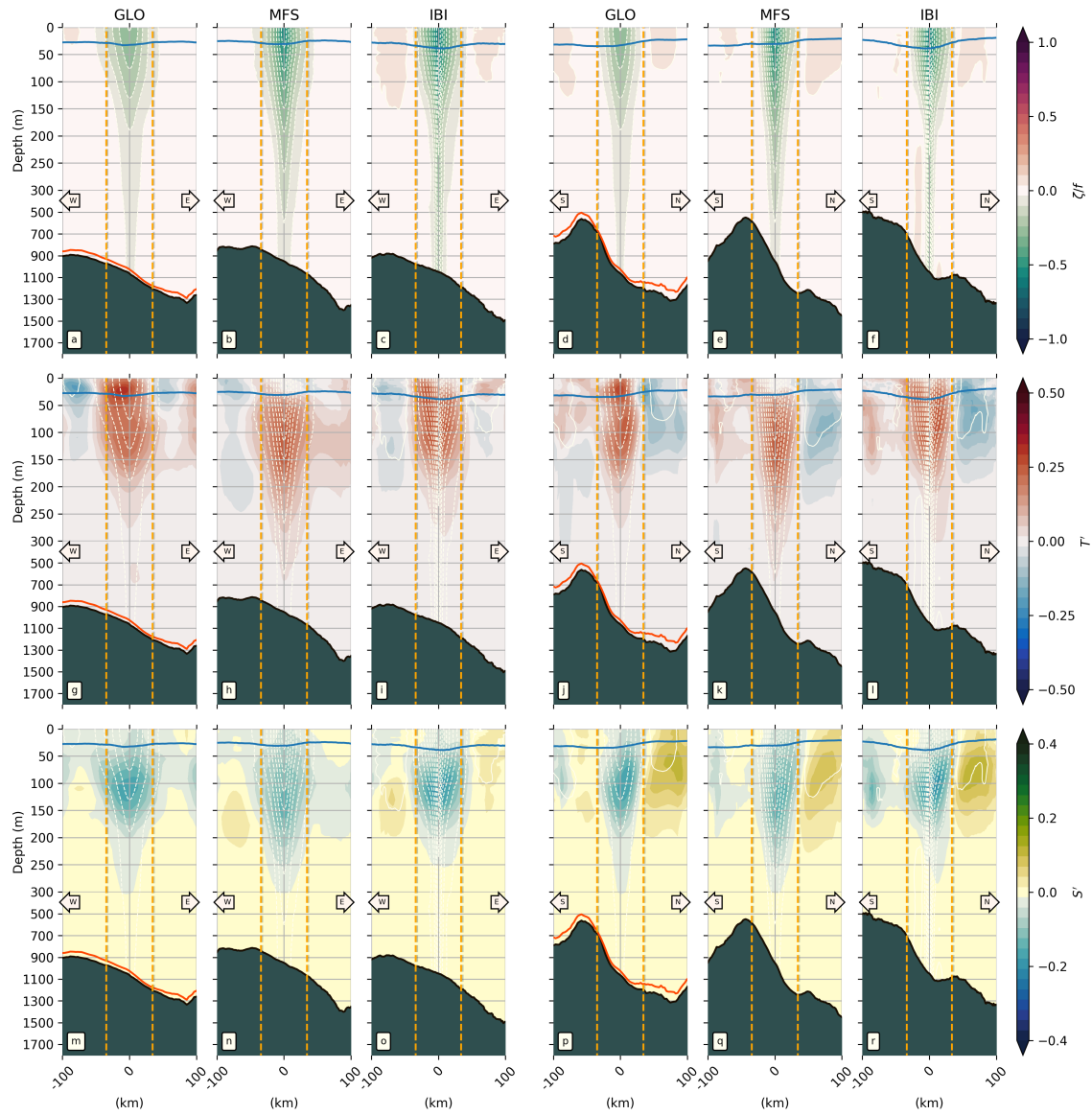



Figure S3. Same as Fig. S2 but for the eastern Alboran gyre.

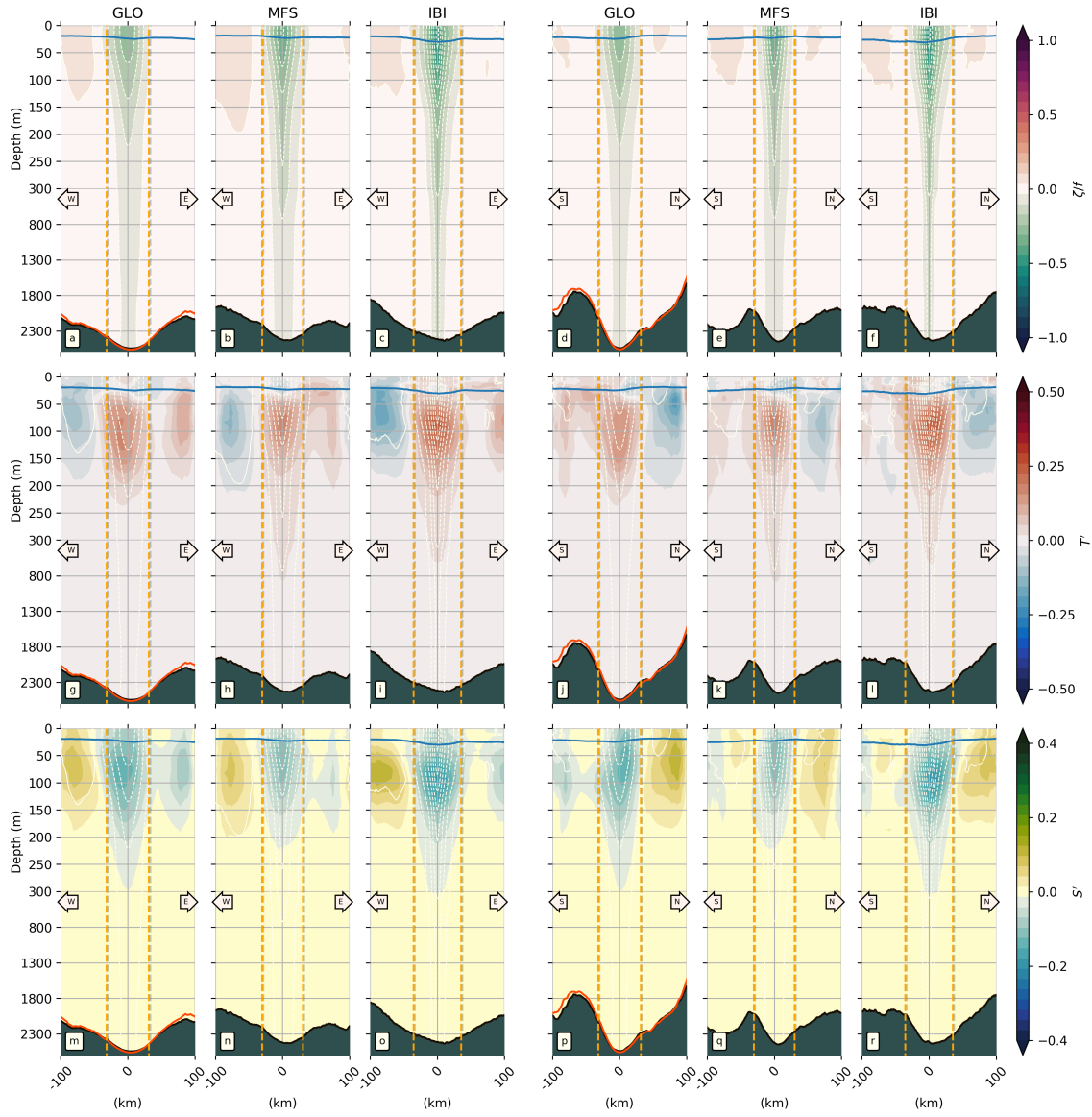



Figure S4. Same as Fig. S2 but for the Cartagena frontal region.

Cyclonic eddy composite sections

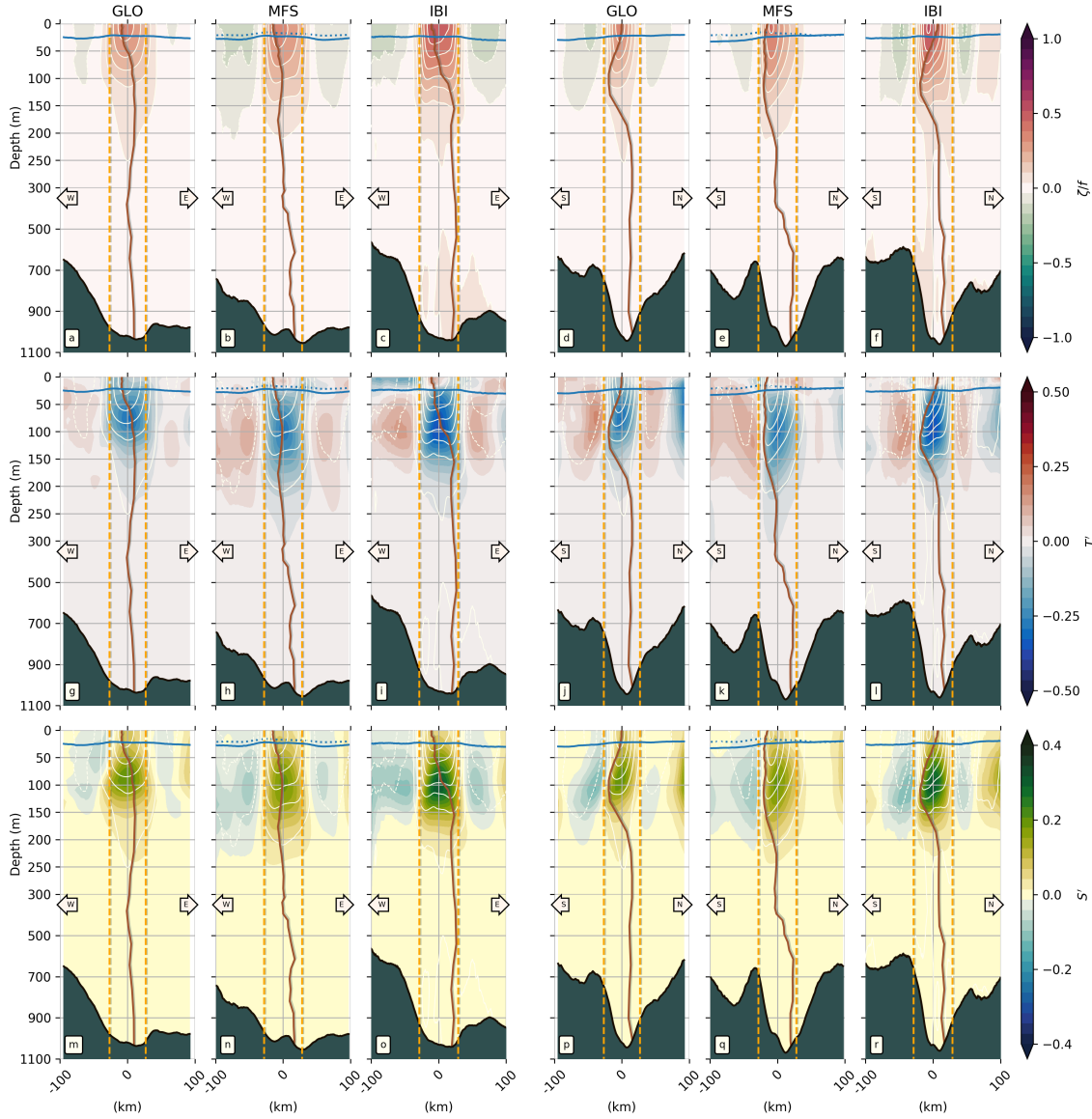



Figure S5. Cyclonic eddy composite sections from *GLO*, *MFS* and *IBI* in the western Alboran gyre. Left-hand-side (right-hand-side) columns show zonal (meridional) sections of (top to bottom) relative vorticity, temperature anomalies and salinity anomalies, from the surface to the ocean floor. The central position of each section is the median of the longitudes and latitudes associated with the eddy observations used to make the composites. Blue lines indicate the mixed layer depth; the dotted blue line corresponds to the MLD from the MFS model. The vertical brown line in each section is the vorticity-based tilt correction (Sec. 2.5). Vertical orange dashed lines indicate the boundaries of each composite eddy based on its mean radius estimate. Composite topographic profiles in black from SRTM, and in red from, respectively *GLO* and *IBI*. Note change of vertical scale at 300 m.

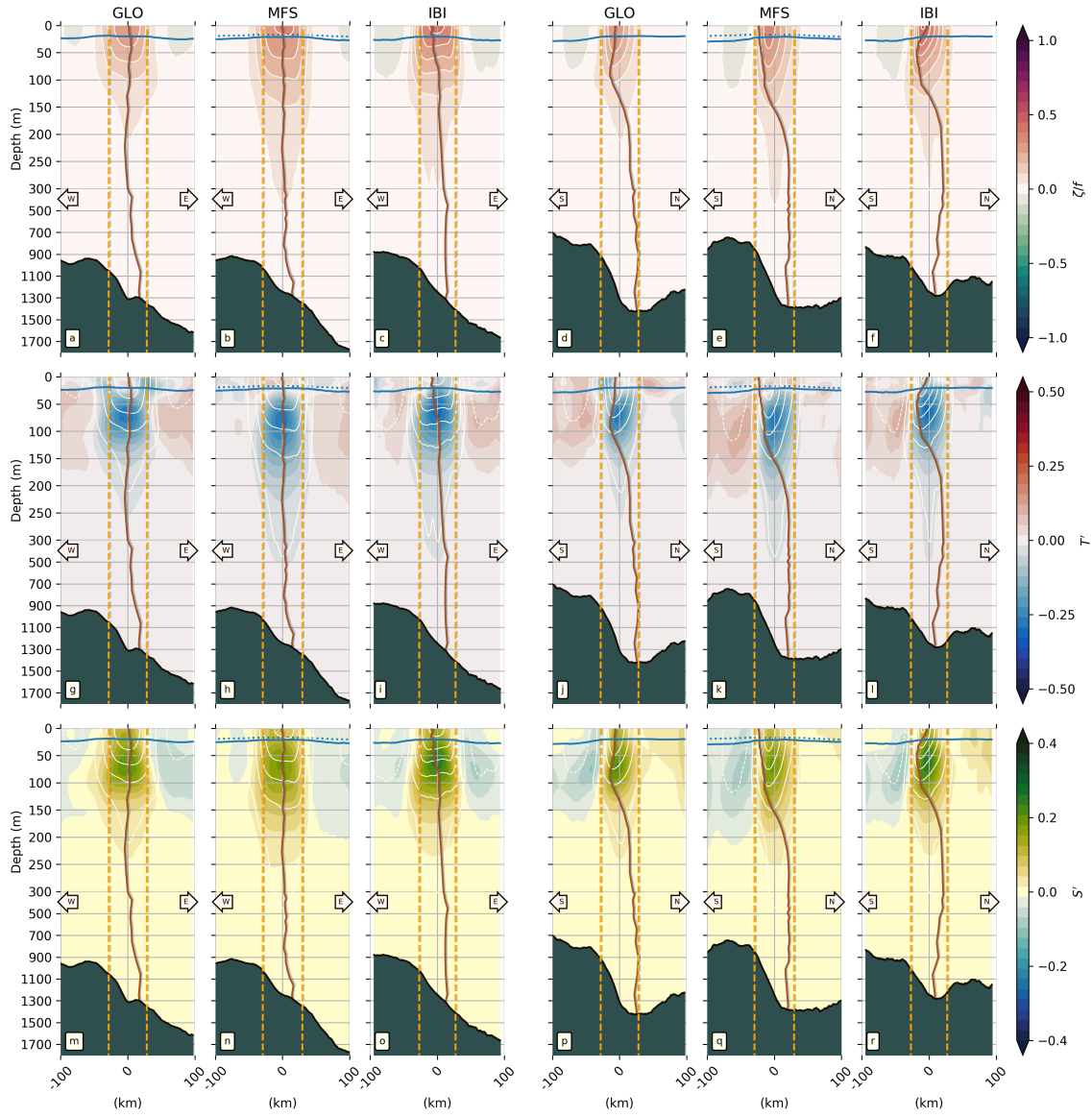



Figure S6. Same as Fig. S5 but for the eastern Alboran gyre.

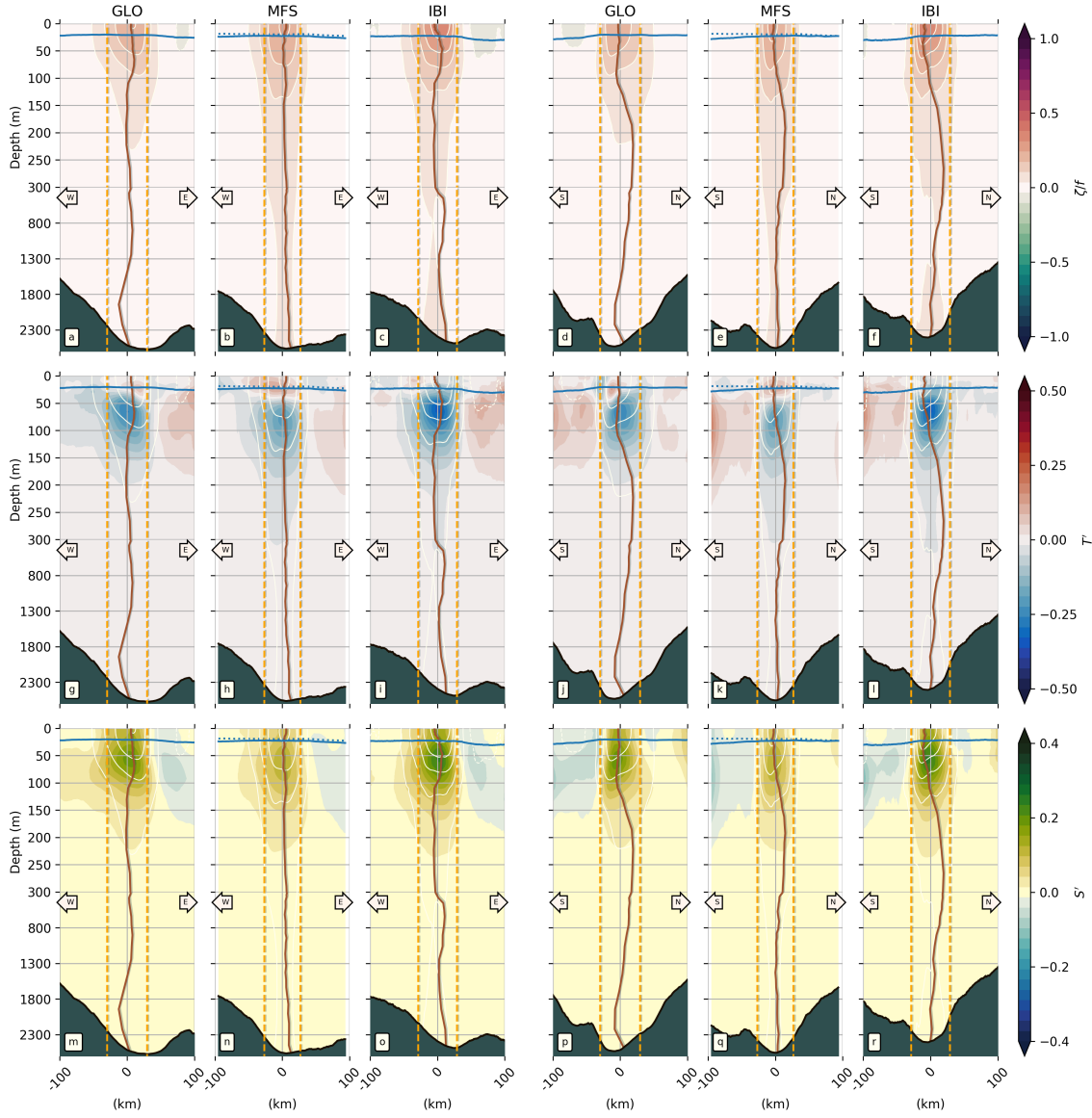



Figure S7. Same as Fig. S5 but for the Cartagena frontal region.

Seasonal mean MLD for the EAG and CRT subregions

MLD (EAG)

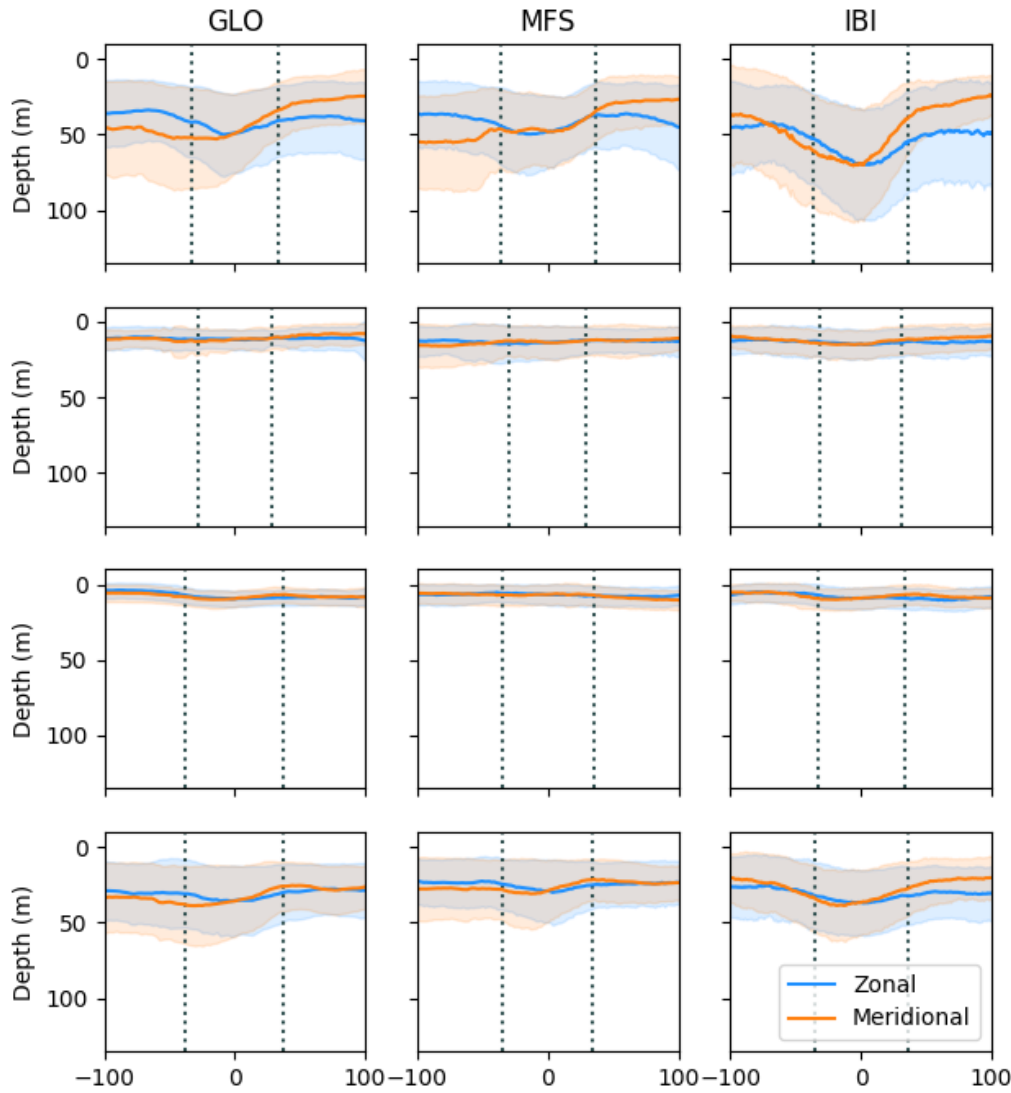



Figure S8. Mean and standard deviation of the seasonal mixed layer depth in anticyclones in the eastern Alboran gyre for *GLO* (left column), *MFS* (middle column) and *IBI* (right column). Zonal (meridional) profiles in blue (orange). Vertical dotted lines mark the mean eddy radius from the center.

MLD (CRT)

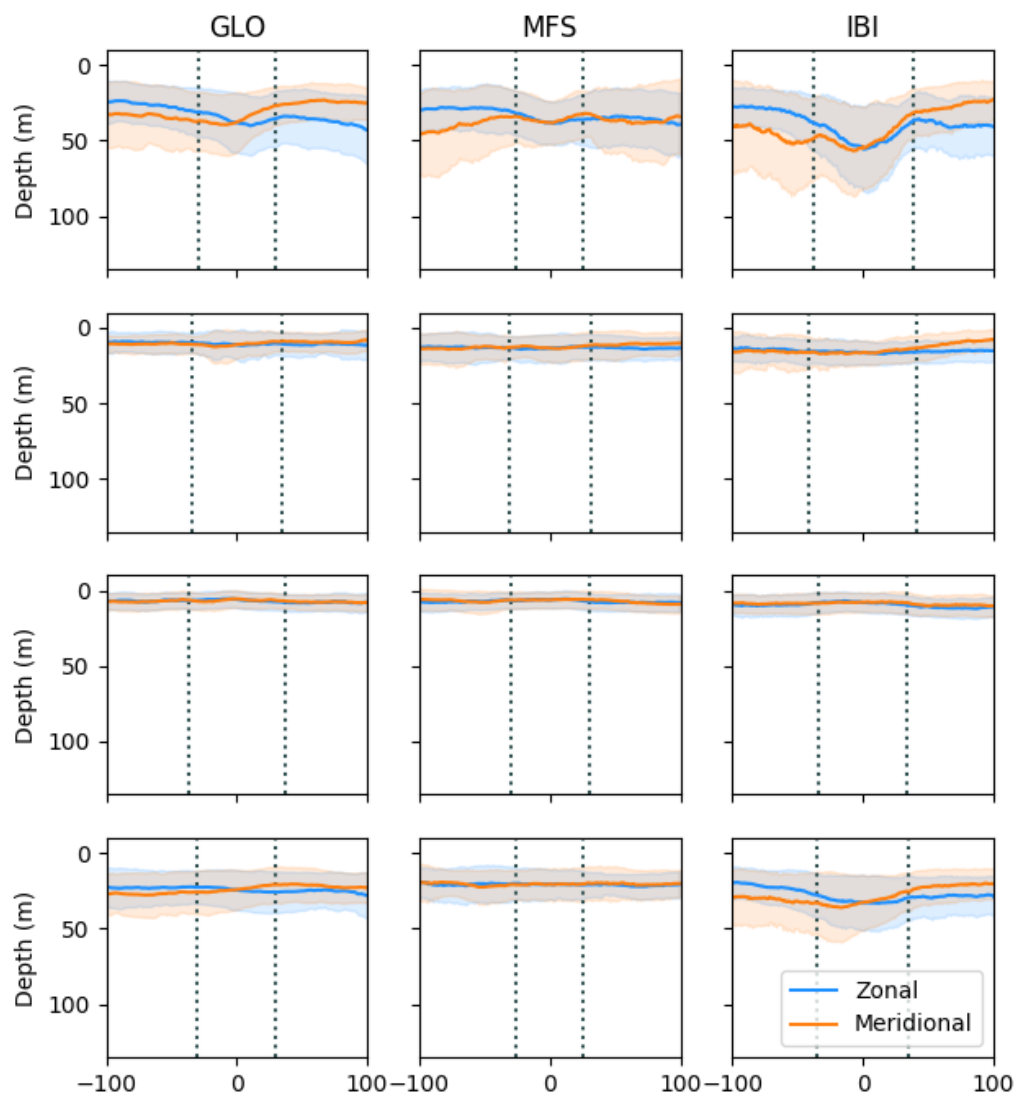



Figure S9. Same as Fig. S8 but for the Cartagena frontal region.

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