



High-resolution diapycnal mixing map of the Alboran Sea thermocline from seismic reflection images

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Abstract. The Alboran Sea is a dynamically active region where the salty and warm Mediterranean water first encounters the incoming milder and cooler Atlantic water. The interaction between these two water masses originates a set of sub-mesoscale structures and a complex sequence of processes that entail mixing close to the thermocline. Here we present a high-resolution map of the diapycnal diffusivity around the thermocline depth obtained using acoustic data recorded with a high-resolution multichannel seismic system. The map reveals a patchy thermocline, with areas of strong diapycnal mixing juxtaposed with others of weaker mixing. The patch size is of a few km in the horizontal scale and of 10-15 m in the vertical one. The comparison of the obtained maps with the original acoustic images shows that mixing tends to concentrate in areas where internal wave become unstable and shear instabilities develop. These results are also compared with others obtained using conventional probes. The values estimated based on the seismic data are within the ranges of values obtained from oceanographic data analysis, and they are also consistent with reference theoretical values. Overall, our results demonstrate that high-resolution seismic systems allow to remotely quantify mixing at the thermocline depth with a lateral resolution of $O(101\text{ m})$.