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## Heat content and temperature trends for different depth layers in the Mediterranean Sea

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The Mediterranean Sea is very sensitive to climatic changes due to its semi-enclosed nature and is therefore defined as one of the hotspots in future climate change projections. In this study, we use Argo float data to assess climatologies and trends in temperature and Ocean Heat Content (OHC) throughout the Mediterranean Sea and for specific sub-basins (e.g. Western and Eastern Mediterranean, Gulf of Lion, South Adriatic). The amount of the OHC, spatially averaged in bins of  $1^\circ \times 1^\circ$  over the period from 2001 to 2020, increases from west to east in the Mediterranean Sea. Time series of temperature and OHC from 2005 to 2020, estimated in the surface and intermediate layers (5-700 m) and deeper layer (700-2000 m), reveal significant warming trends and an increase of OHC. The upper 700 m of the Mediterranean Sea show a temperature trend of  $0.041 \pm 0.012 \text{ }^\circ\text{C}\cdot\text{yr}^{-1}$ , corresponding to an annual increase in OHC of  $3.59 \pm 1.02 \text{ W}\cdot\text{m}^{-2}$ . The Western Mediterranean Sea (5-700 m) is warming fastest with an increase in temperature at a rate of  $0.070 \pm 0.015 \text{ }^\circ\text{C}\cdot\text{yr}^{-1}$ , corresponding to a yearly increase in OHC of  $5.72 \pm 1.28 \text{ W}\cdot\text{m}^{-2}$ . Mixing and convection events within convection sites and along boundary currents transport and disperse the temperature and OHC changes. Significant warming trends are evident in the deeper layers (700-2000 m) of the two deep convection sites in the Mediterranean Sea (Gulf of Lion, South Adriatic), with an exceptionally strong warming trend in the South Adriatic from 2013 to 2020 of  $0.058 \pm 0.005 \text{ }^\circ\text{C}\cdot\text{yr}^{-1}$ , corresponding to a yearly increase in OHC of  $9.43 \pm 0.85 \text{ W}\cdot\text{m}^{-2}$ .

The warming of the different water masses will show its feedback on ocean dynamics and air-sea fluxes in the next years, decades, and even centuries as these warming waters spread or re-emerge. This will provide more energy to the atmosphere, resulting in more extreme weather events and will also stress ecosystems and accelerate the extinction of several marine species. This study contributes to a better understanding of climate change in the Mediterranean region, and should act as another wake-up call for policy makers and society.

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### Supplementary materials

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