EXSALT - Study of compound ocean surface EXtreme events: SALinity-Temperature variations during the onset and decline of marine heat waves and cold spells.

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The study of Marine Heat Waves (MHWs) has gained attention among researchers across the world because of their increasing frequency and intensity over the last years, as a result of climate change. Sea Surface Salinity (SSS) plays an important role in the global water cycle, which appears to be intensifying due to climate change and influences the vertical distribution of heat in the ocean because of its influence on water density. The role of SSS in the onset and offset of MHWs and cold spells, or the changes induced on SSS by these extreme events has not been adequately addressed.

This work will present the main objectives of the EXSALT project (2024-2025), which include:

- How does salinity evolve before, during and after MHWs and cold spells? are changes in salinity favouring the formation or dissipation of these events through the modification of water density; how are the atmospheric conditions influencing the variations in salinity during these temperature extreme events.

- Where, when and how often do compound extreme SST/SSS events occur? how often do these compound events occur, what are the drivers for these events, are these compound events influenced by major climate modes.

- Is the relation between SST and SSS during compound events regionally variable? How evaporation/precipitation, freshwater inputs and other factors affect the variability of SST and SSS during compound events.

The relation between extreme SST and extreme SSS may be region-dependent, and should be established for different areas. Compound events can cause increased damage to the ecosystem than individual events. It is therefore necessary to establish the relation between extreme temperature and salinity compound events, and establish their spatio-temporal patterns in different regions, in order to understand how these events originate and which are the drivers that lead to their formation. In order to establish the SST-SSS relation in different regions, EXSALT will concentrate on the southern North Sea, the western Mediterranean Sea and the Chilean fjords.