Comprehensive Evaluation of Marine and Atmospheric Heatwaves in the Mediterranean Region

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Although global warming is not uniform, the overall trend in globally averaged temperatures shows that more regions are warming than cooling. According to NOAA's 2023 annual climate report, the combined land and ocean temperature has risen by an average of 0.06°C per decade since 1850, for an overall increase of about 1.1°C. Remarkably, warming has accelerated significantly since 1982, reaching 0.20°C per decade, more than three times the previous rate. Given the increasing impact of climate change, heatwaves are not only increasing in frequency, but also in severity, magnitude and duration. They are currently one of the most dangerous environmental threats and can have a huge impact on all aspects of life, including individual and public health, food security and the economy. What's more, these heat events also occur in the ocean, known as marine heatwaves, and they have destructive impacts on marine ecosystems, including coral bleaching, mortality of benthic communities, declines in sea surface productivity, and the loss of seagrass beds and kelp forests. The aim of this work is to assess the occurrence of atmospheric (AHWs) and marine (MHWs) heatwaves in the Mediterranean region over the last four decades. Their monthly, seasonal and annual variations were investigated and the interactions and dependencies of these two temperature extremes were quantified. Furthermore, the variability of ocean-atmosphere heat fluxes during these compound events was also investigated. The MHW dispersion into the water column during the compound of the heat events was assessed and compared to the MHW dispersion into the water column without the AHWs to determine if the combination between the atmospheric and marine heat events results in more heat reaching deeper into the water column, which in turn could reach marine organisms living in colder deep areas. This work is still in preparation and the results will be presented at the colloquium. This study highlights the link between AHWs and MHWs in the Mediterranean and will provide valuable insights into this critical aspect of climate change.