



DAY 3 – Thursday 25 September 2025

Core Argo session – Part 2

Focus on Mediterranean Sea

Marine Heatwaves During the Summer of 2024 in the Aegean, Ionian, and Cretan Seas: A Multi- Platform Analysis Using Satellite and ARGO Floats Data

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The summer of 2024 marked the warmest sea temperatures on record across the Aegean, Ionian, and Cretan Seas (AICS), driven by extreme atmospheric heatwaves under a long-term warming trend. Between 1982 and 2024, mean atmospheric temperatures increased by 0.46 °C per decade, while Sea Surface Temperature (SST) rose even faster at 0.59 °C per decade. In 2024, mean summer SSTs exceeded 28 °C, particularly in the Ionian Sea, southern Cretan Sea, and northern Aegean, setting a four-decade record. Although the number of Marine Heatwaves (MHWs) was relatively lower than in past warm years, their duration and cumulative intensity reached unprecedented levels—nearly double those of 2018, the previous warmest year. The northern Aegean, especially the Thermaikos Gulf, experienced intense MHWs with significant ecological impacts. Extreme warming was amplified by intense downward atmospheric heat fluxes, continuing an interannual increasing trend observed over four decades. Additional drivers included weakened mitigating mechanisms such as Black Sea Water (BSW) inflow and coastal upwelling. Satellite-derived chlorophyll-a data indicated reduced BSW input, while upwelled waters from 40–80 m depths, as derived from available ARGO floats, were warmer than usual, limiting their cooling effect. Notably, elevated temperatures extended to depths of 50 m, indicating a deep and widespread ocean heat anomaly. Prolonged warming in semi- enclosed basins like the Mediterranean has significant physical, biological, and socioeconomic implications for the AICS region. These findings underscore the urgent need for enhanced monitoring and highlight the importance of measurements in the sub-surface ocean that are conducted mainly by ARGO floats.