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Investigating Sea-bottom Cold Water Events in the Marmara

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The Turkish Straits System (TSS), inter-connects the adjacent Aegean, Marmara and Black Seas through the Bosphorus and Dardanelles Straits. The TSS is a complex dynamical system providing transport of water, mass, heat and materials between these domains. A network of 10 autonomous instrument stations on the sea-bottom at a depth range of 779-827m operated by the MARsite consortium recorded temperature and pressure in order to study geophysical processes along the North Anatolian Fault that extends through the Marmara Sea. The most outstanding feature of the measurements were intermittent cycles of drops in temperature of approximate magnitude -0.02ºC from the baseline values, which however cannot be readily explained due to insufficient knowledge of candidate physical and thermal processes at these depths. The typical event starts abruptly and lasts for a period of 0.6-5 days, also abruptly ended, with irregular repetition intervals in the range of 1-21 days. The events were consistently recorded by almost all instruments although with slightly varying shape and phase differences that suggest propagation from east to west. The data suggested that the cold water could follow a number of bottom canyon features at depths of 390-650m along the sill connecting the sub-basins. Attempts to relate the events to the local wind stress and barometric pressure or sea-level do not seem to corroborate direct and independent influence of these forcings. However, comparison with local hydro-meteorological and sea-level measurements indicates strong seasonality of the events with increased occurrence during winters, suggesting the interplay between dynamical elements of the entire system forced by hydro-meteorological environment. Forecasting the TSS circulation with a high -resolution model of coupled basins interconnected to the external domains of the Black Sea and the Aegean Sea demonstrates an energetic stratified response with surface and internal seiches and basin modes documented and analyzed herewith could account for the cold-water events.