Polar marine environments are currently under a significant threat of climate warming caused by human activities (emission of greenhouse gases). This carries with it significant consequences for the the Arctic and beyond, for example in terms of food security and development of large-scale oceanographic patterns that are fundamental in regulating Earth's climate. Mitigation and adaptation measures are needed, but these strategies rely on a comprehensive understanding of how marine environments and ecosystems fare under, and are impacted by, climate warming over a longer time period than the current observational period. Such an understanding is currently lacking due to the short time span and limited geographical scope of modern environmental monitoring efforts, and the inherent uncertainty of modelling simulations. One way around this problem is to look for parallels in the past, in geological archives such as the seabed and its incorporated and preserved characteristics.

The Holocene Thermal Maximum (HTM), which took place 10,000 to 6,000 years ago, is the most recent period of warmer-than-present climate. The APHRODITE project seeks to study the HTM to shed light on marine environments and ecosystems during this warmer-than-present interval. Specifically, APHRODITE will study marine sediments from the HTM across the Arctic, to determine prevailing oceanography, particularly sea ice, the degree of Atlantic Water inflow into the Arctic seas, and water temperatures. Further, APHRODITE will shed light on how marine ecosystems fared under the warm climate of the HTM by studying the remains of organisms preserved either as microfossils or DNA in the sediments. This will elucidate whether HTM ecosystems were diverse or more biologically productive, and whether exotic or invasive species occurred. Together, the oceanographic and biological data will clarify how Arctic environments and ecosystems respond to a warmer climate, and whether they thrive or struggle. In turn, this knowledge will serve as a valuable blueprint for the progression of Arctic environments and ecosystems under an imminent future, warmer climate.