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Circulation patterns and eutrophication phenomena in the Thermaikos Gulf

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Thermaikos Gulf, located in the Northwestern Aegean Sea (Greece), is a marine ecosystem of major importance, not only environmentally (as an area of the deep water formation with contribution to the renewal of the North Aegean deep waters), but also due to the various socioeconomic activities associated with the area. Observational and simulated data are used to investigate the evolution of eutrophication events during the last two years in order to evaluate the current (2017-2019) quality state of the seawater in the Gulf. The quality of the marine environment of Thermaikos Gulf was appraised by measuring physical, chemical and biological parameters. Specific physical-chemical characteristics (temperature, salinity, density along with pH and dissolved oxygen) and biological parameters (chl-a and phytoplankton biomass) throughout the water column were evaluated by conducting in situ measurements during the sampling campaigns. Current fields, derived from a high-resolution 3-D ocean model, together with ADCP measurements, are used to describe the major circulation patterns, the river plume dynamics and the renewal pathways of the Gulf. The obtained results are discussed with regards to seasonal and spatial variability, and the water column stratification. Satellite ocean color data were also used to discuss the in-situ findings and confirm "Dirty" Sea and Red Tide phenomena, that were detected and analyzed based on the physical dynamics and especially the renewal patterns of the Gulf. Moreover, we compare these recent findings to respective observations from a previous period (1997 to 2007) to evaluate potential changes in the quality state of the Gulf with respect to meteorological and river discharge conditions.