# Mediterranean Thermohaline circulation and large scale climatic patterns

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**Abstract**

The link between wintertime variations of the large-scale climatic indices and thermohaline properties of the Mediterranean Sea was studied using correlation coefficients and the difference of the patterns between positive and negative modes. North Atlantic Oscillation (NAO), East Atlantic (EA) pattern and Mediterranean Oscillation (MO) were considered as the climatic patterns.

Stronger heat loss in the Western Mediterranean during the negative NAO mode is associated with intensification of the winter convection, and consequently, the presence of the colder and saltier water in this sub-basin. Therefore, negative NAOI (North Atlantic Oscillation Index) provides a more suitable condition for the Western Mediterranean Deep Water Formation. On the other hand, lower temperature is revealed in the Eastern Mediterranean during NAOI+ due to the enhancement of heat loss. However, lower salinity in the eastern basin during the positive phase cannot be explained by the atmospheric forcing and it is probably due to the internal mechanisms. In addition, high NAOI is associated with less precipitation as well as lower sea level height in the major portion of the basin. However, some differences in the relationship between NAOI and oceanographic conditions in the Mediterranean sub-basins have also been evidenced. More specifically, the sea level in the North Ionian Gyre is not influenced by NAO. Variations of temperature and salinity in the West Alboran Sea are opposite of what is observed in the rest of the Western Mediterranean. In addition, the warmer water in the eastern coasts of the Sicily during the NAOI+ is not related to the surface heat fluxes, and NAO reveals a weak impact on the upper layer temperature and salinity of the Adriatic Sea.

Unlike NAO which has the strong impact on the thermohaline characteristics of the entire basin, the influences of two other indices are limited to the smaller areas. In other words, the effects of EA is more evidenced in the western basin and MO reveals the strong impacts on the thermohaline properties of the Eastern Mediterranean. More specifically, positive EAI (East Atlantic Index) is associated with the warmer and lower salinity water in the Western Mediterranean while the negative mode is characterized by the stronger buoyancy loss due to the heat loss intensification and provides more favorable conditions for the Western Mediterranean Deep Water Formation. Furthermore, during high MO stronger heat loss reduces the temperature of the eastern basin. However, due to additional impact of the internal oceanic processes, the effects of the climatic patterns on the salinity of the Eastern Mediterranean are not considerable.