



## **An out of phase coupling between the atmosphere and the ocean over the North Atlantic Ocean**

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An oscillation band, with a period ranging between 40 and 60 years, has been identified as the most intense signal over the North Atlantic Ocean using several oceanic and atmospheric reanalyses between 1856 and the present. This signal represents the Atlantic Multidecadal Oscillation, an oscillation between warmer and colder than normal conditions in SST. Simultaneously, those changes in SST are accompanied by changes in atmospheric conditions represented by surface pressure, temperature and circulation. In fact, the evolution of the surface pressure pattern along this oscillation shows a North Atlantic Oscillation-like pattern, suggesting the existence of an out of phase coupling between atmospheric and oceanic conditions.

Further analysis shows that the evolution of the oceanic SST distribution modifies atmospheric baroclinic conditions in the mid to high latitudes of the North Atlantic and leads the atmospheric variability by 6-7 years. If AMO represents the oceanic conditions and NAO represents the atmospheric variability then it could be said that AMO of one sign leads NAO of the opposite sign with a lag of 6-7 years.

On the other hand, the evolution of atmospheric conditions, represented by pressure distribution patterns, favors atmospheric circulation anomalies and induces a heat advection which tends to change the sign of the existing SST distribution and oceanic conditions with a lag of 16-17 years. In this case, NAO of one sign leads AMO of the same sign with a lag of 16-17 years.