Atlantic Variability and Predictability
Changes in Atlantic sea surface temperature have the potential to influence coastal and inland climate variability (e.g., the impact of El Niño Southern Oscillation on local weather patterns). Efforts at BSC-ES deal with better understanding its predictability sources and impacts.

**Summary**

Nowadays the ocean is no longer seen as a passive agent suffering the changing weather, but as an integrator of it that feedbacks onto the atmosphere and indeed provides memory to the system thanks to its longer persistence.

The Atlantic Ocean is a complex water mass system that largely contributes to weather and climate conditions in the surrounding continents, particularly in the tropical band and at middle-to-high latitudes. Its variability ranges multiple timescales.

At short term, seasonal-to-annual, variations in the tropical Atlantic are dominated by the Atlantic Niño — leading variability mode of sea surface temperature (SST) anomalies — and are strongly linked to the El Niño-Southern Oscillation (ENSO) cycle. The warm phase of the ENSO cycle induces a SST increase in the tropical Atlantic. Many scientific questions concerning these linkages and their simulation remain however unresolved to date.

At long term, annual-to-decadal, the ocean dynamics gains special relevance. The wide SST signature of the North Atlantic multi-decadal variability, often referred to as the Atlantic Multidecadal Oscillation (AMO), can impact local climate well beyond the tropical region. The AMO signal is also related to changes in the Atlantic Meridional Overturning Circulation (AMOC), a critical component of the Earth’s climate system. This relationship is however more challenging due to the scarcity of observational data. Likewise, the AMO-AMOC relationship is still controversial.

**Objectives**

Under different national (RESPONS, DANAE) and international (FP7 PREFACE, H2020 DPETNA) projects, BSC-ES tries to advance our understanding and prediction of Atlantic SST at seasonal-to-decadal timescales, undertaking the following main research topics:

- Investigate the causes of model biases and work towards their elimination
- Gain dynamical insights into the mechanisms underlying variability and impacts
- Improve seasonal-to-decadal forecasts of Atlantic SST and related phenomena

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