

# Atmosphere-ocean interactions in the North Atlantic Ocean through the relation between SLA and teleconnection patterns

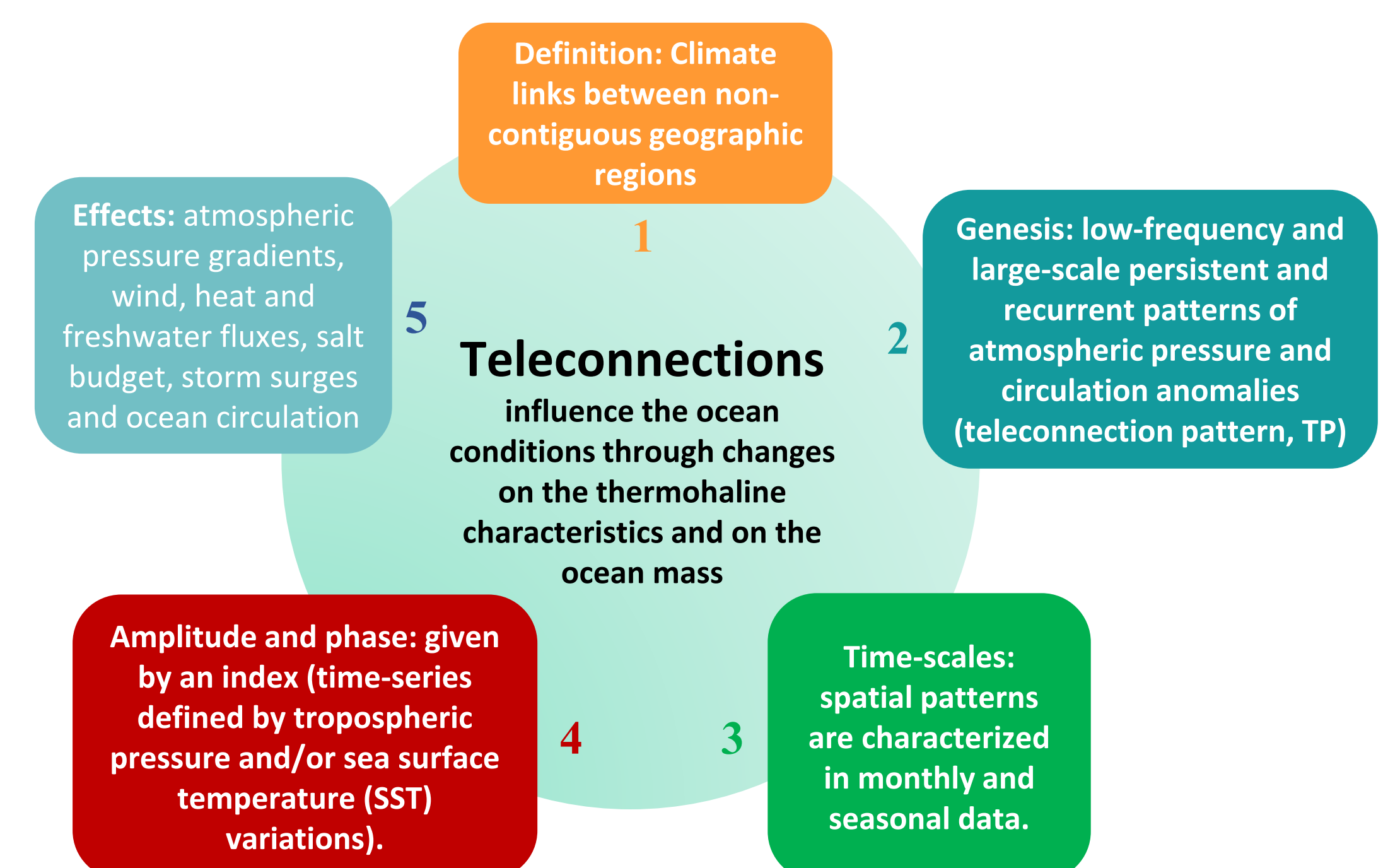
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## Background

The configurations and phases of the North Atlantic Teleconnection Patterns (TP) are currently well known and their effects on e.g. winds, land temperature, precipitation, have been deeply analyzed. However, the NA TP effects on sea level anomaly (SLA) have not been fully analyzed yet.

**Motivation:** understand the response of the SLA field to the most prominent TP acting on the North Atlantic: NAO, EA, EA/WR, SCA, POL.

**Objective:** develop a methodology to provide results to better understand the relation SLA - TP and the atmosphere-ocean links.



## Methodology

### Data:

- SLP and 10 m wind stress: NCEP/NCAR Reanalysis
- Optimum Interpolation Sea Surface Temperature – NOAA OISST
- ESA Sea Level CCI (SL\_cci) V2.0 dataset
- TP monthly time series: CPC – NOAA

**Study period:** Jan 1993 – Dec 2015

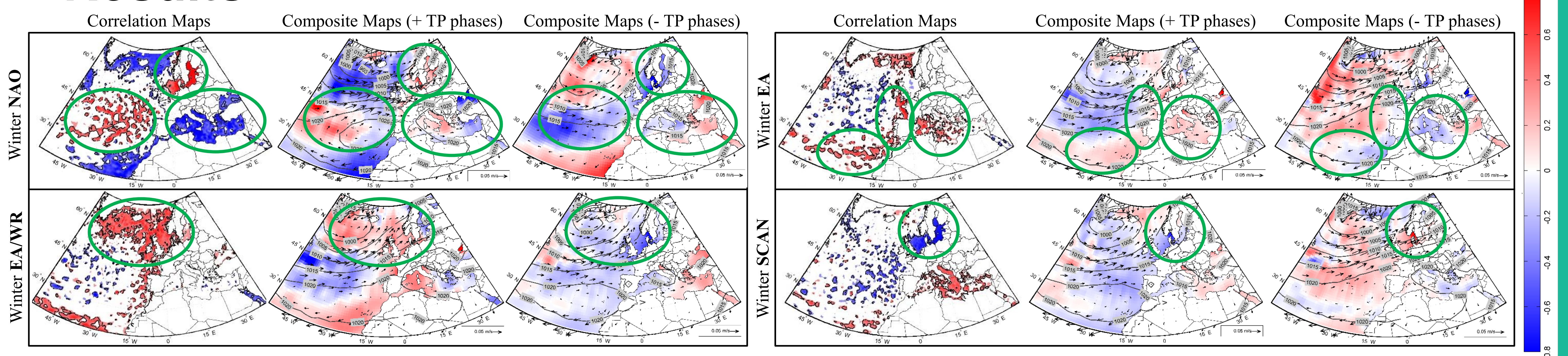
### 1. Computation of the correlation between SLA and each TP index for the standard NH climatic seasons (DJF, MAM, JJA, SON)

- Pearson product-moment correlation coefficient and Student's t-test for statistical inference at 95%.
- SLA time-series standardized prior to seasonal clustering and statistical analysis.

### 2. Computation of SSTA, SLP and wind mean state during +/- TP phases

- Positive (negative) phases:  $\pm 0.5 \times \sigma$  from the mean value of each index for each season.
- SSTA: climatological seasonal mean removed
- Composite maps: SSTA (color), SLP (contours) and surface wind stress (arrows).

## Results



## Conclusions

- Significant correlations between SLA and most of the analyzed TP have been found.
- Regional SLA response to the TP phases depends on the generated winds, SLP and SST anomalies; SST and wind effects are sometimes stronger than the SLP impact.
- Non-stationary inter-annual SLA fluctuations with a non-uniform sea level increase were observed.
- A better understanding of the basin-scale observed SLA changes and atmosphere-ocean links was achieved, contributing to an improved knowledge of the present climate and its long-term evolution, as well as to forecast future effects of the climate change on oceanic and coastal regions.

### Future work:

- Quantification of the importance of each field to the correlation
- TP influence in Eddy Kinetic Energy (EKE) and geostrophic currents
- Analyze the effect of other TP over the North Atlantic region.
- Study how abrupt changes in the TP affect the SLA.