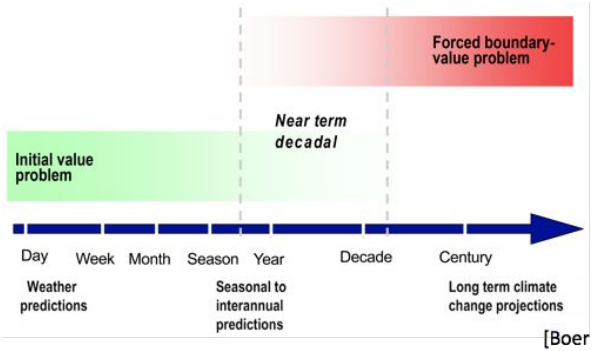
Predicting Climate Change over the multi-annual range: a perspective from CMCC Decadal Prediction System (DPS)

D. Nicolì, A. Bellucci, P. Ruggieri, P. Athanasiadis, G. Fedele and S. Gualdi

European Climate Prediction system
Grant Agreement 776613



[Boer et al., 2016]

The premise of **decadal prediction** is that the **coupled climate system** and its components contain elements, interactions and responses that are **predictable** on **interannual to decadal timescales**

Model Setup

Atm: CAM v.5 1°x1°, L30
Ocean: NEMO v.3.6 1°x1°, L50
Ice: CICE v.4
Land: CLM v4.5

➔ DPS based on **CMCC-CM2-SR5** model *[Cherchi et al., 2018]*

➔ **Full value initialization** strategy:

- Ocean/Sea-ice: **Ensemble of global ocean reanalysis** (ORCA0.5) combining different assimilation schemes (SST nudging with/without 3DVAR assimilation of in-situ T/S) *[Yang et al. 2017]*
- Atmosphere: **ERA40/ERA-Interim** atmospheric reanalysis
- Land: 2 **forced land analysis** (off-line land model forced with different atmospheric fluxes)

➔ **Start dates:** 1st Nov 1960–2019 **every year**

➔ **Ensemble size: 10 members** of **10-year** long hindcasts.

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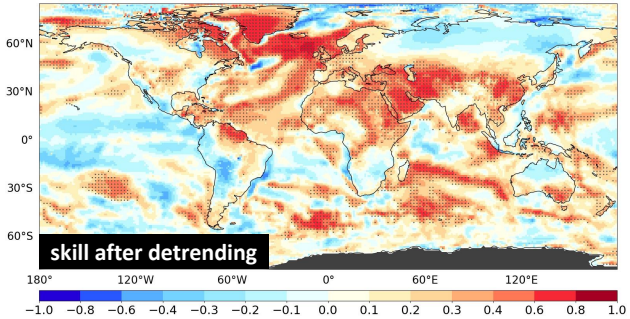
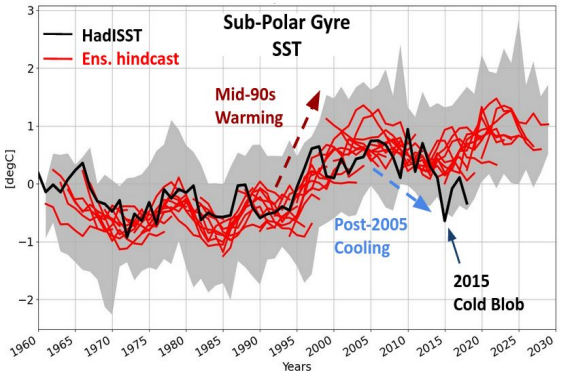
ACC - Anomaly Correlation Coefficient

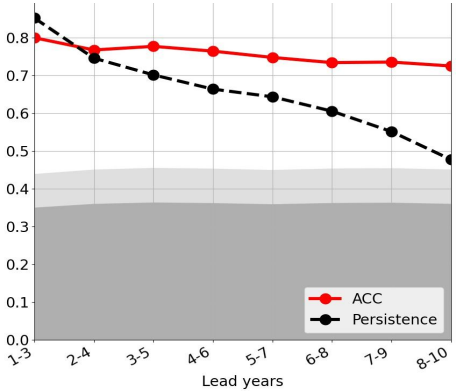
Lead year 2-5 TAS/SST



a measure of the **phase of the variability** (range -1/+1)

$$ACC = \frac{\sum_{i=1}^{n}(v_i - \bar{v})(o_i - \bar{o})}{\sqrt{\sum_{i=1}^{n}(v_i - \bar{v})^2 \sum_{i=1}^{n}(o_i - \bar{o})^2}}$$



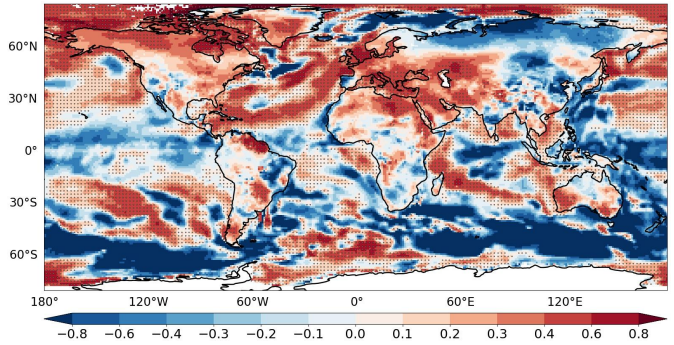


MSSS - Mean Square Skill Score

a measure of the **amplitude of variability** (range -∞/+1)

$$MSSS(H,P,O) = 1 - \frac{MSE_H}{MSE_P}$$

Lead year 2-5 TAS/SST



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