

Analysis of Global Sea Surface Temperature Changes Under Future Scenarios

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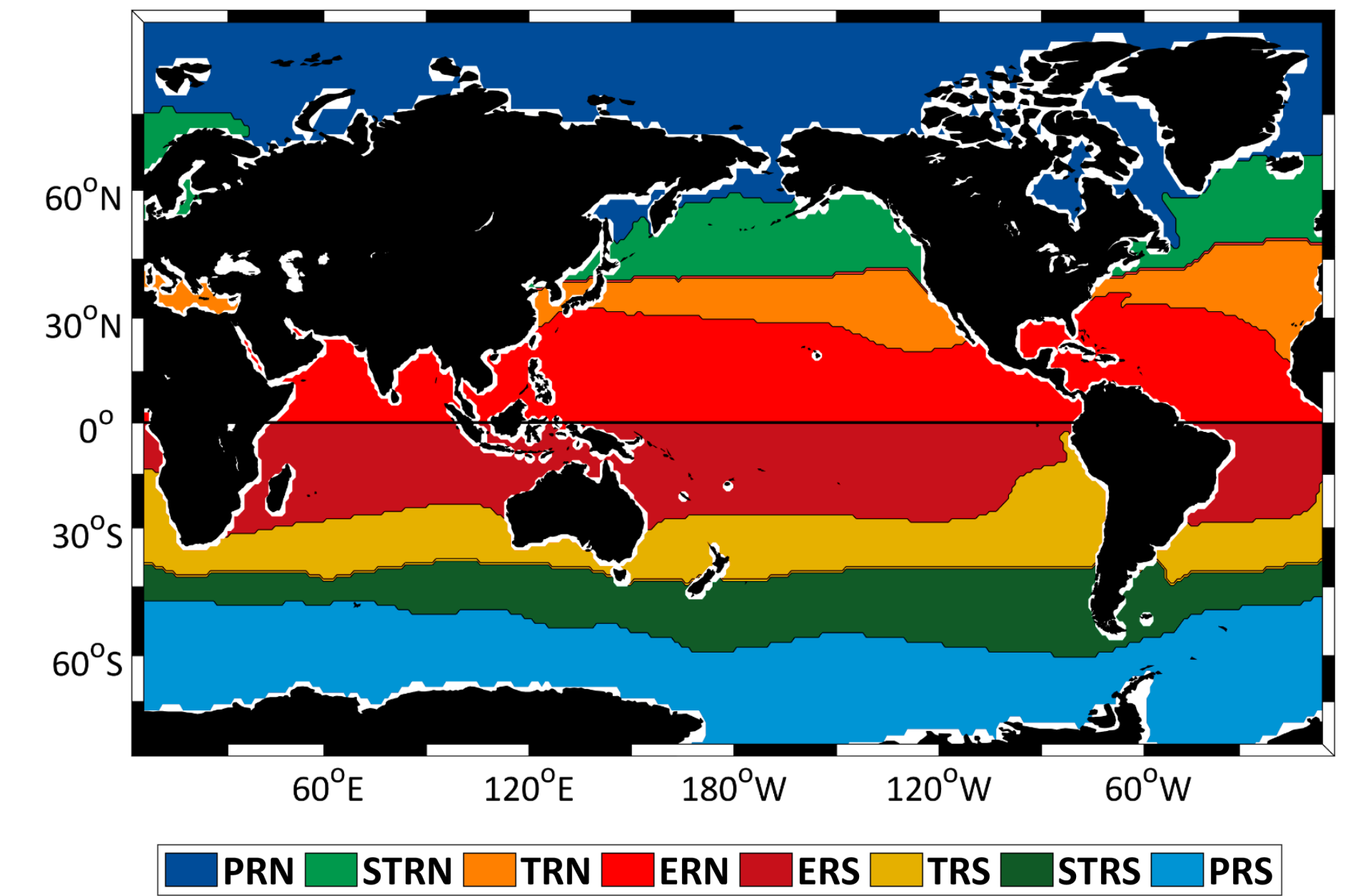


The main aims of this work are to assess the ability of the CMIP5 models in simulating the worldwide sea surface temperature (SST) and to present detailed higher accuracy estimations of the spatio-temporal trends of SST along the southern limit of the Canary Upwelling System (SLCUS) under climate change context

Methodology

- A comparative analysis between CMIP5 models and Era-Interim dataset using monthly historical simulations (1979–2005) was carried out, in order to identify the climate models that best reproduce the worldwide SST patterns;
- This analysis was done comparing the probability distributions between CMIP5 models and Era-Interim dataset as well as through Taylor diagrams inside domains obtained with K-Means cluster analysis, resulting in a spatial subdivision of the domain in regions with similar SST magnitude and variability;
- Data from the selected climate models is used to assess global future changes in the selected domains and specifically along the SLCUS.

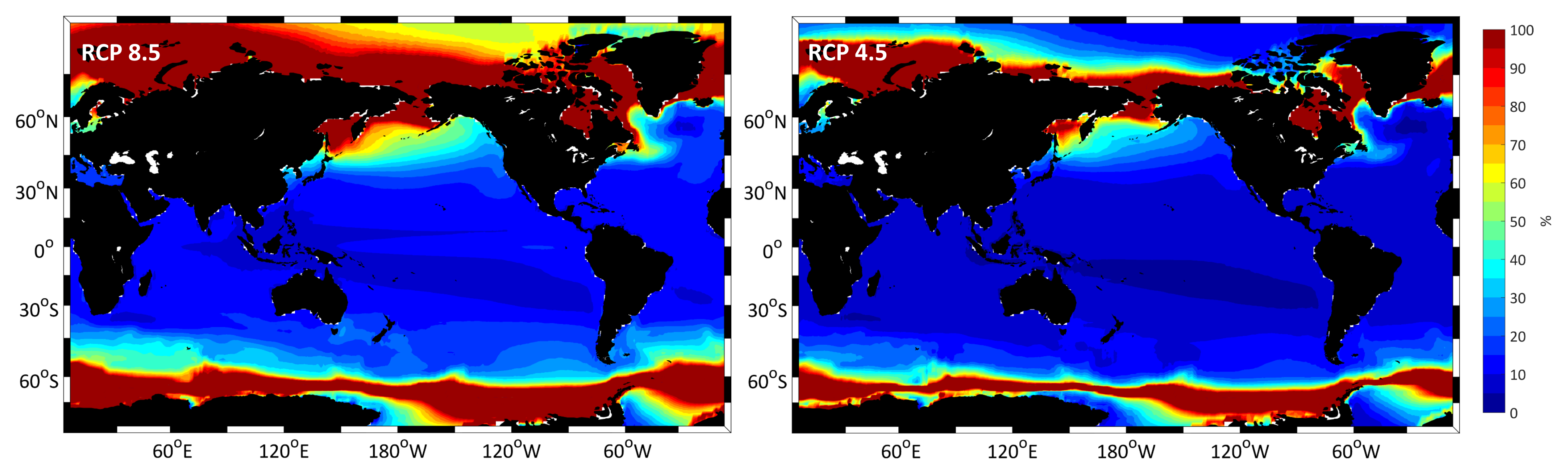
Worldwide regions based on K-Means Cluster Analysis



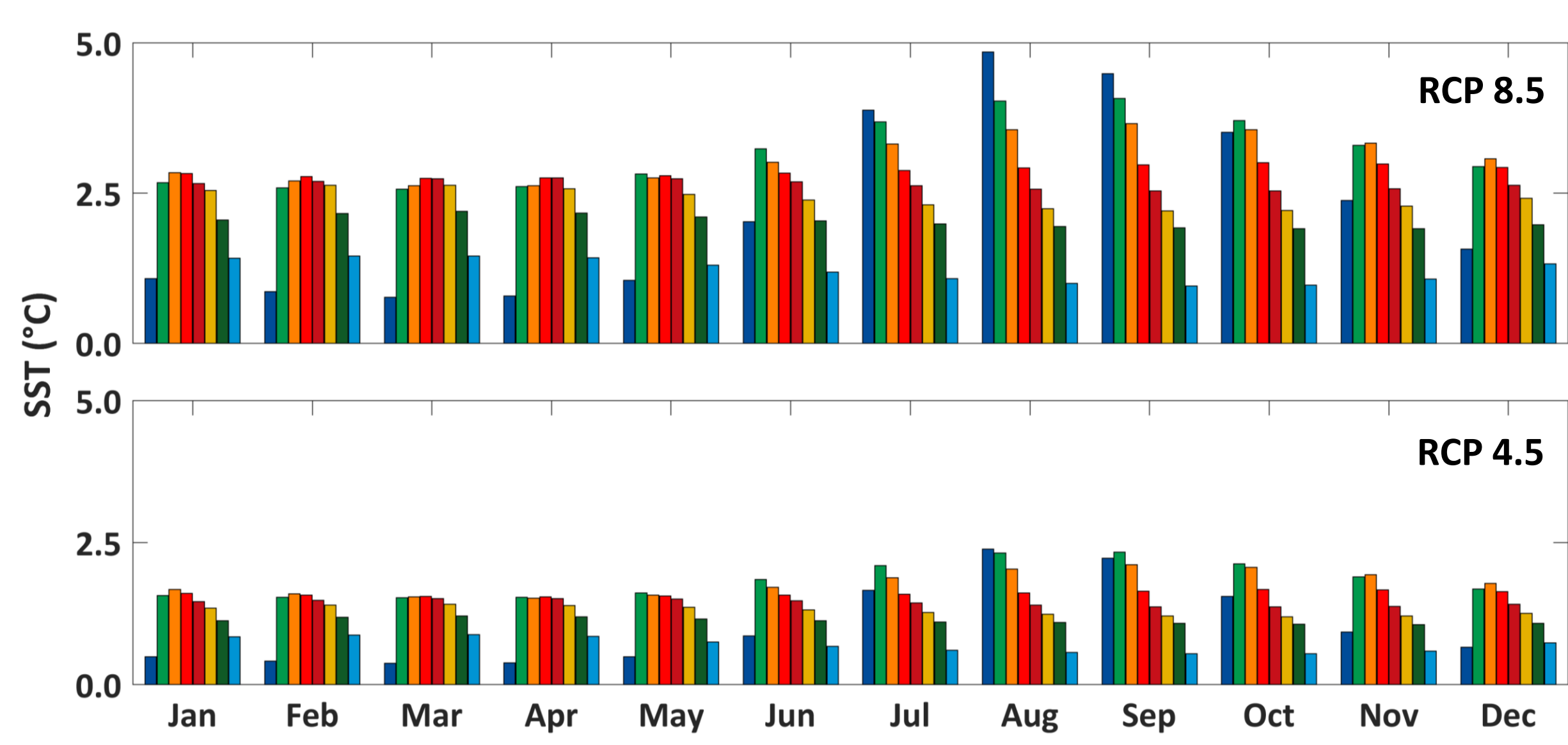
Results

SST projected changes in 2100-2070 with respect to 1975-2005 for RCP 8.5 and RCP 4.5 scenarios

Globally averaged SST is projected by CMIP5 models to warm over the 21st century. For both scenarios, the largest warming is found in the high latitudes.



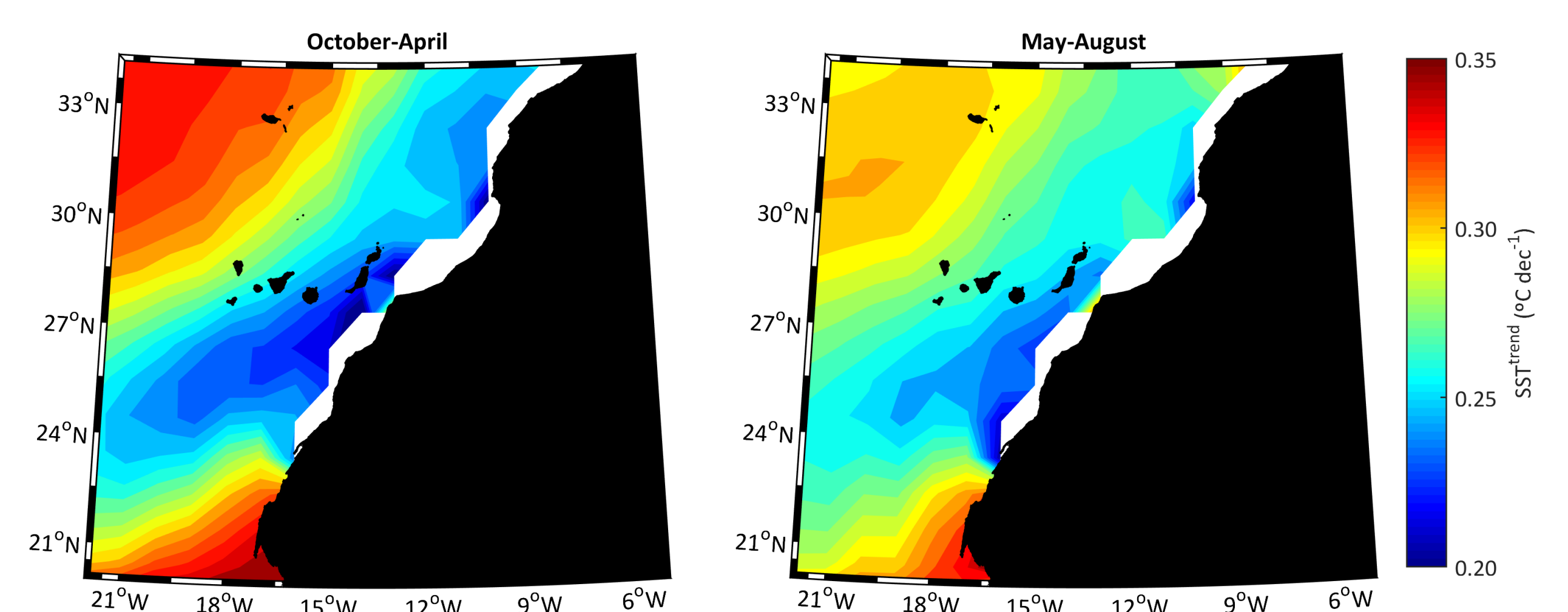
Monthly SST climatological differences between the 2100-2070 and 1975-2005 for RCP 8.5 and RCP 4.5 scenarios



The mean regional monthly SST climatological differences for the eight regions present different climatological changes, which vary throughout the seasons in distinct ways. The climatological differences are always positive for both regions and scenarios, indicating to a warming of all regions, although with different magnitude.

A significant SST warming for both periods throughout the whole region is projected, although it is less intense near the coast due to the presence of coastal upwelling. SST trends for October-April show lower rates compared to May-August along the coast, with values around 0.20 °C dec⁻¹. These trends contrast with the warming rates observed for the rest of the area.

SST trends projected for RCP 8.5 scenario during for 2006–2099 along the SLCUS



Results for future SST trends reveals a general warming throughout the domains, although the warming rate is considerably lower near the shore than at open ocean locations due to coastal upwelling effects. SST projections show higher warming rates from May to August than from October to April in response to the future decreasing trend in the upwelling index during the summer months along the SLCUS

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