

Tropical Atlantic influence on the Pacific under different ocean background states

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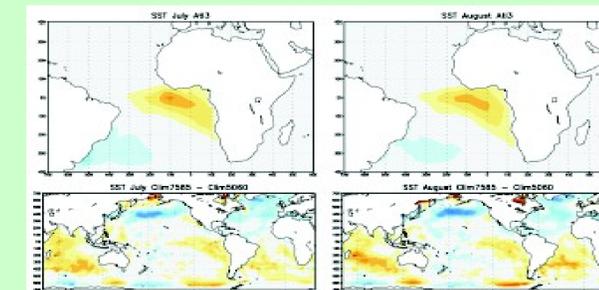
Scientific Question: what is the role of the background state in the Atlantic-Pacific connection?

Models: UCLA, ECHAM & SPEEDY
 Same forcing and two different climatologies
Variable to Analyze: 925 hPa velocity potential

$$R(EN) = R(F) + R(\text{clim}) + R(\text{NL}) \quad **$$

**The response to a SST pattern is the sum of the direct response to the anomalous heating (R(F)), plus the response to the climatology plus a non linear term.

Forcing
 Difference of climatologies



Motivation: important changes in the Atlantic influence on the Pacific before and after the 1970's ([1,2,3])
 These changes can be due to changes in the ocean background state but also to modifications in the spatial configuration of the mode ([4,5])

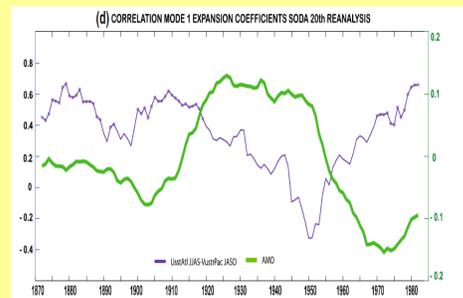


Fig 1: 20-yr window moving correlation between the SST expansion coefficient for the Atlantic and the Pacific mode. From [2]

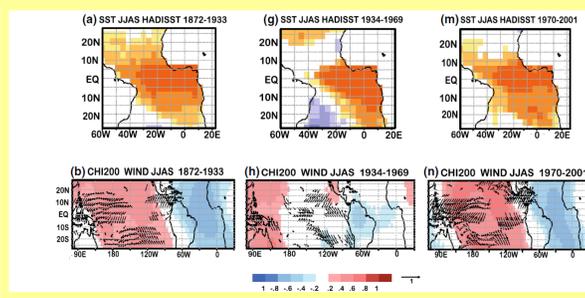
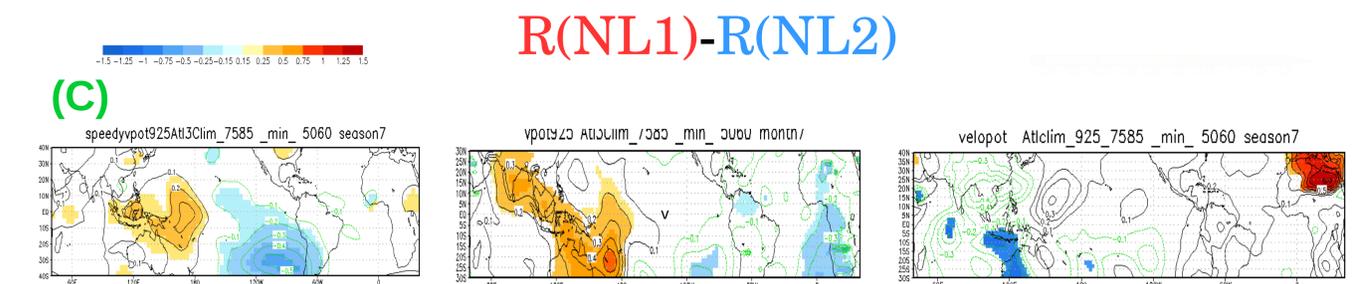
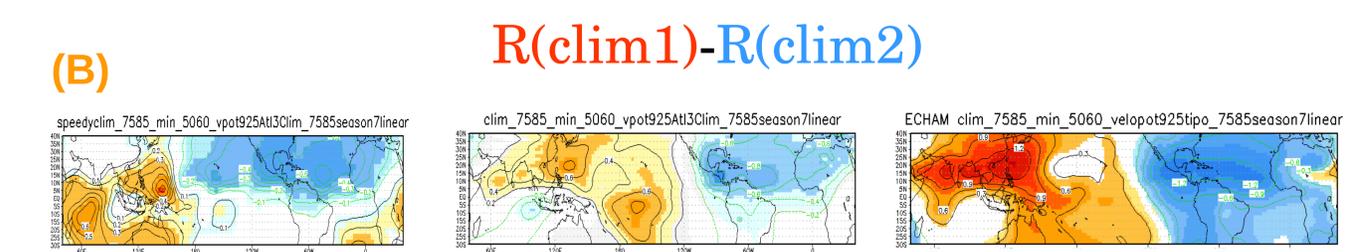
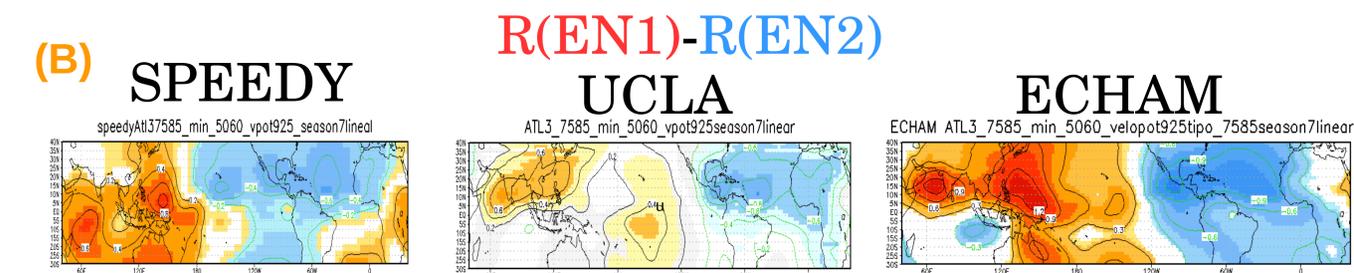
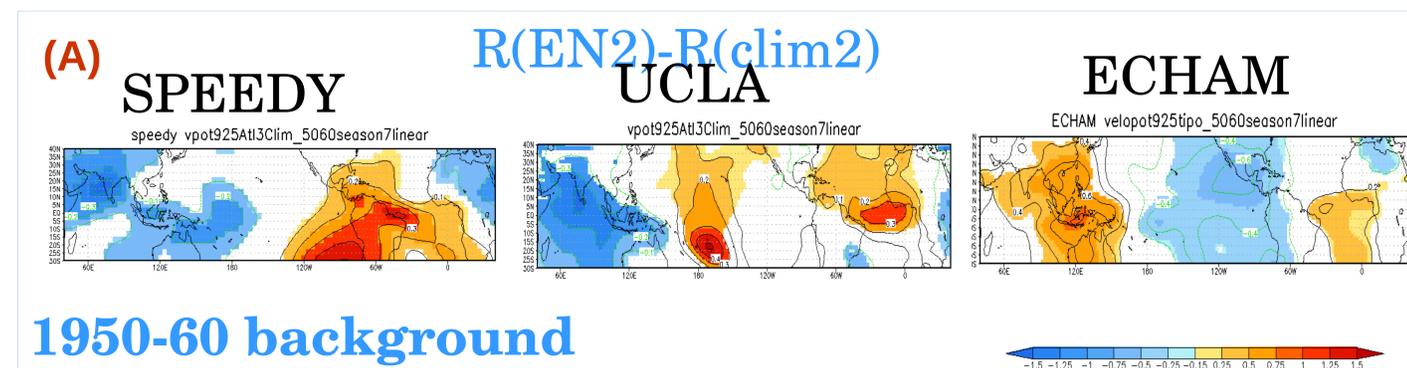
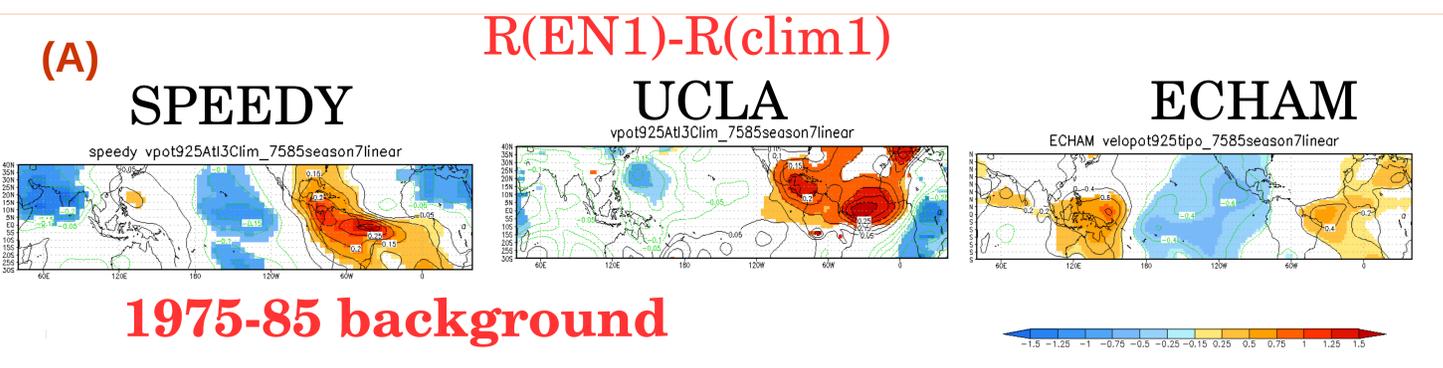


Fig 2: leading mode of the Atlantic-Pacific connection in three different periods. Top : Atlantic SST mode. Bottom: 200 hPa velocity potential and windstress. From [2]

95% (t-test) significant results are shaded



Results:

(A) The anomalous response in SPEEDY and UCLA is different in each of the periods. ECHAM simulates a similar anomalous response.

(B) The difference in the direct response is mainly due to the difference in climatologies.

(C) The difference in anomalous responses between periods corresponds to the non linear terms which are significant for SPEEDY and UCLA and enhance the trades in the western Pacific and a La Niña development. In ECHAM these terms are not significant.

The difference in climatologies reduces the trades and, the non linear terms are the responsible of the Atlantic-Pacific connection

References:

- [1] Rodríguez-Fonseca B, Polo I, García-Serrano J, Losada T, Mohino E, Mechoso CR, Kucharski F (2009) Are Atlantic Niños enhancing Pacific ENSO events in recent decades? Geophys Res Lett 36:L20705
- [2]
- [3] Polo I, Martín-Rey M, Rodríguez-Fonseca B, Kucharski F, Mechoso CR (2015) Processes in the Pacific La Niña onset triggered by the Atlantic Niño, Clim Dyn
- [4]
- [5]