

**A.Navarra, A. Cherchi:
Impact of Increased CO2 Levels on Interannual Tropical
Variability**

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The coupled general circulation model developed in the European project SINTEX has been used to assess the impact of rising levels of CO₂ concentration on the interannual tropical variability. A CGCM scenario with a doubled CO₂ concentration reproduce a general warming on the Pacific Ocean and an El Nino-like oscillation of a constant frequency of about 2 years, in agreement with previous studies [1,3] on the effect of CO₂ increase on ENSO interannual variability and on global warming simulations. Then the CO₂ concentration has been increased up to 4 and 16 times the present. The NINO3 index in standard deviation units (Fig. 1) evidences that when the CO₂ concentration reaches 16 times the present the El Nino-like oscillation seems to disappear, supporting the establishment of permanent El Nino conditions.

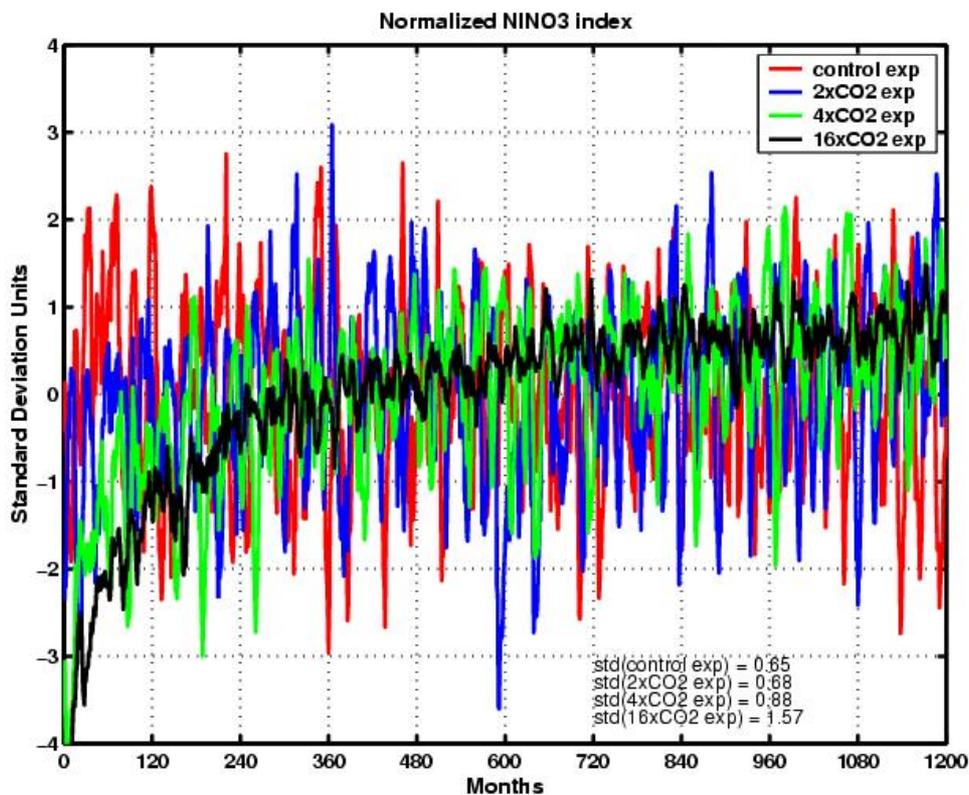


Figura 1: NINO3 index in standard deviation units (lower panel) for the 4 experiments.

The coupled model used in this study has been shown to have a realistic description of the ENSO dynamics in the equatorial Pacific [2]. The increase on the CO₂ concentration affects the equilibrium in the Pacific Ocean which appears to be interested by a global warming, larger in the western part of the basin. The disappearing of an El Niño-like oscillation when the CO₂ concentration reaches 16 times the present is evidenced by the deepening of the thermocline, and the establishment of permanent El Niño conditions.

References

1. Collins M. (2002). The El Niño Southern Oscillation in the Second Hadley Centre Coupled Model and its response to greenhouse warming. *J. Climate* **13**, 1299-1312.
2. Guilyardi E., P. Delecluse, S. Gualdi and A. Navarra (2003). Mechanisms for ENSO phase change in a coupled GCM. *J. Climate* **16**, 1141-1158.
3. Meehl G.A., P.R. Gent, J.M. Arblaster, B.L. Otto-Bliesner, E.C. Brady and A. Craig (2001). Factors that affect the amplitude of El Niño in global coupled climate models. *Climate Dynamics* **17**, 515-526.