M2 SOAC: Fiche de stage de recherche en laboratoire

<u>Laboratoire</u> : LEGOS

<u>Titre du stage</u> : The nonlinear response to El Nino SSTS

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<u>Sujet du stage</u> :

The El Niño-Southern Oscillation (ENSO) is a coupled ocean-atmosphere phenomenon. In essence, an SST anomaly in the equatorial Pacific triggers a wind response whose effect on the ocean strengthens the initial anomaly: this is the Bjerknes feedback. This process contains a number of nonlinearities and the details of the non linear atmospheric processes that contribute to ENSO properties are currently not fully understood. Deep atmospheric convection is central to generating the wind anomalies that allow ENSO events to grow. Observations suggest a strongly non-linear relation between SST and convection.

In this project the student will use dynamcal and /or statistical models to quantify the successive nonlinear links in the Bjerknes feedback chain. The sources of nonlinearity under investigation are:

1) SST-Convection The pathway from SST anomaly to tropical atmospheric circulation is mostly conditioned by the deep convective response to the SST. This depends not only on the anomaly of the SST but also the absolute value of the SST. The same positive anomaly having more effect over a climatologically warmer sea surface. We plan to investigate this statistically using output from AMIP style GCM integrations in collaboration with CNRM.

2) Convection-Surface wind The nonlinearity inherent in atmospheric dynamics means that the response to a deep heating will depend on the background circulation, and often exhibits a response to opposing signs in a convective heating anomaly that are not equal and opposite. We plan to investigate this with a simple dynamical model of the global atmosphere, sampling the rich diversity of ENSO types.

Ideally, results from part (1) above can feed into the specification of part (2). However, one or both of these approaches can followed independently. There is ample scope for sensitivity studies with the dynamical model without having completed part (1).