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**Tian Ma**, Department of Mathematics, Sichuan University, Chengdu, Sichuan , Peoples Rep of China, and **Shouhong Wang\*** ([showang@indiana.edu](mailto:showang@indiana.edu)), Department of Mathematics, Indiana University, Bloomington, IN 47405. *El Nino Southern Oscillation as Sporadic Oscillations between Metastable States.*

We present in this talk a new mechanism of the El Nino Southern Oscillation (ENSO), as a self-organizing and self-excitation system, with two highly coupled processes. The first is the oscillation between the two metastable warm (El Nino phase) and cold events (La Nina phase), and the second is the spatiotemporal oscillation of the sea surface temperature (SST) field. The interplay between these two processes gives rises the climate variability associated with the ENSO, leads to both the random and deterministic features of the ENSO, and defines a new natural feedback mechanism, which drives the sporadic oscillation of the ENSO.

The new mechanism is rigorously derived using a dynamic transition theory developed recently by the authors, which has also been successfully applied to a wide range of problems in nonlinear sciences. (Received January 23, 2009)