

Poster

Abstract Title

Dynamical status and evolution of a climate system en route to chaos

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Study Group

Abstract Text

The model climate system of an AGCM of intermediate complexity (ICM) may exhibit three types of solution: (i) a sort of "mean", robust seasonal dynamics that (topologically) follow the cyclic astronomical forcing without showing substantial intraseasonal activity, (ii) a "summer monsoon solution" with a marked, topologically established, 30-60 day monsoon activity cycle that is born by inflation of the forced annual cycle into a torus segment during boreal summer - with a delicate, instability-prone chaotic segment in early summer -, and (iii) a least stable solution with substantial intraseasonal activity in both summer and winter. The most spectacular insight into details of the system's dynamic organization has been drawn thus far from attractor studies of type (ii) solutions. Inflation into the torus segment proceeds via a subcritical Hopf bifurcation that bears a segment of topologically coexisting solutions and gives rise, as the season advances, to the chaotic regime. Toward midsummer, this regime is quickly left via inverse period multiplication, and the last but one step, period doubling, unveils an enstrophy stage that degenerates then into a "scar" at the torus mantle which later the season unveils an important feature: when the monsoon activity cycle is extinguished, there remains a very slow yet structurally "intraseasonal" wander (between unstable summer and winter fixpoints) that clearly has the character of a Southern Oscillation! Conceptual "climate change" experiments are presented that exhibit further interesting cases, including a 'tunneling' solution of paleoclimatic interest - which might hint at topological conditions of the "Green Sahara".

COI

No conflict of interest

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