MAR08-2007-020161

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Heat waves, climate change and eggplant harvests - simple models of climate systems

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I discuss a simple box model of soil-vegetation-atmosphere interactions that we recently introduced to study the insurgence of summer droughts at continental midlatitudes (D'Andrea et al, GRL 2006, Baudena et al, AWR 2007). I show that the model possesses multiple equilibria and that, for the same synoptic forcing, soil moisture at the beginning of summer and vegetation cover play a primary role in determining which equilibrium will be reached. We also observe a difference in the drought climatologies associated respectively with the dynamics of natural vegetation, capable of adapting to the prevailing soil moisture conditions, and with cultivated vegetation such as eggplant, that cannot spontaneously modify its areal extent. I conclude with some speculations on a conceptual model of the interaction between vegetation and climate at global scale. The results discussed in this talk are the product of joint work with Fabio D'Andrea (ENS, Paris) and Mara Baudena (ISAC-CNR).