



## Combined effect of fire and water scarcity on vegetation patterns in arid lands

Nadia Ursino (1) and M. Cristina Rulli (2)

(1) Department IMAGE, Università di Padova, via Loredan 20, 35131 Padova, Italy. , (2) Department IIAR, Politecnico di Milano Piazza Leonardo da Vinci, 32 I-20133 Milano, Italy.

In many arid zones around the world, the vegetation spontaneously forms regular patterns to optimize the use of the scarce water resources. The patterns act as early warning signal that fragile ecosystems may suddenly undergo irreversible shifts, thus, interpreting the structural shape of vegetation patterns is crucial to deciphering the ecosystem history and its expected further development. Here we modelled fire, as a sudden shift of the ecosystem state variables and functionality and evaluated post-fire scenarios under the hypothesis that two major feedbacks shaped the landscape: a positive feedback between preferential infiltration and plant growth, and a second feedback between infiltration and vegetation burning. A simple model solving a set of partial differential equations for soil moisture, plant biomass, surface water and dead biomass balance predicted significantly diverse post-fire vegetation patterns depending on the fire severity and the degree of soil water repellency induced by the vegetation burning.