Geophysical Research Abstracts
Vol. 18, EGU2016-9594, 2016
EGU General Assembly 2016

State Space Analysis of Feedbacks between Precipitation and Soil Moisture

Carla Victoria Valencia-Negrete and Alin-Andrei Carsteanu

School of Physics and Mathematics, National Polytechnic Institute (ESFM, Instituto Politécnico Nacional), Mexico City, Mexico (alin@esfm.ipn.mx)

One major source of complexity in the hydrological cycle is the existence of feedbacks between its components. Particularly, the subject of this work concerns the feedbacks between precipitation and soil moisture. Atmospheric convection has its origin in a temperature difference amid an area on the Earth's surface and its surrounding neighborhood. The generated upward motion is characterized by a velocity that is proportional to the magnitude of the local temperature gradient. The areas involved range from very small surface scales to large ones. Moreover, atmospheric convection over moist surfaces creates convective clouds, which in turn contribute to precipitation within relatively short time intervals. We attempt to assess the stability of this interconnection between soil moisture and precipitation through information exponents obtained by a proper measure of local surface temperature differences, in a range that can be related to convective clouds. We define a measure $\mu_L\left([x, x+\Delta x], t\right)$, adapted from Maxwell's measure for the number of particles that reach a velocity in a specific range, as $\mu_L\left([x, x+\Delta x], t\right) = N\, f(x)\, \Delta x$, where $\mu_L\left([x, x+\Delta x], t\right)$ is an estimated number of minimal observable surface areas with a local temperature difference in $[x, x+\Delta x]$ at a time t, L is the time lag, N is the total number of minimal observable surface areas, and $f(x)$ is the local temperature differences distribution at a given scale.