Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11486, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11486
EGU General Assembly 2008

Mutltifractal predictability and forecasts of precipitation

D. Schertzer (1,2), J. Macor (1,3), I. Tchiguirinskaia (1,4), S. Lovejoy (5)

(1) U. Paris Est, ENPC/CEREVE, Marne-la-Vallee, France [Daniel.Schertzer@enpc.fr], (2) Météo-France, Paris, France,(3), UNL/FICH, Santa-Fe, Argentina (4) CEMAGREF/HOAX, Aix-en-Provence, France [I.Tchiguirinskaia@cemagref.fr], (5) Phys. dept., McGill U., Montreal, Canada [lovejoy@physics.mcgill.ca]

Multifractals have been more and more recognized as powerful tools to analyze spatial heterogeneities and/or temporal variability of precipitation, including the (scaling) space-time anisotropy. We emphasize that multifractals are not limited to analyze and should be more and more used to first study the precipitation predictability, secondly to obtain optimal forecasts.

The intrinsic predictability limits of dynamics coupled with water content are quite different from those of systems that are only complex in time. Indeed, space time scaling systems do not yield characteristic times of predictability: a limited uncertainty on initial and/or boundary conditions on a given range of time and space scales rapidly grows across the scales and yields power-law decays of the predictability instead of exponential decays. Furthermore, the predictability decay is highly intermittent: the loss of information occurs by intermittent puffs and is therefore multifractal: an infinite hierarchy of power-law exponents is required to characterize the predictability decay from average to extreme events.

Secondly, the multifractal framework allows to proceed to forecasts in a dynamical manner. This is easily achieved with the help of ensemble stochastic forecasts, i.e. simulating a given number of possible future realizations and comparing their relative dispersion. We also discuss the possibility to directly achieve multifractal probabilistic forecasts. In both cases, these forecasts are optimal in the sense that they only limited

by the intrinsic predictability limits discussed above.