Predictability and predictive instability of the daily pluviometric regime in the Iberian Peninsula

M.D. Martinez (1), C. Serra (2), X. Lana (2), A. Burgueño (3)

(1) Departament de Física Aplicada, Universitat Politècnica de Catalunya, Barcelona, Spain,
(2) Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya,
Barcelona, Spain, (3) Departament d'Astronomia i Meteorologia, Facultat de Física,
Universitat de Barcelona, Barcelona, Spain (dolors.martinez@upc.edu / Fax: +34 934016090)

The predictive instability of the daily pluviometric regime in the Iberian Peninsula is analysed by considering 43 rain gauges in Spain and Portugal, with recording periods of 40 years. Two series of data are studied: first, the set of daily amounts; second, the set of dry spell lengths, which are derived taking into account different threshold daily amounts of 0.1, 1.0, 5.0 and 10.0 mm/day. A first approach is given by the Hurst exponent of the rescaled analysis, which will indicate randomness, persistence or anti-persistence of the pluviometric series. A second approach is derived from the first two positive Lyapunov exponents, which govern the degree of instability of possible predictive algorithms devoted to forecast future daily amounts or dry spell lengths. As a general feature, the spatial distribution of the Lyapunov eigenvalues is quite complex. For the set of daily amounts, some influence of the vicinity to the Mediterranean Sea is found. The set of dry spell lengths is characterised by some signs of latitudinal variation. The main feature of the rescaled analysis is the randomness (H close to 0.5). Nevertheless, for the dry spell lengths, two well defined domains associated with slight persistence or anti-persistence are detected. Anti-persistence domains tend to diminish with increasing threshold levels. Daily amount series show lack of anti-persistence with areas of notable persistence ($0.6 < H < 0.8$).