

Statistical analysis of precipitation data in Sicily

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Precipitation patterns are critical for understanding the hydrological and climatological dynamics of any region. Sicily, the largest island of the Mediterranean sea, with its diverse topography and climatic conditions, serves as an ideal case study for analyzing precipitation data to gain insights into regional water resources, agricultural productivity, and climate change impacts. In this talk we adopt quantitative statistical methods, particularly Tsallis q -statistics, to analyze sub-hourly precipitation data from 2002 to 2023, provided by the Sicilian Agrometeorological Informative System (SIAS). We investigate several critical variables related to rainfall events, including duration, depth, maximum record, and inter-event time. The study spans two decades (2002-2012 and 2013-2023), analyzing the distributions of relevant variables. Additionally, we examine the simple returns of these variables to identify significant temporal changes, fitting these returns with q -Gaussian distributions. Our findings reveal the scale-invariant nature of precipitation events, the presence of long-range interactions and memory effects, characteristic of complex environmental processes [1].

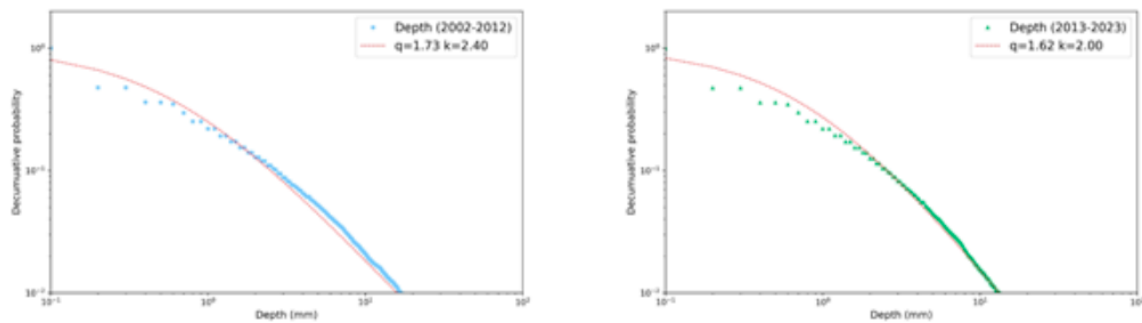


Figure 1 Decumulative probability distributions in log–log scale of winter rainfall depth per event and their q -exponential fits. Comparison between decades: 2002–2012 (left panel) and 2013–2023 (right panel).

References:

- [1] V. Pecorino, A. Pluchino, A. Rapisarda, Entropy 26 (2024) 623, doi.org/10.3390/e26080623