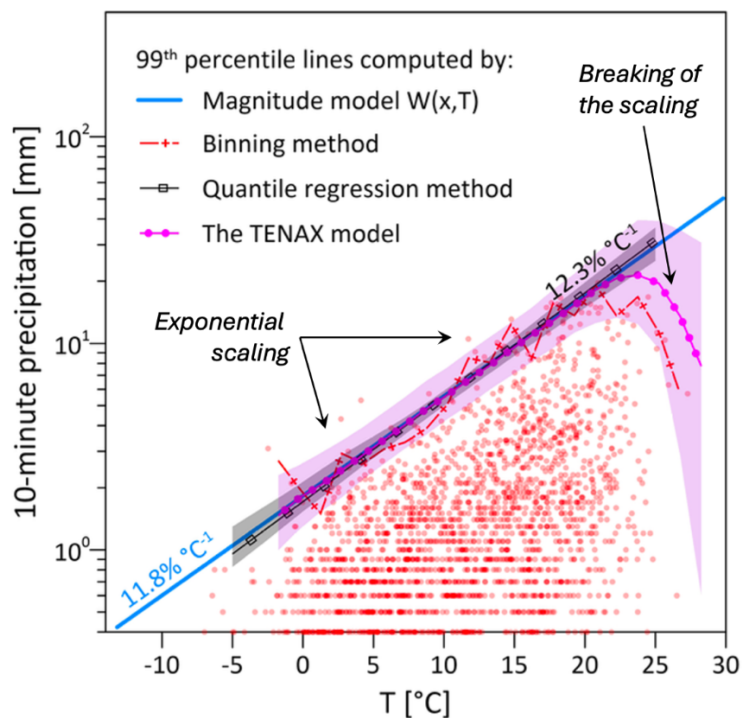


# Global quantification of extreme precipitation statistics and its dependence on atmospheric forcing

(Proposer: Francesco Marra)

**Summary:** This PhD position is part of the HYPES project “Rethinking statistical HYdrology: introducing Physics in Extreme rainfall Statistics” funded by the FIS3 program, in which we aim at producing a statistical description of extreme rainfall probability informed by physics, and therefore explainable, physically consistent, and invariant in space and time. Developing such a model is critical for providing physically-sound projections of future very-rare precipitation extremes.

Predicting the probability of occurrence of extreme events is at the backbone of risk management, hydrological and hydraulic design, and insurance/reinsurance business. Despite its importance, the practical approach to estimating the probability of extremes mostly relies on statistical extrapolations from small samples of empirical data. Explicit inclusion of the available physical knowledge in these statistical models is still at an embryonal stage and requires a multidisciplinary approach at the intersection of atmospheric physics, statistics and hydrology.



**This PhD project aims** at collecting precipitation data from global and regional rain gauge networks and satellite products, geostationary satellite imagery (e.g., Meteosat), and environmental variables from reanalysis products, such as temperature, geopotential height, humidity, aerosols load, etc. The data will then be used to explore the empirical relations between rainfall (heavy rainfall in particular) at multiple spatio-temporal scales and different environmental variables or other quantities (e.g., distance from the sea). This will allow the candidate to propose innovative statistical descriptions of heavy and extreme precipitation at multiple scales in which physical and physiographic variables enter as covariates.

**Collaborations:** Prof. Simon Michael Papalexiou (Technical University of Hamburg, Germany), Prof. Hayley Fowler (University of Newcastle, UK)

**Related funding:** FIS3, DOR