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FOCA: a new quality-controlled collection of floods and catchment attributes in Italy

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In recent years, various national databases of geomorphoclimatic watershed attributes have been released. Relevant examples are the CAMELS datasets for countries such as the United States, Australia, Chile, Brazil, Switzerland, France, Germany, and the United Kingdom (now integrated into Caravan), and LamaH-CE.

This work introduces FOCA (Italian FLOOD and Catchment Atlas), a national-scale collection of 631 Italian basins that we fully characterized by providing more than 100 attributes related to geomorphology, soil, land cover, NDVI, climate, and extreme precipitation. The basins reported in FOCA are derived from a national-scale inventory of peak floods and annual maximum daily floods named "Catalogo delle Piene dei Corsi d'acqua Italiani", realized thanks to a data rescue initiative performed by merging recent data, already available in digital format, with historical information available on printed documents.

The selection of descriptors that we included in FOCA followed three main criteria: a) national spatial coverage; b) absence of regional or local distortions; c) adequate spatial resolution. Preference was given to local sources, resorting to global data only in specific cases. The inclusion of basin boundaries will allow users to assess additional descriptors using their models or datasets.

FOCA stands out from other national datasets due to its robust collection of geomorphological descriptors, computed using the *r.basin* algorithm of GRASS GIS and subjected to thorough quality controls. Another distinctive feature is the incorporation of extreme rainfall characteristics, evaluated using station data instead of reanalysis data — deviating from the approach often seen in the development of CAMELS datasets. For this purpose, the Improved Italian - Rainfall Extreme Dataset (I²-RED) has been used. I²-RED is a national collection of rainfall extremes measured by more than 5000 rain gauges from 1916 up to the present that was developed as the outcome of a data rescue project.

With this nationwide data collection, a wide range of environmental applications, with particular reference to flood studies, can now be undertaken on the Italian territory.