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A new resource on Italian large dams, their catchments, and key attributes

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Italy, like many other Mediterranean countries, is increasingly facing meteo-hydrological hazards, with extreme weather events becoming more frequent and intense. These changing conditions pose serious risks to dam safety and call for a reassessment of spillway design floods to adapt to evolving hydrological scenarios.

Historical flood data may no longer reflect the full range of potential events, highlighting the urgent need for updated and accurate hydrological information. In response to this challenge, the Italian Large Dams Committee emphasized the importance of improving hydrological data at dam sites to improve flood management strategies.

In this context, we present a comprehensive dataset that include geometrical characteristics, as well as watershed-related features, for all 528 large dams in Italy. Freely accessible on Zenodo, this dataset represents the most extensive resource available on Italian dams, providing precious structural and environmental information to researchers, policy makers and stakeholders involved in water resource management and infrastructure planning.

The dataset presents detailed structural information about each dam, such as commissioning year, height, and type, alongside data on reservoir features like volume, surface area, and intended uses. Some of this information is sourced from the General Department of Dams and Hydro-Electrical Infrastructures. Notably, it also includes critical parameters such as reservoir surface area and the elevation of the maximum water level allowed, which are essential for assessing each dam's capacity to mitigate flood peaks effectively.

On the other hand, key catchment characteristics, such as size, shape, slope, and land cover, are crucial for modeling flood scenarios and addressing these escalating risks. The database contains basin characteristics, including geomorphological, soil, land cover and climatic attributes, as well as basin boundaries, that are determined using standardized and uniform procedures, ensuring consistency throughout the country. Taking into account the availability of the "twin" dataset from Claps et al. (2024), a wide level of detail is therefore provided on about a thousand watersheds, all over Italy, including both dammed and gauged watersheds.

As climate change and water resource challenges intensify, a thorough understanding of our

existing infrastructure becomes crucial. In this sense, this work can help to improve our capability to manage the complex interplay between dams and their hosting environment.