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Thermopeaking in alpine streams: event characterization and time scales

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The present study provides a detailed quantification of the "thermopeaking" phenomenon, which consists of sharp intermittent alterations of stream thermal regime associated with hydropeaking releases from hydroelectricity plants. The study refers to the Noce River (Northern Italy), a typical hydropower-regulated Alpine stream, where water stored in highaltitude reservoirs often has a different temperature compared to the receiving bodies. The analysis is based on a river water temperature dataset that has been continuously collected for one year at 30' intervals in four different sections along the Noce River. A suitable threshold-based procedure is developed to quantify the main characteristics of thermopeaking, which is responsible for thermal alterations at different scales. The application of Wavelet Transform allows to separately investigate thermal regime alterations at sub-daily, daily and weekly scales. Moreover, at a seasonal scale, patterns of "warm" and "cold" thermopeaking can be clearly detected and quantified. The study highlights the relevance of investigating a variety of short-term alterations at multiple time scales for a better quantitative understanding of the complexity that characterises the river thermal regime. The outcomes of the analysis raise important interdisciplinary research questions concerning the effects of thermopeaking and of the related short- and medium-term effects on biological communities, which have been rather poorly investigated in ecological studies.