



Global warming increases flood risk in mountainous areas

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Annual and winter temperatures have been recently observed to increase in time. We will not consider the question if this is a symptom of an increasing trend or of a long-term fluctuating behaviour, but we will devote our attention to investigate the sensitivity of mountainous systems to this temperature increase. Other studies have shown that all the major continental mountain chains exhibit a change in the freezing levels, melting season indicators, temperature lapse rates and snow cover, and these changes are generally found to be of greater amplitude at higher elevations.

Mountains are therefore fragile ecosystems, prone to rapid and intense reactions to the temperature changes. In this study the discharge response to temperature increase of snow-dominated basins is investigated by means of a simple contributing area model. In the model, the occurrence of snow over the portion of basin above the freezing elevation produces a mitigation of floods that depends on simple features of the precipitation process, of the temperature regime and on distribution of elevation within the basin. The response in terms of flood risk sensitivity to different climatic impulses is evaluated for classes of basins with different elevation characteristics. Model results in terms of temporal variation of the mean of the flood frequency distribution are compared with a database of long-term discharge series measured in the Swiss Alps. Good agreement between modelled and empirical trends is found, making us confident on the possibility to transpose this simple modelling framework to scarcely gauged or ungauged regions.