



Rainfall analysis and its implication on the mass balance and hydrological regime of the Zongo Glacier (Bolivia)

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The general context of the study is to describe the changes in the mass balance and in the hydrological regime of the Zongo glacier in relation with the rainfall variability. The hypothesis considered is that the characteristics of the rainy season strongly influence the mass balance and the hydrological regime with a control on the fusion. A new daily rainfall database for the last thirty years in the real cordillera region has been elaborated and two climatic regions can be distinguished: the Altiplano and Zongo Valley. Several methods are tested for each region to characterize the rainy season (duration, onset, end, amount of rain) considering different thresholds. Results show that annual rainfall is controlled by the number of rainy days on the Altiplano and by the intensity in the Zongo Valley. No strong correlations between ENSO and annual rainfall have been found. Comparing the last two decades, we observe a decrease of the amount of rain during the installation of the rainy season but an increase of the intensity. Inter-annual variability of the rainy day number is constant for the decades [1990-2000] and [2000-2010] but a change in the seasonal cycle is shown especially during the onset and the heart of the rainy season. The second part of the study quantifies the impact of the rainy season on the Mass balance and the hydrological regime considering each characteristic: duration, onset and end of the rainy season. The correlation between different properties and the runoff from the fusion is stronger than the correlation between the mass balance and the rainy season properties. The properties of the rainy season that explain better the hydrological behavior are the duration and the amount of rain. Finally, this study propose a link between the rainy season with hydrological functioning and mass balance for the Cordillera Real in Bolivia and these results have to be generalized for the other mountainous tropical regions.