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Numerical investigations with WRF about atmospheric features leading to heavy precipitation and flood events over the Central Andes' complex topography

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It's known that some extremes such as heavy rainfalls, flood events, heatwaves and droughts depend largely on the atmospheric circulation and local features. Bolivia is no exception and while the large scale dynamics over the Amazon has been largely investigated, the local features driven by the Andes Cordillera and the Altiplano is still poorly documented.

New insights on the regional atmospheric dynamics preceding heavy precipitation and flood events over the complex topography of the Andes-Amazon interface are added through numerical investigations of several case events: flash flood episodes over La Paz city and the extreme 2014 flood in south-western Amazon basin. Large scale atmospheric water transport is dynamically downscaled in order to take into account the complex topography forcing and local features as modulators of these events. For this purpose, a series of high resolution numerical experiments with the WRF-ARW model is conducted using various global datasets and parameterizations. While several mechanisms have been suggested to explain the dynamics of these episodes, they have not been tested yet through numerical modelling experiments.

The simulations captures realistically the local water transport and the terrain influence over atmospheric circulation, even though the precipitation intensity is in general unrealistic. Nevertheless, the results show that Dynamical Downscaling over the tropical Andes' complex terrain provides useful meteorological data for a variety of studies and contributes to a better understanding of physical processes involved in the configuration of these events.