



Wildfires in South America and its impact on the central Andes glaciers

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The acceleration of ice mass loss observed since the 1970s in the tropical Andes is an alert on climate changes which can directly and indirectly impact most part of the populations living in the western Andes arid regions. In these regions, The glacier melting occurs throughout the year, contributing partially to the water supply to the rivers which provide water to the cities. It is estimated that during drought periods in the tropical Andes (Bolivia, Ecuador and Peru), 3.92 millions of people depend on the glacier melting water. The models currently used to predict the Andean glaciers behavior in response to climate change are based on energy balance which incorporate changes in meteorological conditions on glaciers. However, These models do not take into consideration the albedo reduction caused by Black Carbon (BC) aerosol deposition over the glaciers (BC-albedo effect), which has been pointed to be an important factor to glaciers retreat process in Greenland, West of China, and in the Hymalayas. In South America, the largest sources of BC emission are the wildfires in the Amazon basin and Brazilian savanna (cerrado), which release about 30 Gg/year of BC. The transport, deposition and impact of the BC from Amazon basin on the Central Andes Glacier is still unknown. In this work we modeled the emission, transport, deposition and impact of BC, from wildfires in Amazon basin, on central Andes Glaciers. We observed that seasonal changes in the atmospheric circulation which cause the transition between dry and wet periods in the Andean Mountains create favorable conditions for the transport of BC (and others aerosols) from the Amazon basin towards the central Andes. The BC deposition on the glaciers significantly reduces the snow/ice albedo on the surface, which contributes to the melting process. We estimate that changes in the Zongo glacier (located at Cordillera Blanca - Bolivia) albedo due to BC deposition have the potential to increase the glacier annual melting by 2.0-4.8%. In fact, it was possible to observe an equivalent increase on glacier melting in September, during the peak of the fire season at the Amazon basin. As a consequence, the annual melting period gets longer, and ice mass loss is higher than expected due to climate warming only.