Geophysical Research Abstracts, Vol. 9, 06569, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06569

The impact of climate change on the water supply of the Amaluza dam, south Ecuador

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The tropical Andes is home to a large number of hydropower plants. The Andean topography provides good opportunities for hydropower production. Due to the perennially wet climate and the high water regulation capacity of the upper Andean ecosystems, base flow in many rivers descending from the upper Andes is constant and reliable and guarantees an efficient power generation. The Paute river basin, south Ecaudor, is home to one of the largest hydropower plants in the Andean region. The Amaluza reservoir is located at 1994 m altitude and stores about 120 million m3. The power plant's capacity is 1075 MW and provides 55 to 60% of Ecuador's electricity. On average, between 25 and 40% of the water arriving in the Amaluza reservoir originates from the high altitudinal grasslands above the tree line, which are characterised by a wet climate and porous volcanic soils with a high water regulation capacity. However, this ecosystem, locally known as paramo, is particularly vulnerable for climatic changes. The effects of global climate change on the hydrology of the rio Paute basin and the impacts on the water supply for the Amaluza dam are assessed using a coupled climate - hydrology model. The data scarcity in the Paute basin is in severe contrast with the extreme climatic variability over the basin and severely complicates modelling efforts. Uncertainty analysis reveals that with the currently available data, it is impossible to predict significant changes in the discharge of the Paute river. However, the results suggest a slight decrease of total discharge and a more severe increase of seasonality of the discharge. The increase in the flow variability is attributed to changes in the precipitation pattern, as well as a loss in water storage capacity in the soils of the paramo ecosystem.