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WATER BALANCE OF GLACIERIZED CATCHMENTS IN BOLIVIAN ANDES

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The continuous worldwide glacier retreat since 1850s rapidly and greatly affects the availability of fresh water, for domestic, agricultural and industrial use in the regions where depend on glacier-melt. The situation is particularly acute in South America, which has about 99% of worldwide tropical glaciers in Andes Mountains. In the joint project "GRANDE (Glacier Retreat impact Assessment and National policy DEvelopment)", Glacier Condoriri, Tuni and Huayna Potosi in Cordillera Real (68.12W, 16.13S) are under study as which are the main water resources of human consumption and hydropower generation for the city of La Paz and El Alto in Bolivia.

In this study, glacierized area change in Cordillera Real was observed using semi-automated method extracted from Landsat Thematic Mapper (TM) scenes from 1980s to 2007 using a band ratio as TM4/TM5. The analysis results illustrated that the glacier melting process is accelerated in the past 20 years and disappearing around 2030 to 2050. Meanwhile, based on limited meteorological and hydrological data, water balance in this region was analyzed. The results proved the glacier melting acceleration observation and how glacier melting water behaved as major water recourse in the study region. Among all 3 glacierized sub-catchments, Condoriri has the biggest runoff coefficient (runoff depth (mm) / precipitation (mm)), which was as high as 2.02 in 2004 to 2005, while Tuni has the smallest runoff coefficient, which was 1.39 in 2004 to 2005. However, the area of Condoriri and Huayna Potosi each is more than twice as much as Tuni. According to the percentage lost of Tuni glacier observed in the latest 20 years, Tuni is predicted to be the first disappeared.

Keywords: glacier, water balance, Landsat, band ratio