Geophysical Research Abstracts
Vol. 16, EGU2014-15765, 2014
EGU General Assembly 2014

Technological improvements in the field-based monitoring of glaciers in the Huasco basin, Northern Chile

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Difficulties with the terrain, weather conditions and accessibility makes high altitude field-based glacier monitoring (>4000 m.a.s.l) particularly challenging. Due to this field measurements are often incomplete and temporally limited when available. Given the importance of temporal analyses when monitoring glacierised environments (especially those that are directly influenced by human activities such as mining) the development and improvement of field-based monitoring techniques is thus essential. Here a series of field technologies are presented that are intended to improve the monitoring of glaciers in the Pascua Lama mining project, Northern Chile (29º18'S , 70º03'W). Efforts focus on monitoring changes in the energy balance and the spatial distribution of albedo variation over glacier surfaces. Technological innovations are described in the use of: (1) meteorological networks (automatic weather stations) – improved for better transmission in unfavourable weather conditions through the use of high frequency portions of the electromagnetic spectrum; (2) Non-metric fixed camera systems – improved to allow continuous monitoring of glacier albedo variations by using high frequency transmission over the Industrial, Scientific and Medical (ISM) band and low power servers based on ARM architecture. The implementation of these technologies has so far successfully improved data acquisition were applied and offers a robust alternative to the traditional field-based glacier monitoring methods used previously.