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Snow cover volumes dynamic monitoring during melting season using high topographic accuracy approach for a Lebanese high plateau witness sinkhole

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Climate change and its negative impact on water resource is well described. For countries like Lebanon, undergoing major population's rise and already decreasing precipitations issues, effective water resources management is crucial. Their continuous and systematic monitoring overs long period of time is therefore an important activity to investigate drought risk scenarios for the Lebanese territory. Snow cover on Lebanese mountains is the most important water resources reserve. Consequently, systematic observation of snow cover dynamic plays a major role in order to support hydrologic research with accurate data on snow cover volumes over the melting season.
For the last 20 years few studies have been conducted for Lebanese snow cover. They were focusing on estimating the snow cover surface using remote sensing and terrestrial measurement without obtaining accurate maps for the sampled locations. Indeed, estimations of both snow cover area and volumes are difficult due to snow accumulation very high variability and Lebanese mountains chains slopes topographic heterogeneity. Therefore, the snow cover relief measurement in its three-dimensional aspect and its Digital Elevation Model computation is essential to estimate snow cover volume. Despite the need to cover the all lebanese territory, we favored experimental terrestrial topographic site approaches due to high resolution satellite imagery cost, its limited accessibility and its acquisition restrictions. It is also most challenging to modelise snow cover at national scale. We therefore, selected a representative witness sinkhole located at Ouyoun el Siman to undertake systematic and continuous observations based on topographic approach using a total station.
After four years of continuous observations, we acknowledged the relation between snow melt rate, date of total melting and neighboring springs discharges. Consequently, we are able to forecast, early in the season, dates of total snowmelt and springs low water flows which are essentially feeded by snowmelt water. Simulations were ran, predicting the snow level between two sampled dates, they provided promising result for national scale extrapolation.