Doctoral Thesis Title:
Estimation of surface ice velocity in rock glaciers, debris-covered glaciers and debris-free glaciers using UAV photogrammetry and satellite imagery.

Supervisor/s: José Luís Lerma García.

Abstract:
The present investigation contemplates the study of four glaciers: two rock glaciers, one debris-covered glacier and another debris-free glacier, all of them located in the Maipo River basin in the central mountain range of Chile. Two of the glaciers in the research are part of a glacier monitoring study carried out by the Anglo American Sur mining company, which began in 2008. The objective of the company has been to study and obtain the necessary information to establish a base line of glaciers. The other two glaciers are also located in the same hydrographic basin, sub-basin of El Volcán River, La Engorda estuary. The importance of this sub-basin is the waters are an important part of the drinking water supply of the megacity of Santiago. An important need is to estimate the water contribution to the basin. This research will aid in sustainable planning and development in the basin that holds the majority of the population and supports also a large economic activity in Santiago of Chile.

The general objective is to determine the optimal method to know the magnitude of the surface displacement of rock glaciers, debris-covered and debris-free, of very slow displacement (rock glaciers), applying image analysis techniques on UAV and satellite imagery to establish the surface displacements in these glaciers.

Part of the objective of the research proposed is to enrich the studies to estimate the surface velocities of glacier displacement with techniques that allow improving their results. This will support the results of surface velocities obtained to date, and promote better estimates glacier mass balances and the water regimes of a specific river basin.

Available Means:
The materials available for the investigation will be provided by the companies Geoestudios S.A. and the Anglo American Sur company. Part of the research that will be carried out in the doctoral program, will allow supporting the integration of studies of glacier mass balance and water supply of a glacier basin. The studies that Anglo American Sur Company develops comply with the requirements of environmental permits applicable to any initiative and expansion and investment that the company wants to develop.

References:
Fey, C., & Krainer, K. (2020). Analyses of UAV and GNSS based flow velocity variations of the rock glacier Lazaun, Italy. Geomorphology, 107261. https://doi.org/10.1016/j.geomorph.2020.107261

Friedl, P., Seehaus, T., & Braun, M. (2021). Global time series and temporal mosaics of glacier surface velocities, derived from Sentinel-1 data Peter. (June), 1–33.

Kaufmann, V., Kellerer-Pirklbauer, A., & Seier, G. (2021). Conventional and UAV-Based Aerial Surveys for Long-Term Monitoring (1954–2020) of a Highly Active Rock Glacier in Austria. Frontiers in Remote Sensing, 2(October), 1–18. https://doi.org/10.3389/frsen.2021.732744

Millan, R., Mouginot, J., Rabatel, A., Jeong, S., Cusicanqui, D., Derkacheva, A., & Chekki, M. (2019).

Mapping surface flow velocity of glaciers at regional scale using a multiple sensors approach. Remote Sensing, 11(21), 1–21. https://doi.org/10.3390/rs11212498

Vivero, S., Bodin, X., Farías-Barahona, D., MacDonell, S., Schaffer, N., Robson, B. A., & Lambiel, C. (2021). Combination of Aerial, Satellite, and UAV Photogrammetry for Quantifying Rock Glacier Kinematics in the Dry Andes of Chile (30°S) Since the 1950s. Frontiers in Remote Sensing, 2(November), 1–17. https://doi.org/10.3389/frsen.2021.784015

Friedl, P., Seehaus, T., & Braun, M. (2021). Global time series and temporal mosaics of glacier surface velocities, derived from Sentinel-1 data Peter. (June), 1–33.

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