Micromorphological characteristics of Andean cryogenic deposits produced by landslides in Erizos valley, San Juan, Argentina

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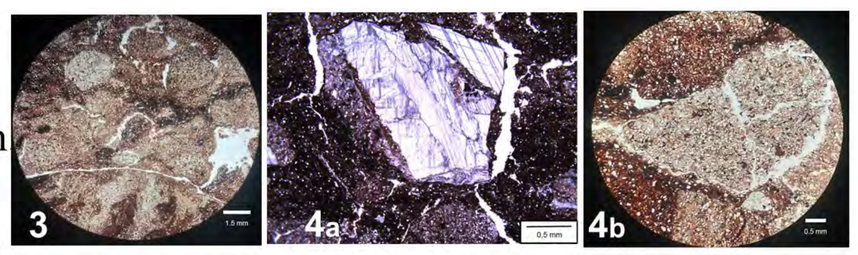
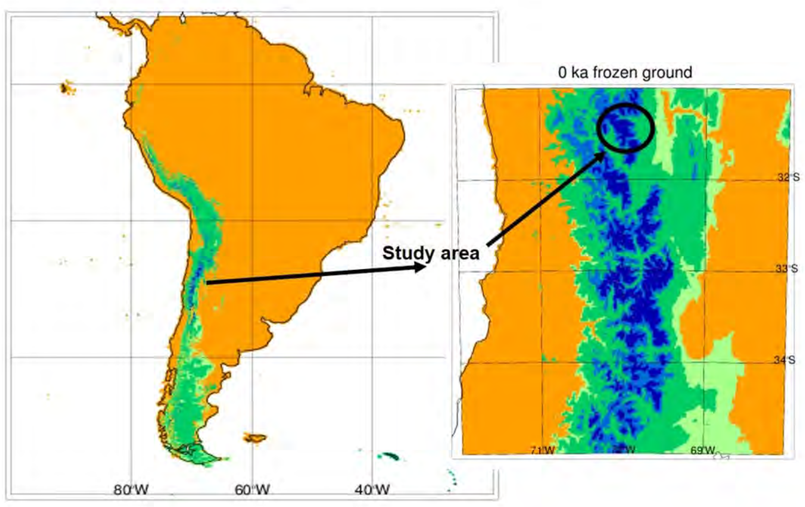
Introduction

A tongue-like landslide, which has already appeared in images since 1985, left present evidence of the origin of a molard field and its genesis in the Central Andes of San Juan. It presents a typical cone morphology. It clearly comes from a covered root with cryogenic processes and a likely degraded cryoform on the slope. Through micromorphology, this work looks for representative patterns in new formed soils on this type of geoforms to characterize current and paleo-environments.

Study Area

This molard deposit is located in Erizos valley, Andes of San Juan (31.707149 ° S, 70.275189 ° W), Argentina. The MAAT at 4020 m asl (Paso de la Guardia, 2009–2012) is -2°C approximately and the precipitation 280 mm. The study area is surrounded by the Santa Cruz Mountain Range, with a periglacial environment (>3700 m to 4700 asl) and mountain permafrost in an unstable condition. The height of the distal part of the deposit is approx. 3100 m asl. The lithology (epiclastic rocks and pyroclastic rocks) was assigned to the *Rancho de Lata* Formation of Upper Triassic/Lower Jurassic age (Álvarez, 1997).





Methodology

The geology, lithology and geomorphology of the region were studied. Maps and profiles (1) of the residual cones (2) were made. For the core of the work, known micromorphological methods with focus on the interpretation of past sedimentary conditions were used.

Results

Today, along the landslide remnant, geoforms interpreted as molards are thawed, dry and shrunken. Their distribution is random. Particularly in the distal part, along the landslide, it is possible to detect some aligned cones. Underneath the cover lies a compact apedal profile with clear signs of freezing and thawing.

The thin cuts observations show a fragmoidic to meta-fragmoidic fabric, but also sectors with conglomeric fabric (3). The c/f is close porfiric, without organic indicators. An aseptic S-matrix was clearly determined from the original material. Broken and angular lithics are andesites with carbonate veins and cement, and limestones. Skeleton grains are angular quartz, angular phenoclasts of plagioclase, altered micas, opaque minerals, carbonate grains and olivines. Vesicles interconnected with the planes/cracks and in a sub-vertical position are present. There are equant and prolate vesicles. Silt coatings surrounding the vesicles and phenoclasts (4a) were observed. Non-accommodated planes/cracks of variable diameter, curved planes/cracks with irregular surfaces are common (4b). Brown to blackish coatings of iron hydroxides, covered and filled cracks with plasma (5) and a type of matrans (6, Bal, L. 1973) covering minerals were found.

Discussion and Conclusions

The thin sections of the samples portray indicators of their past Andean tundra environment with freezing and ice, but there is also material transfer, likely because of the posterior landslide phenomenon. On the one hand, silt cappings, silt concentrations and the conglomeric fabric are largely indicators of the previous cryogenic processes, but on the other hand, silt coatings with ferruginous clay may be considered as a product of mass transportation. Finally, plasma displacement through the cracks is an indicator of a posterior illuviation under mild cold conditions. Equant and planar voids and cracks are associated to air and stress in the process of post sliding ice degradation. Non-accommodated planes/cracks allowed their incomplete closure in shrinking stages and water flowing, favoring the soil illuviation. The residual cones, in this case, are the result of erosion, associated to the dynamics of the remnant frozen ground, the amount of present ice and its thickness under new environmental conditions.

Bibliography

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