Multi-seasonal land cover changes of South Peruvian Highland Andean ecosystems

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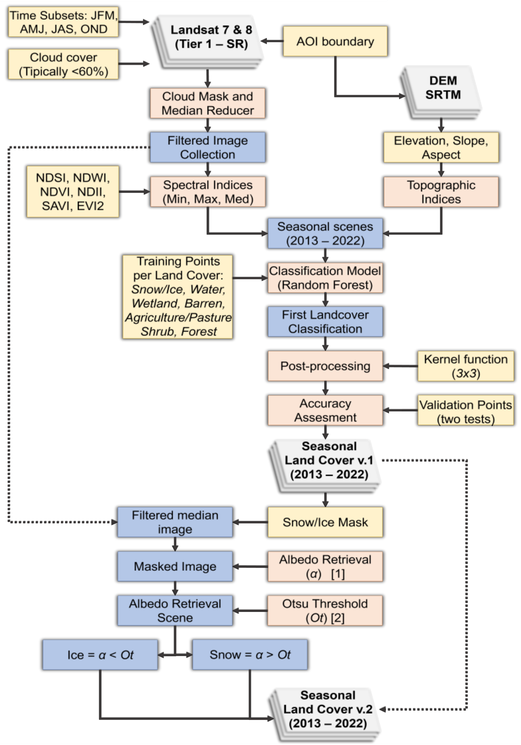
I. INTRODUCTION

Mapping land cover areas is fundamental to understanding changes in time and space and their interclass relationships. Most studies focus on area changes on an annual basis, omitting the seasonal variability of some ecosystems caused by external factors.

In this study we focus on the seasonal mapping of land cover areas of Andean ecosystems over 10 years in the Vilcanota-Urubamba Basin (VUB) (11,047 km2) to observe the spatial and seasonal variations of ecosystems and how they interact with each other.

II. METHODOLOGY



III. RESULTS

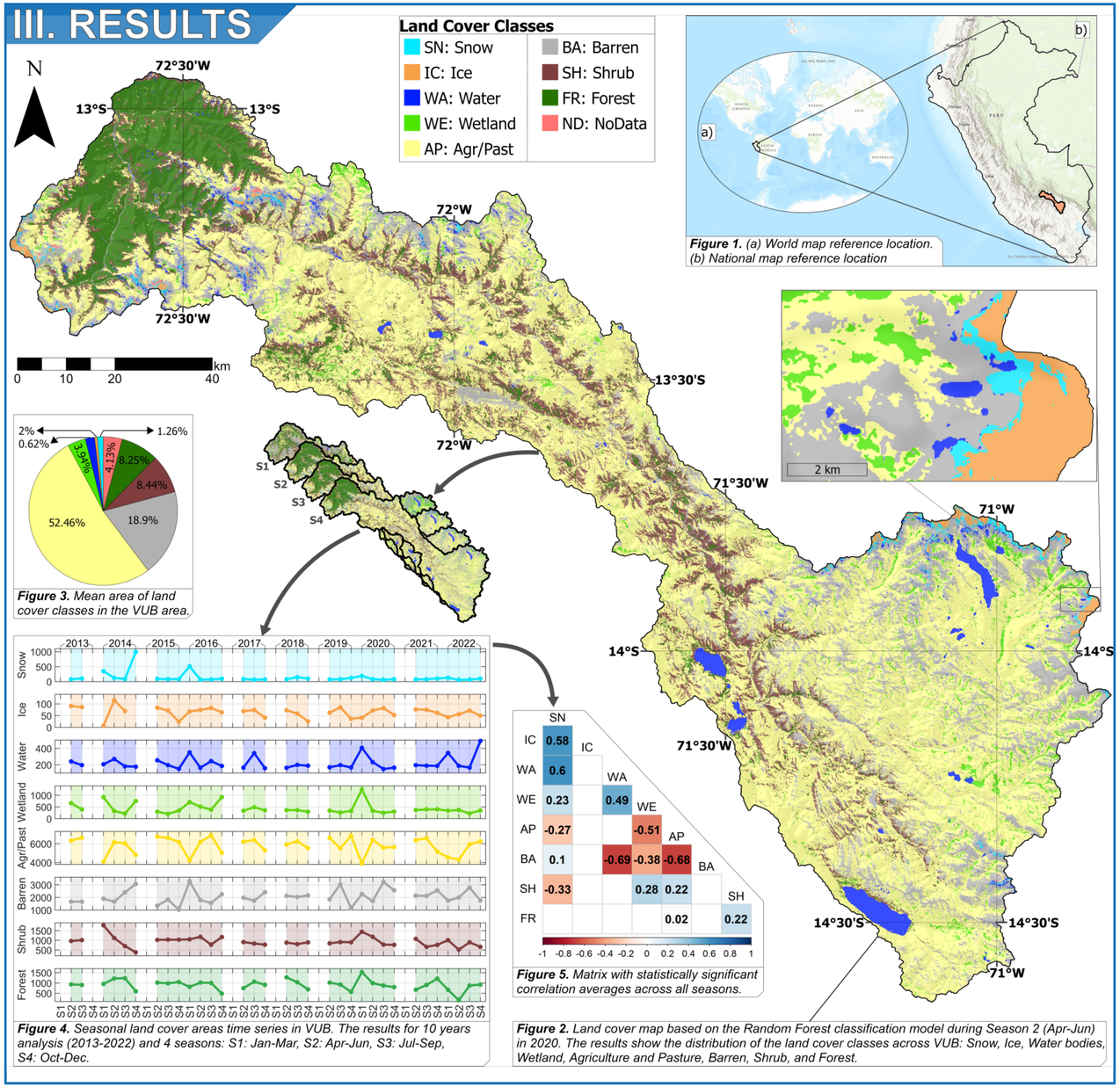


Figure 2. Land cover map based on the Random Forest classification model during Season 2 (Apr-Jun) in 2020. The results show the distribution of the land cover classes across VUB: Snow, Ice, Water bodies, Wetland, Agriculture and Pasture, Barren, Shrub, and Forest.

Figure 1. (a) World map reference location. (b) National map reference location

Figure 3. Mean area of land cover classes in the VUB area.

Figure 4. Seasonal land cover areas time series in VUB. The results for 10 years analysis (2013-2022) and 4 seasons: S1: Jan-Mar, S2: Apr-Jun, S3: Jul-Sep, S4: Oct-Dec.

Figure 5. Matrix with statistically significant correlation averages across all seasons.

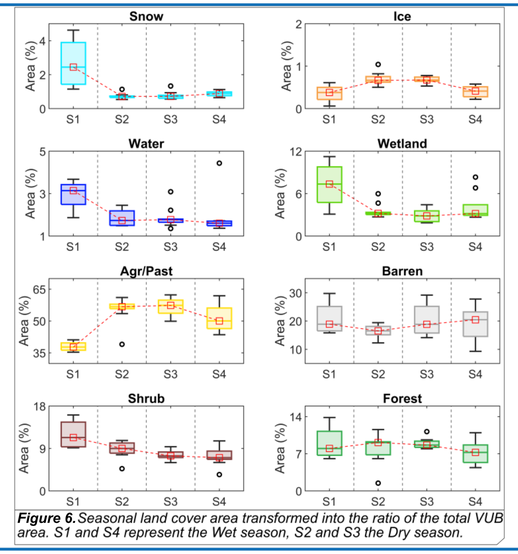


Figure 6. Seasonal land cover area transformed into the ratio of the total VUB area. S1 and S4 represent the Wet season, S2 and S3 the Dry season.

IV. CONCLUSIONS

By applying a multi-seasonal mapping approach using Google Earth Engine, we were able to determine the area variability of Andean ecosystems at a higher spatial (30 m/px) and time (every 3 months) resolution. We find that Snow changes are correlated ($p<0.05$) to Wetland ($r=0.23$) and Water areas ($r=0.6$) which are also related to each other ($r=0.49$). Agriculture and Pasture areas have an inverse correlation with Barren areas ($r=-0.68$) and Wetlands ($r=-0.51$).

We can interpret these results and infer the dependence between highland aquatic or vegetated ecosystems and the seasonal hydrological response to glaciers and weather patterns. The next step of this research is to understand their ecohydrological interactions with modelling.

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