IoT-based Dashboard for Mapping Snow Cover Fraction in Quasi-Real Time

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Rising global temperatures have reduced snow events in many regions, including the alpine environment. From a cartographic perspective, data visualisation and interactivity provide insight into related parameters through space and time.

This work proposes the development of a map-based Dashboard to support Snow Cover Fraction monitoring in Corvara in Badia, Italy in quasi-real time. It is expected to integrate and visualise data from a Cosmic Ray Neutron Sensor (CRNS) connected through an IoT, on-site measurements, available online environmental data, and satellite imagery.

OBJECTIVES

To help domain experts by incorporating cartographic knowledge to facilitate the analysis and communication through interactive data visualisation.

To proposing the application of cartographic and visualisation research for the specific needs of the scientific snow monitoring community.

METHODOLOGY

1. Geospatial Analysis and Snow Cover Fraction Integration.

- Blue Snow Threshold algorithm [4]
- Data Standardisation.

2. Interface Development.

- Expertise Requirements
- Definition of Aggregation Levels.
- User Testing.

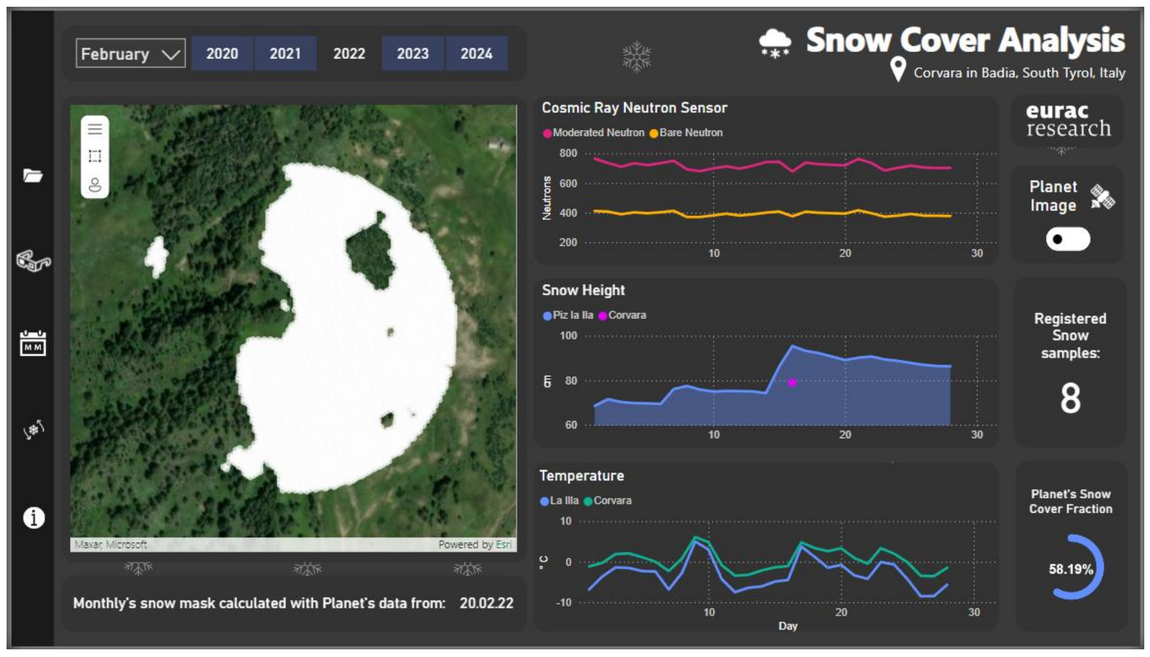

Fig. 2 Developed dashboard's monthly page, with daily aggregated time series.

Fig. 3 Field campaign, Corvara April 2024.

RESULTS

From requirements surveys, weather parameters such as temperature and snow height were considered for complementing satellite imagery, on-site measurements and the CRNS data integration.

As the data relationship was held through date and time attributes, the variant time stamps were considered. A constant aggregation level was noted as essential to ensure time coordination when selecting over the interactive time series.

EVALUATION

The snow mask generated significant interest among domain experts, who were focused on the resolution approach and the dynamic changes by area, reflecting their deeper analytical needs. They perceived effectiveness for conducting time series analysis and understanding snow cover variability over time, linking the data's dynamic nature to specific periods that could be selected within the interface. In contrast, non-experts were more concerned with the dataset's origin, the aggregation levels and the design before the testing.

CONCLUSION

This research encourages the scientific community to integrate dynamic-based visualisations into their research and science communication strategies. Presenting findings at various levels of comprehension translates into informed decision-making, leading to strategic policies that support ongoing climate change monitoring and better actions toward achieving the SDGs. Finally, this approach provides accessible and comprehensive insights into future milestone findings.

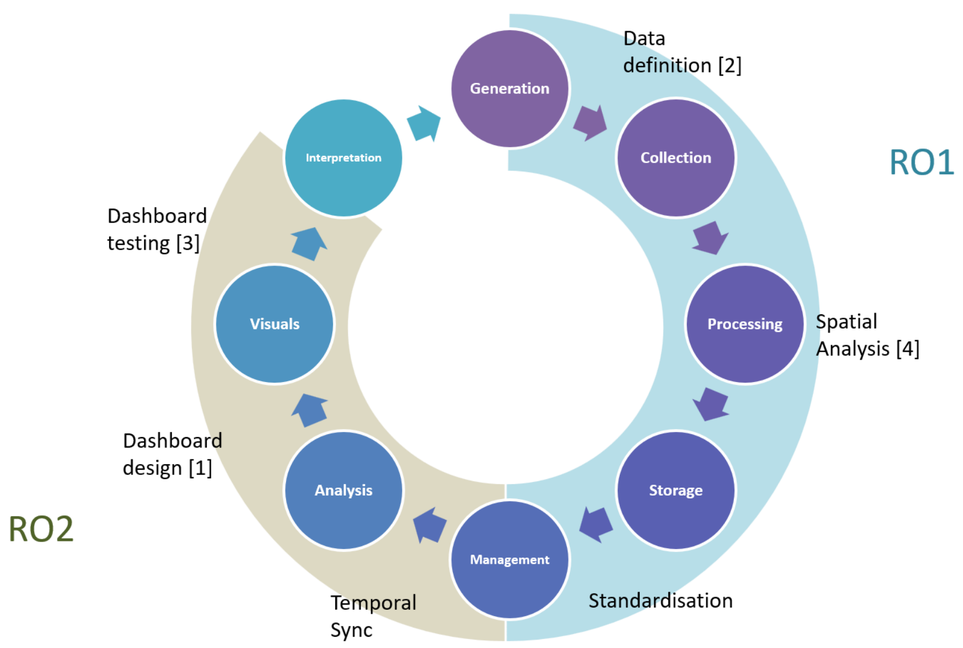

Fig. 1 Research data management, following the Data Life Cycle.

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