



Long term mass balance monitoring and evolution of ice in caves through SfM-MVS and GPR techniques

1° CONVEGNO ISTITUTO DI SCIENZE POLARI

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Melting ice in caves is a hot question!



Leupa ice cave

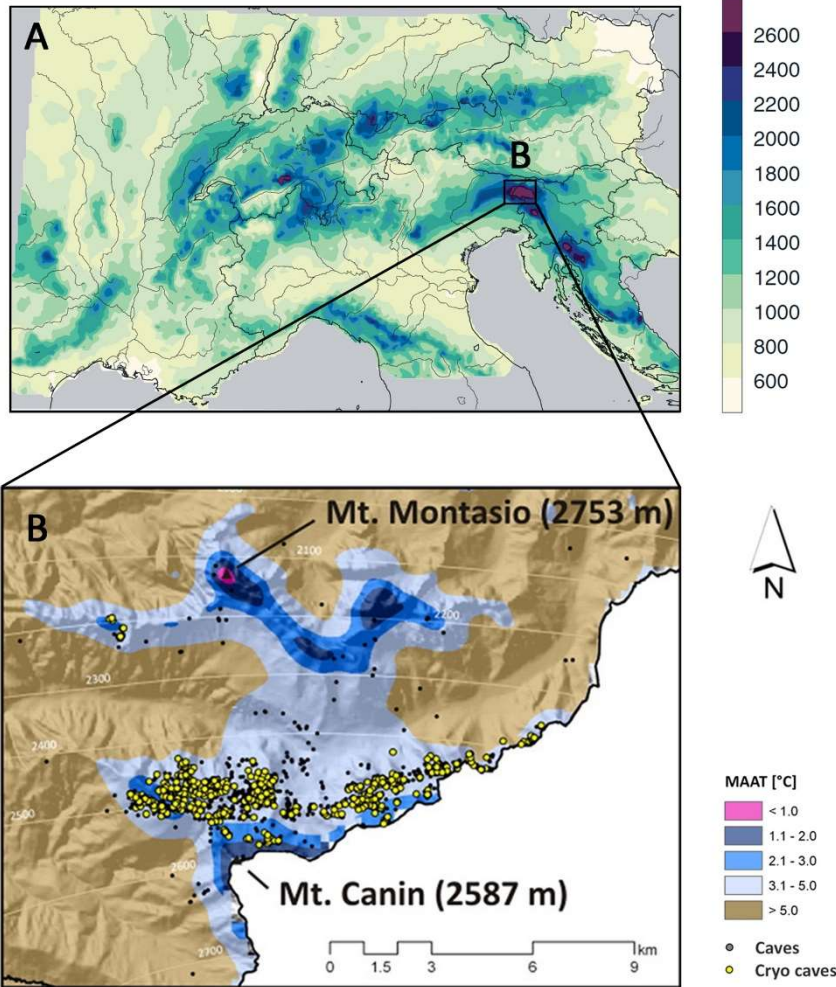
Mass balance monitoring are still based
on discrete measurements

Ice depth and volume are rarely measured

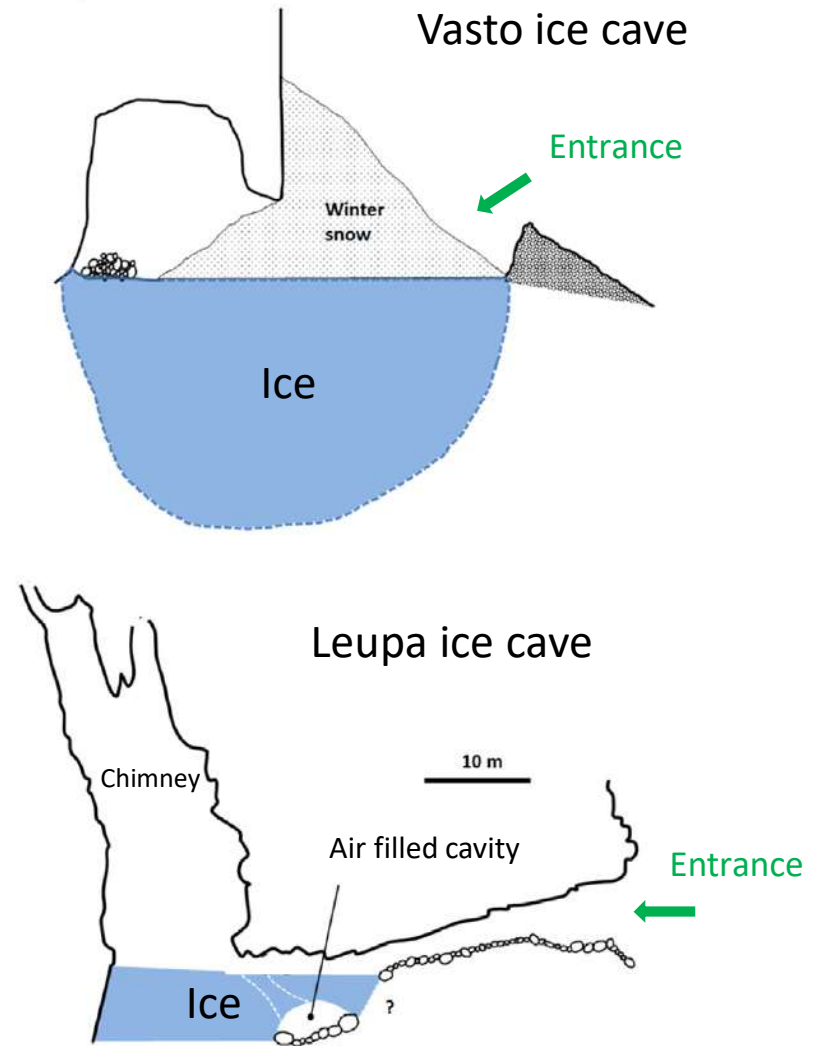
Quantify volume and surface
changes of permanent ice
deposits in caves

Study area

(Isotta et al., 2013)



(Colucci et al., 2016)



Phase 1

Data acquisition

Photo acquisition

GCP referencing

GPR acquisition

Phase 2

Processing and analysis

Agisoft Metashape

SfM-MVS

CloudCompare

Point cloud comparison

Prism 2 / Petrel

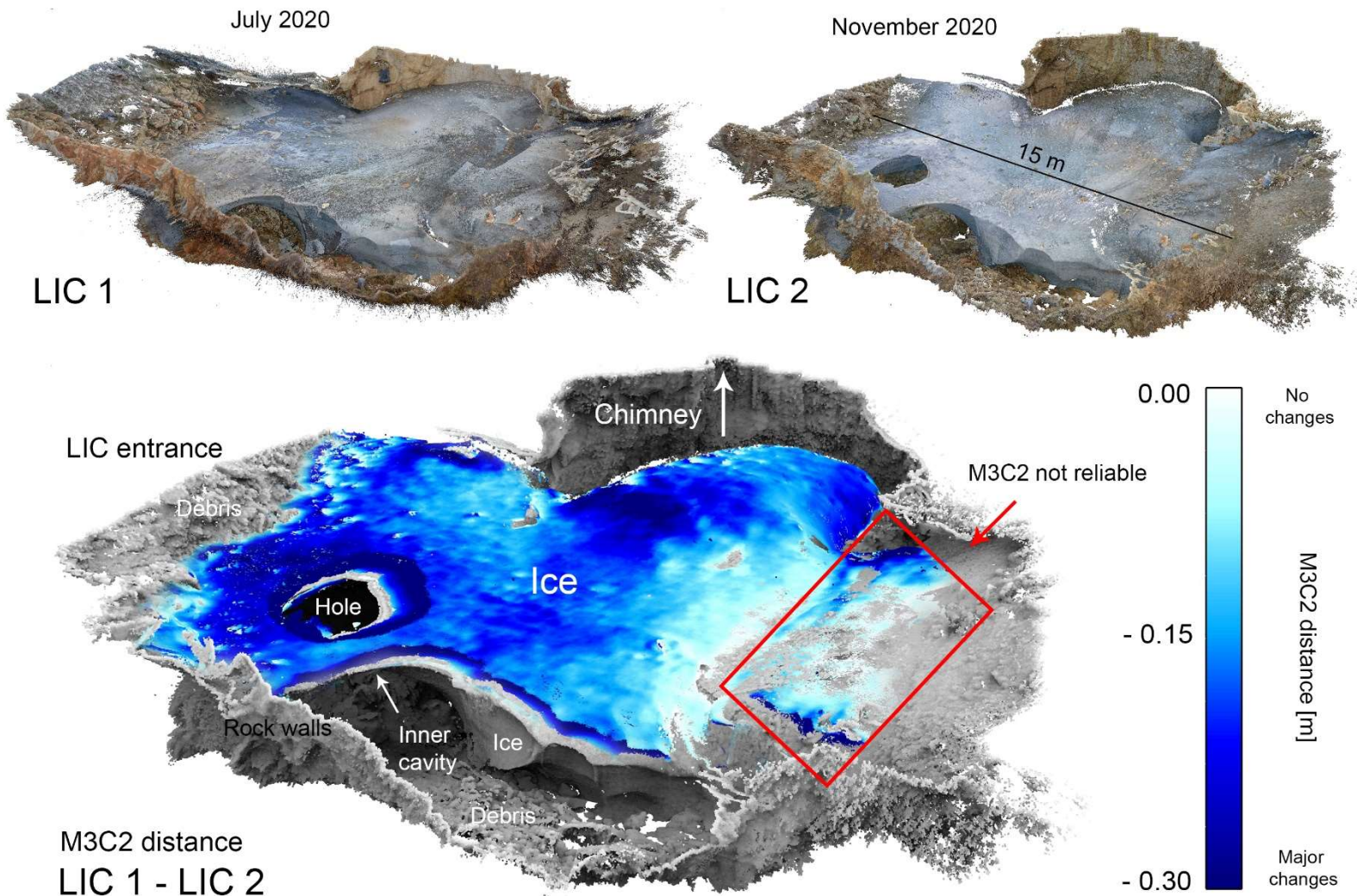
GPR

OUTPUT

Multi year
mass balance

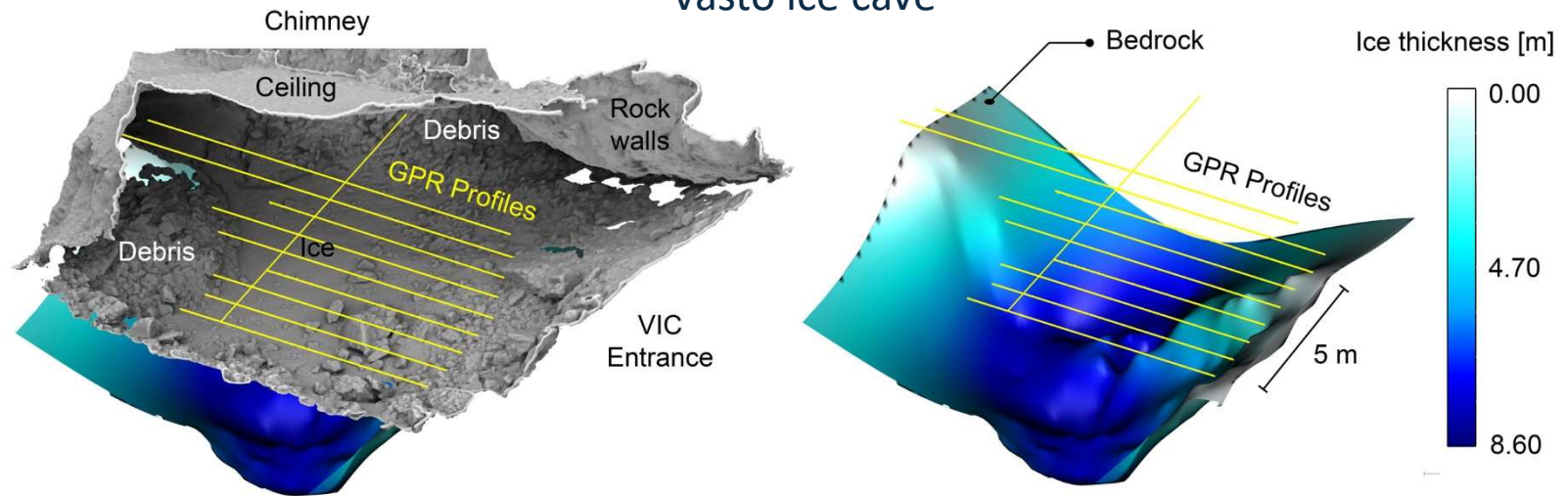
+

Ice volumes

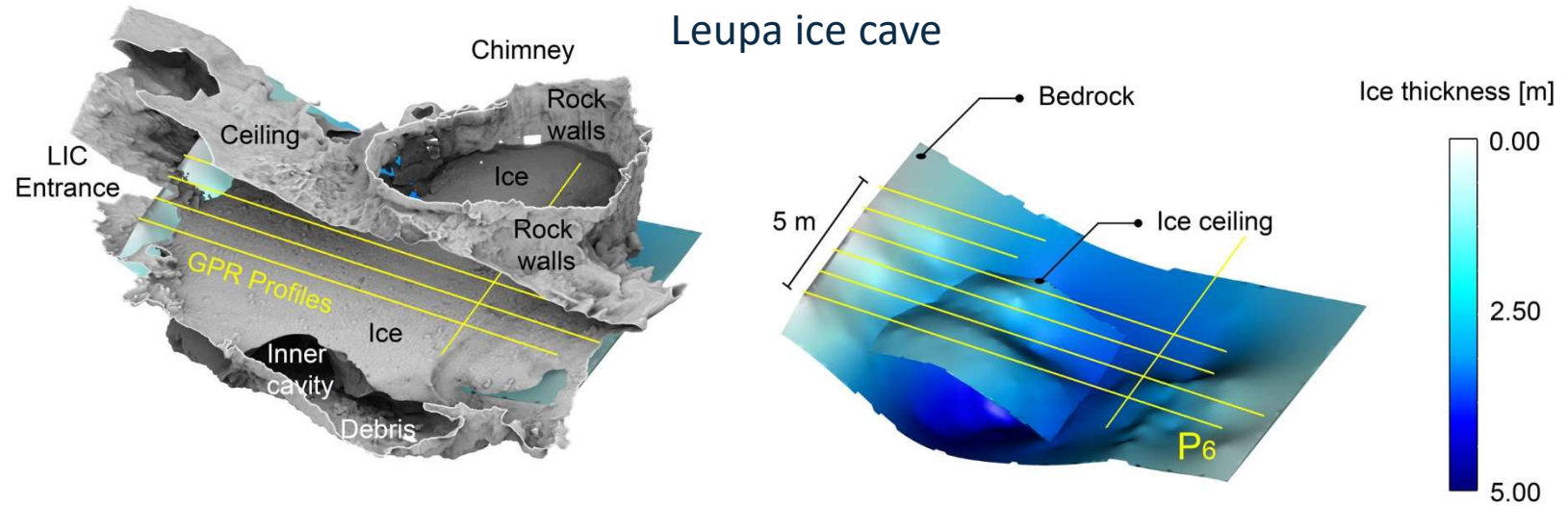


GPR output

Vasto ice cave



Leupa ice cave



Vasto ice cave lost 13.6% of its estimated ice volume from 2012 \Leftrightarrow - 134.00 m³ of ice

Leupa ice cave lost 49.4% of its estimated ice volume from 2012 \Leftrightarrow - 180.00 m³ of ice

- First example of multi-year quantitative mass balance of ice in caves, including estimation of total ice volumes
- Robust and repeatable workflow to start long term monitoring of ice in caves





GRAZIE PER L'ATTENZIONE

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