

# Monitoring rock slope stability in high-mountain regions

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Friday, November 17th 14.30 - 16.00  
PALAFFARI Basement HALL -1, Piazza Adua 1 Florence



# Motivation

Rock slopes in periglacial areas are remote zones, however...  
 ...structures and infrastructures may be present in these areas, together with touristic activities

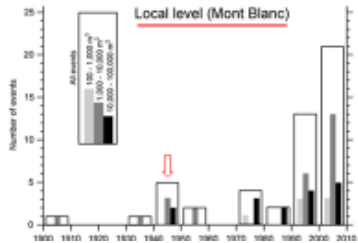
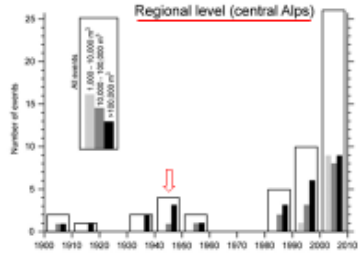


# Motivation

Periglacial areas show increasing rate of rock instabilities associated to climate change

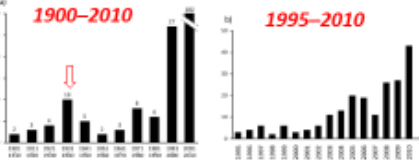
- Threat for tourism and infrastructures
- Loss of landscape/natural heritage  
(es: Dolomiti)

Switzerland and Italy and France border regions: 1900 - 2010



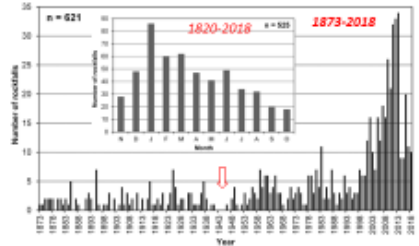
Austria

Sass and Oberlechner (2012)

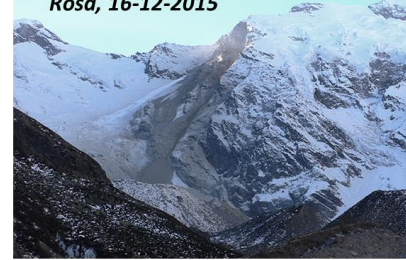


Germany

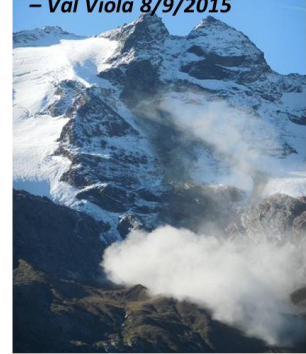
Rupp and Damm (2020)



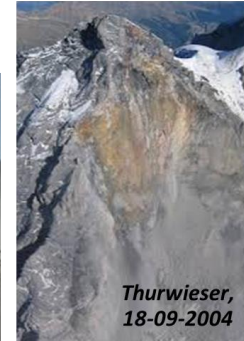
Punta tre amici, Monte Rosa, 16-12-2015



Cima di Lago Spalmo - Val Viola 8/9/2015



Cima Una 12-10-2007



Thurwieser, 18-09-2004

Cengalo, 23-09-2011

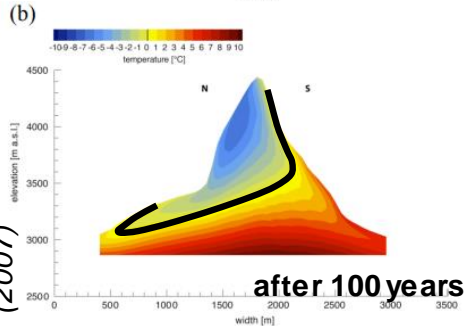
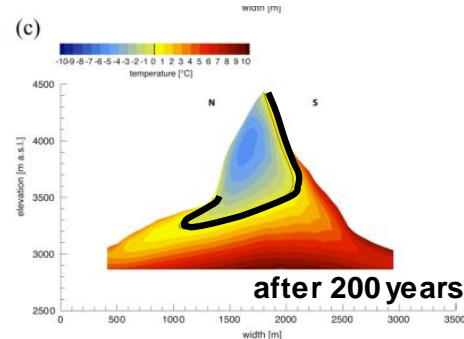
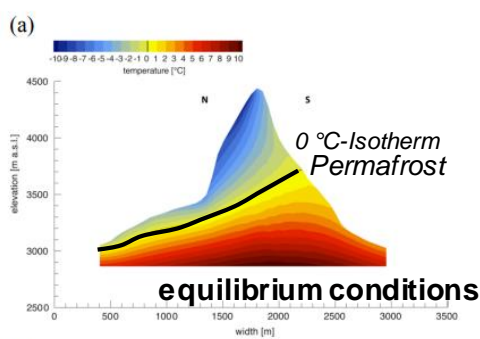




# Motivation

Processes responsible for instabilities at high elevation still need to be investigated:

- Glacier retreat and slope oversteepening
- **Permafrost degradation**



**Monitoring of  
rock-slopes in  
high-mountain  
areas**





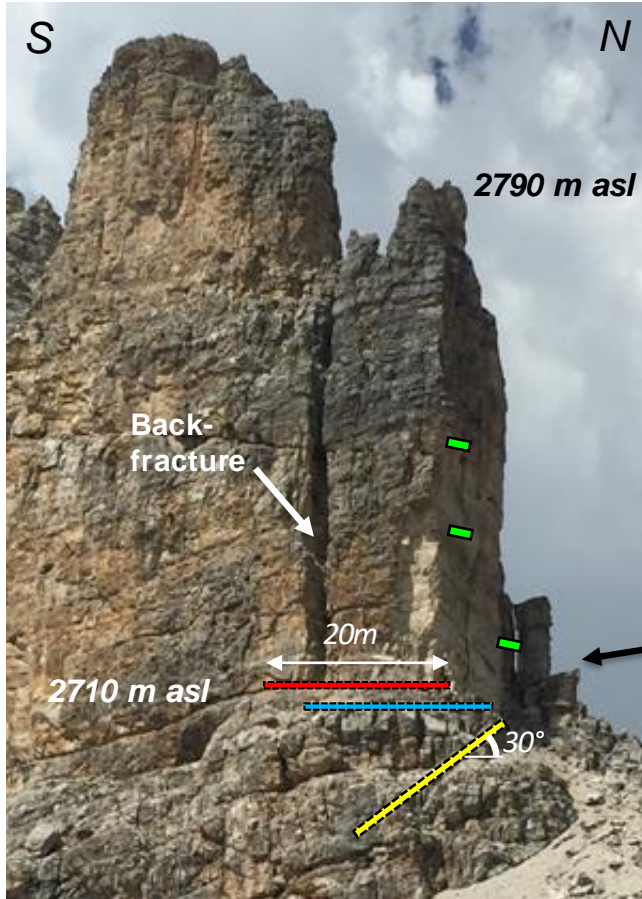
## Gruppo del Sella, Sass de Lech



North face of the wall  
Dolomia Principale / Raibl  
contact  
High degree of tectonic  
damage

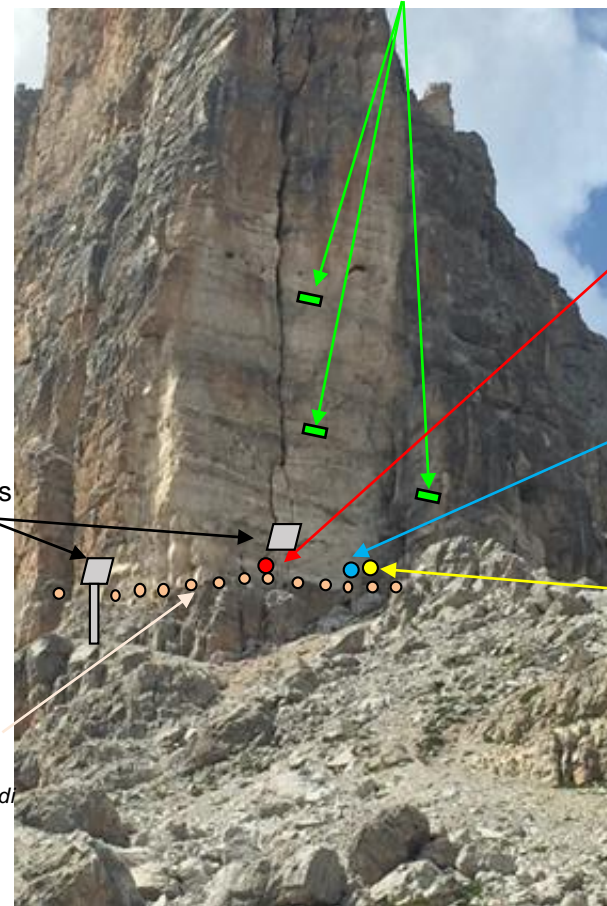


Monitoring system



boreholes  
(Provincia di Bozano)

ETR  
(Provincia di Bozano)



**Horizontal hole- DMS**  
90 mm, 21 m  
(inclin.extens., T, AE)

**Thermometric chain**  
90 mm, 21 m

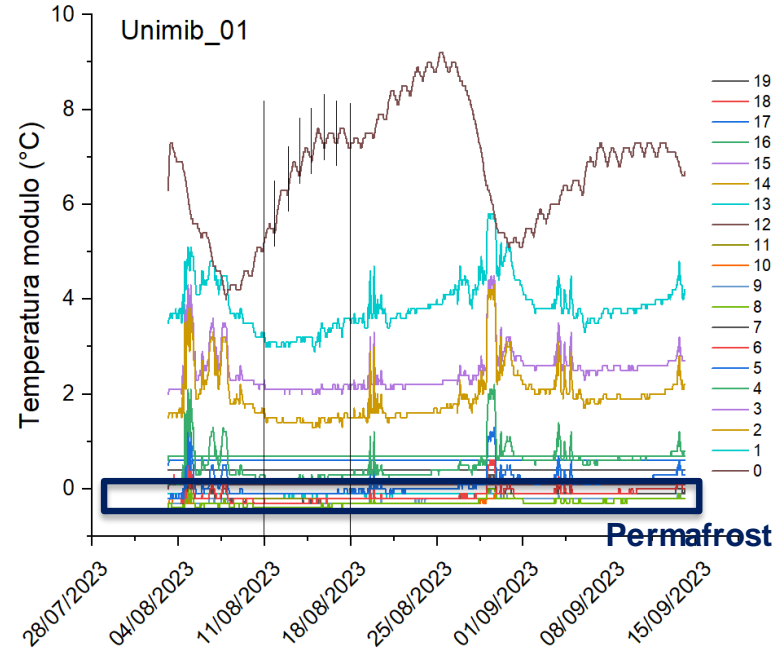
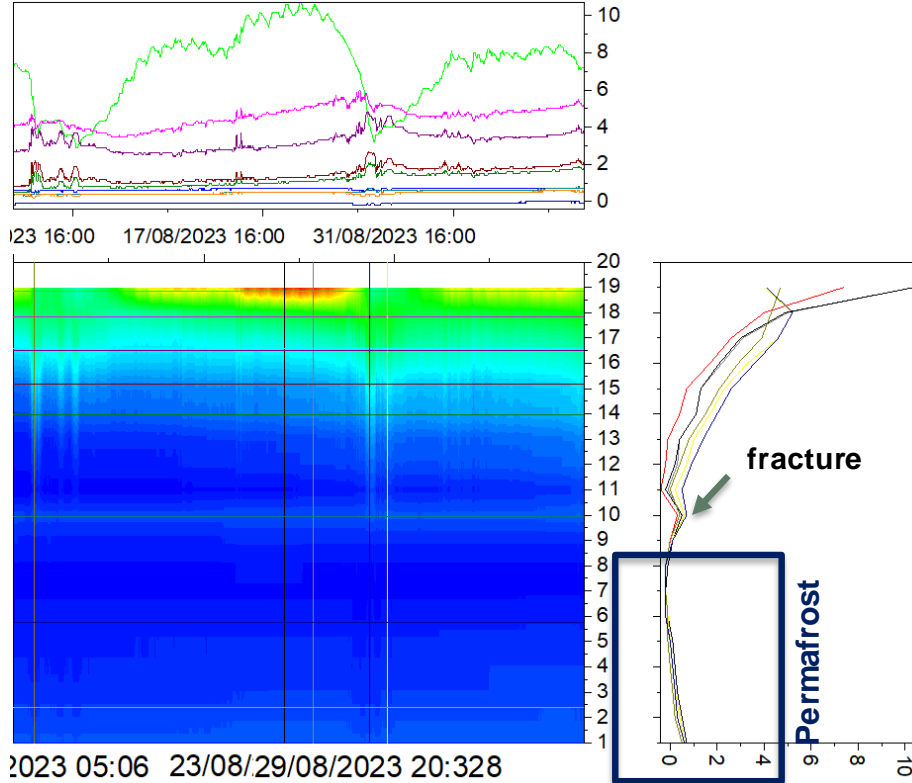
**Inclined hole - DMS**  
90 mm, 21 m  
(inclin.extens., T, AE)

System installation – agosto 2023





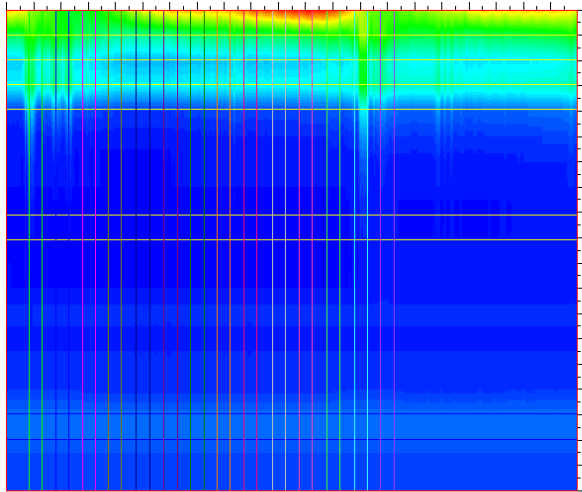
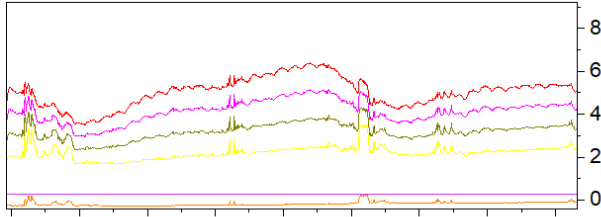
### Sub-horizontal DMS



Temperature

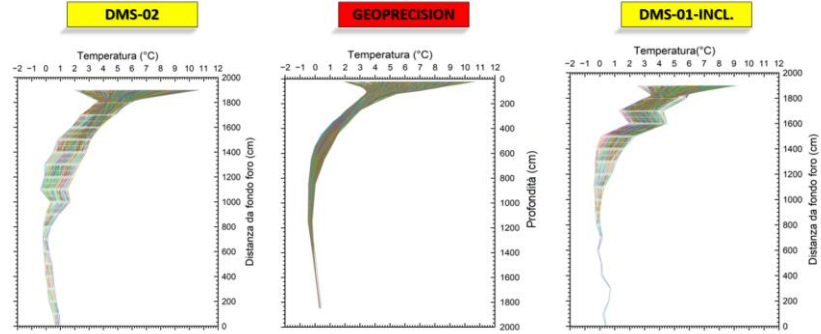
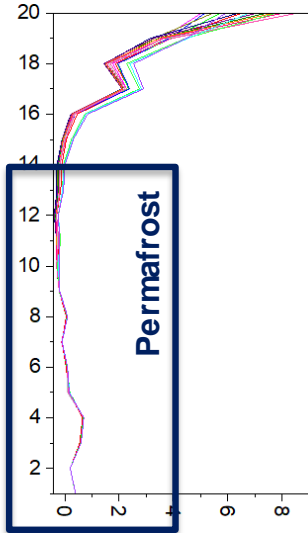


### Inclined DMS

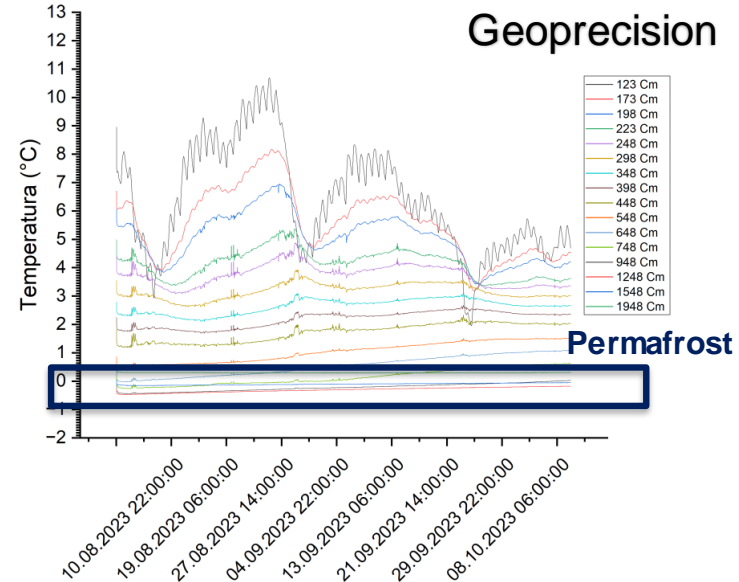


11:11 11:17 11:22 12:24/08/2023 15:15 15:00

surface



### Geoprecision

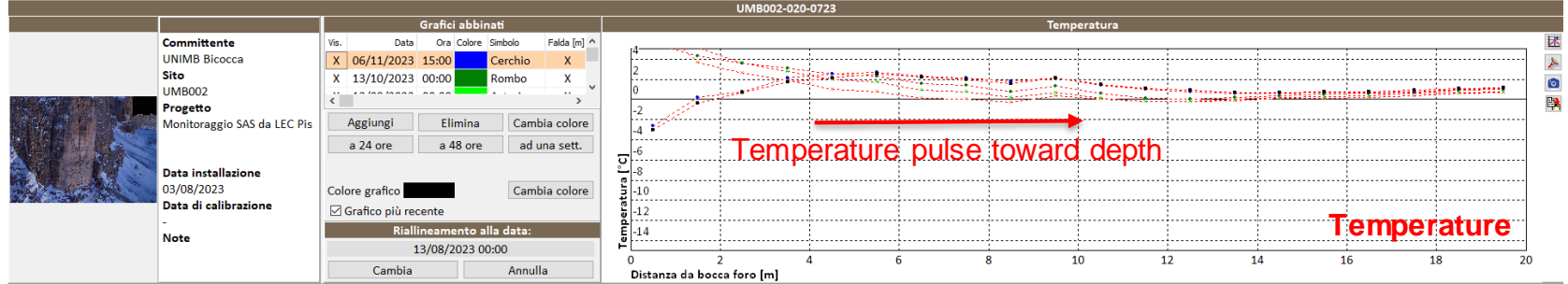


Temperature

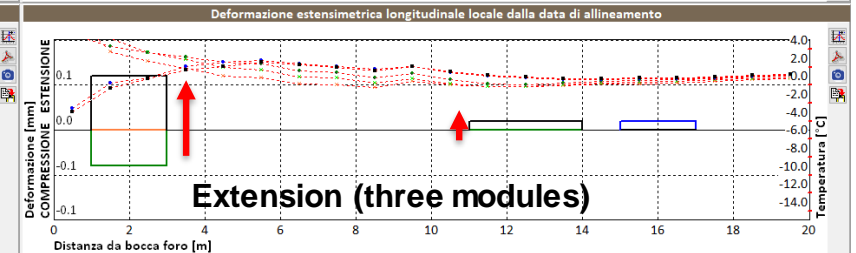
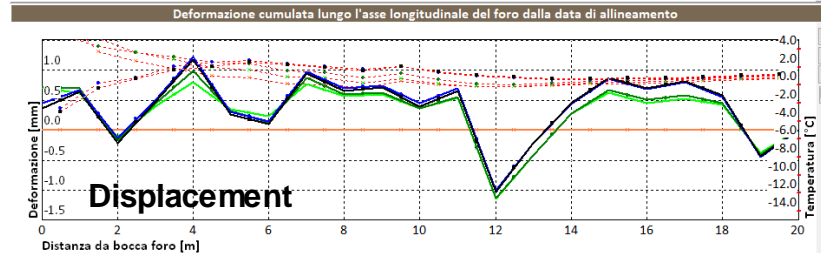
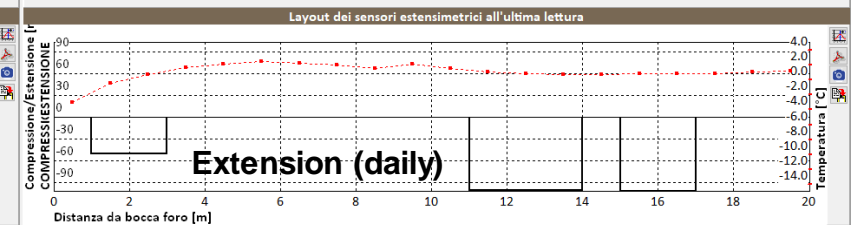
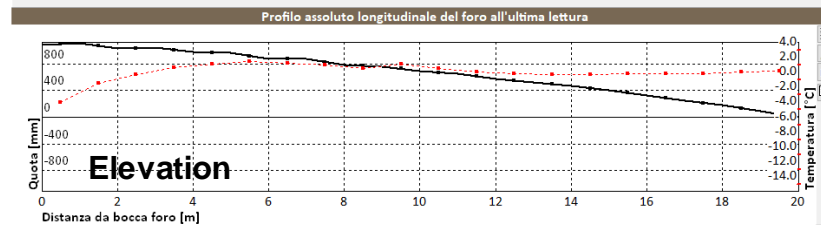
# Sub-horizontal DMS

DMS EW (Grafici relativi alla colonna: UMB002-020-0723)

Strumenti Visualizza Dati storici ?



Cumula da mod. 0  Cumula da mod. 19



Default zoom Adatta Massimizza Esporta su PDF Spost. differenziale

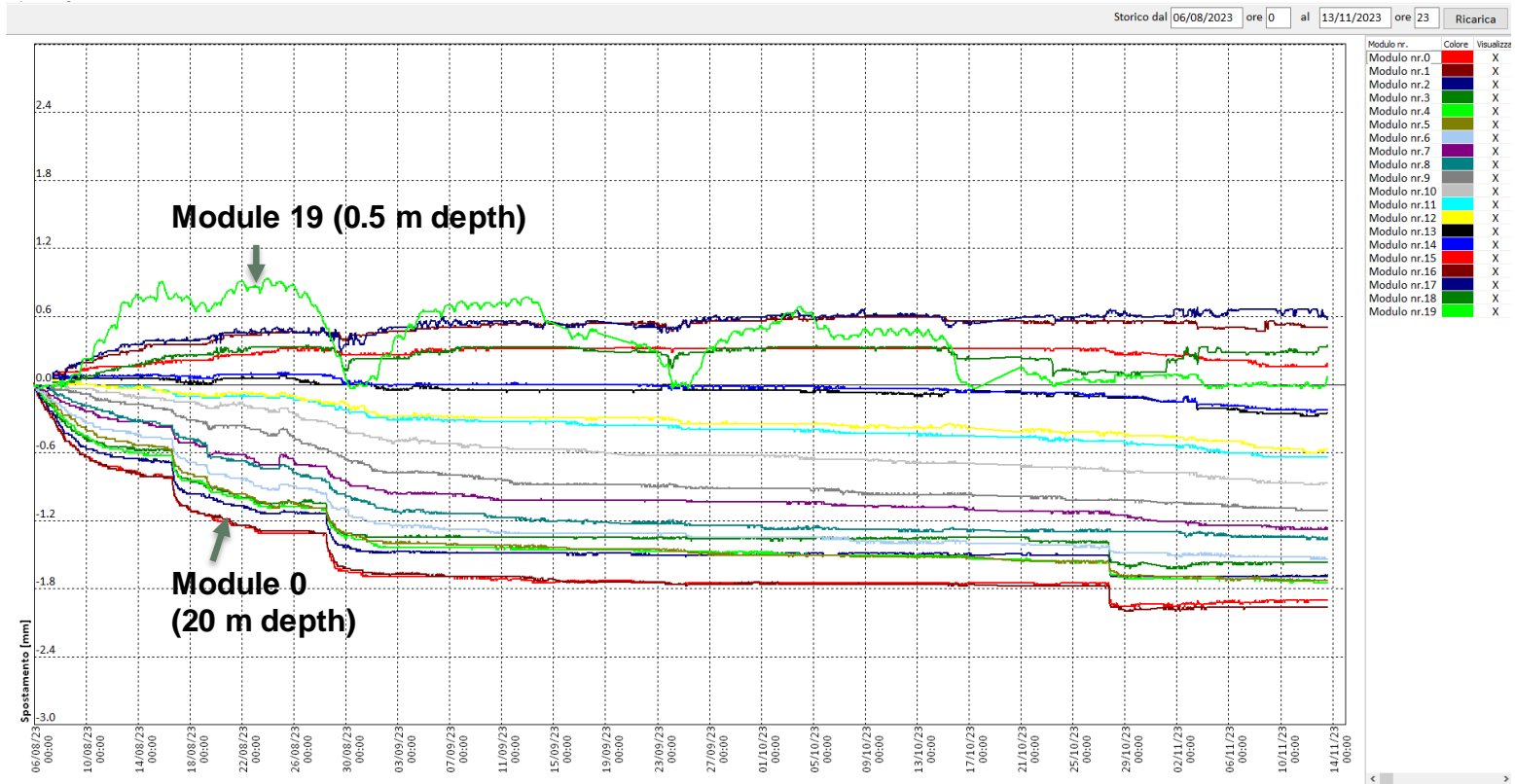
Colonna: UMB002-020-0723

Data ultimo campione: 13 Novembre 2023 15:00

Displacements



# Sub-horizontal DMS

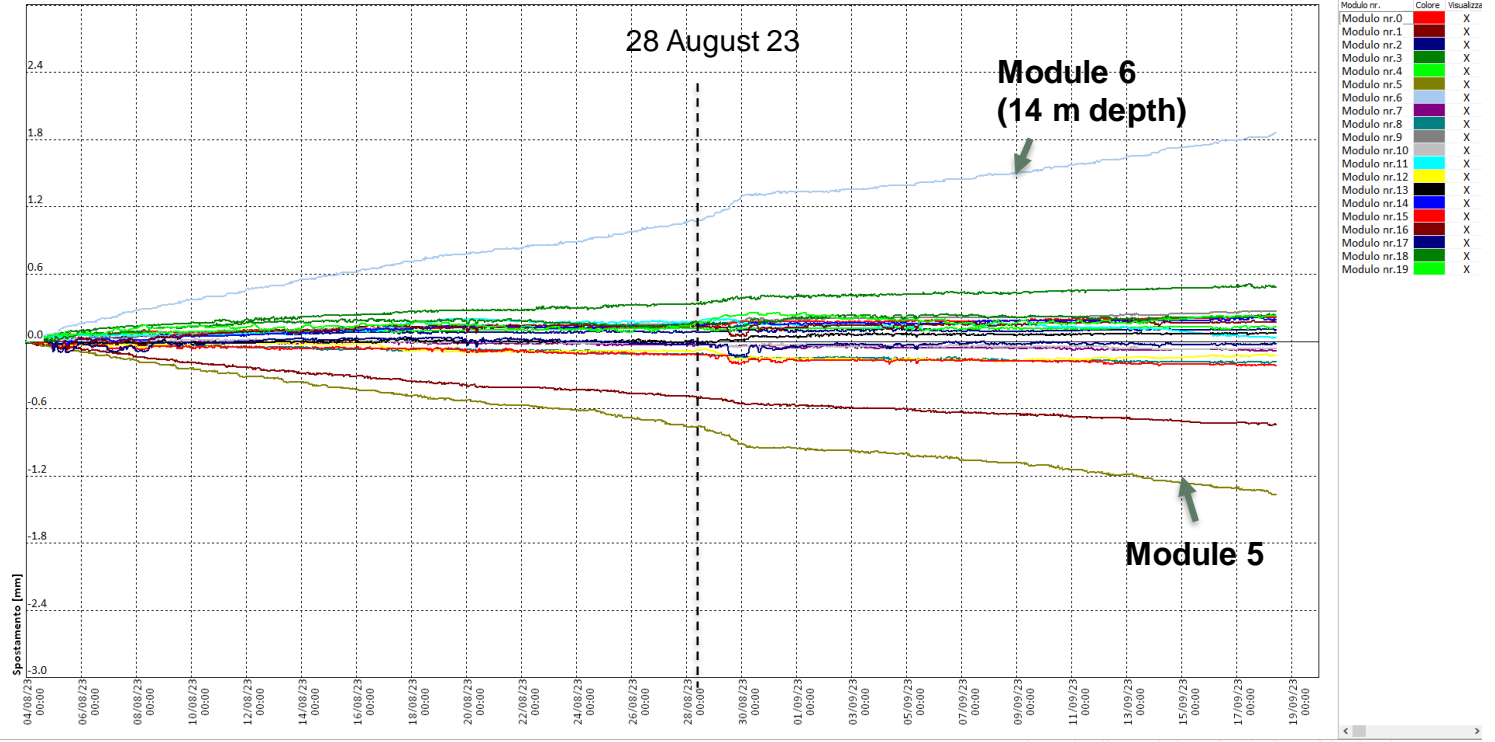


Displacements

# Inclined DMS

DMS EW [UMB001-020-0723 - Spostamenti storici dal 04 Agosto 2023 ore 0 al 18 Settembre 2023 ore 23 - Direzione di riferimento (180° N)]  
 Esportazione grafici Ricarico automatico Altro

Storico dal 04/08/2023 ore 0 al 18/09/2023 ore 23 Ricarica



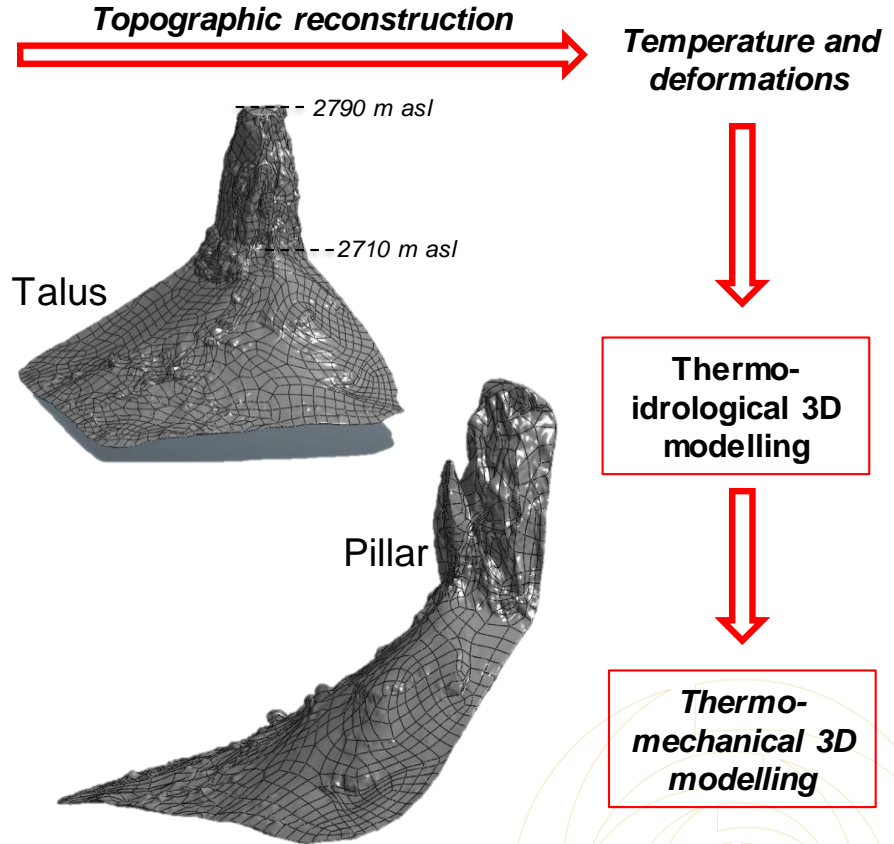
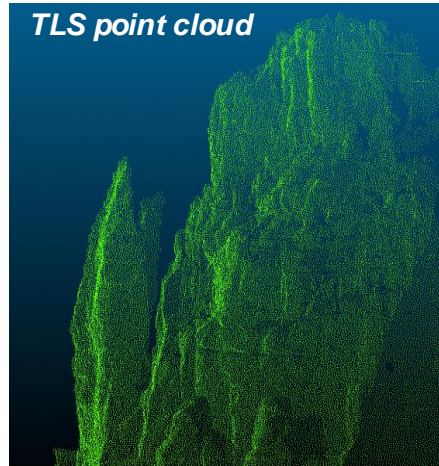
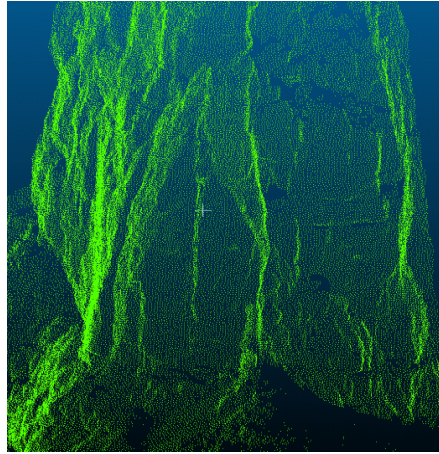
Displacements



## Future applications

Use of monitoring data

- Numerical modeling
- Displacement forecast
- Climate change



# Thanks for the attention

<https://geosciences-ir.it>

