

# Permafrost monitoring at Piz Nair, St. Moritz

## Site and infrastructure monitoring



The mountain station of the Piz Nair cable car, St. Moritz's local mountain, is located at an altitude of 3,056 m above sea level and is anchored to serpentinite rock in permafrost.

Due to climate change, the permafrost zone has shifted and is affecting the stability of the mountain station's foundations.

The rock beneath the foundations has partially eroded and the retreat of the permafrost is causing settlement and horizontal displacement due to a decrease in the shear and compressive strength of the rock. In order to monitor the planned foundation improvements during the renovation work on the subsoil in summer 2025, various manual and automatic monitoring measurements have been installed by various companies since 2020.

In 2024, Grünenfelder und Partner AG took over these measurement systems, expanded them, and has been carrying out the manual monitoring measurements ever since. The TEDAMOS Web platform provides mountain railway operators with a platform where all measurements are consolidated and easily interpreted.

- 📍 St. Moritz, Switzerland
- 👤 Engadin St. Moritz Mountains AG
- 🕒 2024 - ...

### Services

- ◆ Manual, tachymetric 3D deflection measurements at building and terrain points
- ◆ Automatic tachymetric 3D monitoring of the steel construction of the mountain station and the rear garage
- ◆ Automatic GNSS measurements of the mountain station
- ◆ Automatic settlement monitoring of building parts with crack meters
- ◆ Automatic force transducer monitoring
- ◆ Automatic temperature measurements in 5 boreholes and in the air
- ◆ Operation of webcam
- ◆ Periodic area-wide deflection measurements of the area surrounding the mountain station using drones
- ◆ Integration of all previous and current measurement results into the TEDAMOS web portal

### Technologies

#### Automated

- ◆ 2 total stations
- ◆ 2 GNSS sensors
- ◆ 8 crack meters
- ◆ 4 force transducers
- ◆ 5 thermistor chains up to 18 m depth
- ◆ 2 temperature sensors
- ◆ 1 webcam

#### Manual

- ◆ Total station
- ◆ Area drone Wingtra GEN II
- ◆ Inclinator



**BB St. Moritz, Überwachung Piz Nair**  
 Flächenhafter Vergleich (Drohne)

**Datenverwaltung**  
 Epochen +  
 09.08.2024, 11 Uhr  
 26.08.2015, 14 Uhr  
 Plandaten +  
 Eigene Layers +

**Analysetools**  
 Punkt Linie Polylinien Flächen  
 Aktivieren

**Höhenvergleich**  
 Aktivieren

WCSBL  
 CH1903+

**Eigenschaften**  
 09.08.2024, 11 Uhr  
 Kein Tag gesetzt  
☒ Orthophoto  
☒ Höhenmodell  
☒ Hillshade  
 meter  
 3025,1  
 3017,19  
 3009,28  
 3001,36  
 2993,45  
 2985,54  
 2977,63

**Messpunkte**  
☒ Passpunkte  
**Hintergrund**  
☐ Hintergrund aus  
☒ OpenStreetMap  
☐ Landkarte  
☐ Swissimage  
☐ ESRI World Imagery

Vektor: 179 mm  
 Map: 9.0 m

Herunterladen

46° 30' 17.66" N, 09° 47' 17.93" E, 2979.932 m ü. M.  
 RMSE: Georeferenzierung (1696 Pt.) 3.5 cm | 0.4 pixel | Anzahl Kameras: 2 | Anzahl Bilder: 1692



