Freeze-thaw cycles in the rocks of the Bessanese experimental site (Western Alps, Italy)

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INTRODUCTION

Freeze-thaw action induces both rock weathering and mass wasting, destabilizing rock and debris slopes in high mountain regions. Matsuoaka, in 1998, defines an Effective Freeze-Thaw Cycle (EFTC) as a fall below -2 °C of the rock surface temperature followed by a rise above +2 °C.

OBJECTIVES

Our main objectives are: to investigate rock and air temperature variability in an instrumented site at high elevation in the Western Alps of Italy, to identify rockfall events occurred in the monitoring period, and finally to search for possible links between rock and air temperature and rockfall occurrence.

METHODS

Calculation of EFTCs in rocks and air

Rock and air temperature data have been collected by:
- 7 MicroTemp Dataloggers (MTs) with known measurement uncertainty, placed in 2016 at 10 cm depth
- Automated Weather Station (AWS) of ARPA Piemonte installed since 1988

MTs Site Topographic Geology Elevation (m) Aspect Slope (°) Date Detachment location Data source Additional information
1 A-Gastaldi Hut Rock outcrop C 2667 NE 80 200716-150818 27 august 2017 At the base of the NE ridge of the Uja di Bessanese Keeper of the Rifugio Gastaldi A-Gastaldi Hut data
2 A-Gastaldi Hut Rock outcrop C 2666 NE 85 200716-150818 30 september 2016 At the base of the NE ridge of the Uja di Bessanese Keeper of the Rifugio Gastaldi A-Gastaldi Hut data
3 A-Gastaldi Hut Rock outcrop P 2572 NE 85 200716-150818 27 august 2017 At the base of the NE ridge of the Uja di Bessanese Keeper of the Rifugio Gastaldi A-Gastaldi Hut data
5 A-Gastaldi Hut Rock outcrop P 2586 NE 80 200716-150818 27 august 2017 At the base of the NE ridge of the Uja di Bessanese Keeper of the Rifugio Gastaldi A-Gastaldi Hut data
6 A-Gastaldi Hut Rock outcrop PCI 2790 SE 80 170816-150818 30 september 2016 At the base of the NE ridge of the Uja di Bessanese Keeper of the Rifugio Gastaldi A-Gastaldi Hut data
7 A-Gastaldi Hut Rock outcrop PCI 2772 SE 80 170816-150818 27 august 2017 At the base of the NE ridge of the Uja di Bessanese Keeper of the Rifugio Gastaldi A-Gastaldi Hut data

The two photos represent rockfalls detachment and accumulation zones.

EXPERIMENTAL RESULTS

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