MALATRA PROJECT

MALATRA (Monitoraggio dell’Ambiente glacial mediante Tecnologia RFID / Glacial Environment Monitoring by means of RFID Technology) is the first project of GLACIES research unit. It aims to develop a tracking and identification system for measuring physical parameters in glacial environment using RFID (Radio Frequency Identification) technology. The system is composed by sensors equipped tags deployed on the glacier and a handheld reader to download the stored data. The devices allow to monitor the properties of the ice, in an easier and more widespread way than traditional procedures, in areas where human intervention is difficult and dangerous.

SYSTEM DESIGN

The research unit has studied and realised in its entirety both the design, both the realization of the layout of the printed circuit boards (PCB), the software and the firmware. The PCB hosts the sensors (magnetometer, accelerometer, PT1000 temperature sensor, pressure sensor), an antenna for the RF communication, a serial port and a microcontroller able to manage all the functionalities. Changing the firmware, the same board, connected to the PC via serial communication, can act as a reader or battery powered as a tag. In the tag version, sampling the sensors once a day, the battery life is estimated to last 5 years.

FIELD TEST

Period: 2013/12/19 - 2014/03/10
Altitude: 1450 m
Installation: capsule with tag+sensor at ground surface
Measured parameters by MALATRA devices:
- temperature (bottom of snowpack) - hourly;
- RSSI (Received signal strength indication) - daily

INDREN GLACIER INSTALLATION

Date: 2014/04/18
Altitude: 3300 m
Installation: tags with sensors have been installed in two holes and georeferenced using a GNSS receiver.
Measured parameters by MALATRA devices:
- temperature, tag tilt,
- tag orientation, pressure
Program of measures: every 12 hours.
Tags verified via RF (Radio Frequency) with the reader.

INDREN FIRST SURVEY

Date: 2014/05/03 Altitude: 3300 m
Period of activity: 16 days
The data were compared with those from daily snow and weather observations of the stations placed in Lake Gabiet (LG) at Gressoney-La-Trinité, at 2380m of altitude, and at Cime Bianche (CB) in Valtournenche, at 3100m of altitude.

We are witnessing an early stage of thermal variation, presumably related to the mass of snow and ice volume of the holes that has been restored to its original condition. After a transient, the temperatures become steady. Tags 2 and 10, in the ice, maintain a constant difference of about 1°C; tag 6, in snow, shows a little increase on 26th April, in correspondence of a slight air temperature growth (both for CB and LG), in a period with no new snow. After 27th April, tag 6 temperature becomes steady in spite of air temperature changes; this may be due to new snow accumulation.

NEXT INSTALLATIONS and OUTLOOKS

- Installation on Glacier of Thoula (Mont-Blanc), to be related with mass balance measurements.
- Use of the devices in other domains (landslides and rock glaciers monitoring).
- Further development of GLACIES unit through the involvement of local businesses and international scientific organisations.
- Improvement of methods for remote accurate localisation.