Investigation of permafrost sensor dynamics

Topic	T9.1 Meteorological traceability and uncertainty
Oral or Poster Presentation	Poster Presentation

INVESTIGATION OF PERMAFROST SENSOR DYNAMICS

P. Pavlasek [1,2], A. Merlone [3], F. Sanna [3], G. Coppa [3], S. Ďuriš [2], Z. Ďurišová [2], J. Palenčar [2]

[1] *Slovak Institute of Metrology, Bratislava, Slovakia*
[2] *Slovak University of Technology, Bratislava, Slovakia*
[3] *Istituto Nazionale di RicercaMetrologica, Torino, Italy*
E-mail (corresponding author): Pavlasek@smu.gov.sk

Permafrost soils are an important part of the whole climate and environmental system as they play an important role in storing carbon and water. As permafrost makes around 15 % of the global land cover the amount of stored carbon and water is not negligible. These types of soils provide a direct source of water for plants in severe drought areas, during summer and keep surplus water in the soil until the next season. Furthermore the trapped carbon is of high concern as the increasing global temperature could cause the release of this undesired substance.

To be able to determine the current state of the permafrost thickness and its evolution in time it is important to have a precise measurement of permafrost temperature. Commonly the measurements are performed by temperature sensors that are placed in a narrow drill hole several meters deep. The temperature is recorded continuously during the whole year. The problematic point of this measurement is the day/night cycle, during which the temperature elevates due to increasing solar radiation. This creates an oscillating behaviour of measured temperature that is affected by the sensor dynamics that is different form sensor to senor. In order to be able to have reliable and traceable permafrost temperature data the different sensor dynamics need to be determined and included into the measurement uncertainty.

This paper presents an experimental measurement method by which means it is possible to determine the different permafrost senor dynamic it the range from -30 °C to +30 °C. The paper furthermore discusses the uncertainty contribution from this sensor property and furthermore compares the dynamics of different tested sensors.

Acknowledgements

This work is being developed within the frame of the EMRP (European Metrology Research Programme) joint research project ENV58 “METEOMET”. Furthermore the work was supported by the Slovak R&D Agency, projects APVV-15- 0295, APVV-15-0164, the Scientific Grant Agency of the Ministry of Education of the Slovak Republic projects VEGA 2/0610/17, VEGA 1/0556/18 VEGA - 1/0098/18 and KEGA039STU-4/2017.