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The adaptation of iButtons® for near-surface rock temperature and thermal offset measurements in a high alpine environment – Instrumentation and first results, Kitzsteinhorn (3203 m), Hohe Tauern, Austria

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High alpine regions are very rough terrains influenced by extreme weather conditions. Steep and inaccessible terrain complicates the installation and maintenance of monitoring instruments. Among other hazards lightning stroke, low temperatures and mass movements have a strong impact on permanently installed instruments. Therefore technical challenges include the development of robust measuring instruments to resist harsh environmental conditions.

The presented work is part of the MOREXPERT ('Monitoring Expert System for Hazardous Rock Walls') project. One of the project's main objectives is the development of an easy to use and maintainable monitoring system with respect to cost and benefit. The assessment of rock permafrost distribution across the whole summit pyramid (300 meters in height, 3.5 ha) and the consideration of the heterogeneous topography requires a large number of temperature loggers. To meet these requirements iButtons® were used. The iButton® is a computer chip enclosed in a 16mm thick stainless steel can. The used DS1922L/T temperature logger iButtons® are rugged, self-sufficient systems that measure temperature and record the result in a protected memory section with an accuracy of $\pm 0.5°C$ from -10°C to +65°C and a resolution of 0.0625°C. In contrast to conventionally used temperature loggers, iButtons® are cheap, end-user friendly and easily replaceable in case of damage. For this reason a large number of measurement sites can easily be equipped for the measurement of near-surface rock temperatures and thermal offset. A special instrumentation workflow for the installation of iButtons® in depths of 10 and 80 cm was developed. All iButtons® were attached to polyethylene rods and placed in previously drilled holes. First results show a good applicability of iButtons® for rock temperature measurements.