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Abstract

Many high-mountain regions around the world are warming at rates that significantly exceed the global mean. This warming trend has severe consequences (e.g. glacier retreat, permafrost degradation, biodiversity reduction), which however often occur with significant lag times and in non-linear fashion. Accurate identification and quantification of climate change impacts thus requires extended observation periods and long-term monitoring approaches. Conventional research funding through state agencies is in most cases restricted to just three years and hence does not provide an appropriate framework for long-term studies of climate change impacts. Alternative funding sources are therefore needed.

Rapid warming of alpine regions represents a significant safety concern for high-alpine infrastructures and puts their operators under increasing pressure to adapt to changing environmental conditions. To ensure operational safety, legal protection and economic sustainability climate change consequences need to be monitored over long time scales, which potentially makes operators of high-alpine infrastructures ideal partners for long-term research cooperations.

In this contribution we describe the framework and focus of the Open-Air-Lab Kitzsteinhorn (OPAL) – a long-term geoscientific monitoring funded and logistically supported by a local tourism enterprise (Gletscherbahnen Kaprun). The OPAL was initiated in 2010 by an extensive public-private-partnership. Since 2016 it is exclusively funded from private sources. By combining data on external forcing (climate), internal responses (rock temperatures) and surface changes (rockfall, glacier retreat), the OPAL provides valuable insights on the correlation between climate warming and rock mass destabilization in high-alpine rock faces. Over the past decade the OPAL has grown into Austria's most extensive research site for bedrock permafrost and rockwall monitoring and features one of the most substantial inventories for high-alpine rockfall related to deglaciation worldwide.