Transforming Data into Climate Resilience for Cold Regions

CryoSCOPE

PROCESSES • MODELING • FORESIGHT

GLOBAL CONTEXT

The changing cryosphere in polar regions and high-altitude mountains, such as the Arctic and the European Alps and the Himalayas, play a crucial role in regulating sea levels and freshwater availability. Accelerated melting, driven by global warming, disrupts river flows and ecosystems, with consequences for communities such as: low reservoir levels in Iceland, affecting winter traffic predictability in Northern Scandinavia and impacting the Sami people and the forest industry. In the Arctic, thawing permafrost releases methane, further exacerbating global warming. In midlatitude regions such as the European Alps and Himalayas, accelerated melting disrupts the food-energy-water nexus, causing hazards like glacier lake outburst floods (GLOFs).

Adapting to these changes requires evidence-based recommendations, but current models struggle with the complexities of cryosphere-atmosphere-hydrosphere systems. Knowledge gaps in glacier-permafrost-snow-hydrology processes, along with limitations in snow monitoring and modelling, hinder accurate predictions. The lack of an integrated system to simulate compound hazards like GLOFs increases uncertainty in adaptation strategies.

FACTS

Melting ice affects river flow and ecosystems, disrupting water, energy, and communities in cold and mountainous areas.

Rapid melting in areas like the Alps and Himalayas causes dangers, including glacier lake outburst floods (GLOFs).

Thawing permafrost releases methane, speeding up global warming, with serious effects on Arctic environments and climate change.

Current models face challenges in predicting ice changes due to gaps in knowledge about snow, aerosols, and hazards.

RESOURCES

- Cross-Chapter Paper 6: Polar Regions | Climate Change 2022: Impacts, Adaptation and Vulnerability
- Thawing permafrost | Arctic Council
- Glacial Lake Outburst Floods - ICIMOD
- World glacier monitoring service - under the auspices of: ICSU (WDS), IUGG (IACS), UNEP, UNESCO, WMO, AMAP

Project Overview

CryoSCOPE

ABOUT

CryoSCOPE explores the Cryosphere, Atmosphere, and Hydrosphere (CAH) coupled system to enhance understanding of how ice, snow, and permafrost interact with atmospheric and water systems in the cold regions of the Svalbard (Norway), Norway, Finnish Lapland, Iceland, the Swiss Alps, and the Indian Himalayas. The project utilizes cutting-edge ground-based measurements and remote sensing proxies. With 19 partners across 8 countries, CryoSCOPE analyzes the real-world impacts of local to global-scale modeling and AI-driven applications for various end-users. Applications include improving winter trafficability in Finland, optimizing hydropower generation in the Nordics and Switzerland, mapping glacial lake outburst flood (GLOF) hazards, and predicting drought impacts in cold regions. Through stakeholder collaboration, the project develops tailored services that integrate machine learning with physics-based models to predict snow and ice-related processes. By creating targeted adaptation and mitigation strategies, CryoSCOPE strengthens climate resilience in some of the world's most vulnerable frozen landscapes.

cryoscope-project.eu

KEYWORDS

- Ground based and Earth Observations
- Cryosphere Process
- Atmospheric Drivers
- Integrated System Modelling
- Compound Hazards
- Cryosphere Atmosphere-Hydrosphere (CAH) systems
- Diverse Landscapes

PARTNERS

Coordinated by ILMATIETEEN LAITOS METEOROLOGISKA INSTITUTET FINNISH METEOROLOGICAL INSTITUTE

UNIS The University Centre in Svalbard

SNOWCAP · CSC · University of Kashmir · ETH zürich · FAU Friedrich-Alexander-Universität · LAPPIA · IIT Roorkee · Landsvirkjun · REVOLVE · MuoN solutions · University of Oulu · ÖAW Austrian Academy of Sciences · Suomen ympäristökeskus Finlands miljöcentral Finnish Environment Institute · NTNU · Metsäteho

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- 8 countries
- 19 partners
- 48 Duration Months

For more details about the Partners and Budget, please visit: CORDIS.

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