

# 急激な気象変化に伴う雪崩災害に対する 道路管理の判断支援に関する研究

Study on a Road Management Technology to Support Decision-Making on Avalanche Disasters Resulting from Rapid Changes in Weather

近年、気候変動に伴う激甚化した気象災害や大規模災害による影響が懸念されています。積雪寒冷地の北海道でも、多量降雪後の大雨や気温の急激な上昇による影響が現れており、これらに伴う雪崩による被害が発生しています。雪氷チームでは、防災地質チームと協力して、厳冬期における多量降雨などの急激な気象変化に伴う雪崩災害に対して、冬期道路交通の安全性確保を図り、道路管理を支援する手法の開発に取り組んでいます。

In recent years, there have been concerns about the adverse effects of the more extreme meteorological disasters and large-scale disasters that are associated with climate change. Even in Hokkaido, which is a snowy cold region, heavy rainfall and rapidly rising air temperatures after heavy snowfall have caused avalanches that have brought considerable damage.

The Snow and Ice Research Team, in cooperation with the Geological Hazards Research Team, has been developing technologies to support winter road management. The technologies will ensure the safety of road traffic against avalanche disasters caused by sudden weather changes, such as heavy rainfall in midwinter.



厳冬期の多量降雨による  
雪崩災害事例  
Example of avalanche  
disasters caused by  
heavy rainfall in midwinter

## 斜面積雪の安定性評価手法の提示

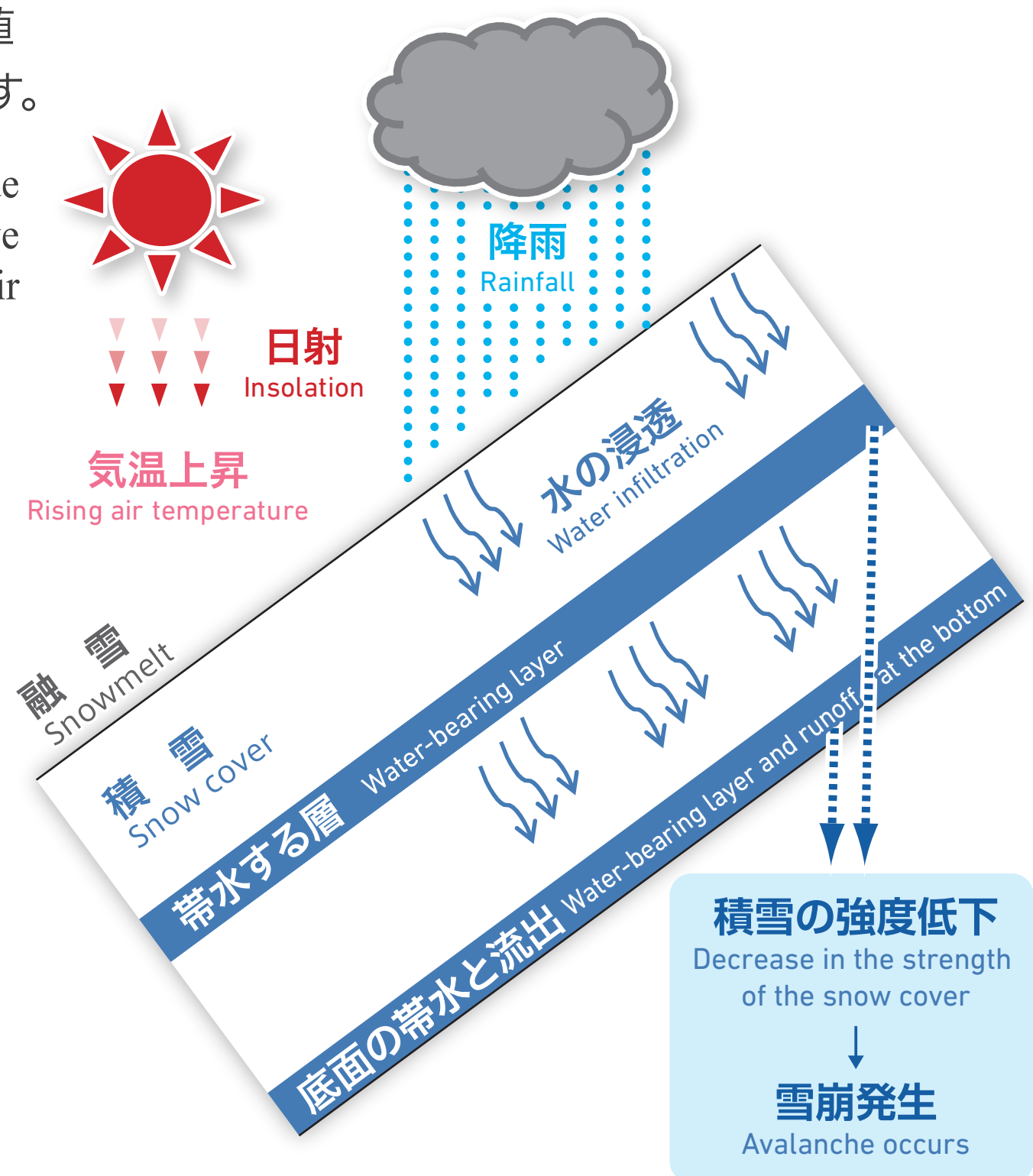
Presenting a technology for assessing the stability of snow cover on slopes

積雪内部の雨水や融雪水の移動過程と積雪底面からの流出過程を明らかにすることを目的として、現地調査や数値解析を行います。これらの結果から、厳冬期の大雨や急激な気温上昇に伴う斜面積雪の安定性評価手法を検討します。

We will conduct onsite surveys and numerical analyses to clarify the movement processes of rainwater and snowmelt water inside the snow cover and at the bottom of the snow cover when the water runs off. Based on the results of the surveys and analyses, we will examine a technology for evaluating the stability of snow cover on slopes at times of heavy rainfall and rapidly rising air temperatures in midwinter.



▲色水を使った積雪内部の水分移動に関する現地調査例  
Example of onsite survey for water movement inside the snow cover using colored water



▲降雨や気温上昇による雪崩の発生過程の概念図  
Conceptual diagram for the occurrence of  
an avalanche caused by rainfall and rising air temperatures

## 積雪下の土砂の安定性評価手法の提示

Presenting a technology for assessing the stability of soil under the snow cover

雨水や融雪水の地盤への浸透や移動および湧出の過程を明らかにすることを目的として、現地調査や室内実験、数値解析を行います。これらの結果から、積雪下の土砂の安定性評価手法を検討します。

We will conduct onsite surveys, lab experiments, and numerical analyses to clarify the processes of infiltration and movement of rainwater and snowmelt water inside the snow cover and of runoff to the ground. Based on the results of these activities, we will examine technologies for evaluating the stability of soil under the snow cover.

## 雪崩災害に対する道路管理の判断支援手法の開発

Development of technology to support decision-making on road management regarding avalanche disasters

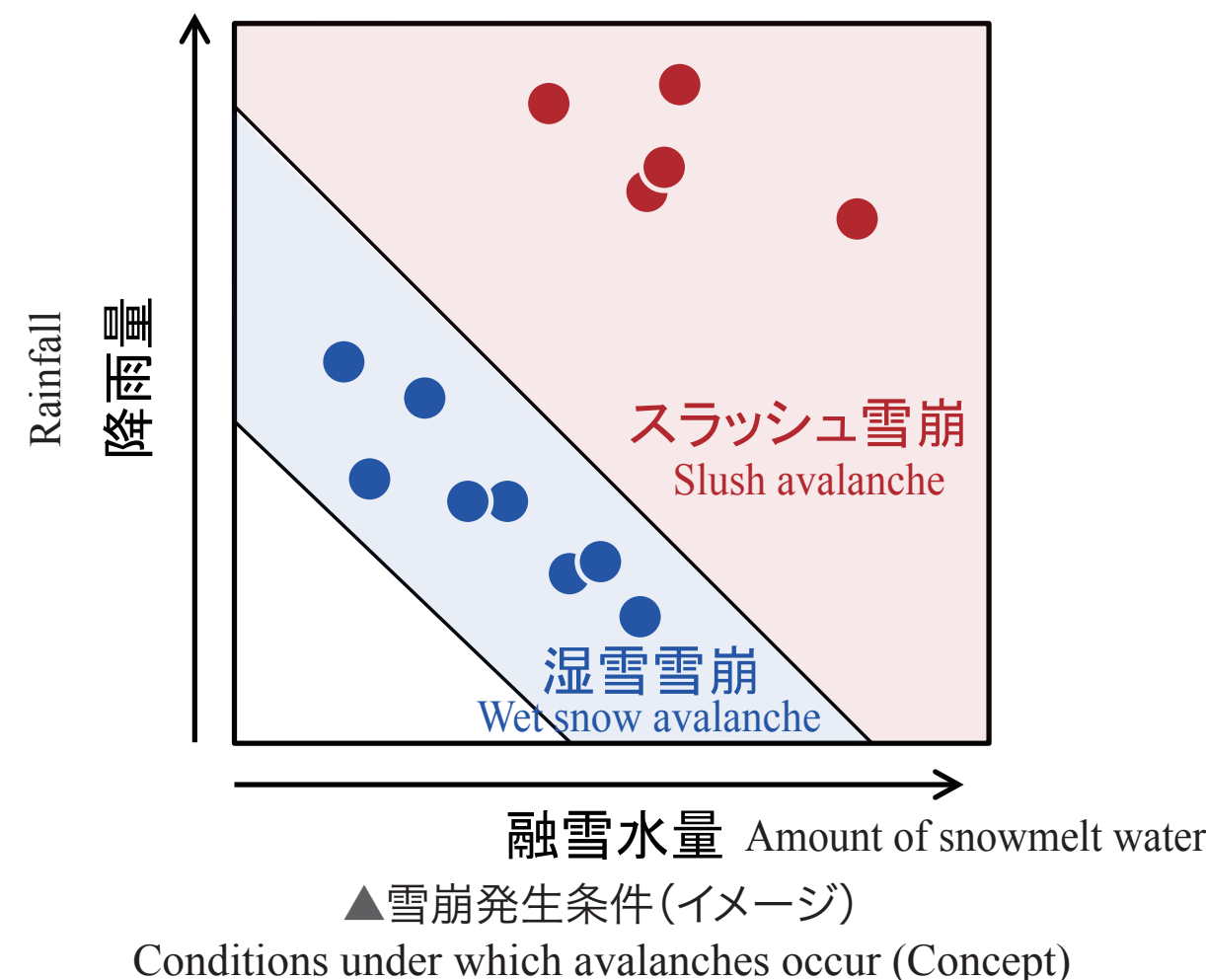
降雨量や融雪水量などを用いた厳冬期の大雨や急激な気温上昇に伴う雪崩災害の発生条件を明らかにすることを目的として、過去の雪崩事例解析を行います。この結果と、斜面積雪の安定性評価手法および積雪下の土砂の安定性評価手法に基づいて、雪崩災害に対する道路管理の判断支援手法を検討します。

We will conduct analyses of past avalanche disasters to clarify the conditions under which avalanche disasters caused by heavy rainfall and sudden rises in air temperature occur in midwinter. For these analyses, we will use rainfall, the amount of snowmelt water, and other data. We will examine technologies for supporting decision-making in road management when avalanche disasters occur based on the analysis results, technologies for assessing the stability of the snow cover on slopes, and the stability of the soil under the snow cover.



湿雪雪崩：水を含んだ雪が斜面を流下する現象  
表層雪崩：すべり面が積雪内部  
全層雪崩：すべり面が地面  
スラッシュ雪崩：大量の水を含んだ雪が流動する雪崩

**Wet snow avalanche:** A phenomenon in which snow containing water slides down the slope  
**Surface avalanche:** When the sliding surface is within the snow cover  
**Full-depth avalanche:** When the sliding surface is the ground surface  
**Slush avalanche:** An avalanche in which snow containing large amounts of water flows down the slope



▲雪崩発生条件(イメージ)  
Conditions under which avalanches occur (Concept)