

雪崩予防柵の合理的設計手法に関する研究

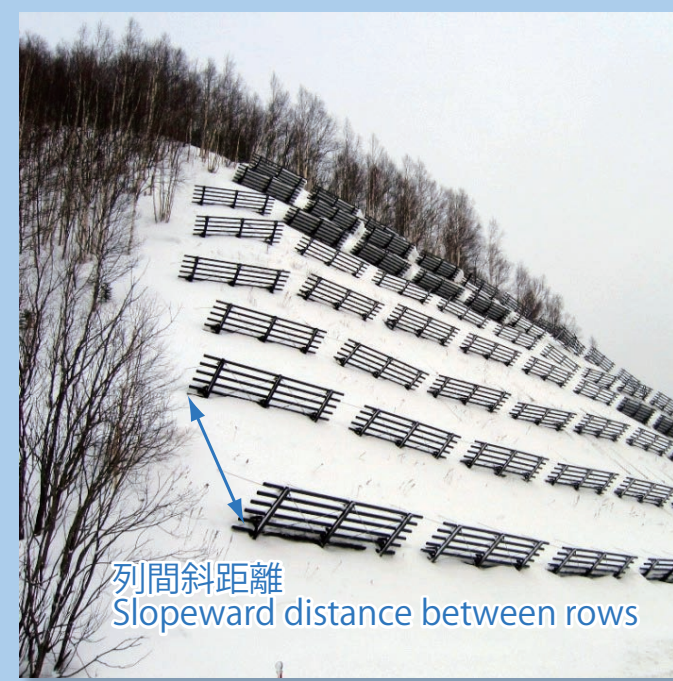
Rational Design Method for Avalanche Snow Bridges

現在の雪崩予防柵の設計手法では、積雪深が小さくなるほど雪崩予防柵の斜面方向の設置間隔である列間斜距離が短くなります。そのため、雪の少ない地域で雪崩予防柵の設置基数が増えるという矛盾が生じています。

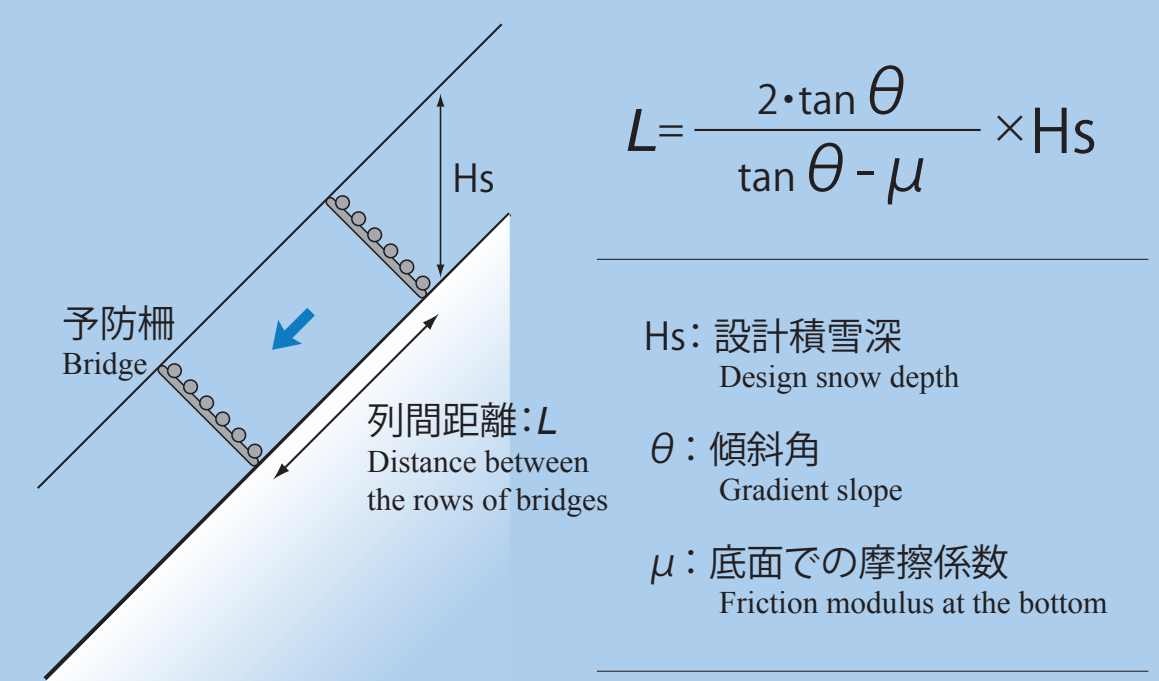
このため寒地土木研究所では、雪崩予防柵の列間斜距離の合理的な設計手法を検討し、柵の列間を広げる考え方を提案しました。

The slopeward distance between rows of avalanche snow bridges as calculated by using the current design method involves a counterintuitive result: The design distance decreases with decreases in snow depth. Because of this, snow bridges installed in areas with moderate snow depth now outnumber those installed in areas with great snow depth.

The Civil Engineering Research Institute for Cold Region is proposing that the slopeward distance between rows of avalanche snow bridges can be increased through the use of a rational design method.



▲雪崩予防柵の設置例
Avalanche snow bridges
installed on a slope



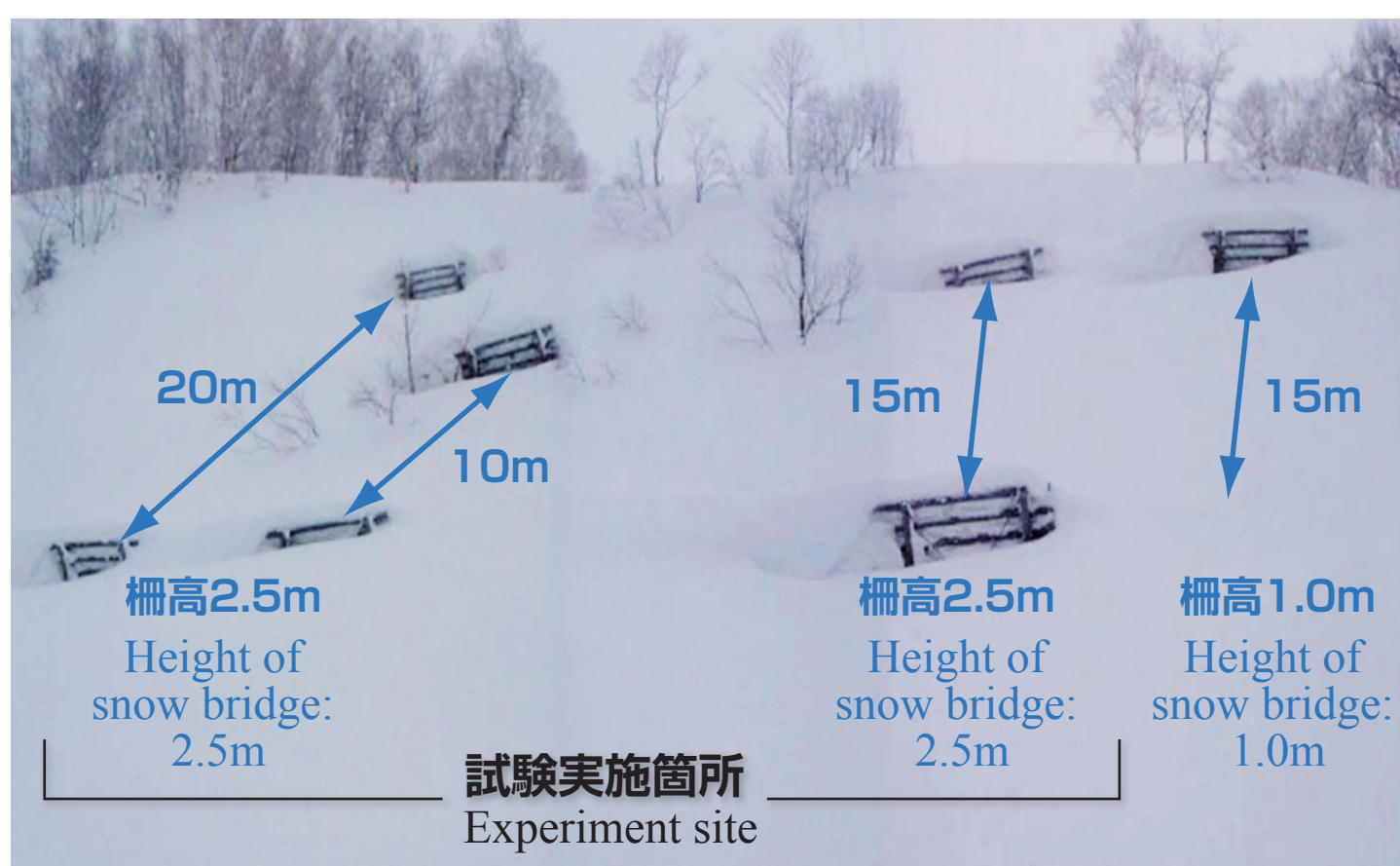
▲ 現行の設計要領による積雪深 (Hs) と列間斜距離 (L) の関係
Snow depth (Hs) and slopeward distance between rows (L) based on the current design guideline

雪崩予防柵の列間斜距離に関する現地試験

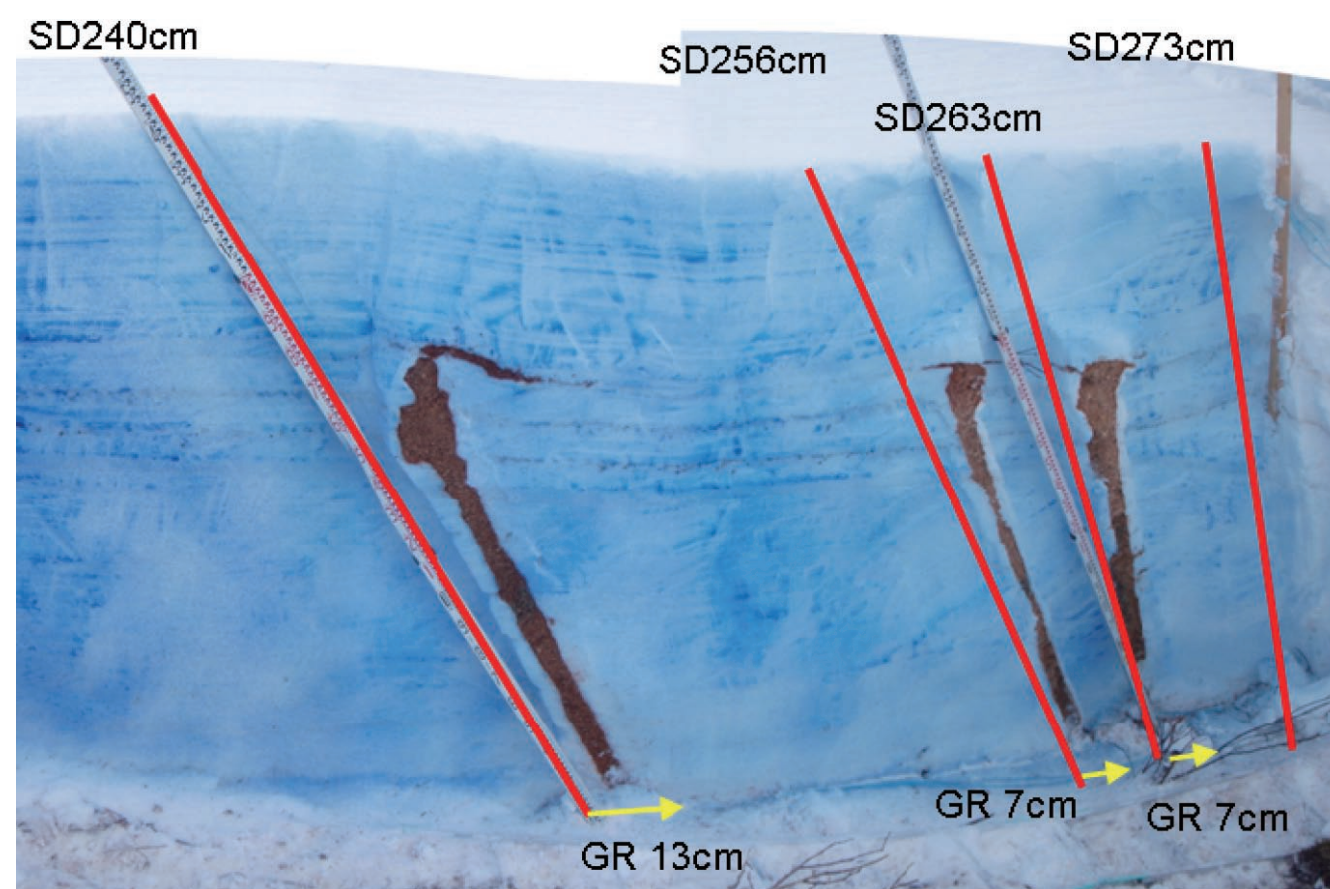
Field experiment on sloeward distance between rows of avalanche snow bridges

雪崩予防柵の列間斜距離の合理的な設計手法を検討するため、柵の列間斜距離を変えた実物大の雪崩予防柵を用いた現地試験を行いました。試験の結果、柵の列間斜距離を長くすると、斜面積雪の移動速度(グライド速度)が大きくなり、また柵に作用する雪圧も大きくなる等の傾向を把握しました。

Toward developing a rational method for determining the maximum slopeward distance between rows of snow bridges, field experiments were conducted in which sets of snow bridges were installed with several different slopeward distances. It was found that when the distance between the rows was greater, the glide speed (moving speed) of snow on the slope was greater, as was the pressure of the snow acting on the snow bridge.



▲現地試験の状況



▲斜面積雪の移動状況の観察
Snow movement observed on the slope



▲雪圧の測定方法

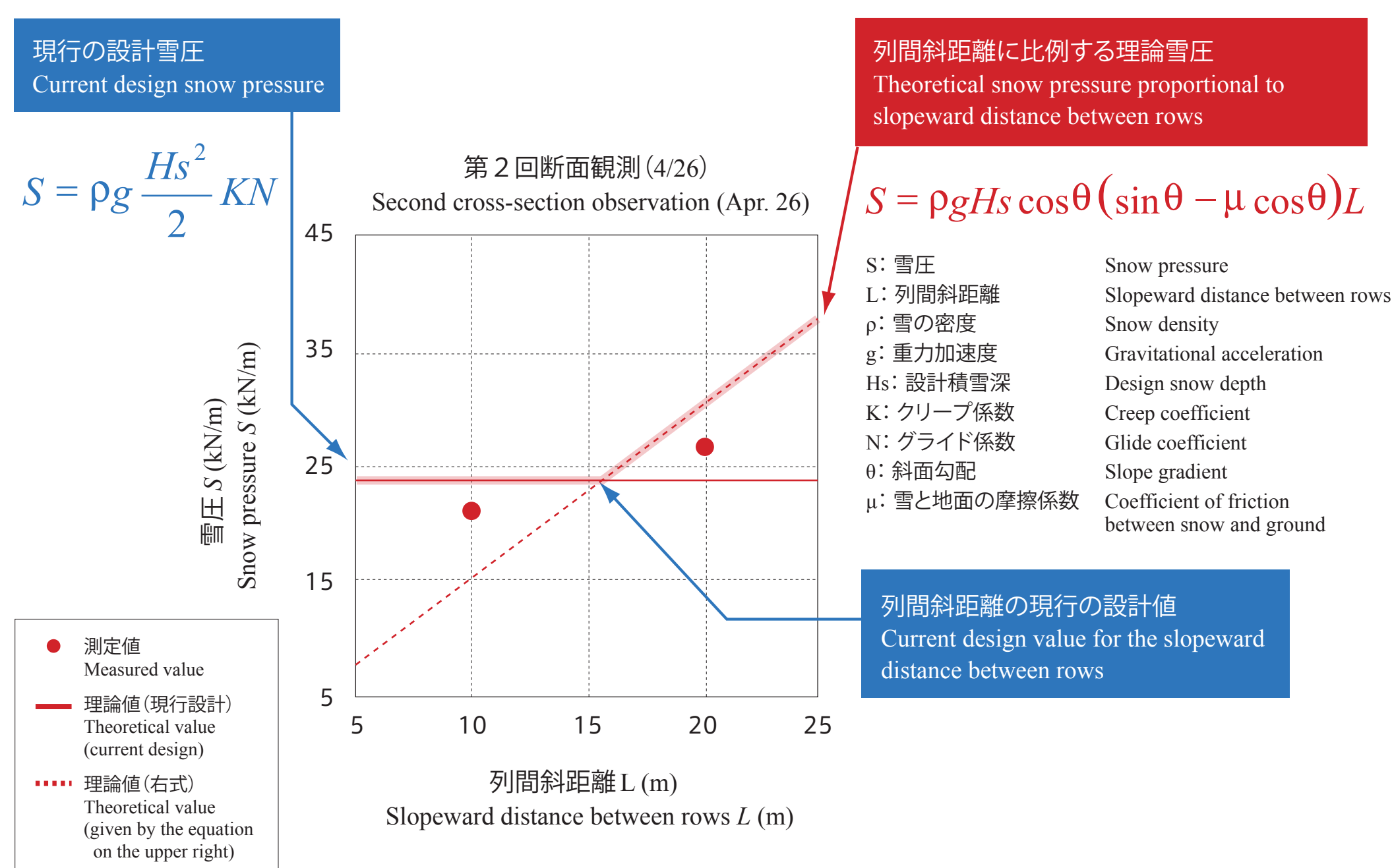
Measurement of snow pressure on the snow bridge

雪崩予防柵の合理的な設計手法の検討

Rational design method for avalanche snow bridges

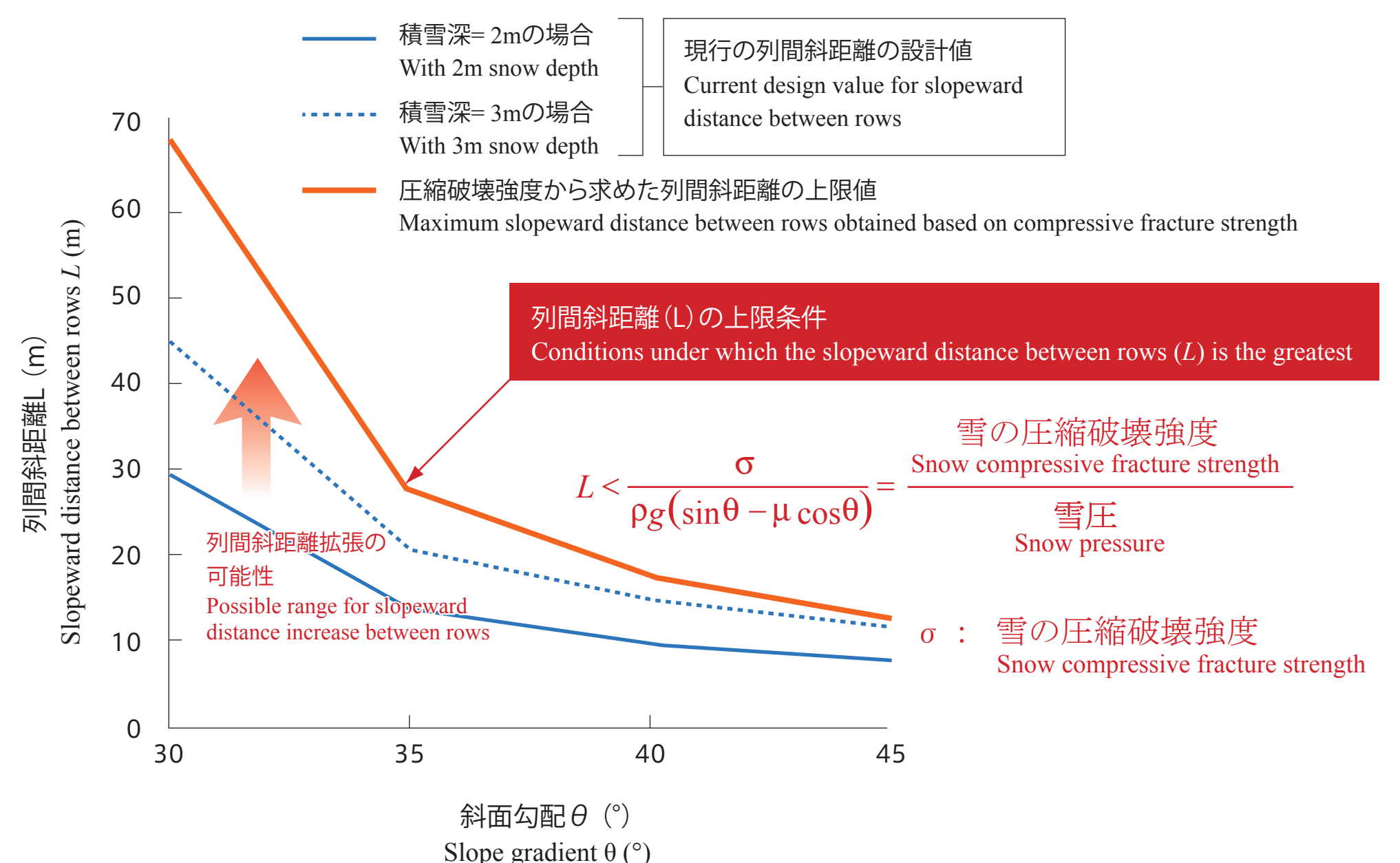
雪崩予防柵の列間斜距離を現行の設計より長くした場合の雪圧は、現行の設計雪圧とは異なる理論雪圧によって与えられます。列間斜距離を広げることによる雪圧の増加と雪の破壊強度との比較検討によると、雪崩予防柵の列間斜距離を拡張できる範囲は、積雪深が小さいほど、また斜面勾配が小さいほど大きくなるという結果が得られました。

For the snow bridges installed with a greater slopeward interval than that of the current design, the snow pressure differs from the theoretical snow pressure of the current design guideline. Based on the relationship between the snow pressure, which increases with increases in slopeward installation interval, and the fracture strength of snow, it was found that the maximum permissible interval could be increased for cases of smaller snow depth and slope gradient.



▲雪圧の測定値と設計値の比較

Measured and theoretical values of snow pressure



▲斜面勾配と列間斜距離(L)の関係
Relationship between slope gradient and slopeward distance between rows (*L*)