

# AVALANCHE FORMATION & RELEASE – PREWORK

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## REQUIRED READING

For your prework for this topic, please read these articles. Come to the School armed with questions!

*On the sustainability and arrest of weak layer fracture in whumpfs and avalanches*, by Dave Gauthier and Bruce Jamieson

Don't let the title of this paper intimidate you. This is a clearly written paper on weak layer fracture and arrest, two important components of avalanche release.

[http://arc.lib.montana.edu/snow-science/objects/ISSW\\_O-043.pdf](http://arc.lib.montana.edu/snow-science/objects/ISSW_O-043.pdf)

*The role of slabs and weak layers in fracture arrest*, by Karl Birkeland, Alec van Herwijnen, Eric Knoff, Mark Staples, Ned Bair, and Ron Simenhois

In this paper we modified slabs and weak layers in the field, and tested how those modifications affected fracture arrest. This gives us some further insights into the fracture process.

[http://arc.lib.montana.edu/snow-science/objects/ISSW14\\_paper\\_O7.01.pdf](http://arc.lib.montana.edu/snow-science/objects/ISSW14_paper_O7.01.pdf)

*The effect of increasing load on weak layer fracture*, by Karl Birkeland and Alec van Herwijnen

This paper looks at what happens when we add additional load to the snowpack and gives insights into why avalanches are more likely during and immediately following storms.

[http://arc.lib.montana.edu/snow-science/objects/ISSW16\\_O1.03.pdf](http://arc.lib.montana.edu/snow-science/objects/ISSW16_O1.03.pdf)

*Snow stabilization following storms: Field experiments and modelling of temporal changes in snow mechanical properties following loading*, by Karl Birkeland, Alec van Herwijnen, Ben Reuter, and Bastian Bergfeld. This paper looks how changes in the mechanical properties of the snowpack following loading lead to stabilization.

<https://arc.lib.montana.edu/snow-science/item.php?id=2665>

*Review of spatial variability of snowpack properties and its importance for avalanche formation*, by Juerg Schweizer, Kalle Kronholm, Bruce Jamieson, and Karl Birkeland

This paper provides a thorough, though fairly academic, review of the spatial variability research prior to 2008 and the implications of this work for avalanche release. Don't worry about the details since we will discuss the important points at the school. (PDF provided)

## SUGGESTED READING

*The effect of changing slope angle on extended column test results: Can we dig pits in safer locations?* by Karl Birkeland, Ron Simenhois, and Joachim Heierli

Though some of the reasoning behind the results in this paper might be a bit dated with recent new information, the practical results are still valid and have important implications for safely evaluating stability.

[http://arc.lib.montana.edu/snow-science/objects/ISSW\\_O-010.pdf](http://arc.lib.montana.edu/snow-science/objects/ISSW_O-010.pdf)

*The effect of changing slab thickness on fracture propagation*, by Ron Simenhois and Karl Birkeland

This paper looks at the effect of changing slab thickness of fracture propagation. The results are relevant for both avalanche mitigation work with explosives and skier triggered avalanches.

[http://arc.lib.montana.edu/snow-science/objects/P\\_8045.pdf](http://arc.lib.montana.edu/snow-science/objects/P_8045.pdf)

*Post-control avalanches*, by Liam Fitzgerald

Liam wrote this paper for the National Avalanche School many years ago, but it remains relevant today. He presents two possible scenarios for post-control releases. We will discuss in lecture why Scenario I is much more likely than Scenario II. (PDF provided)

*Snow Sense*, by Jill Fredston and Doug Fesler

Pages 55 through 63 of this classic avalanche book provide a straightforward and simplified description of avalanche release.

## **USEFUL WEBSITES**

If you want to check out more articles on avalanche release, as well as many other topics related to snow and avalanches, here are three good places to get a start on some of the newer articles that are available:

International Snow Science Workshop database at Montana State University –  
<http://arc.lib.montana.edu/snow-science/> (searchable database of all ISSW papers)

Forest Service National Avalanche Center –  
<https://avalanche.org/technical-papers/> (recent NAC papers, theses, etc.)

University of Calgary Applied Snow and Avalanche Research Group –  
<http://www.eng.ucalgary.ca/Civil/Avalanche/papers.htm> (recent papers by U of C's ASARC)