

## **AVALANCHE DANGER PATTERNS**

### **A NEW APPROACH TO SNOW AND AVALANCHE SCIENCE**

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#### **INTRODUCTION**

We encounter patterns constantly in everyday life. As applicable to the avalanche danger patterns introduced here, the challenge is to recognize clearly delineated, frequently recurring, blatantly perilous situations over the course of highly varied winters. The fact is, accident analysis over the last twenty years has made it abundantly evident that two small handfuls of danger patterns have been responsible for the overwhelming majority of avalanche accidents. Assuming adequate knowledge and appropriate conduct, most of these avalanche accidents would be avoidable.

#### **DANGER PATTERNS – A COMBINATION OF WEATHER, SNOW LAYERING AND AVALANCHE ACTIVITY**

Of preeminent importance is to recognize which combination of snow layering (itself the consequence of just previous weather conditions) plus weather conditions immediately following, currently prevails. That is what brings about, i.e. determines the character and extent of the unfolding avalanche. Backcountry skiers with sufficient experience can manage to call forth (often unconsciously) stored knowledge of such avalanche scenarios from their rich memory trove of experiences and to adapt their conduct accordingly. However, most backcountry skiers simply lack the time for an intensive study of snow, weather conditions and avalanches. For that reason, they simply perceive a snow-covered landscape, without having an inkling of the dangers lurking behind it.

#### **AN OVERVIEW OF THE INDIVIDUAL DANGER PATTERNS**

Initially arising out of a vague notion of composing a list of loosely defined individual danger patterns, an utterly cohesive system has crystallized over time. In the course of its development, the 10 decisive danger patterns were ascertained and defined which cover no less than 98% (at least) of all danger situations which occur during the course of a given winter. The hallmark of these patterns lies in their repeated recurrence, not merely (although mostly) over the course of a single winter season, but above all, over a series of different, highly varying winters.

The 10 most significant avalanche danger patterns at a glance

- dp.1 the second snowfall
- dp.2 full depth snowslide
- dp.3 rain
- dp.4 cold following warm / warm following cold
- dp.5 snowfall after a long period of cold
- dp.6 cold, loosely packed new fallen snow plus wind
- dp.7 shallow snow areas in a season of heavy snowfall
- dp.8 surface hoar blanketed with fresh fallen snow
- dp.9 graupel blanketed with fresh fallen snow
- dp.10 springtime scenario

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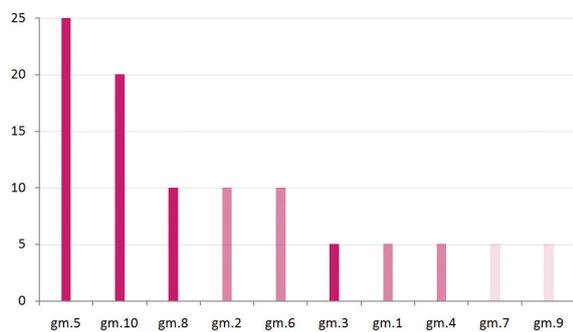
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## DANGER PATTERN SUBDIVISIONS

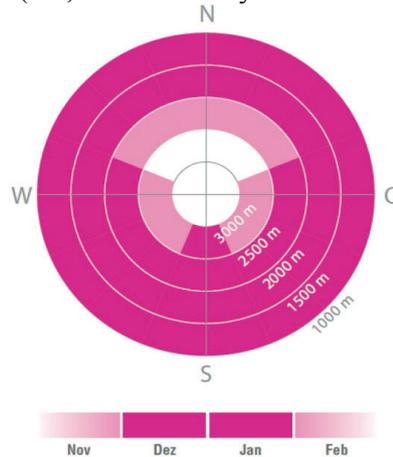
The individual danger patterns can be sub-divided in terms of seasonality, physical area and according to their so-called ‘threat’.

For example, the pattern ‘the second snowfall’ occurs particularly frequently in November and December, whereas the pattern ‘springtime scenario’ is typical of the months March and April. Broken down in terms of physical area, the individual danger patterns can be distinguished by their altitude, exposition and region.

The subdivision ‘threat’ denotes the urgency and potential extent of danger inherent in a given pattern. For example, the pattern ‘snowfall after a long period of cold’ is responsible for about 25% of all avalanche accidents, whereas the pattern ‘graupel’ numbers among the rarely occurring patterns, responsible for only a small proportion of accidents (but, is for that very reason a ‘trap for experts’).



**Fig. 1** ‘Threat’ of given danger patterns (dp)



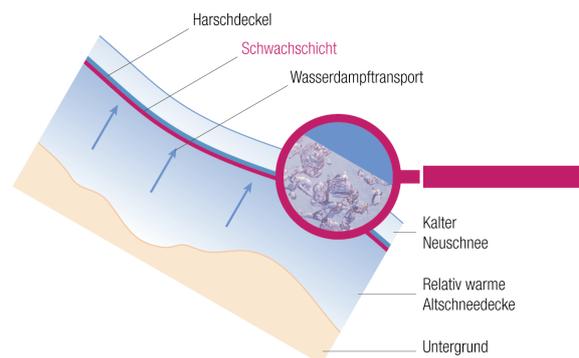
**Fig. 2** Physical area/seasonality depiction of dp.4

## ACCIDENT EXAMPLES AND BACKGROUND KNOWLEDGE

Of particular significance for accident prevention is a clear and easily graspable depiction of individual danger patterns. To that end, a high-impact method combining an ‘actual avalanche accident’ and explanatory ‘background knowledge’ was chosen. In other words, de facto avalanche accidents were described and analysed, assigned to the appropriate danger pattern and finally, rounded out with the necessary details of meteorology, snow and avalanche science, accompanied by corresponding graphs.



**Fig. 3** Avalanche accident Metzen 03.01.2010 (gm.4)



**Fig. 4** Snow layering ‘cold following warm’ (dp.4)

## SOURCES

Mair R., Nairz P., (2010). lawine. die 10 entscheidenden gefahrenmuster erkennen. Tyrolia Verlag Innsbruck, ISBN 978-3-7022-3086-9

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