

The working group #1 “Matrix & Scale” was assigned the following task at the General Assembly (GA) in Tutzling in 2017:

Define the key terms used in the matrix and danger scale, revise the “spontaneous avalanches”-part of the matrix and evaluate / improve weaknesses of the avalanche danger scale.

The work-group included the following members:

- Karsten Müller (group leader)
- Lorenzo Bertranda
- Igor Chiambretti
- Thomas Feistl
- Pavel Krajci
- Gloria Marti
- Patrick Nairz
- Benjamin Zweifel
- Cecile Coleou

The working group “Matrix & Scale” and Technical Advisory Board (TAB) present the following results to the General Assembly:

We define avalanche danger in the following way:

Avalanche danger is a function of snowpack stability, its spatial distribution and avalanche size.

The working group and TAB met several times and detected two main weaknesses:

1. That two main factors contributing to avalanche danger are not clearly defined
A satisfactory common accepted definition for the two terms, snowpack stability and spatial distribution, could not be found. Opposing arguments and a lack of scientific support made it impossible to find solutions. The WG sees this lack of clear and written definitions for two out of three factors defining the avalanche danger - and thus the European Avalanche Danger Scale and EAWS Matrix - as a major weakness of the current system. Defining these two terms would not only improve the consistency and quality of our avalanche forecasting services, but also improve the ease of use of our products for the public.
2. That the workflow to assess the avalanche danger level is not defined
Another weakness identified was the lack of a clear definition of how the avalanche danger level was to be derived from the three main factors. The EAWS Matrix and ADAM still have some shortcomings in this respect.

Since 1993, the common base has been the European Avalanche Danger Scale. While being an important step towards a common understanding, it still left room for substantial interpretation. This has led to different interpretations, standards and workflows among the European forecasting services over the past decades. Today’s ease of travelling between countries, but also exchange of information and cross-border cooperation for assessing avalanche danger makes these differences tangible, both for us and our users. This

therefore requires tighter collaboration and standardization. While most of us accepted the fact that there is a need for more thorough definitions of the common factors, we struggle finding an adequate solution.

Since any changes may take time and involve certain costs, we aim for a slow but solid change. The discussion we are currently having here in Europe has been going on for more than 10 years in North America, where the recent publication of the Conceptual Model of Avalanche Hazard has been the result - CMAH (Statham et al., 2018). The CMAH defines the major factors and describes a concept (procedure) for assessing and determining the avalanche danger (but not the danger level).

We propose to use the CMAH as a reference for future work on the definitions of major factors by EAWS. This would mean that terminology and definitions in the Matrix and danger scale should be measured against its respective representation in the CMAH. Thus, for a term or definition to be adopted, it needs to be considered as an improvement (or at least equal) to its counterpart in the CMAH by the TAB/EAWS members. In addition, this will also send a signal that we aim to collaborate closer with our North American colleagues in order to have internationally consistent products and procedures. The Result would be an improved system that eliminates any shortcomings in the EADS and CMAH.

Concluding from the above-described findings, we suggest the following voting for the upcoming GA in Oslo 2019:

EAWS will use the definition of the avalanche danger as presented in this document, and, use the Conceptual Model of Avalanche Hazard as the reference for future work and development on the terms used in the European Avalanche Danger Scale and EAWS Matrix.

The long-term goal is to draft a complete framework/concept, that once accepted by the EAWS will replace the existing system. This will mean a new Matrix and/or Avalanche Danger Scale will be created. As opposed to gradually adapting new terms, which could risk confusion by mixing new and old definitions, a situation we want to avoid.

PS: All the documents are also available on the EAWS OneDrive: Working groups – Matrix and scale – Voting 2019