

Assessing local avalanche hazard: Can models help?

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ZAMG
Zentralanstalt für
Meteorologie und
Geodynamik

Motivation

ZAMG: National weather service & responsible for regional avalanche warning
(e.g. Styria, Lower Austria)

➤ **Models are of great help and very well established in many operational applications e.g.:**

- Weather forecast, severe weather warning: **Yes**
- Hydrological forecast, flood warning: **Yes**
- Avalanche warning: **Not really**

Input for the discussion



What are the obstacles in the usage of models for Avalanche Warning Services (AWS)?

- Are there fundamental limitations for the application of models in operational avalanche warning?
 - How to tackle these challenges and limitations?
 - Is further development of available models necessary?
 - Can we learn from neighbouring disciplines (landslides, debris flow, flash floods, ...) ?

Input for the discussion



What are the obstacles in the usage of models for Avalanche Warning Services (AWS)?

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 - Is further development of available models necessary?
 - Can we learn from neighbouring disciplines (landslides, debris flow, flash floods, ...) ?

OR

- Are AWS just „old-fashioned“ and „out-of-date“?
- Future perspective:
 - 10 years from now the usage of models will be common also in AWS
 - Models will provide detailed snow cover forecasts and runout simulations, supporting avalanche forecasters

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Model-Aided Assessment and Prediction of Local Avalanche Hazards

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Motivation:

Support local authorities, public stakeholders
and users in risk assessment and mitigation

Scope of application:

Exposed infrastructure and settlement areas,
endangered ski resorts

Idea:

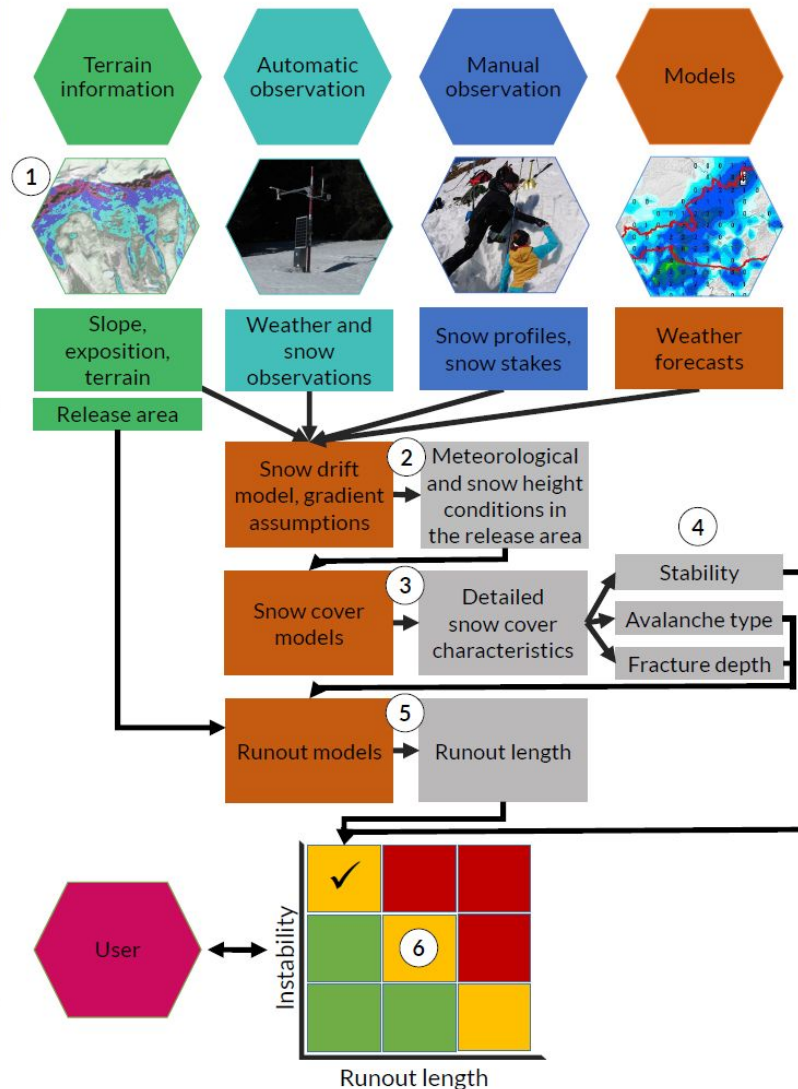
- Develop a system to assess and predict local avalanche risk with the help of a model-chain
- Integrate and combine various model - and observational data components to optimally assess local avalanche danger

Concept:

- ① Collect and combine all data representing local conditions
- ② Estimate conditions in the avalanche release area (account for snow drift and gradients of atmospheric parameters)
- ③ Simulate detailed snow cover characteristics in the release area (SNOWPACK¹, empirical models)
- ④ Use model results to assess snow cover stability, avalanche type, fracture depth
- ⑤ Select runout scenario
- ⑥ User-tailored risk assessment matrix

References:

¹ Lehning, M., Bartelt, P., Brown, R.L., and Fierz, C., 2002: A physical SNOWPACK model for the Swiss avalanche warning: Part III: meteorological forcing, thin layer formation and evaluation. Cold Regions Science and Technology, 35(3): 169-184.



INPUT COMPONENTS

Terrain information
Automatic observations
Manual observations
Weather forecasts

SNOW AND AVALANCHE MODELS

Empirical models
Snow drift models
Snow cover models
(numerical, empirical)
Avalanche runout models
(scenario-based)

RISK ASSESSMENT MATRIX

Risk assessment tailored to the
specific local application

