

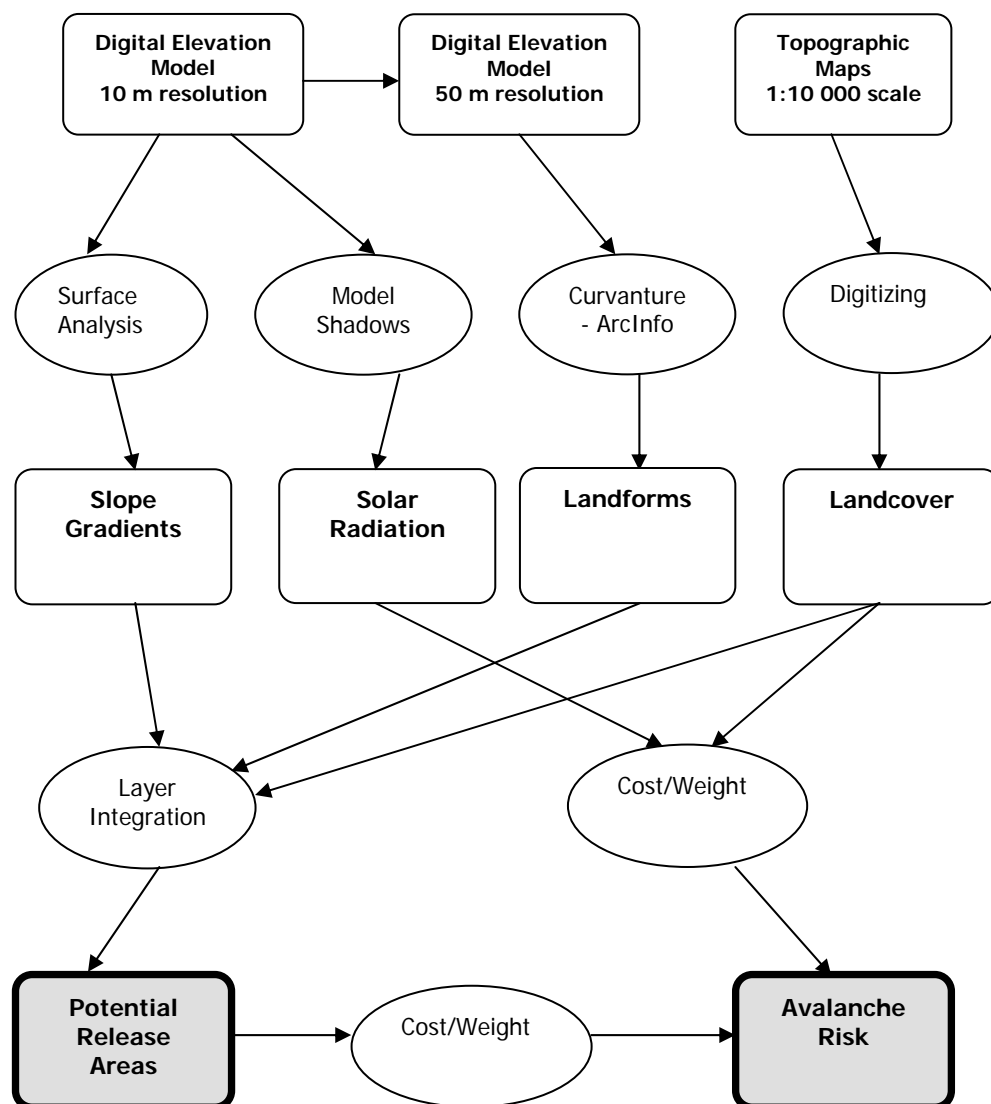
Avalanche risk assessment in the Tatra Mts., Kasprowy Mt. region, Poland

Point of contact:

Pawel Chrustek, Jagiellonian University, Krakow, Poland, gislab@gis.geo.uj.edu.pl or chrustekpaw@poczta.onet.pl

Rationale:

The aim of the study is to define the Potential Release Areas of snow avalanches in the vicinity of the Kasprowy Mt., in the Polish Tatra Mts. and to assess the avalanche risk for those areas.



1. Slope gradients: areas with inclination between 30 and 60 degrees, with the highest frequency of avalanches. Other areas were not considered in the analysis.

2. Landforms: relief form types: convex, concave and flat. Snow avalanches have the highest frequency on convex landforms, and lower frequency on flat and concave landforms.

3. Solar Radiation: input solar radiation indicator in the period of snow cover persistence (November – April). The indicator was evaluated with Model Shadows in ArcGIS on a basis of average extent of shadows cast by relief forms in the winter time. The areas with the lowest input of solar radiation allow to develop the depth hoar, which destabilizes the snow cover.

4. Landcover: landcover types: forest, dwarf pine shrub and lakes. Forests stabilize the snow cover, practically excluding the possibility of snow avalanche release. The dwarf pine shrubs act in the same way, however only until the snow depth is less than height of vegetation cover.

5. Potential Release Areas: Potential release areas for different landform types.

6. Avalanche Risk: Avalanche risk assessment in the Potential Release Areas based on following factors: *Landforms, Solar Radiation, Landcover*

All factors influencing the avalanche risk were quantified. Following values were used:

- Relief forms:
 - convex forms 10
 - flat forms..... 8
 - concave forms..... 6

- Land cover
 - open areas 6
 - dwarf pine shrubs..... 4

- Solar radiation
 - areas with minimal radiation input 4
 - other areas 2

Values were summed for the study area using map overlay. The results were grouped into three classes of avalanche risk.

- Avalanche risk
 - moderate avalanche risk (yellow)..... < 15

- considerable avalanche risk (orange) 15 – 17
- high avalanche risk (red) > 17

The Avalanche Risk in the Tatra Mountains is a part of the Master Thesis under supervision of Prof. Wojciech Widacki, in the GIS Laboratory, Institute of Geography and Spatial Management, Jagiellonian University, Cracow, Poland.

References

Gruber U., Maggioni M., Stoffel A., 2002: *Definition and characterisation of potential avalanche release areas*. Proceedings of the 2002 ESRI International User Conference

Gruber U., 2001: *Using GIS for Avalanche Hazard Mapping in Switzerland*. Proceedings of the 2001 ESRI International User Conference

Aims:

The main goal is to distinguish Potential Release Areas in the Tatra Mountains

Addressed users:

Tourists, climbers, avalanche researchers

Geographic Area:

Kasprowy Wierch region in the Tatra Mountains – Poland

Upper LeftX: 423090.8130840 Upper LeftY: 5456511.6244850

Lower RightX: 427188.99055490 Lower LeftY: 5452811.26108704

Projected coordinate system name: WGS_1984_UTM_Zone_34N

Geographic coordinate system name: GCS_WGS_1984

Data, Feature Types and web services:

Avalanche Risk – geotiff

Potential Release Area – geotiff

Landforms – geotiff

Slope gradients – geotiff

Landcover – shp

Solar Radiation – shp

Stream network – shp

Summits – shp

Screenshots:

Fig. 1. Potential release areas of snow avalanches in the Kasprowy Mt. region.

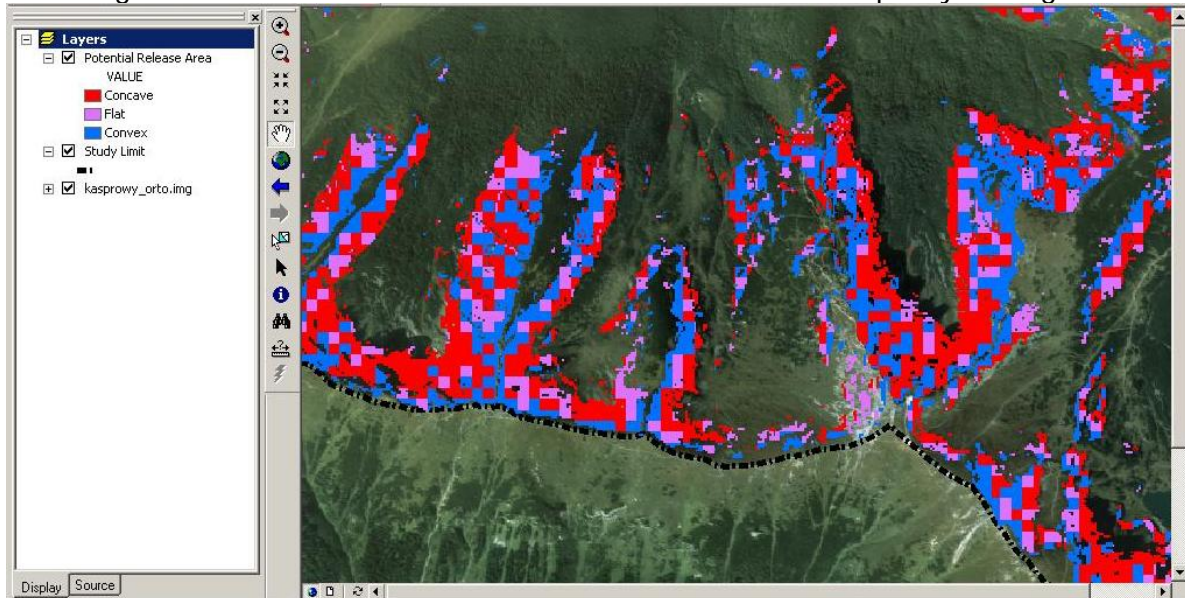


Fig. 2. Snow avalanche risk in PRA

