Snow maps for Climate Atlas of Slovakia

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SNOW - an ecological phenomena, Smolenice, SK 19-21 September 2017

Motivation

-Number of atlases involving some climate maps from the territory of Slovakia were issued.

-The only atlas dealing specifically with the climate in Slovakia was the Atlas of Climate of the Czechoslovak Republic (1958) which covered the period 1901-1950.

-The main goal of coming Climate Atlas of Slovakia was to continue in the scope of previous maps both in the topics and in the time line.

-Periods 1961-2010 and 1981-2010 were chosen for basic climate evaluation.

Snow maps

-The Atlas contains 11 chapters and snow and snow cover forms one of them.

The selection of the maps to be created was done under following criteria:

-The maps should cover full territory of Slovakia and to reflect the geographical features of the area.
-To show the process of snow accumulation.
-To describe the local conditions with the relevant statistical characteristics.
-To reflect the seasonal course of the snowfall and snow cover.

Methodology

The data

-all data came from the network run by the Slovak Hydrometeorological Institute. It means one method to observe and measure was applied. (Snow depth measured at 7am, SWE measured each Monday at 7am).

-all data used is coming from the selected meteorological stations which fulfilled quality criteria and represent a certain geographical unit.

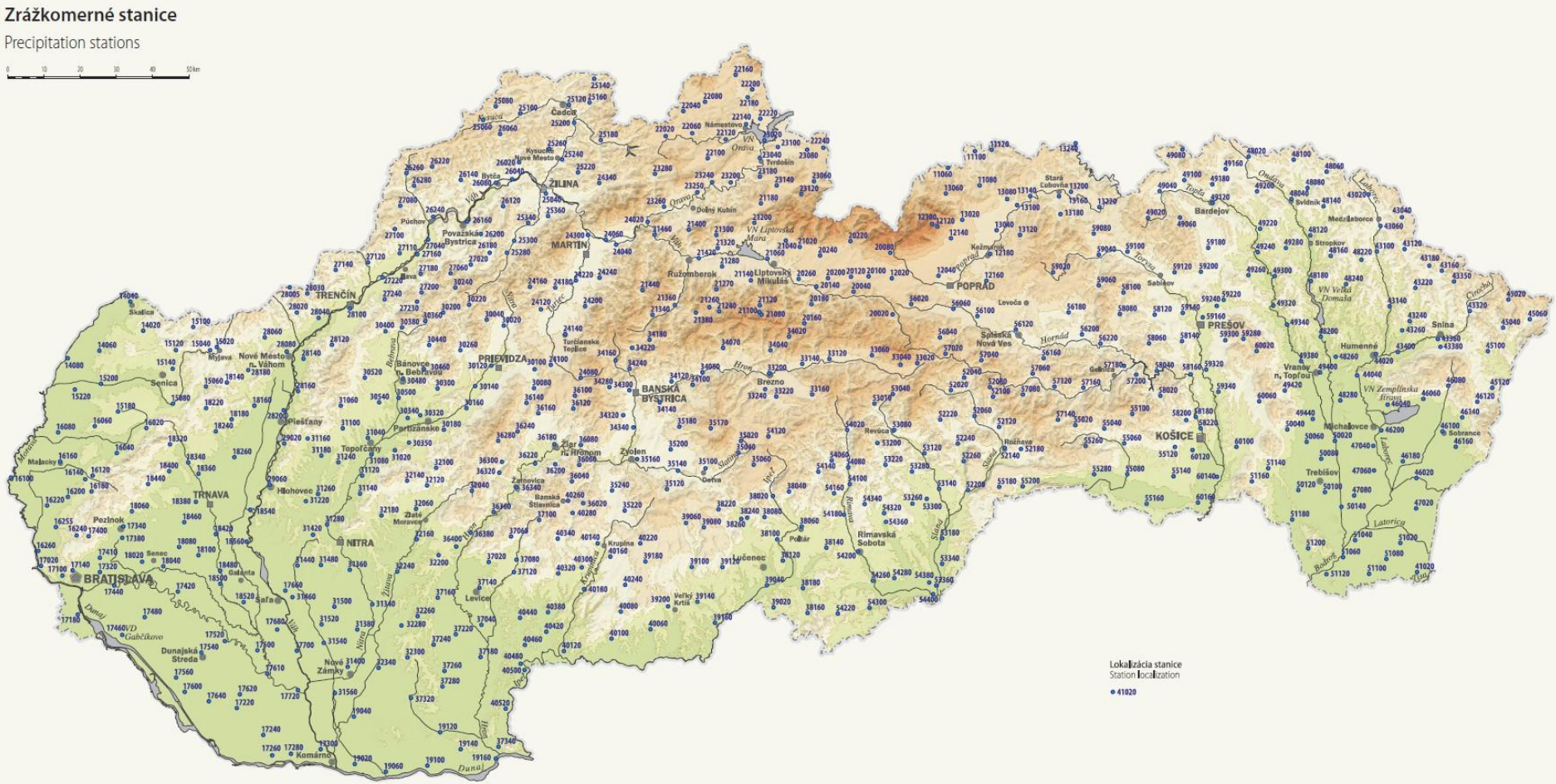
-all datasets were homogenized by MASH v3.03 (Multiple Analysis of Series for Homogenization). This method homogenizes monthly as well as daily data series and also to fulfill limited data gaps.

-the data from the country borders were homogenized at regional scale (within CarpatClim project).

-All the time series for the particular maps were processed in GIS environment.

Methodology

The network of stations used in map creation process.
405 time series were used together with several fictive stations (mostly from the mountain regions).



Methodology

-the time series were supplemented by so called fictive stations /complementary points/, according to the bind of the snow characteristic to terrain features and in the areas with lack of real stations.

-based on the regression relations the values of interpreted characteristic were derived from their regional dependency on the elevation or other terrain feature or from other data sources (totalizer raingauges).

-the time series from the period 1981/1982-2010/2011 were used.

Methodology

AGhydroInterpolace – an interpolation procedure for ArcGIS was used to calculate the areal patterns of snow characteristics. (P. Stercl, 2008)

This application developed at Czech Hydrometeorological Institute provides:
-the calculation of the field of continuous variable (climate characteristics) in the form of basic grids based on the point observation of the particular value and its relation to another cintinuous value.
-correction of the areal displacement of the respective value based on the point measurements
The application works under ArcGIS system version 9.2 and higher and it further extends the functionality of existing „Orographic interpolation“.

Produced set of maps

Snowfall (14 characteristics)

Average annual seasonal number of days with snowfall
Average monthly number of days with snowfall at selected stations
Average monthly number of days with snowfall in December
Average monthly number of days with snowfall in January
Average monthly number of days with snowfall in February
Average monthly number of days with snowfall in March
Average seasonal number of days with new snow depth ≥ 5 cm
Number of cases with new snow depth ≥ 20 cm in the period 1981 – 2010
Average seasonal number of days with new snow depth ≥ 10 cm
Average seasonal number of days with new snow depth ≥ 15 cm
Average of seasonal totals of the new snow depth
Average date of the first snowfall
Average date of the last snowfall
Recorded maxima of snowfall and snow cover from selected stations during winter seasons in the period 1981 – 2010

Produced set of maps

Snow cover (22 characteristics)

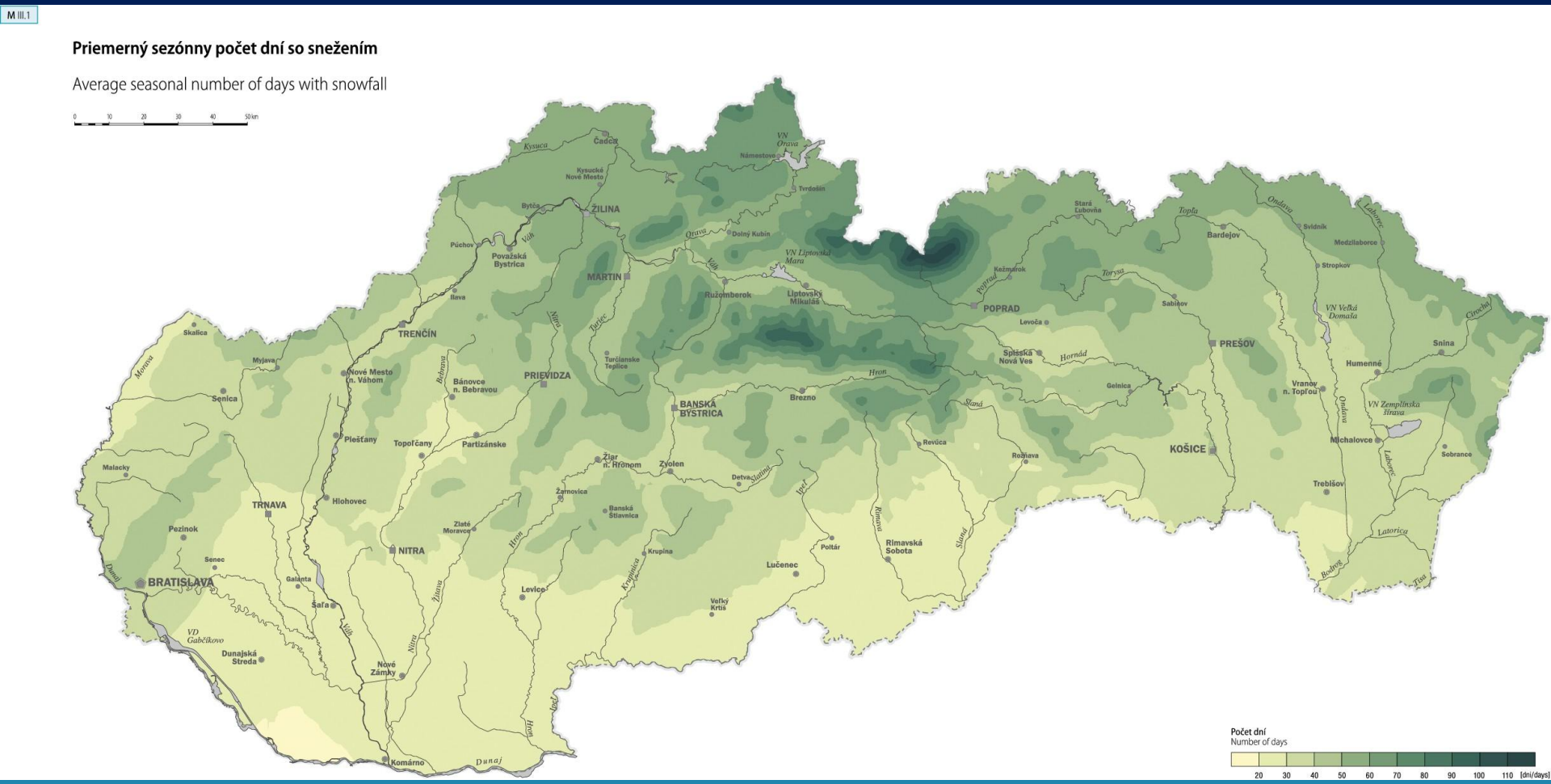
Average seasonal number of days with snow cover
Average monthly number of days with snow cover in November
Average monthly number of days with snow cover in December
Average monthly number of days with snow cover in January
Average monthly number of days with snow cover in February
Average monthly number of days with snow cover in March
Average monthly number of days with snow cover in April
Average seasonal number of days with snow cover depth ≥ 10 cm
Average seasonal number of days with snow cover depth ≥ 20 cm
Average seasonal number of days with snow cover depth ≥ 50 cm
Average of the seasonal maxima of snow cover depth

Produced set of maps

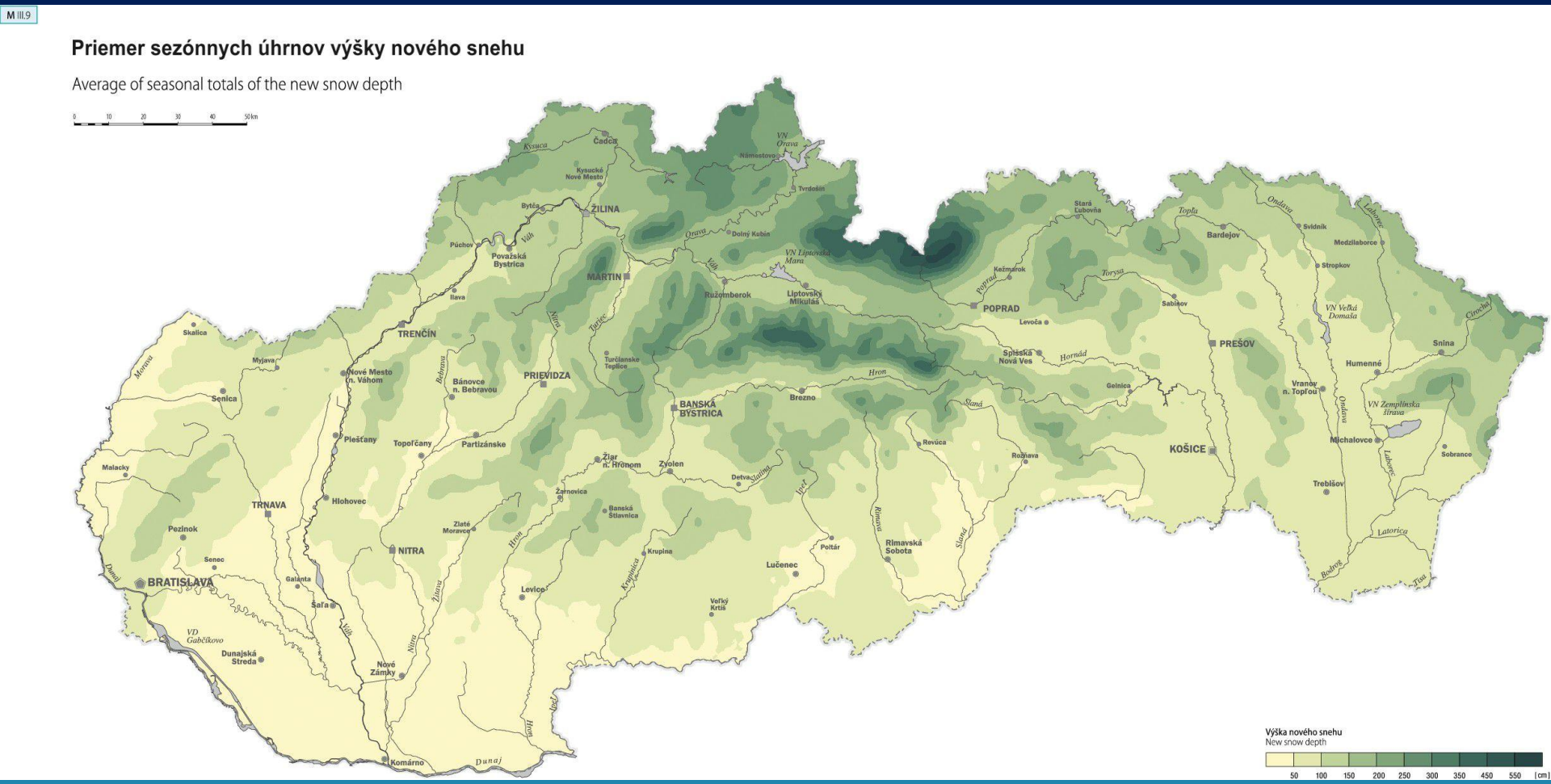
Snow cover (22 characteristics)

Maximum depth of snow cover at low elevations
Maximum depth of snow cover at mountain sites
Average monthly maximum of snow cover depth in November
Average monthly maximum of snow cover depth in December
Average monthly maximum of snow cover depth in January
Average monthly maximum of snow cover depth in February
Average monthly maximum of snow cover depth in March
Average monthly maximum of snow cover depth in April
Average monthly number of days with snow cover at selected stations
Average seasonal maximum of water equivalent of snow cover
Average date of the first snow cover
Average date of the last snow cover

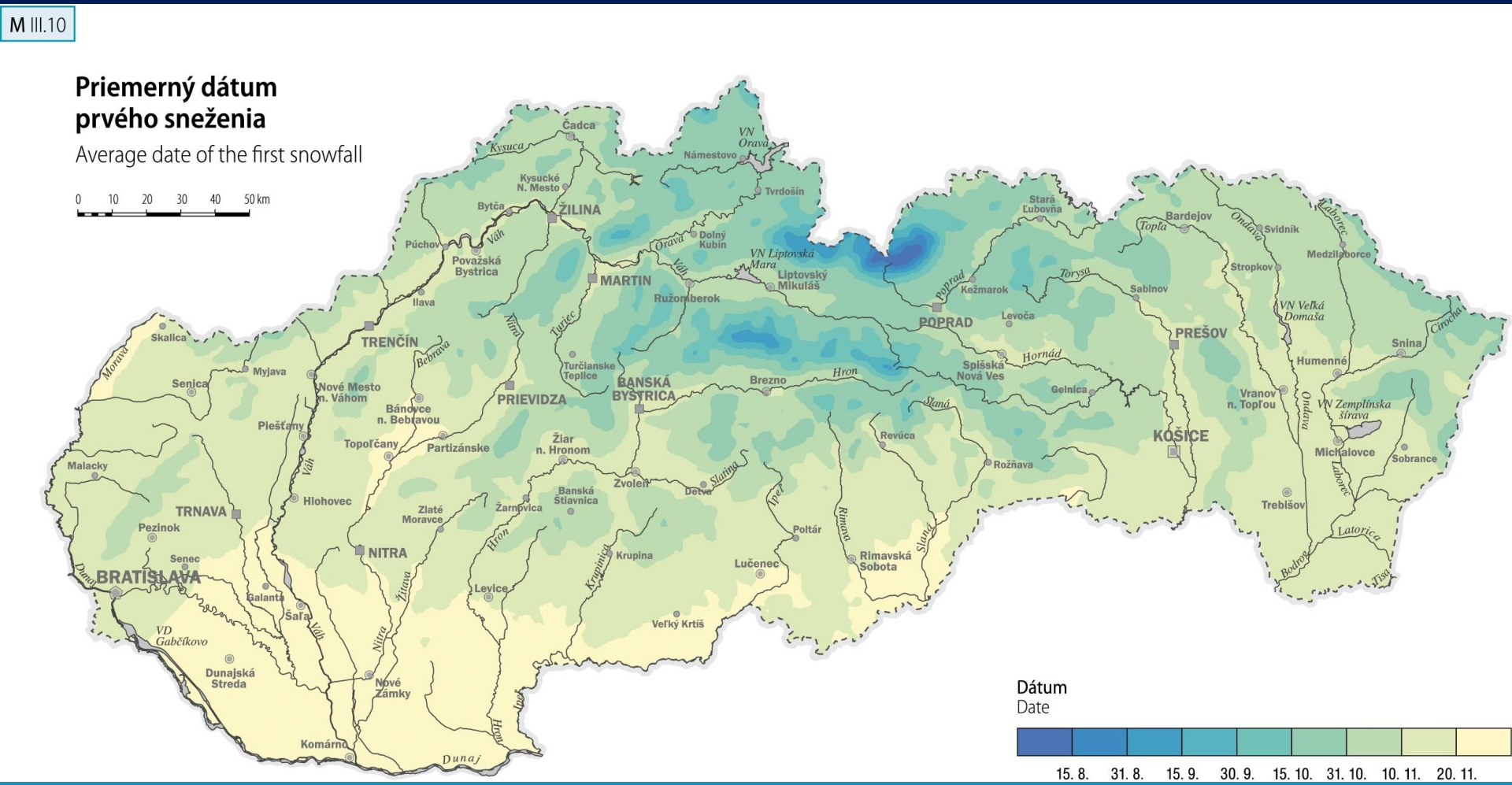
Maps demonstration



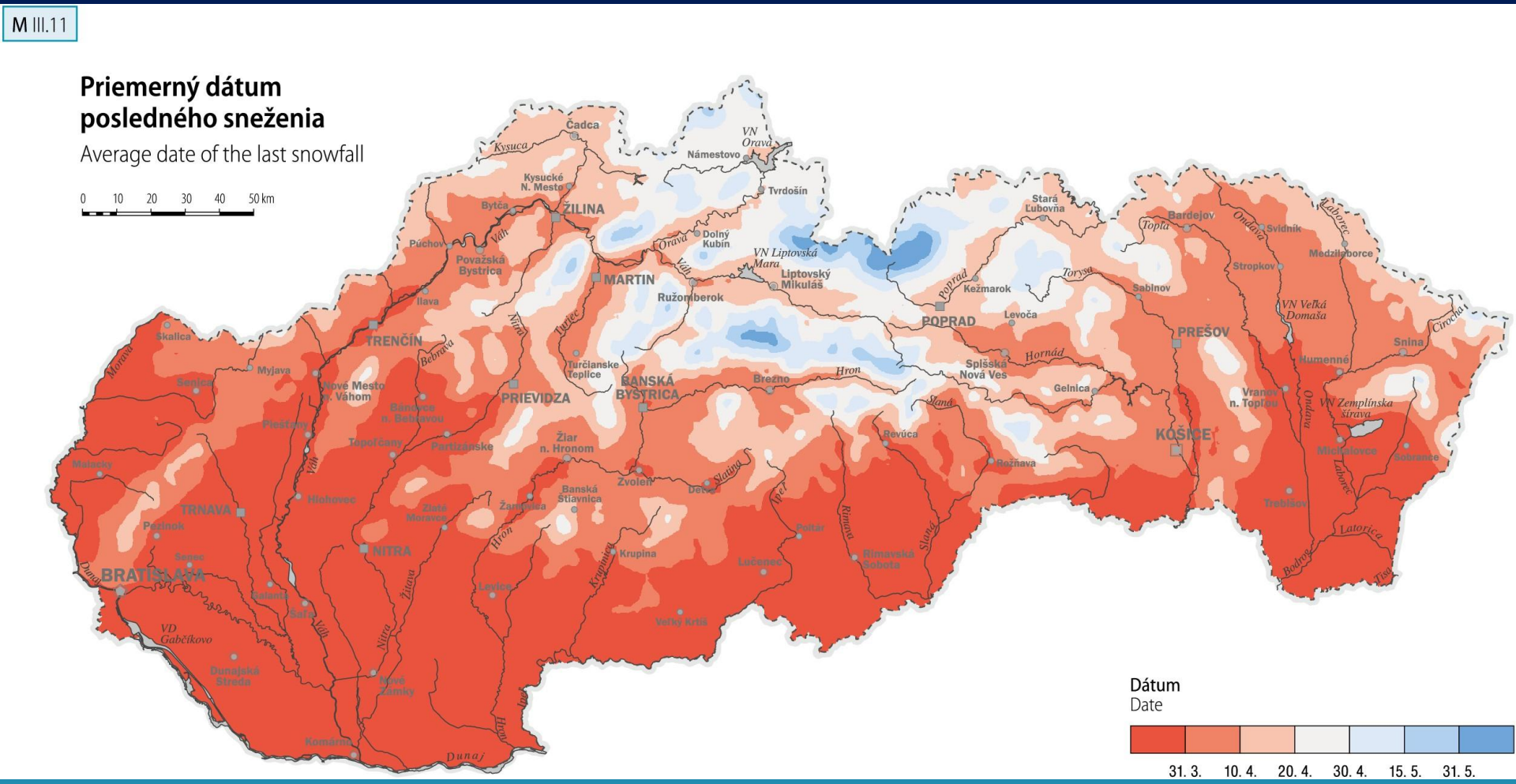
Maps demonstration



Maps demonstration

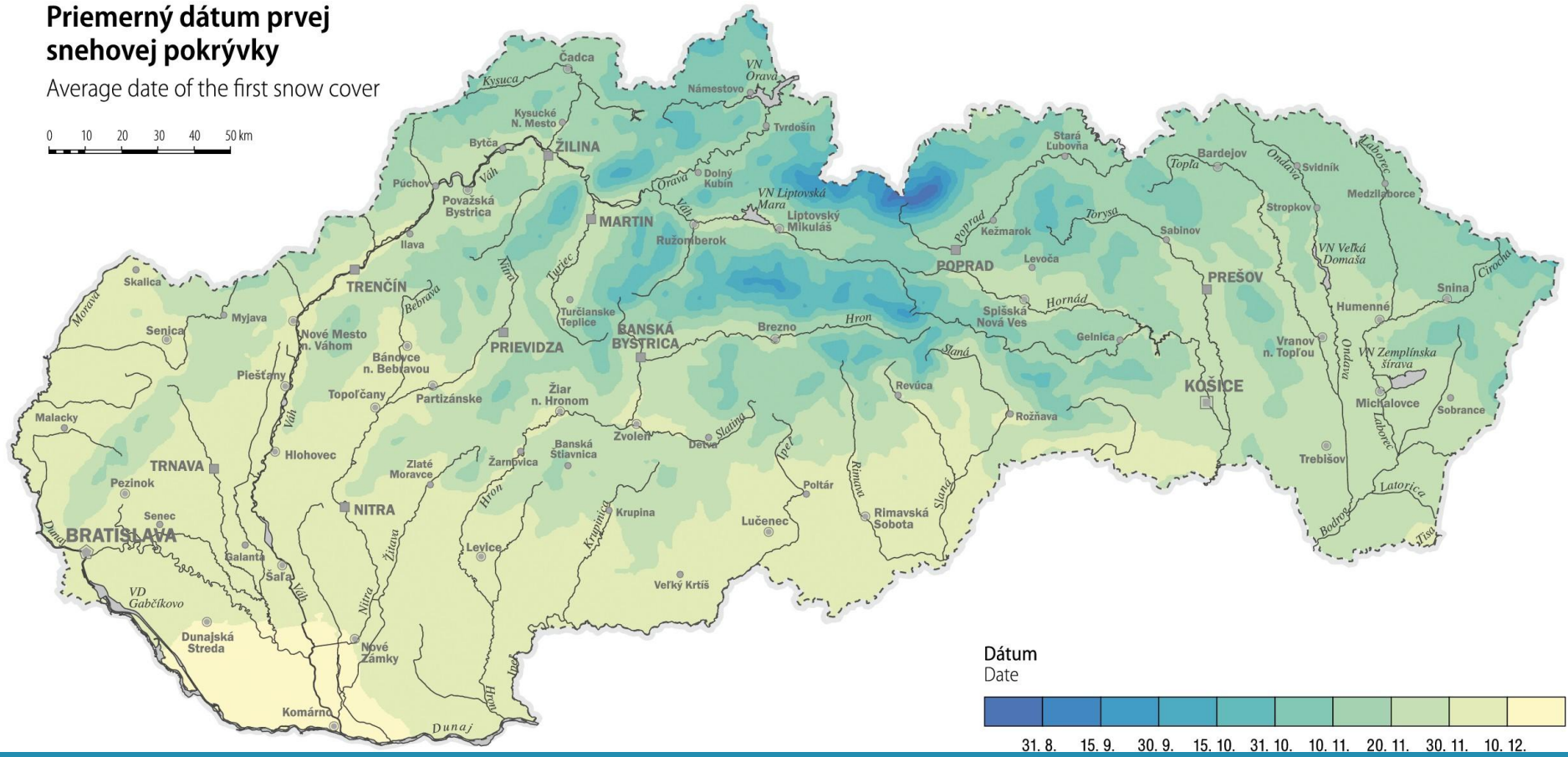


Maps demonstration



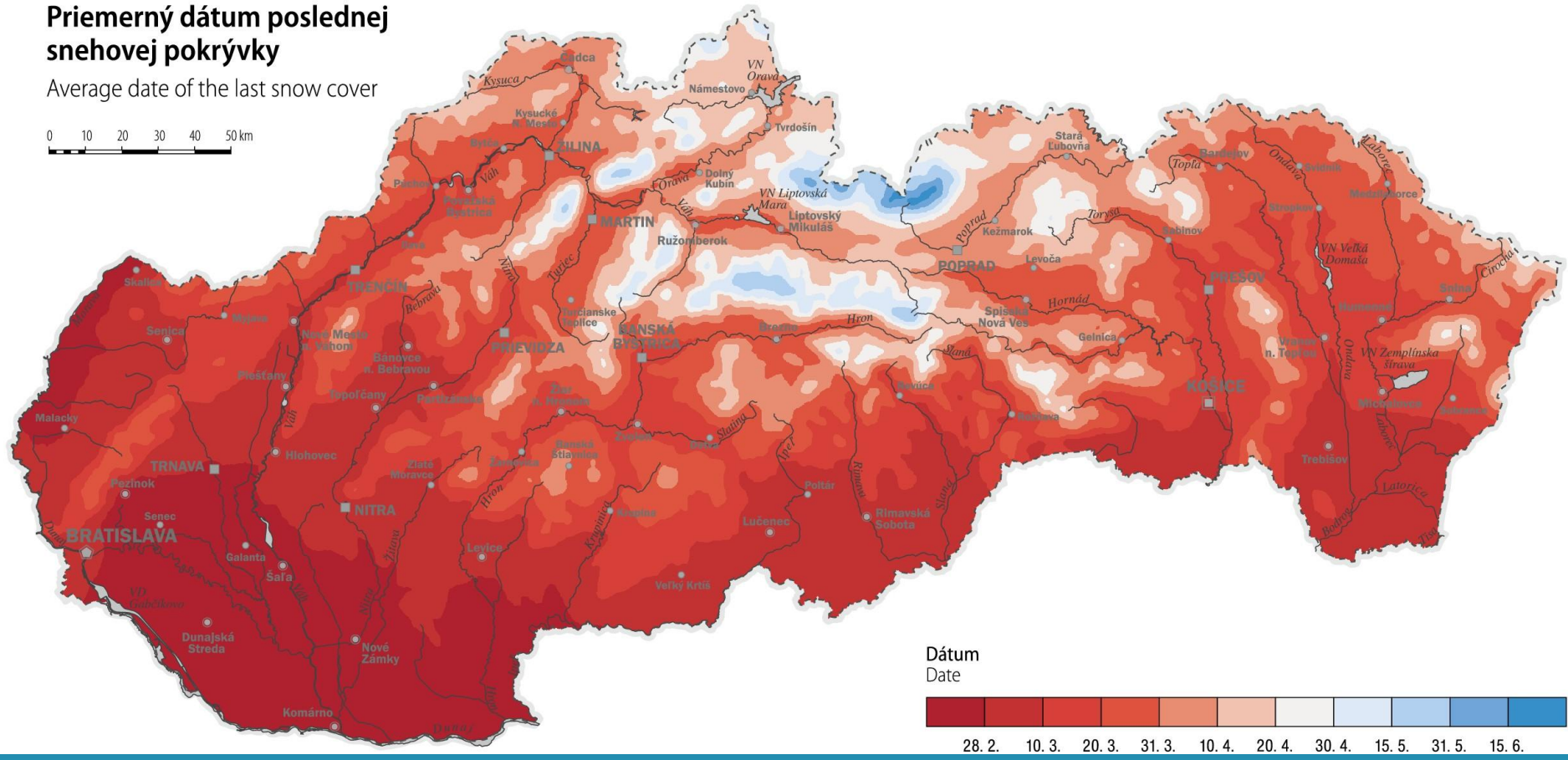
Maps demonstration

M III.26

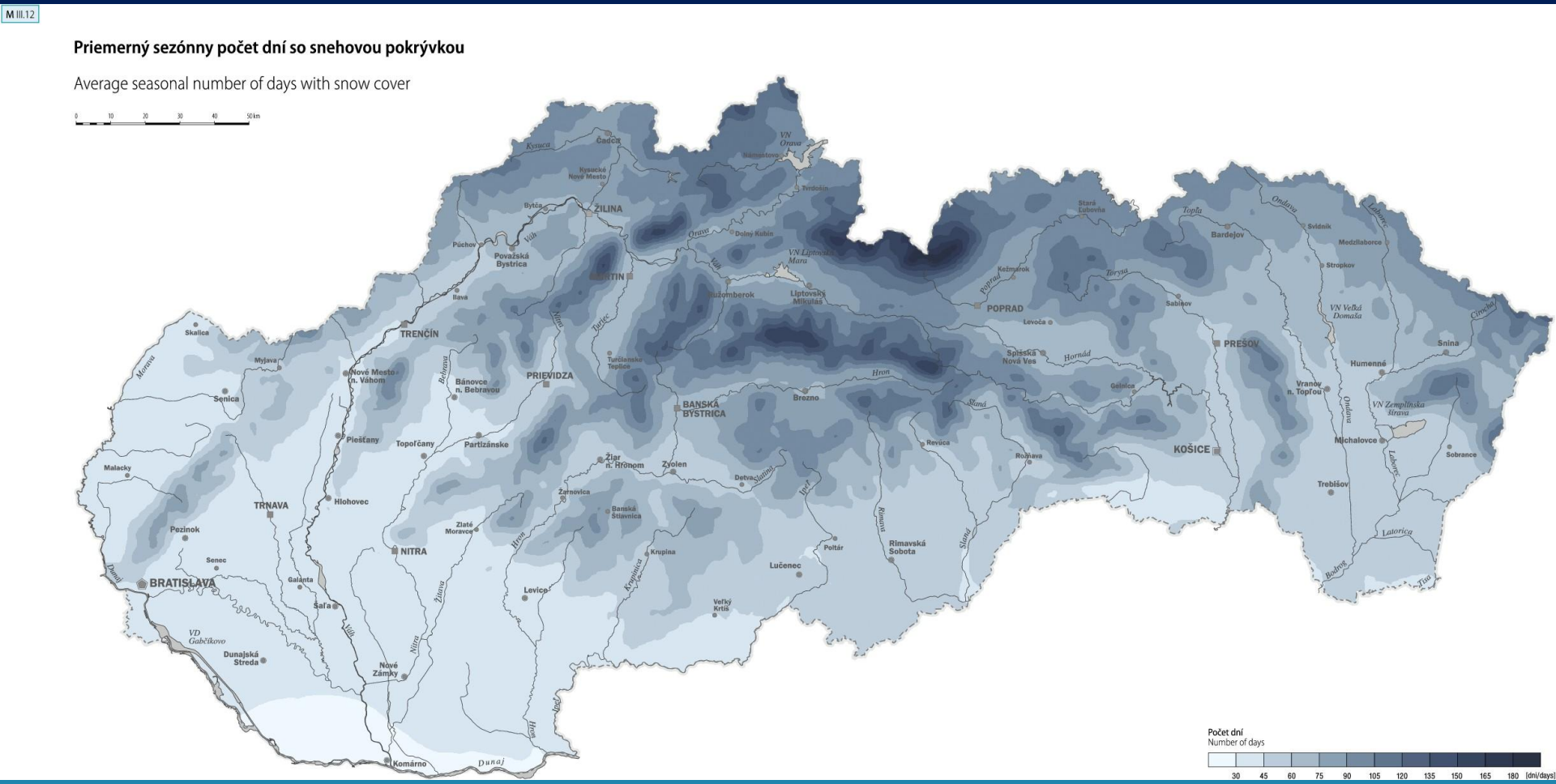


Maps demonstration

M III.27

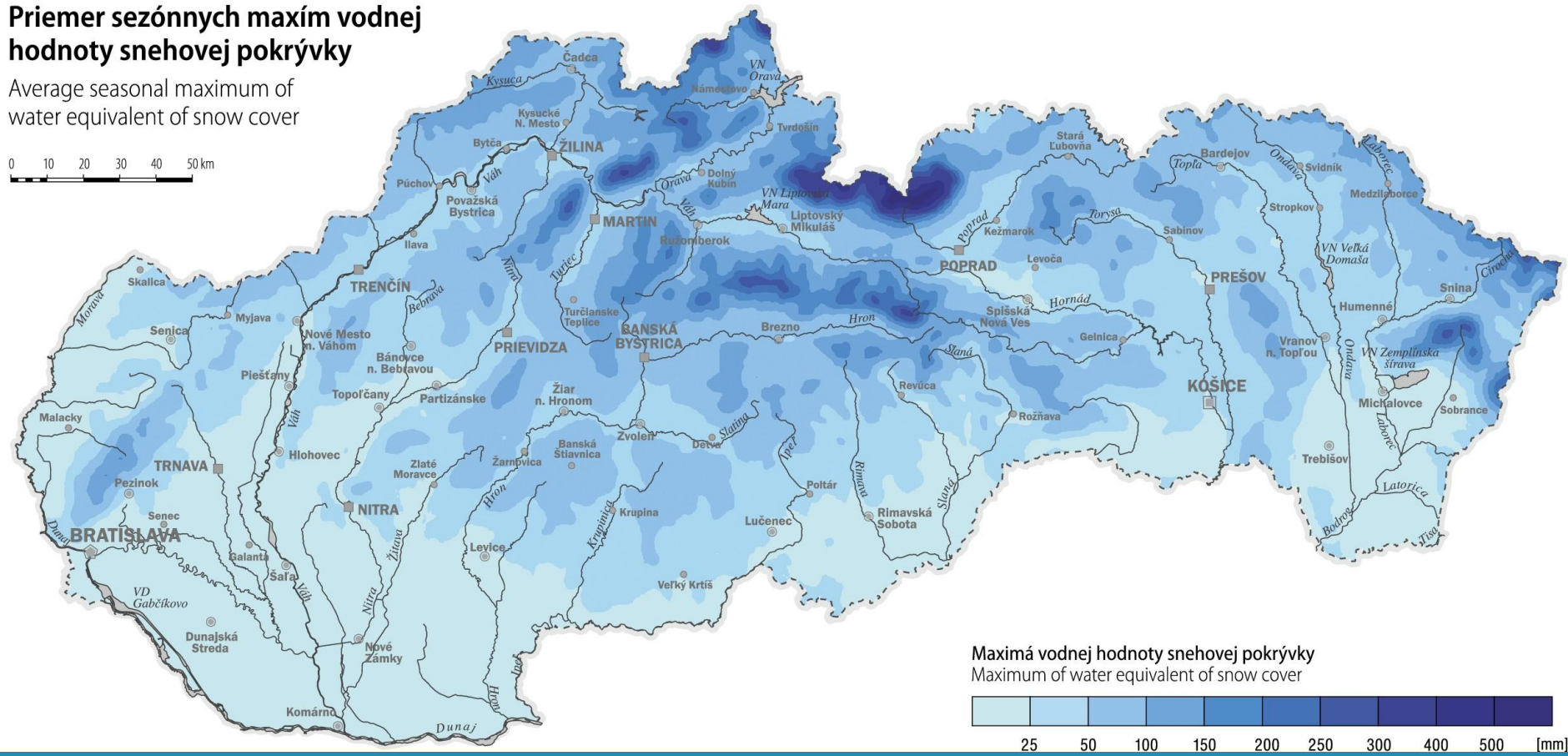


Maps demonstration



Maps demonstration

M III.21

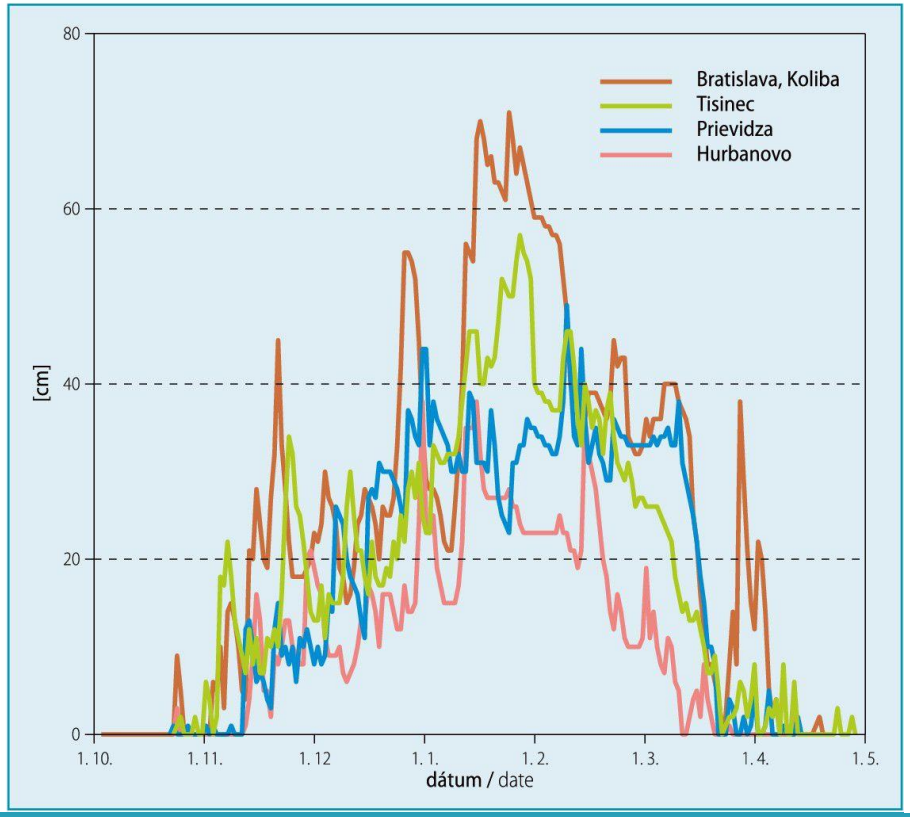


Maps demonstration

G III.6

Maximálna výška snehovej pokrývky v nízkych polohách

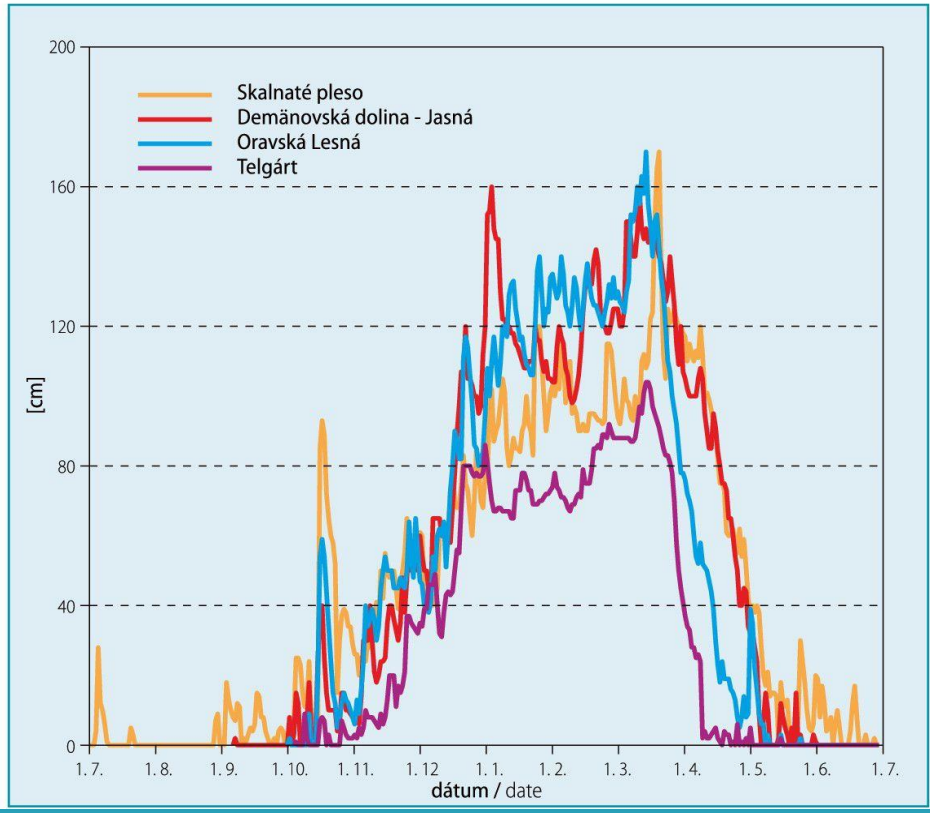
Maximum depth of snow cover at low elevations



G III.7

Maximálna výška snehovej pokrývky v horských polohách

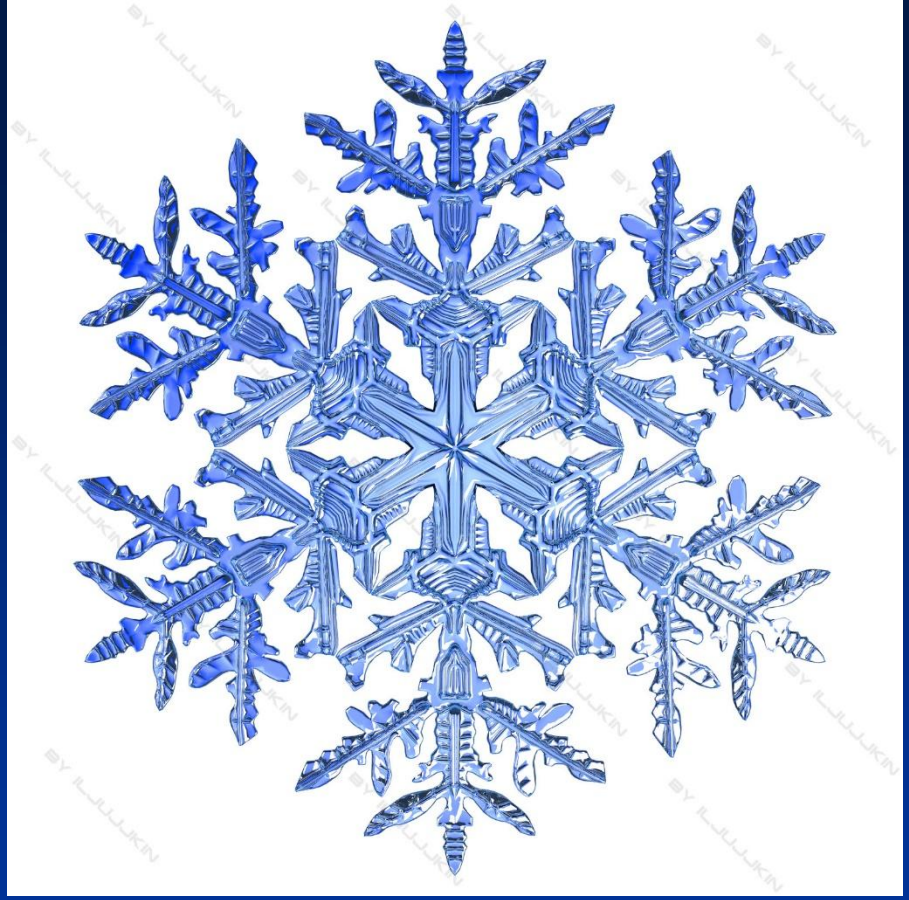
Maximum depth of snow cover at mountain sites



Further work?

-to prepare the climate maps for 1991 – 2020

-to prepare the equivalent set of maps for normal periods since 1901 to evaluate the climate trends



Thank you