

COST Action ES1404 - Short Term Scientific Mission (STSM)

Scientific report

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Host institution: Earth Science Institute, SAS (Slovakia)

Period: from 13-12-2015 to 19-12-2015

Methodical aspects of snow and snow cover measurements

Purpose of the visit

The main purpose of this STSM was to compare the methodical aspects of snow and snow cover measurements carried out in both countries. One second goal was to consider the possible opportunities for funding of common snow activities in order to strengthen the research collaboration between both institutions.

Work carried out

According to the planned schedule I visited Dr. Povol Nejedlik from the Earth Science Institute at the Slovak Academy of Sciences in the period 14 – 18 December 2015. During my stay in Slovakia we visited on 15 and 16 December the following meteorological stations in the High Tatras: Stará Lesná (780 m), Lomnický štít (2634 m), Skalné pleso (1751 m). These places are represented by the red circle on the map below and on next two photos – Figure 2.

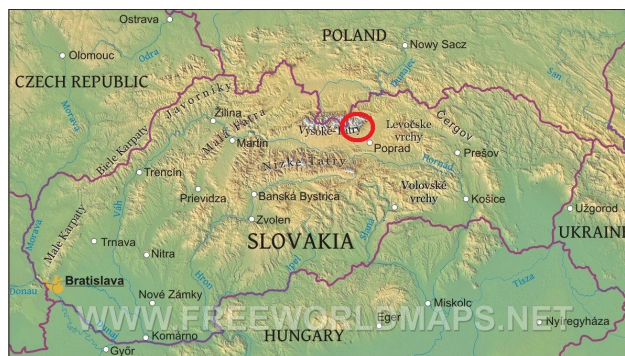


Figure 1. Location of the visited places



Figure 2. Stations Lomnicki Shtit (left) and Skalneto pleso (right)

After our return we visited on 17 December the Hydrometeorological Institute in Bratislava. Together with Dr. Nejedlik we met the meteorological observers in these stations and we had short discussions with some of the members of the team elaborated the new climate atlas of Slovakia, the head of the forecast department and the Director of the Division for Climate observation from the Slovak Hydrometeorological Institute in Bratislava. We discussed the methodology and sensors for measurements of the snow cover and snow characteristics and the use of snow products in the weather forecast.

Special interest for me has been the implementation of automatic sensors for measurements of the characteristics of the snow cover as something what is foreseen in Bulgaria. I was shown the snow laser sensor for measurement of the snow depth, which is now used in the operational practice at the meteorological stations of Slovakia, and we discussed its advantages in comparison to the ultrasonic device. The last one had been utilized in the beginning of the automation of the snow measurements in meteorological network of the Slovak Hydrometeorological Institute but later on was replaced, because it did not give good results. This seems to be surprisingly at first sight, having in mind the opposite conclusions of Ryan and Doesken (2008), but similar difficulties have been experienced by the experts from the Estonian Environment Agency. In the light of the transition from manual to automatic measurements we discussed also the comparability of the uncertainties of both methods.

Some differences in the measuring methodology were identified such as the measurements of the newly snow and the intensity of the snowfall. In Slovakia the newly snow is measured routinely at 7 am when new snow has fallen and in Bulgaria it is only indirectly assessed. The snowfall intensity in both countries is assessed by the horizontal visibility or by the means of the increase of the snow cover and the change of the snow density, but in Slovakia this intensity can be classified into 4 categories while in Bulgaria in three. In Bulgaria also a quantitative assessment of the snowfall intensity has been used recently (but still not operational), which is based on a relation between the snow concentration in the air (w , g/m³) and the horizontal visibility (V , m) found by Stallabrass (1978):

$$w = 2100V^{-1.29},$$

Another discussed topic were the measurements of the snow water equivalent, which are carried out manually in both countries, but its more detailed treatment was left for the planned field campaign in Slovakia in February 2016.

We talked over also the new climate atlas of Slovakia and especially the part for the snow cover and its characteristics in the mountain regions. The preparation of such an atlas is foreseen also for Bulgaria and the experience of the Slovak scientific team will be very valuable for its implementation. We discussed some aspects of the elaborations of the climatic maps such as the methods for interpolation in the mountain regions, the avoiding of inconsistency at frontier areas and the use of artificial stations as complementary tool.

We started also a discussion of the possible common snow activities and measurements in a bilateral scientific program between the two countries and of the preparation of a proposal for the next expected call in 2016.

We ended our meetings with some practical arrangements of the forthcoming snow field campaign in Slovakia in February 2016 and the Bulgarian participation.

Due to the short time no publication could be prepared but there is an idea for a comparative study of the snow conditions in the mountain regions of the two countries, where different tendencies of the snow cover have been observed recently – decreasing (in Bulgaria) and increasing (in Slovakia).

References:

Ryan W. and Doesken N., 2008, Evaluation of Ultrasonic Snow Depth Sensors for U.S. Snow Measurements, Journal of Atmospheric and Oceanic Technology, Vol. 25, p. 667-684

Stallabrass, J. R. 1978 Airborne snow concentration and visibility. Second Int. Symp. Snow Removal and Ice Control