EMS Annual Meeting Abstracts
Vol. 16, EMS2019-881-1, 2019


# Return values for snow load in Slovenia

Neža Lokošek and Gregor Vertačnik
Slovenian Environment Agency, climate analyses, Slovenia (gregor.vertacnik@gov.si)

Snow is an important resource for water management, hydropower generation or tourism. It formation is affected by numerous atmospheric and geographic conditions. Regional differences in season, altitude, humidity, and other variations result in a range of snow densities.

It is often assumed that, as a consequence of global warming, a reduction of snow load on the ground should be expected. In reality, it should be considered that the snow load on ground often depends on local orographic situations that can determine increases of the height of local snow falls, even in case when the average snow height is reduced considering larger areas. In addition to that, the capacity of the atmosphere to hold moisture increases with the temperature, and this phenomenon may lead to an increase of both, the snow density and the occurrence of extreme snowfalls in regions where temperatures still may happen to be below freezing level during precipitation events.

Where climate is cold enough, midwinter temperatures will remain substantially below zero even after a moderate warming. Thus, at least in the middle of the winter, the phase of precipitation and snowmelt should be quite insensitive to temperature changes. Conversely, where winters are milder, even a modest warming will act to convert part of the snowfall to rainfall and to increase the frequency and intensity of melting episodes. Changes in snow water equivalent (SWE) induced by the expected global warming are thus probably more likely to occur in mild than in cold areas.

Therefore, snow load in Slovenia was reassessed for multiple return periods within the CROSSRISK project. Valid data from 97 stations that had at least 40 years of measurements was used between 1948 and 2018. Snow load was estimated from the root sum squared of total daily snow height. We evaluated location, scale and shape parameters from generalized extreme value distribution (GEV) for each station separately. Each parameter was spatially interpolated (kriging) in Slovenian domain with 1 km resolution. According to the literature shape parameter is only slowly varying in space. We decided to limit it between -0,3 to 0,5. Unusual values of location and scale parameters were removed in a way that spatial interpolation was done again, this time with logarithmic values of station estimates of scale and location values. From interpolated parameters (exponential values of location and scale) return values for snow load was assessed for different return periods and each grid point in our domain. Slovenia is due to the Alps and the Dinaric Alps climatically divided into two distinctly different regions, therefore kriging was applied separately for the littoral and continental region. Results from both regions were merged along the border for Adriatic Sea and Black Sea drainage basins.