



Study of the frequency of heavy snowfall on the coast of Catalonia (Western Mediterranean) using an exponential model

Darío Redolat (1) and Roberto Moncho (2)

(1) Geography student. Universidad Complutense de Madrid. Madrid, Spain (dxrandr@gmail.com), (2) Fundación para la Investigación del Clima, Madrid, Spain (robert@temps.cat)

The wet snow causes big problems in society, as the gridlock of traffic, the disruption of airport services and the collapse of wires and towers of power. Although the northeastern coast of the Iberian Peninsula has recorded a few days of snow (less than 1 day / year), when a snowfall occurs, it tends to be intense because of the large precipitable water content (Martin-Vide, 1984). In particular, the Mediterranean provides a significant convection during cold surges from central Europe. In Catalonia, there are few observatories which measure the thickness of the snow, making it difficult to spatial study of return periods of heavy snowfall. The aim of this study was to analyze the frequency of heavy snowfall of 3 observatories in Catalonia, and estimate the associated return periods. The used model of probability was an adaptation of the exponential model for snow, adding an additional parameter:

$$\pi(n \geq N) = \exp(-kN^m) \quad (1)$$

where $\pi(n \geq N)$ is the probability that the thickness of a snowfall (n) is greater or equal to N , while k and m are adjustable parameters. The results showed that the model fits well to the frequency of the thickness of the snow, as it obtained a normalized mean absolute error (NMAE) of 12%, both for weak and intense snowfalls. For longest series, the NMAE is reduced to 10% or less. Regarding the extreme values of the snowfalls, the model predicts that a snowfall of 50 cm in one day has a return period of 24 ± 8 years for Badalona (100 m) and 28 ± 8 years for Fabra (415 m). For the observatory of L'Estartit (Girona), the predicted return period of the same snowfall is 46 ± 5 years, which is consistent with observations: there has been a record in the last 63 years of more than 50 cm en un día. Therefore, this study may serve to quantify the risk of heavy snow on the Catalan coast, but can also be applied to other areas of the Iberian Peninsula and thus can be updated snow risk maps with greater accuracy in return periods.

MARTÍN-VIDE, J. (1984): *Frecuencia anual y distribución mensual de las nevadas en el Tibidabo*. Notes de Geografía Física, 10:17-22.