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# Relationships between corridor morphological variables and avalanche deposits volumes

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Avalanche deposits cause various types of damage to properties and infrastructures every winter, resulting in significant direct and indirect economic losses. However, the factors controlling the deposit volumes are still largely unknown. The main objective of this study is to analyze the geometric characteristics of avalanche deposits in order to understand their relationships with the avalanche corridors' morphology in the French Alps. Our study focuses on the analysis of 1491 avalanche deposits spread out over 79 corridor in the upper part of the Haute-Maurienne valley, Savoie department, during the period 2003-2017. This work uses data from the Permanent Avalanche Survey (EPA) database, an inventory of avalanche events occurring at well-known, delineated and mapped corridors in France. A statistical method is used to study the relationships between corridor morphological variables and their associated deposit volumes. Our study area exhibits an mean deposit volume of 17 500m$^3$ ($q_{5\%}$ = 4 500 m$^3$ and $q_{95\%}$= 84 000 m$^3$).

Results show that the relationships between corridor morphology and deposit volumes are only significant ( > 0,3 and P < 0,001) for avalanches that occur in winter (November-February). The frequency of snow avalanches also influences the size of the deposits, with the largest deposits observed in corridors that show high annual avalanche frequency. However, avalanche deposit volumes occurring in corridors with a low annual frequency correlate more strongly with the corridor morphology. On the other hand, snow avalanche volumes deposited in spring (March-May) seem to be mostly driven by meteorological variables with almost no correlation with the corridor's morphology. In more details, deposit volumes are primarily determined by the corridor maximum or mean altitude, which reflects the potential amount of snow that can be mobilized. Corridor slope also exhibit a significant relationship with deposit volumes, which is partially indirect through the effect of the slope on corridors mean annual avalanche frequency. Eventually, surprisingly enough, morphological variables that may intuitively appear as important for deposit volumes such as surface area or orientation are uncorrelated or only poorly correlated with avalanche deposit volumes.