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## Can Saharan dust deposition impact snow stability in the French Alps?

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Mineral dust and black carbon are potent drivers of the snow cover evolution. After their deposition on the snow surface, they can impact snow albedo and thus the snowpack evolution including the timing of snow-melt. While BC deposition is rather constant along the winter season, mineral dust deposition is more sporadic in the French Alps, subject to large dust outbreak events coming from Sahara. The dust deposition drastically changes the snow color, its absorption of solar energy and, as a consequence, modifies the internal temperature of the snow layers and their metamorphism. While mountain practitioners often report higher avalanche activities after dust deposition events, there is, up to now, no clear evidence neither from observations nor modelling that dust deposition enhances avalanche activity. Here, we investigate, using ensemble detailed snowpack simulations, the impact of dust outbreak on snow metamorphism, snow stratigraphy and mechanical stability by comparing simulations with and without dust deposition under several meteorological conditions. The results show that the dust deposition can impact the spatial and temporal distribution of the unstable slopes. The effect of the deposition largely depends on the timing of dust deposition with respect to subsequent snowfalls. It also depends on the elevation, the aspect and the time since deposition event. By using multiphysics simulations, we were able to assess the robustness of our conclusions with respect to snowpack modelling errors.