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A new experimental set-up to study the shear strength of snow-mortar interfaces

Gianmarco Vallero, Monica Barbero, Fabrizio Barpi, Mauro Borri-Brunetto, and Valerio De Biagi
Politecnico di Torino, DISEG, Torino, Italy (gianmarco.vallero@polito.it)

The progressive failure of a snow layer deposited on a stiff substrate is at the base of the comprehension of several physical processes that can be found both in natural and artificial conditions. For instance, glide avalanches often originate from the reduction of the basal friction between the snowpack and the underlying ground due to the presence of liquid water film or depth hoar at the snow-ground interface. Moreover, the interaction between snow and construction materials relates to many other applications such as the study of new and more efficient snow removal techniques, the safety of travelers along snow covered roads, the snow redistribution from roofs and buildings, etc.

Despite this large number of application fields, laboratory investigations are still limited. We performed cold room tests on artificially made snow-mortar interface specimens through a direct shear test device. The effects of confinement pressure, temperature and dry snow hardness (due to sintering times) were taken into account. The tests were carried out in displacement-controlled conditions in order to study the entire failure process at the interface and the following irreversible sliding. The results show some interesting and encouraging aspects for understanding the shear strength of the interface. From a micromechanical point of view we recorded the tests with a high-definition video camera and analyzed the data with the Particle Image Velocimetry technique to obtain the motion fields on the external side of the specimens. Here, we present and discuss some preliminary results of the experimental activity and suggest some future implementations and further developments of the studied topic.