Geophysical Research Abstracts
Vol. 19, EGU2017-13574, 2017
EGU General Assembly 2017

Investigation of the sintering rate of snow with high-resolution penetration tests

Isabel Peinke (1), Pascal Hagenmuller (1), Guillaume Chambon (2), Jacques Roulle (1), and Samuel Morin (1)

(1) Météo-France - CNRS, CNRM UMR 3589, Centre d'Etudes de la Neige, Grenoble, France, (2) IRSTEA (UR ETGR) – Centre de Grenoble, Saint-Martin-d'Hères, France

Sintering in snow is very active due to a high homologous temperature and has a major effect on the evolution of the snow mechanical properties. We investigated the sintering rate of snow using high-resolution penetration tests performed with the Snow Micro Penetrometer (SMP) in a cold room at -10°C. To this end, we prepared several samples by sieving rounded grain snow with different sieve sizes (0.8, 1 and 1.6 mm) and conducted numerous SMP tests at different times during the first day of sintering. The SMP was modified such that only the measuring tip was in contact to the snow and we mounted three different tips with diameters of 4, 5 and 8 mm. The increase of the measured mean penetration resistance is shown to follow a power law whose exponent is defined as the sintering rate. The sintering rate mean value is about 0.25, which is consistent with values reported in the literature and it increases with specific surface area and depth. However, the sintering rate diminishes when SMP tip size increases, which is counterintuitive for a material property. An advanced analysis is thus required to extract relevant material properties, as the deflection at rupture, individual rupture force of bonds, and spatial intensity of rupture events, out of the SMP signal. A Poisson shot noise model [Löwe and Herwijnen 2012] was used, in which a depth-dependence of the parameters was assumed. The individual rupture force follows a power law with exponents around 0.3 with almost no dependency on the tip size. In comparison, the time evolution of intensity and deflection at rupture were negligible. This approach exploits the high-resolution of the SMP to give new insights on the sintering mechanisms in snow.