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Comparing snow settlement at field and laboratory scales

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Much of our actual knowledge about snow physics stems from cold laboratory experiments. Small snow samples of one to a few centimetres in size are studied by means of powerful laboratory techniques such as X-ray micro-tomography. Time scales range from a few days to several weeks. It is expected that the detailed knowledge of both snow micro-structure and snow physics gained from these laboratory experiments will lead to a new generation of snow-cover models. Field experiments, on the other side, look at scales of few tenths of centimetres to a few metres within the natural snowpack. Specially designed sensors allow in situ measurements of settlement of arbitrarily defined "snow layers" over a whole season. Particularly during snowfalls, three distinct periods can usually be observed starting with an initial and mostly rapid settlement followed by a less pronounced densification that ends with a much lower, snow type depending settlement rate for densities above around 270 kg m^{-3}.

The question remains, however, whether these two scales can be covered by one and the same model. Indeed, while laboratory experiments are mostly done on quasi-homogeneous samples, layering is always present and influential in the natural snowpack. Are thus results from cold laboratory experiments comparable to findings from field studies? We will discuss laboratory and field experiments with regards to snow settlement, focussing on possible common behaviour at different densities.