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On the evolution of the snow surface during snowfall

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The deposition and attachment mechanism of settling snow crystals during snowfall dictates the very initial structure of ice within a natural snowpack. We apply ballistic deposition as a simple model to study the structural evolution of the growing surface of a snowpack during its formation. The roughness of the snow surface is predicted from the behaviour of the time dependent height correlation function. The predictions are verified by simple measurements of the growing snow surface based on digital photography during snowfall. The measurements are in agreement with the theoretical predictions within the limitations of the model which are discussed. The application of ballistic deposition type growth models illuminates structural aspects of snow from the perspective of formation which has been ignored so far. Implications of this type of growth on the aerodynamic roughness length, density, and the density correlation function of new snow are discussed.