Abstract Submitted
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Clustering and settling of snow particles in atmospheric turbulence[1] CHENG LI, KAEUL LIM, TIM BERK, ALIZA ABRAHAM, MICHAEL HEISEL, MICHELE GUALA, FILIPPO COLETTI, JIARONG HONG, St. Anthony Falls Laboratory, University of Minnesota — Understanding the turbulence effect on snow settling velocity is critical for accurate modeling of ground snow accumulation during a snowfall. Following the study of Nemes *et al.* [JFM, 2017, 814, 592-613], a systematic investigation on the snow settling velocity upon changing turbulence and snow concentration is conducted using data from four deployments between 2016 and 2019. The snow settling velocity and concentration was measured using field-scale PIV/PTV, the snow particle size and morphology were characterized using digital in-line holography, and the air turbulence was quantified using sonic anemometers. The turbulence and snow conditions from these deployments range from low ($Re_\lambda \approx 900$) to high turbulence ($Re_\lambda \approx 9000$), and from weakly-clustered to strongly-clustered snow, respectively. The settling speed (W_s) are enhanced for all cases compared to quiescent fall speed (W_q). The enhancement ratio ($W_\mathrm{s}/W_\mathrm{q}$) increases with Re_λ initially, drops after a threshold is reached, and it is maximized when the aerodynamic stopping distance of the snow particles is comparable with the Taylor microscale. The clusters are elongated in the vertical direction. In the case of strong clustering, the settling velocity positively correlates with particle concentration evaluated at different scales.

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Cheng Li
St. Anthony Falls Laboratory, University of Minnesota

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