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Ice microphysics of low-level ice clouds in the Arctic: Satellite analysis

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Climate in the Arctic changes at a faster rate than in the rest of the globe, a phenomenon called "Arctic Amplification" that requires improved scientific understanding. Boundary-layer clouds may play an important role. At temperatures below 0^{o}C, mixed-phase clouds exist and their phase and longevity is influenced by the abundance of ice crystals, which in turn is a function of aerosols serving as ice nucleating particles (INPs). Previous studies from in situ observations suggested a local source of INPs due to biological activity over open ocean. Here we investigate the ice crystal concentrations at a large scale by exploiting a newly-developed dataset retrieved from active radar/lidar satellite remote sensing. The data allow to study pure ice clouds in the boundary layer. Clouds are distinguished i) by latitude bands, ii) according to the underlying surface type (sea ice or ocean) and iii) as coupled/decoupled from the surface. Contrary to previous expectation, we find that at a given latitude and temperature, there are more ice crystals over sea ice than over open ocean. This enhancement is particularly found for coupled clouds south of 70^{o}N, but also for decoupled clouds.