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Estimation of the penetration effects of the Ka-band radar signal into the Arctic sea ice snowpack.

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In the context of quantifying Arctic sea ice volume at global scale, altimetry provides a unique tool to estimate sea ice thickness through the freeboard method that mainly consists in evaluating the thickness of emerged sea ice. Most of the altimeters employed to retrieve sea ice thickness operate at Ku-band frequency (13.6 Ghz). Over Arctic sea ice and at this frequency, the radar signal is only slightly affected by scattering and absorbtion due to the presence of snow over the ice. Therefore, it is commonly admitted that most of the return echo comes from the ice surface.

Launched in February 2013, the Saral-AltiKa mission carries a Ka-band (36.5 Ghz) altimeter that is a great opportunity to expand the study of sea ice thickness. However, unlike the Ku-band operating systems, most of the Ka-band signal does not reach the sea ice surface and is scattered by overlying snow layers. For this reason and in order to obtain the best estimate of sea ice thickness with Ka-band radar, it is crucial to evaluate the bias due to penetration of the radar signal into the snowpack at this frequency.

We combine both Ku and Ka band radar observations to study the influence of radar penetration into the snow and estimate the extinction coefficient over Arctic sea ice. Our results are of the same order of magnitude of what is found in Antarctica.

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