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Sensitivity of sea ice growth to snow properties in opposing regions of the Weddell Sea in late summer

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The sensitivity of sea ice to the contrasting seasonal and perennial snow properties in the southeastern and northwestern Weddell Sea is not yet considered in sea ice model and satellite remote sensing applications. However, the analysis of physical snowpack properties in late summer in recent years reveal a high fraction of melt-freeze forms resulting in significant higher snow densities in the northwestern than in the eastern Weddell Sea. The resulting lower thermal conductivity of the snowpack, which is only half of what has been previously assumed in models in the eastern Weddell Sea, reduces the sea ice bottom growth by 18 cm. In the northwest, however, the potentially formed snow ice thickness of 12 cm at the snow/ice interface contributes to an additional 2 cm of thermodynamic ice growth at the bottom. This emphasizes the enormous impact of unappreciated regional differences in snowpack properties on the thermodynamic ice growth.