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## Snow on Arctic sea ice in a warming climate as simulated in CESM

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Snow on Arctic sea ice is important for several reasons: it creates a habitat for microorganisms and mammals, it changes sea-ice growth and melt, and it affects the speed at which ships and people can travel through sea ice. Therefore, investigating how snow on Arctic sea ice may change in a warming climate is useful for anticipating its potential effects on ecosystems, sea ice, and socioeconomic activities. Here, we use experiments from two versions of the Community Earth System Model (CESM) to study how snow conditions change over time. Comparison with observations indicates that CESM2 produces an overly-thin, overly-uniform snow distribution, while CESM1-LE produces a variable, excessively-thick snow cover. The 1950-2050 snow depth trend in CESM2 is 75% smaller than in CESM1-LE due to CESM2 having less snow. In CESM1-LE, long-lasting, thick sea ice, cool summers, and excessive summer snowfall facilitate a thicker, longer-lasting snow cover. In a warming climate, CESM2 shows that snow on Arctic sea ice will: (1) have greater, earlier spring melt, (2) accumulate less in summer-autumn, (3) sublimate more, and (4) cause marginally more snow-ice formation. CESM2 reveals that snow-free summers can occur ~30-60 years before an ice-free central Arctic, which may promote faster sea-ice melt.