SESSION: (B6) Frontiers in earth system prediction

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Regional Arctic sea-ice prediction: Potential versus operational seasonal forecast skill

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Seasonal predictions of Arctic sea ice on regional spatial scales are a pressing need for a broad group of stakeholders, however, most assessments of predictability and forecast skill to date have focused on pan-Arctic sea-ice extent (SIE). In this work, we present the first direct comparison of perfect model (PM) and operational (OP) seasonal prediction skill for regional Arctic SIE within a common dynamical prediction system. This assessment is based on two complementary suites of seasonal prediction ensemble experiments performed with a global coupled climate model. First, we present a suite of PM predictability experiments with start dates spanning the calendar year, which are used to quantify the potential regional SIE prediction skill of this system. Second, we assess the system's OP prediction skill for detrended regional SIE using a suite of retrospective initialized seasonal forecasts spanning 1981-2016. In nearly all Arctic regions and for all target months, we find a substantial skill gap between PM and OP predictions of regional SIE. The PM experiments reveal that regional winter SIE is potentially predictable at lead times beyond 12 months, substantially longer than the skill of their OP counterparts. Both the OP and PM predictions display a spring prediction skill barrier for regional summer SIE forecasts, indicating a fundamental predictability limit for summer regional predictions. We find that a similar barrier exists for pan-Arctic sea-ice volume predictions, but is not present for predictions of pan-Arctic SIE. The skill gap identified in this work indicates a promising potential for future improvements in regional SIE predictions.