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Improvements in September Arctic sea ice predictions via assimilation of summer CryoSat-2 sea ice thickness observations

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Because of a spring predictability barrier, the seasonal forecast skill of Arctic summer sea ice is limited by the availability of melt-season sea ice thickness (SIT) observations. The first year-round SIT observations, retrieved from CryoSat-2 from 2011 to 2020, are assimilated into the GFDL ocean–sea ice model. The model's SIT anomaly field is brought into significantly better agreement with the observations, particularly in the Central Arctic. Although the short observational period makes forecast assessment challenging, we find that the addition of May–August SIT assimilation improves September local sea ice concentration (SIC) and extent forecasts similarly to SIC-only assimilation. Although most regional forecasts are improved by SIT assimilation, the Chukchi Sea forecasts are degraded. This degradation is likely due to the introduction of negative correlations between September SIC and earlier SIT introduced by SIT assimilation, contrary to the increased correlations found in other regions.