THE RECORD LOW BERING SEA ICE EXTENT IN 2018: CONTEXT, IMPACTS, AND AN ASSESSMENT OF THE ROLE OF ANTHROPOGENIC CLIMATE CHANGE

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Late winter and early spring Bering Sea ice extent during the passive microwave era (1978/79 to 2017/18) does not have a statistically trend. Instead, sea ice conditions have been characterized by alternating multiyear stanzas of relatively high and low ice extent seasons (e.g., Stabeno et al. 2012), while Overland et al. (2012) find evidence for large but infrequent multiyear anomalies in southern Bering Sea air temperatures (late winter/spring sea ice being a major factor). However, some aspects of sea ice extent do exhibit a significant trend that is potentially relevant to ongoing Earth system warming. Figure ES1a illustrates plots the number of days per season (1 August–31 July) that the ice extent exceeded 50,000 km^2. The trend of minus 44 days in 40 years is significant with $p < 0.01$. Similarly, the earliest autumn date with ≥50,000 km^2 has a linear trend change of 19 days later, as seen in Fig. ES1b. The trend of −1,840 km^2 yr^{-1} is not statistically significant. Figure ES2 shows the observed trend in relation to the distribution trends in the CESM-LENS pre-industrial and 1980–2018 historical model simulations.

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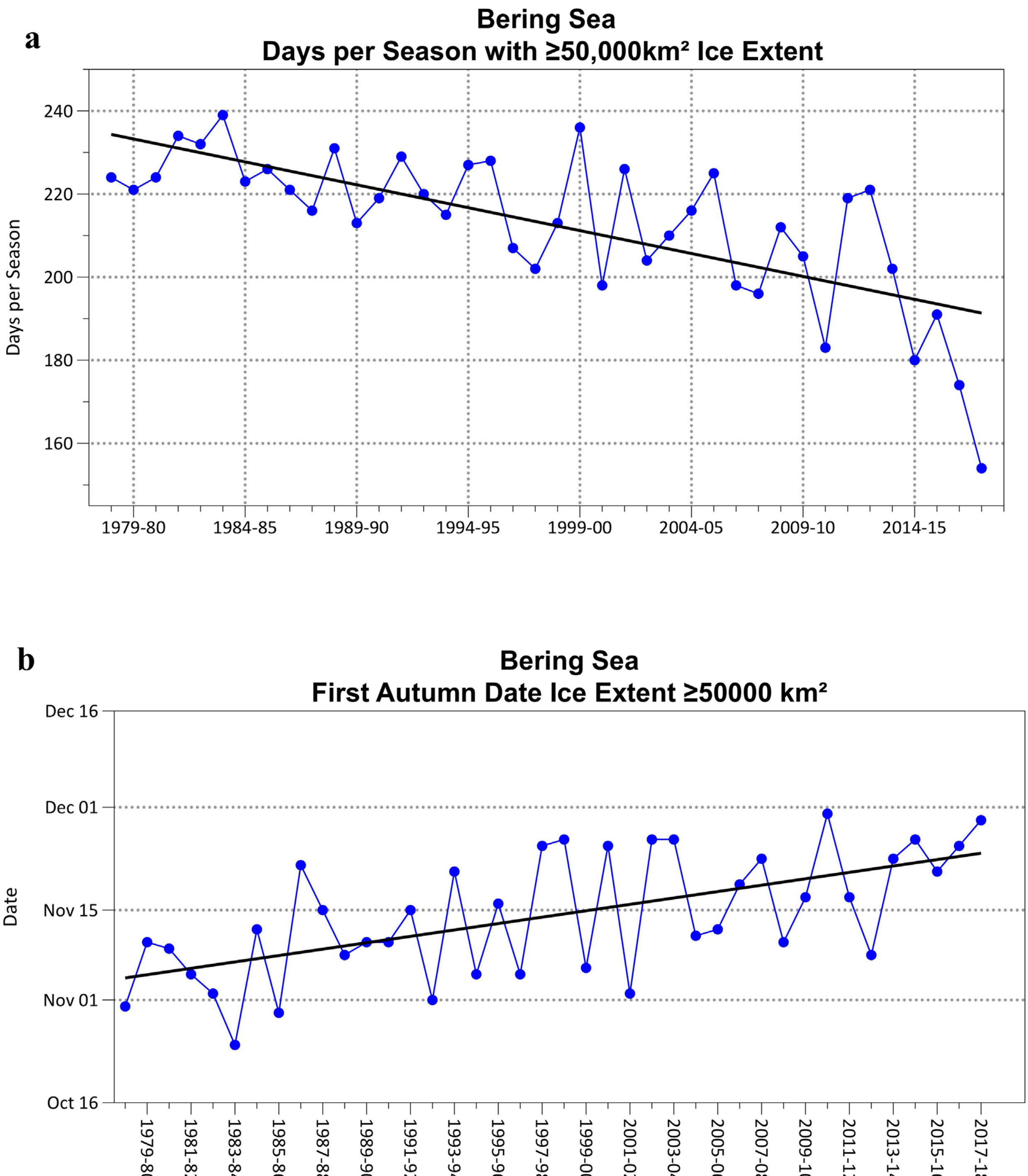

Fig. ES1. (a) Total numbers of days with ice extent ≥50,000 km² per season (1 Aug–31 Jul) and linear regression; (b). Date of the first occurrence of ≥50,000 km² during the autumn. Both trends are significant at $p \leq 0.01$. Data from Fetterer et al. (2017).

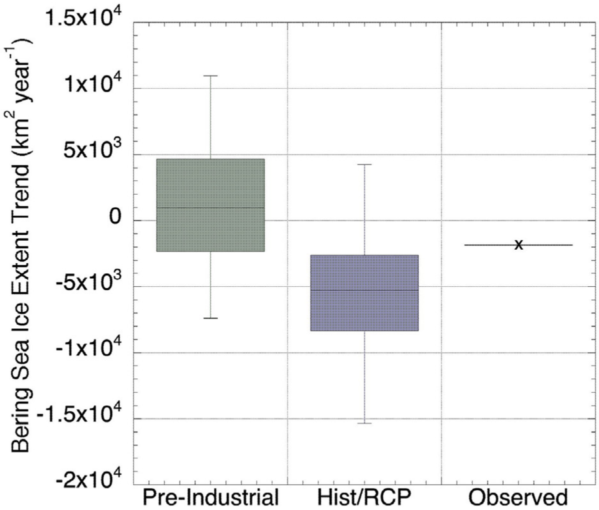

Fig. ES2. Box plots of 39-yr trends for (left) the 1,800 member pre-industrial CESM-LENS, (middle) the 40-member 1980–2018 CEMS-LENS, and (right) the observed trend from Sea Ice Index v3 (Fetterer et al. 2017). Shaded areas represent the 25th–75th percentiles and the whiskers the extremes. The observed trend is at the 87.5th percentile of the historical ensemble members.