



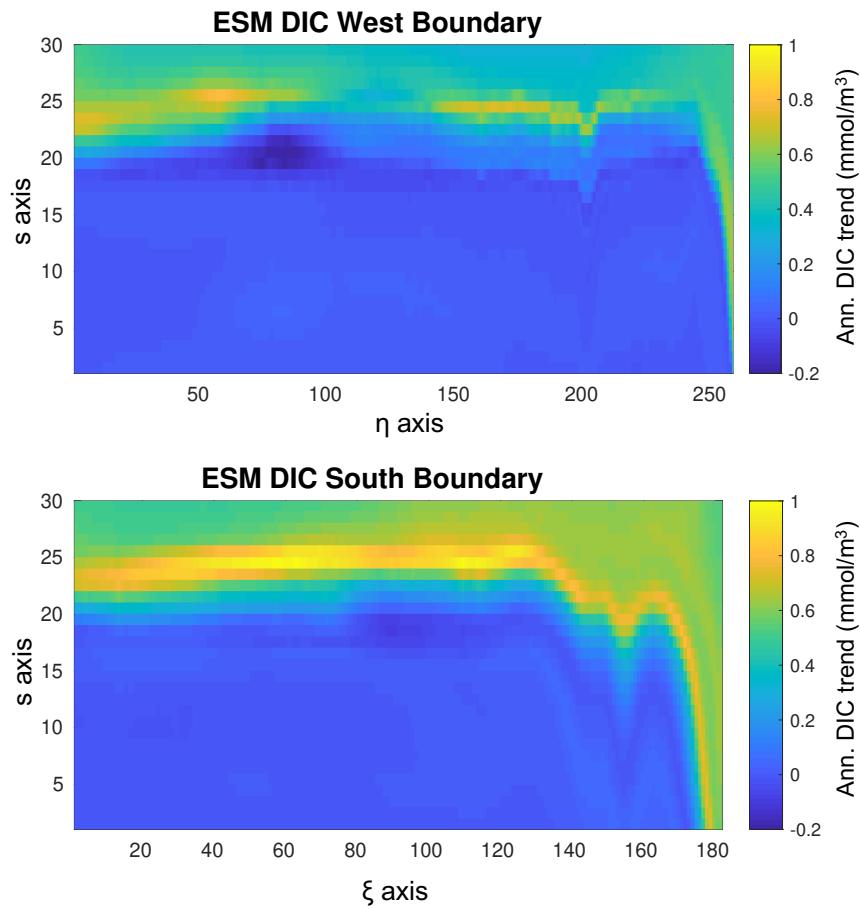
*Supplement of*

## **Amplified bottom water acidification rates on the Bering Sea shelf from 1970–2022**

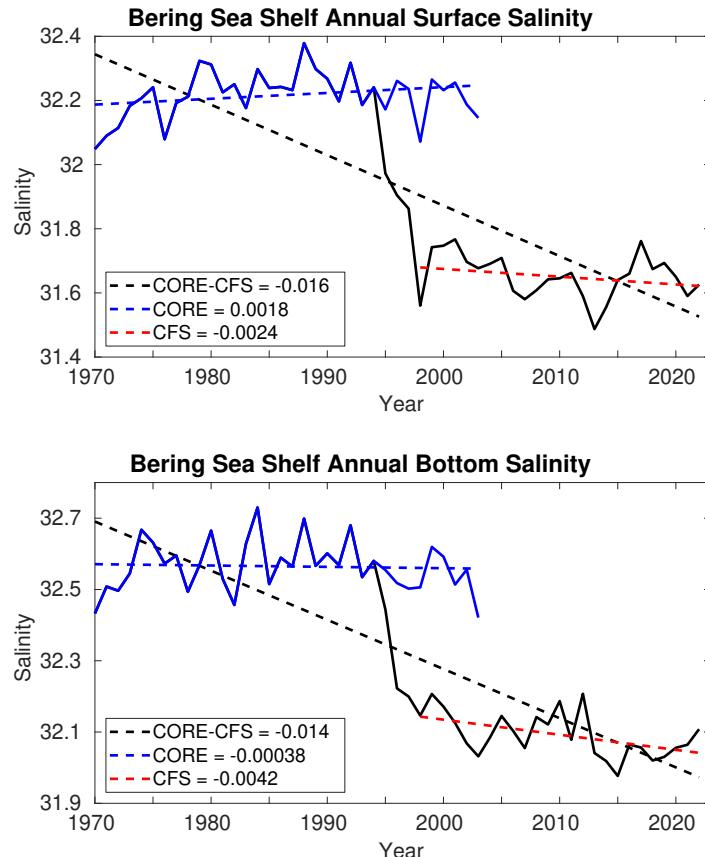
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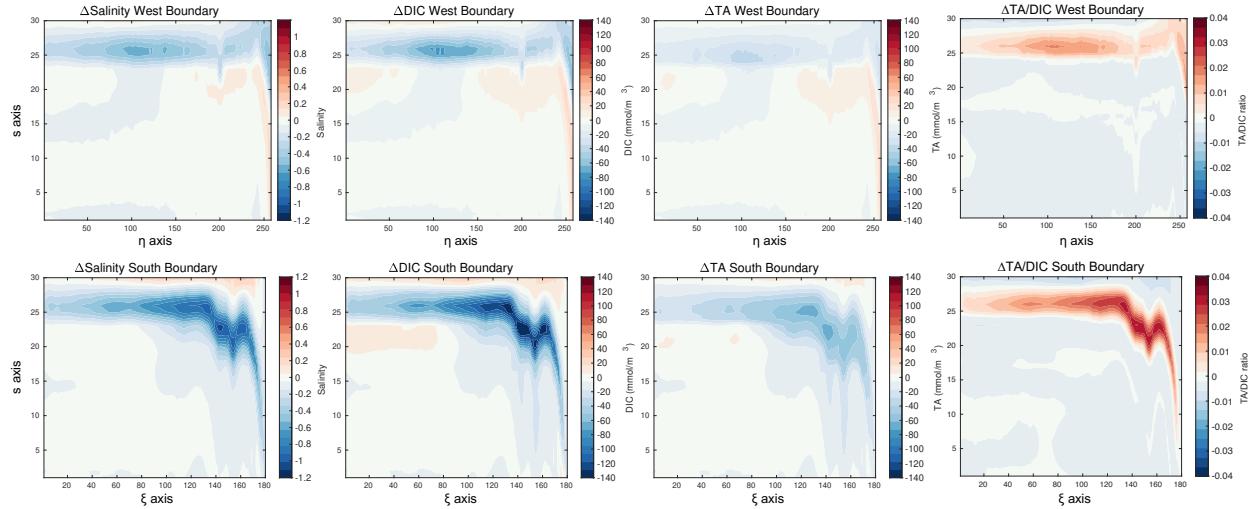
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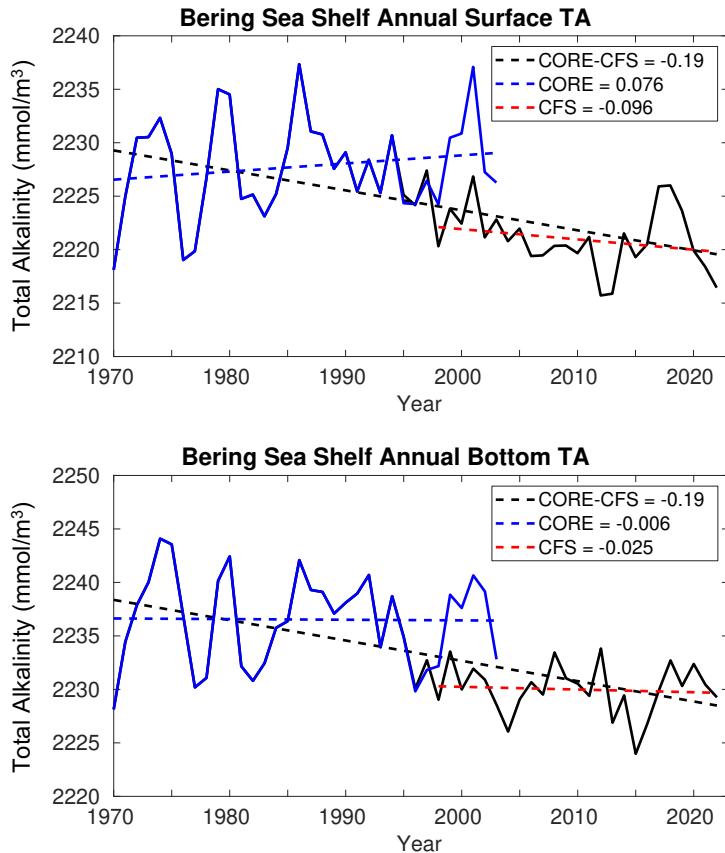
**Figure S1:** Annual mean ensemble trend in DIC calculated from the 3 ESMs over the 1970–2008 timeframe and applied to the DIC boundary conditions for the Bering10K ROMS model. The West and South boundaries on the respective  $\eta$ -axis and  $\xi$ -axis are shown in Figure 1, and the  $s$ -axis is the  $s$ -dimension vertical coordinate level, where  $s=30$  is the surface layer and  $s=0$  is the bottom layer.



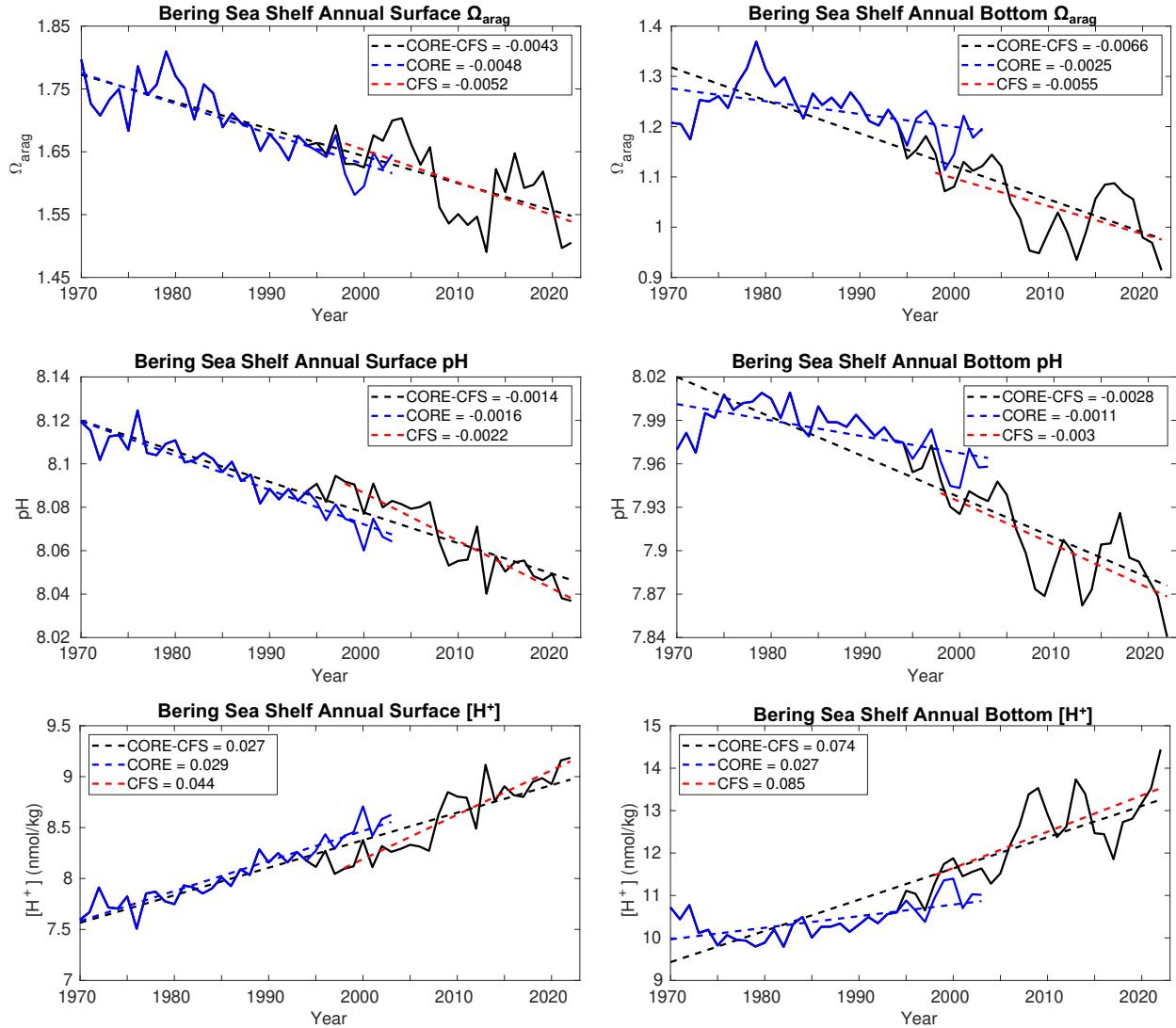
**Figure S2:** Timeseries plot of model annual average surface salinity (top) and bottom salinity (bottom) averaged over the Bering Sea shelf. The 1970-2022 CORE-CFS hindcast is shown as the black solid line while the 1970-2003 CORE-extended simulation is the blue solid line. The three trends are calculated over the 1970-2022 CORE-CFS timeframe (black dashed line), the 1970-2003 CORE timeframe (blue dashed line), and the 1998-2022 CFS timeframe (red dashed line).



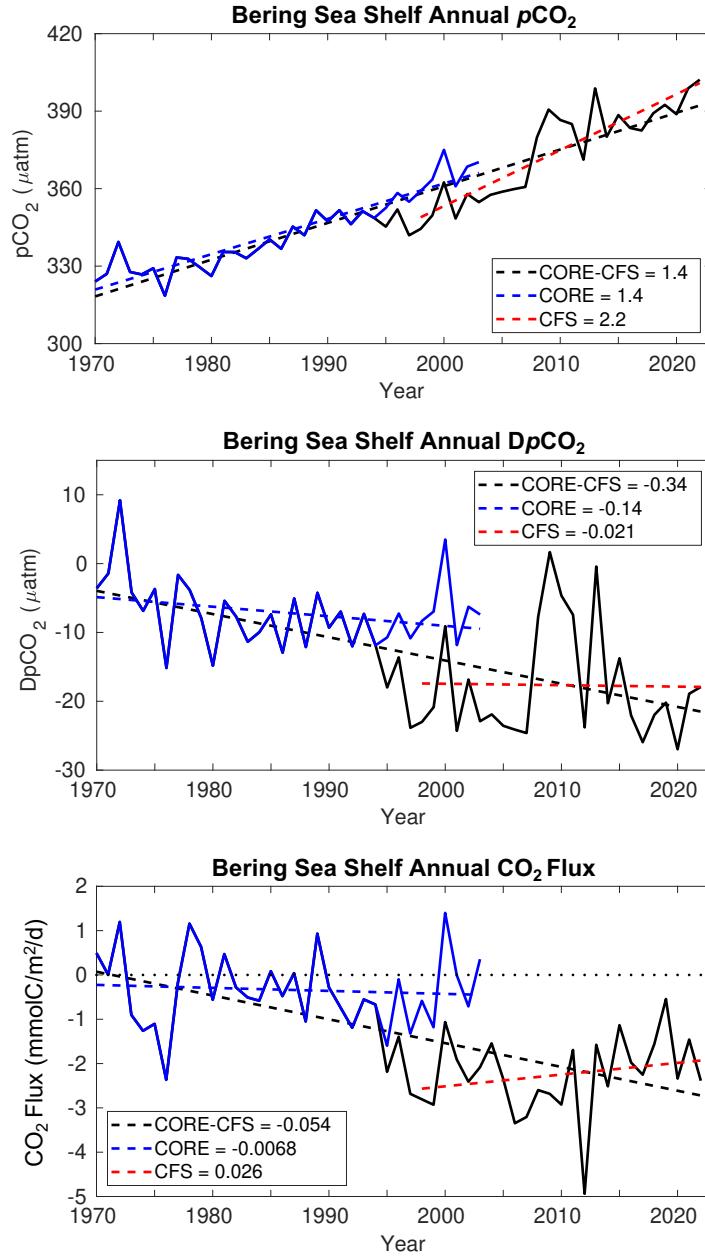
**Figure S3:** Changes in the western and eastern boundary for salinity, DIC, TA, and the TA/DIC ratio that result from the shift in forcing from CORE to CFSR in 1995. Delta values are specifically calculated between the two timeframes of 1985-1994 and 1995-2004. The West and South boundaries on the respective  $\eta$ -axis and  $\xi$ -axis are shown in Figure 1, and the s-axis is the s-dimension vertical coordinate level, where  $s=30$  is the surface layer and  $s=0$  is the bottom layer.



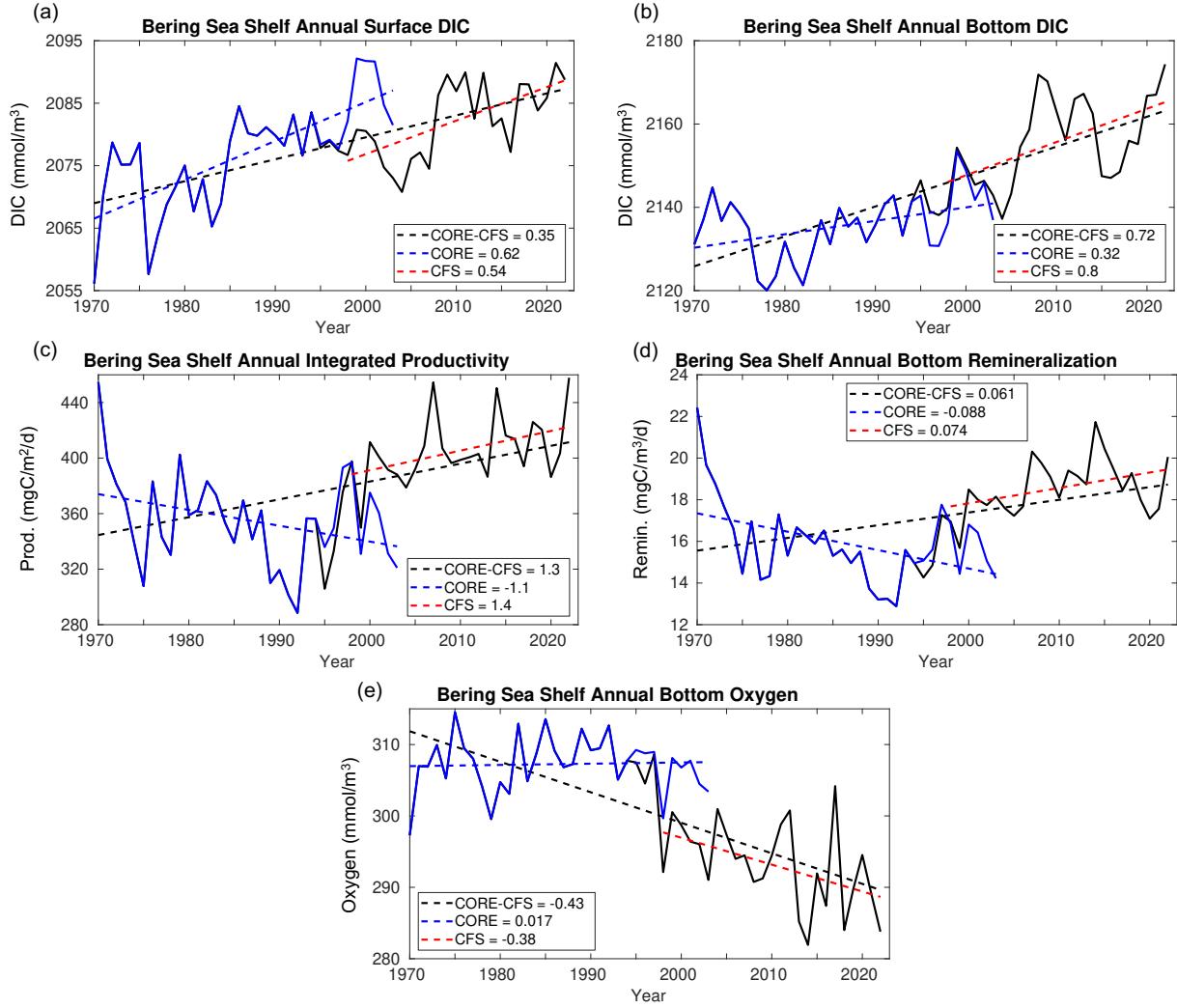
**Figure S4:** Timeseries plot of model annual average surface total alkalinity (top) and bottom total alkalinity (bottom) averaged over the Bering Sea shelf. The 1970-2022 CORE-CFS hindcast is shown as the black solid line while the 1970-2003 CORE-extended simulation is the blue solid line. The three trends are calculated over the 1970-2022 CORE-CFS timeframe (black dashed line), the 1970-2003 CORE timeframe (blue dashed line), and the 1998-2022 CFS timeframe (red dashed line).



**Figure S5:** Timeseries plots of model annual average surface (left) and bottom (right)  $\Omega_{\text{arag}}$  (top), pH (middle), and  $[\text{H}^+]$  (bottom) averaged over the Bering Sea shelf region. Also shown are the linear trend values over three different timeframes. The 1970-2022 CORE-CFS hindcast is shown as the black solid line while the 1970-2003 CORE-extended simulation is the blue solid line.



**Figure S6:** Timeseries of model annual average (top) surface ocean  $p\text{CO}_2$ ,  $D\text{pCO}_2$  (middle), and  $\text{CO}_2$  flux (bottom). Here,  $D\text{pCO}_2$  is defined as  $p\text{CO}_2^{\text{ocean}} - p\text{CO}_2^{\text{atmo}}$  and a negative  $\text{CO}_2$  flux signifies a flux of carbon into the ocean. The 1970-2022 CORE-CFS hindcast is shown as the black solid line while the 1970-2003 CORE-extended simulation is the blue solid line.



**Figure S7:** Timeseries plots of Bering Sea shelf model annual average (a) surface DIC, (b) bottom DIC, (c) depth integrated primary productivity, (d) bottom water remineralization, and (e) bottom water oxygen concentration. Also shown are the linear trend values over three different timeframes. The 1970-2022 CORE-CFS hindcast is shown as the black solid line while the 1970-2003 CORE-extended simulation is the blue solid line.