Supplemental Material

Additional Figures

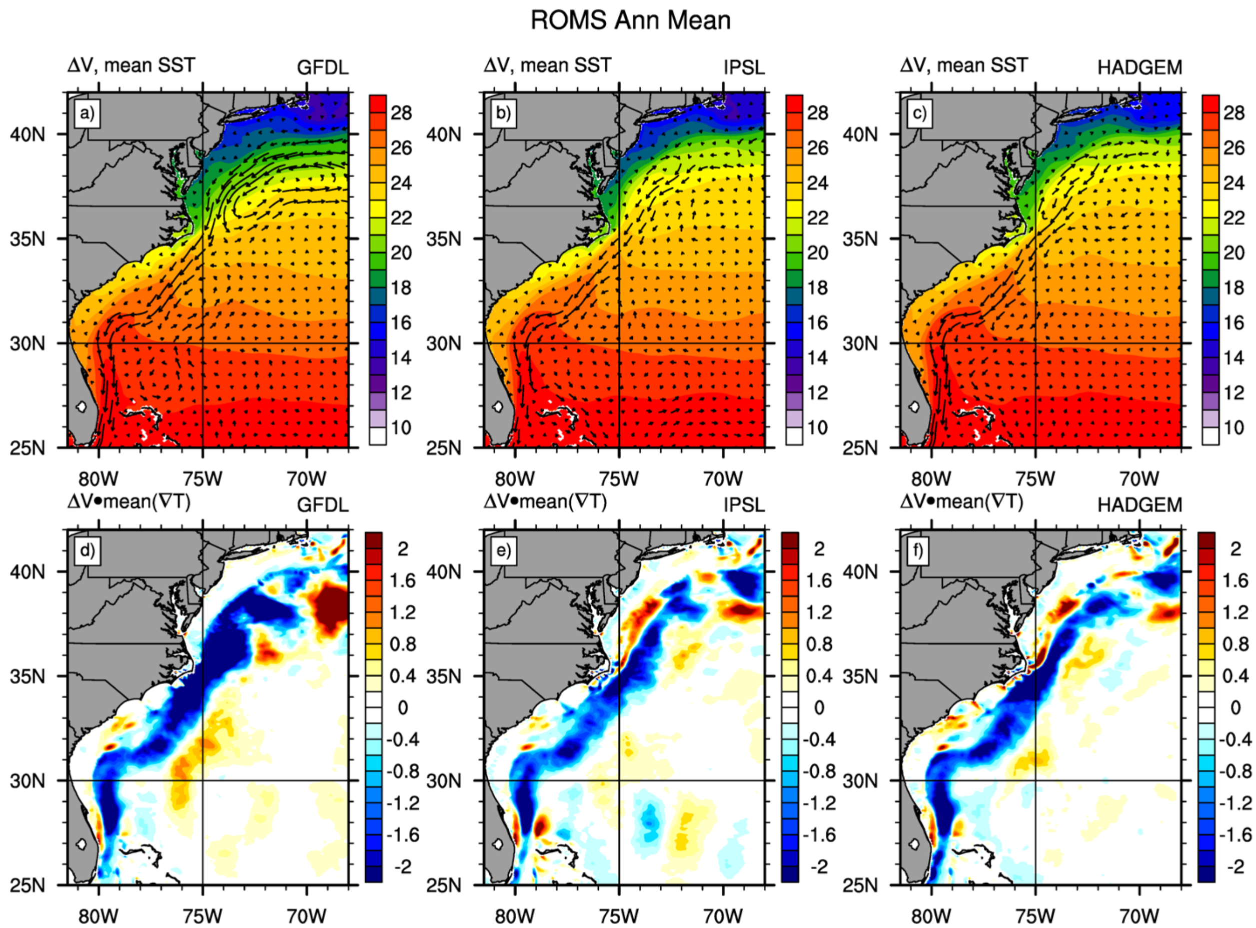

Fig. SM1

Fig. SM1. The effect of the change in the Gulf Stream on SSTs. Top panels show the response of the surface ocean currents to climate change (RCP8.5-CTRL) in the ROMS simulations driven by the GFDL (left) IPSL (center) and HadGEM (GCMs (right), overlaid on the mean temperature field (shaded, interval 1 °C) from the CTRL run. The southwest directed vectors indicate the slowing of the Gulf Stream in the future, as a result less warm water is advected north. As shown in a budget framework in the lower panels, the anomalous current (RCP8.5-CTRL or Δ) acting on the climatological mean temperature gradient from the CTRL acts to cool the ocean, i.e. $(\Delta \boldsymbol{V} \cdot \nabla \overline{SST}) < 0$, in the Gulf Stream region.

CMIP5 GCM Response: SST (˚C)
RCP8.5-Hist (shaded), Historical (contour)

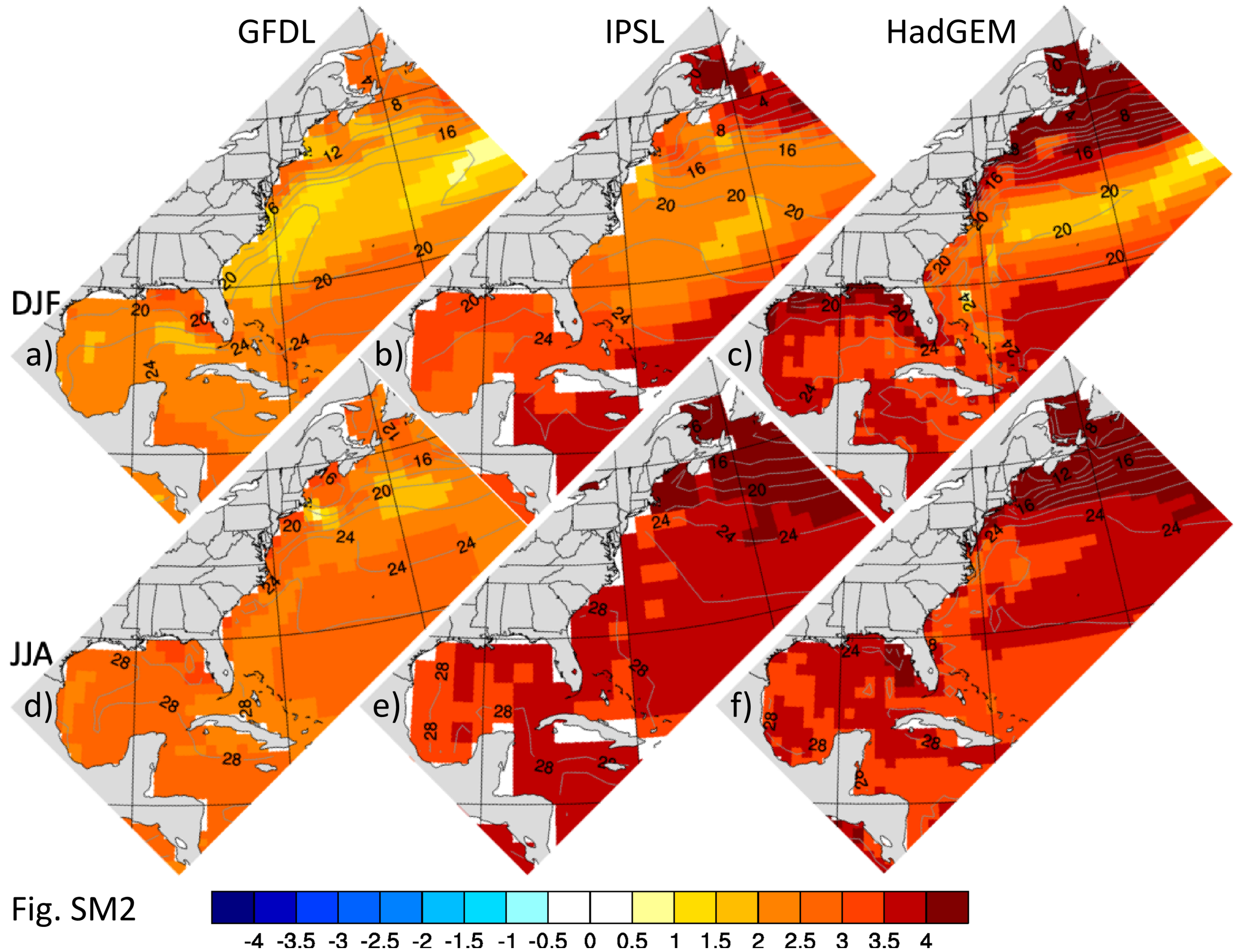

Fig. SM2. SST climatology and response to climate change from the IPCC GCMs over the same domain as used in the ROMS simulations. SST during the historical period (1976-2005, contours, interval 2 ˚C) and the SST response (shaded, interval 1.0 ˚C) obtained from the difference between the future (2070-2099 in the RCP8.5 simulations) and the historical period during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL, and (c) (f) HadGEM GCMs.

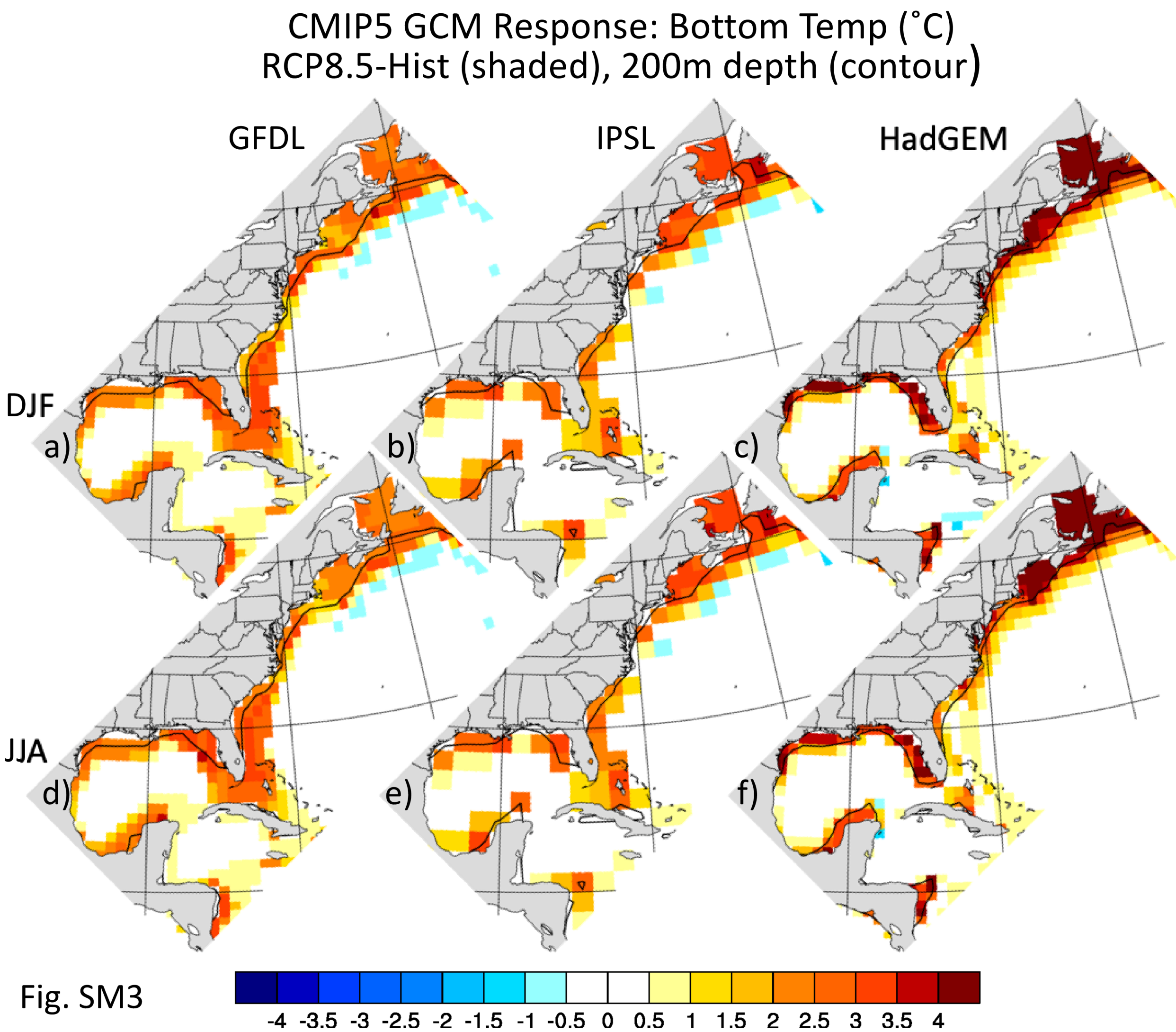

Fig. SM3

Fig. SM3. Bottom temperature response (RCP8.5 - historical) during DJF (top) and JJA (bottom). Obtained from the (a) (d) GFDL, (b) (e) IPSL, (c) (f) HadGEM GCMs. The 200m isobath, representing the shelf break, is indicated by the black curve.

CMIP5 GCM Response: Salinity (PSU)
RCP8.5-Hist (shaded), Historical (contour)

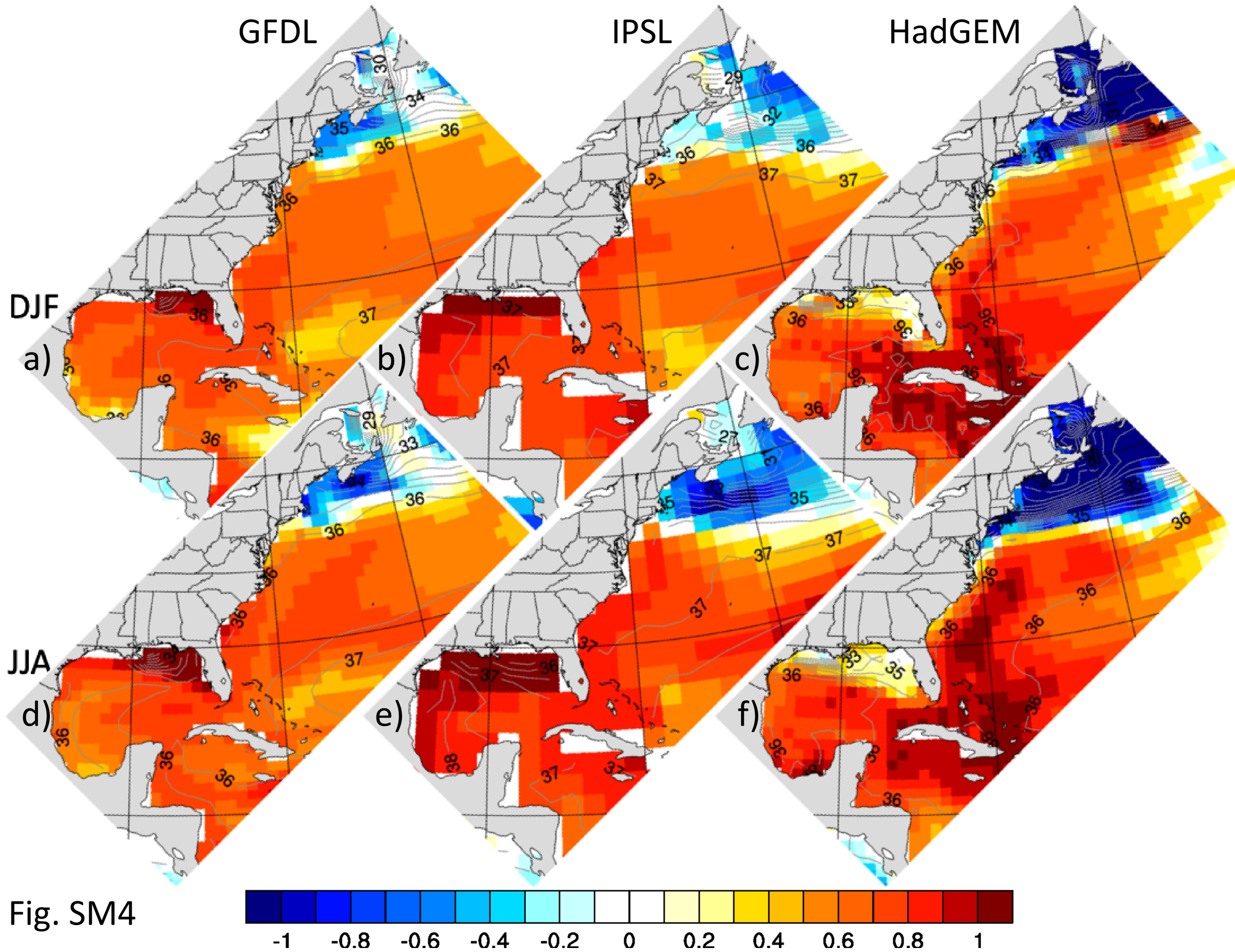

Fig. SM4. Sea surface salinity (SSS) during the historical period (1976-2005, contours, interval 1 PSU) and the SSS response (RCP8.5-historical, shaded, interval 0.1 PSU) during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL, and (c) (f) HadGEM GCMs.

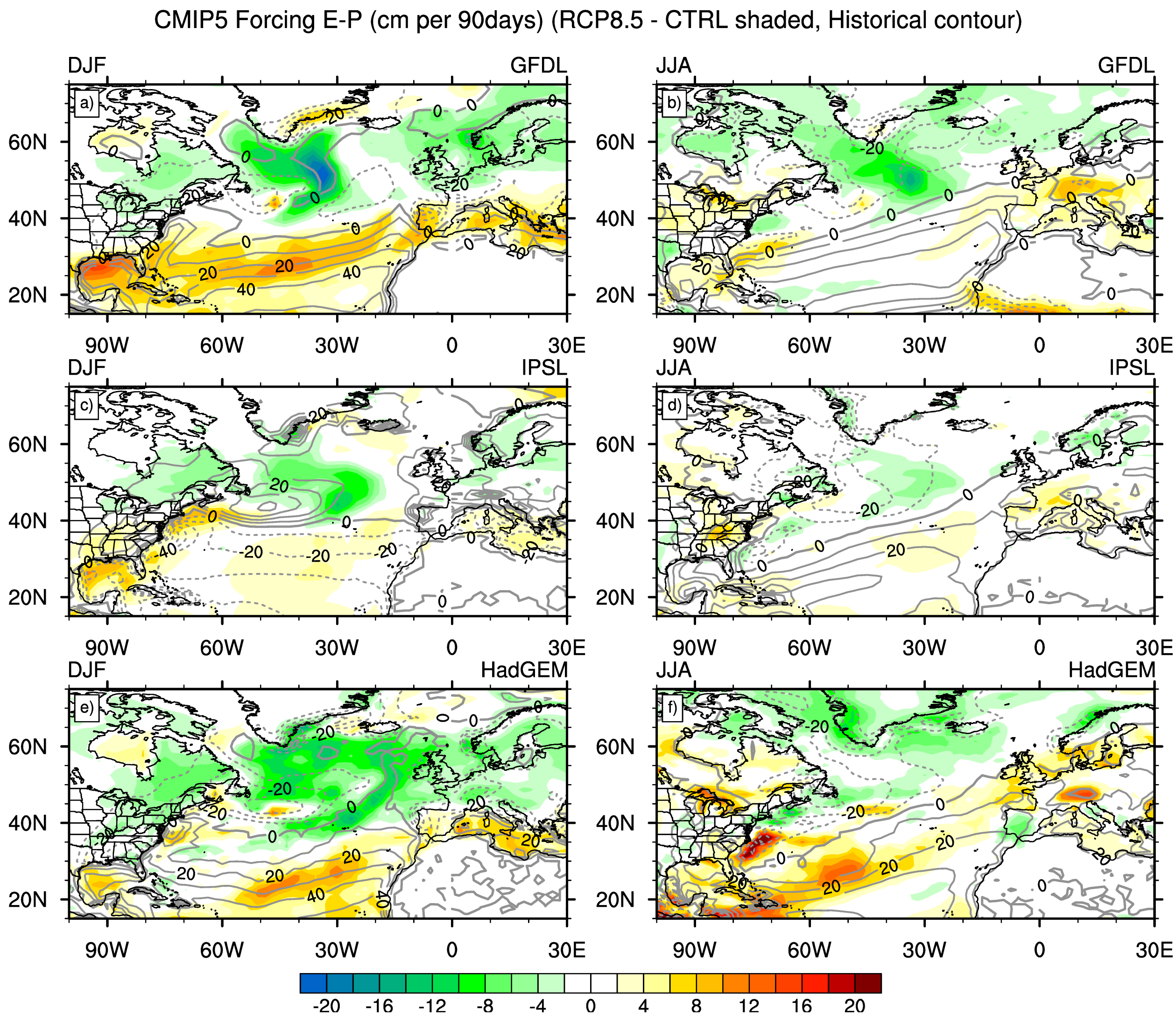

Fig. SM5. Surface evaporation minus precipitation (E-P) during the historical period (1976-2005, contours, interval 20 cm per 90 days) and the E-P response (RCP8.5-historical,shaded, interval 20 cm per 90 days) during DJF (left) and JJA (right) in the (a) (b) GFDL, (c) (d) IPSL, and (e) (f) HadGEM GCMs. Note 90 days is the length of the winter and summer seasons.

CMIP5 GCM River Runoff (10^{-5} kg m^{-2} s^{-1}) (RCP8.5-Historical)

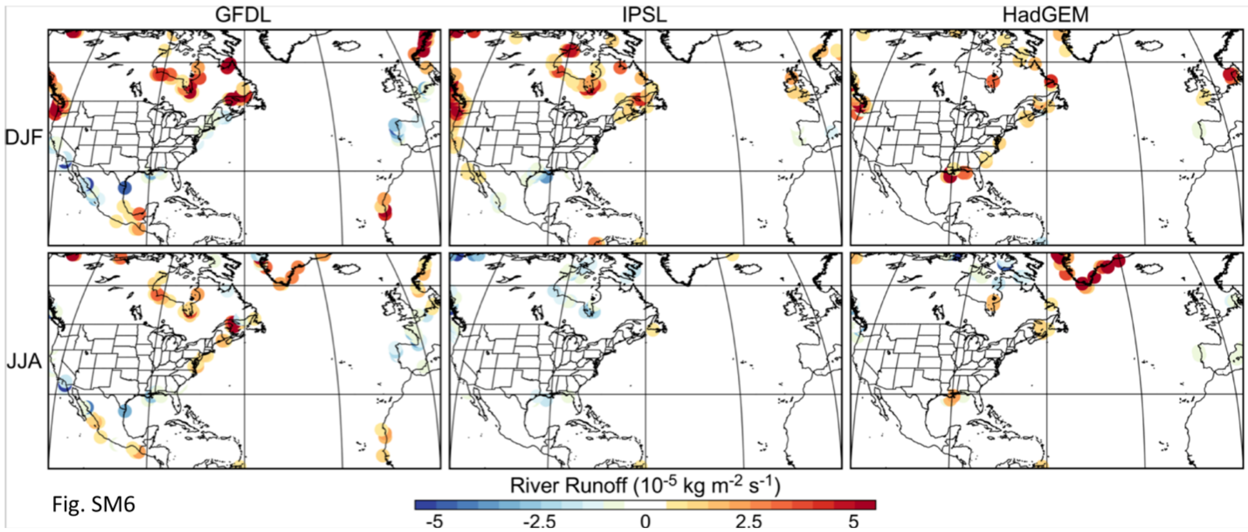

Fig. SM6. Response in river runoff (RCP8.5-historical, shaded, interval 5 x 10^{-6} kg m^{-2} s^{-1}) during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL, and (c) (f) HadGEM GCMs. Runoff is given at the locations of where rivers enter the ocean as indicated by Dai et al. 2009.

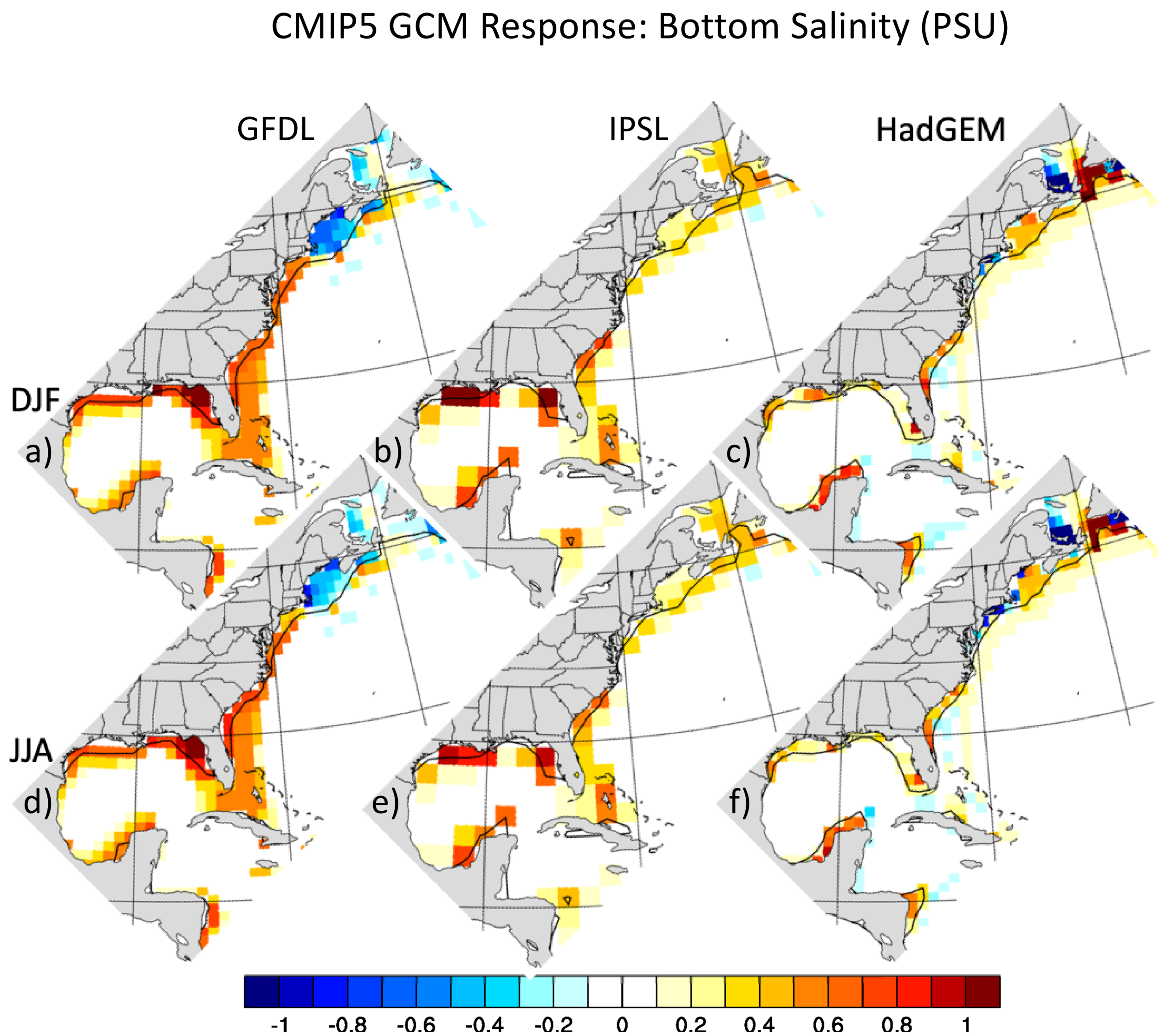

Fig. SM7. Bottom salinity response (RCP8.5 – historical, shaded, interval 0.1 PSU) during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL, and (c) (f) GCMs. The 200 m isobath is indicated by the black curve.

ROMS Response SST – Temp at 100 m (˚C)

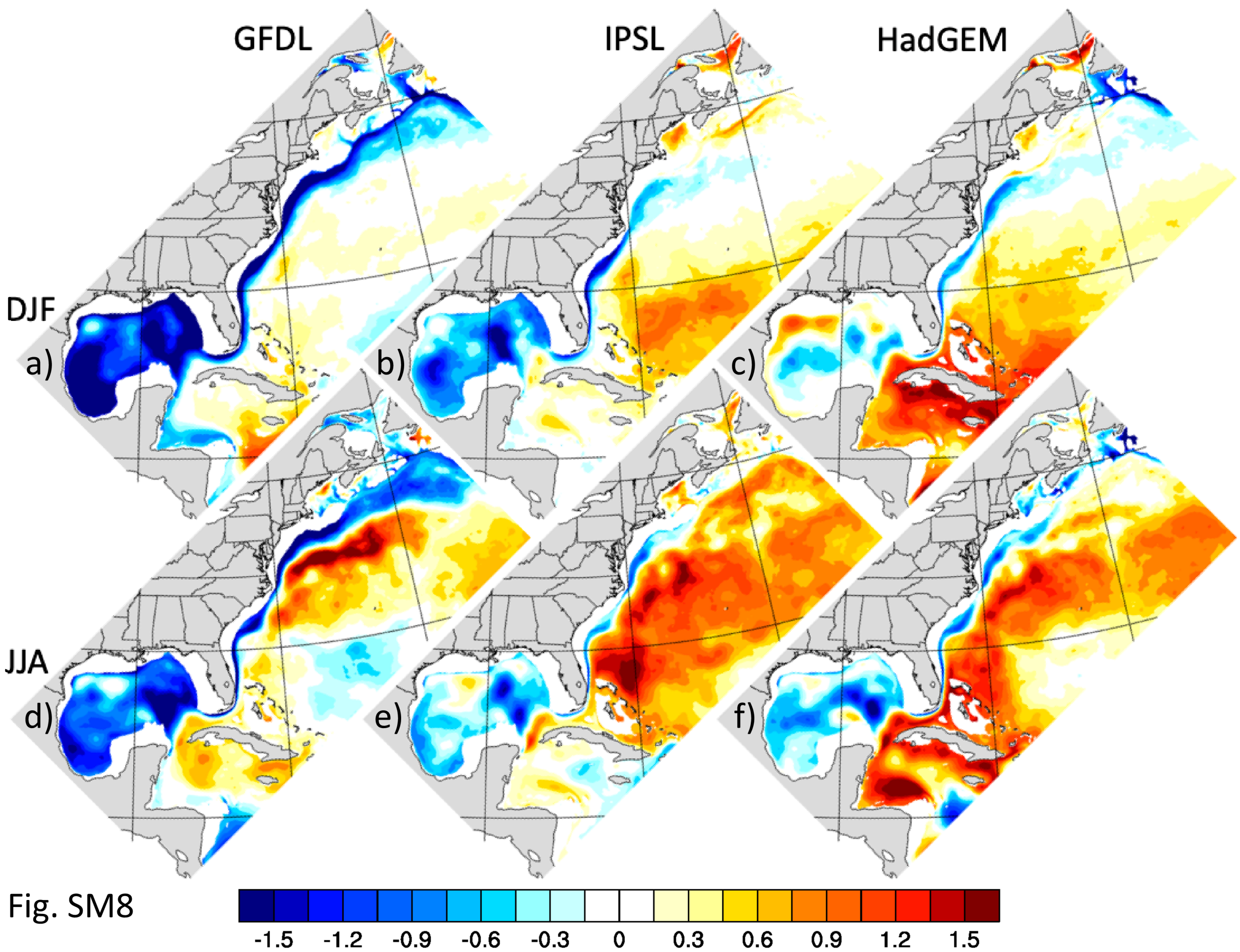

Fig. SM8. The response in the temperature component of the stratification, indicated by SST minus temperature at 100m (RCP8.5-CTRL, shaded, interval 0.15 ˚C) in ROMS during DJF (top) and JJA (bottom) in(a) (d) GFDL-ROMS, (b) (e) IPSL-ROMS, and (c) (f) HadGEM-ROMS.

CMIP5 GCM Response: 100m-SFC density (kg m^{-3})
RCP8.5-Historical (shaded), CTRL (contour)

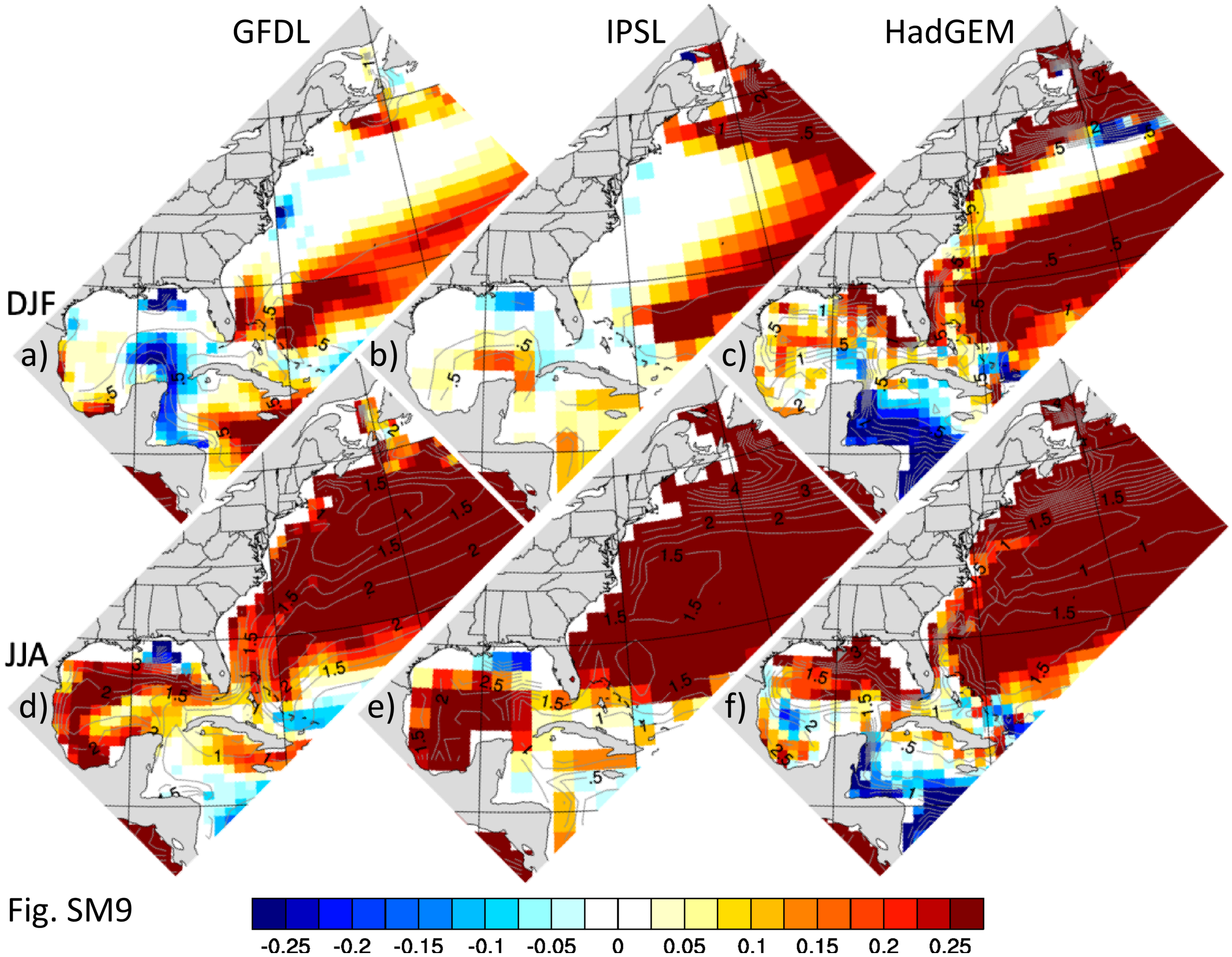

Fig. SM9

Fig. SM9. The stratification, indicated by the 100m - surface density, in the CTRL (0.25 kg m^{-3} contour) and the stratification response (RCP8.5 – Historical, shaded, interval 0.025 kg m^{-3}) during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL and (c) (f) HadGEM GCMs.

CMIP5 GCM Response: SST -100m Temperature (˚C)

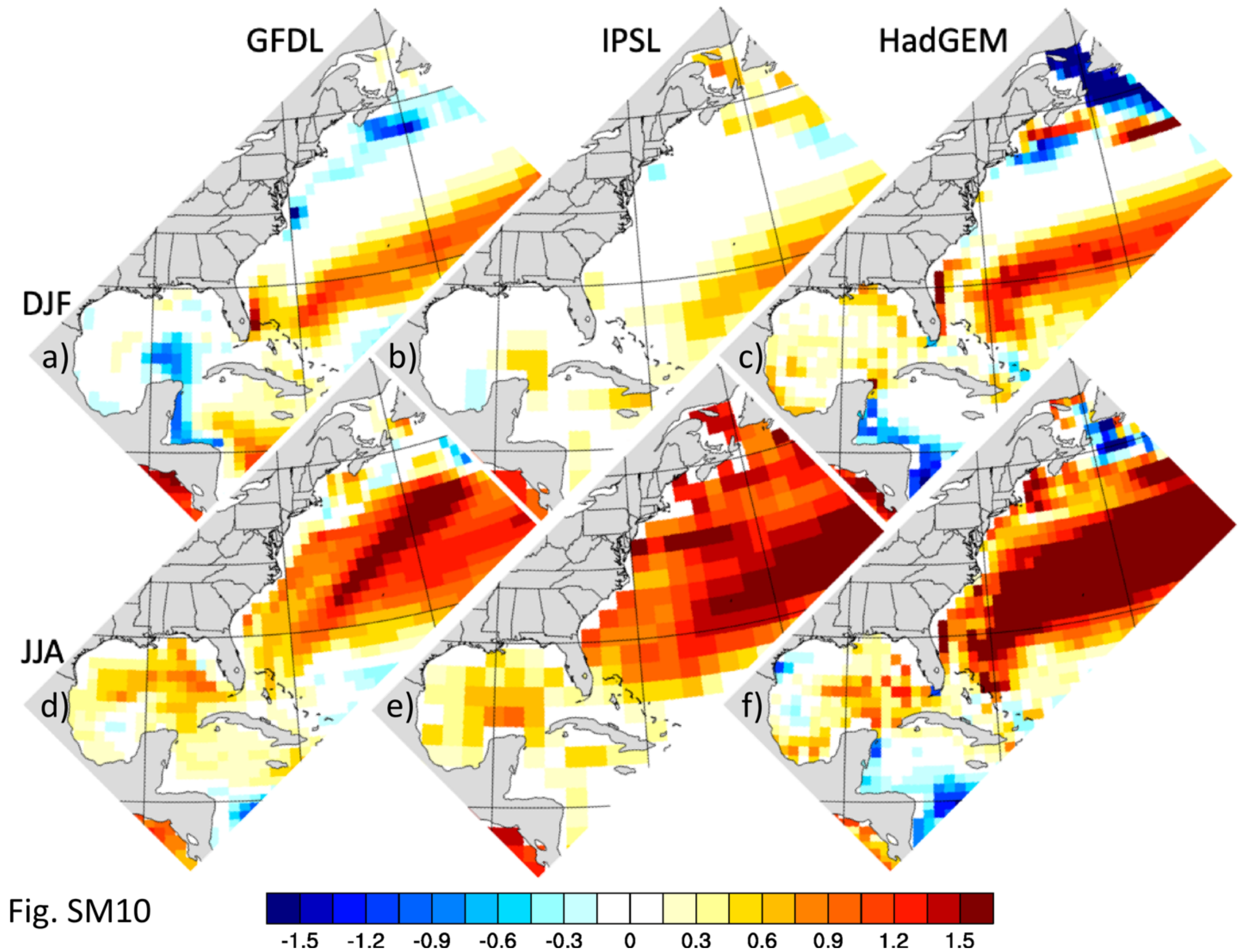

Fig. SM10

Fig. SM10. The response in the temperature component of stratification: SST - 100m temperature (RCP8.5 – Historical, shaded, interval 0.15˚C) during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL and (c) (f) HadGEM GCMs.

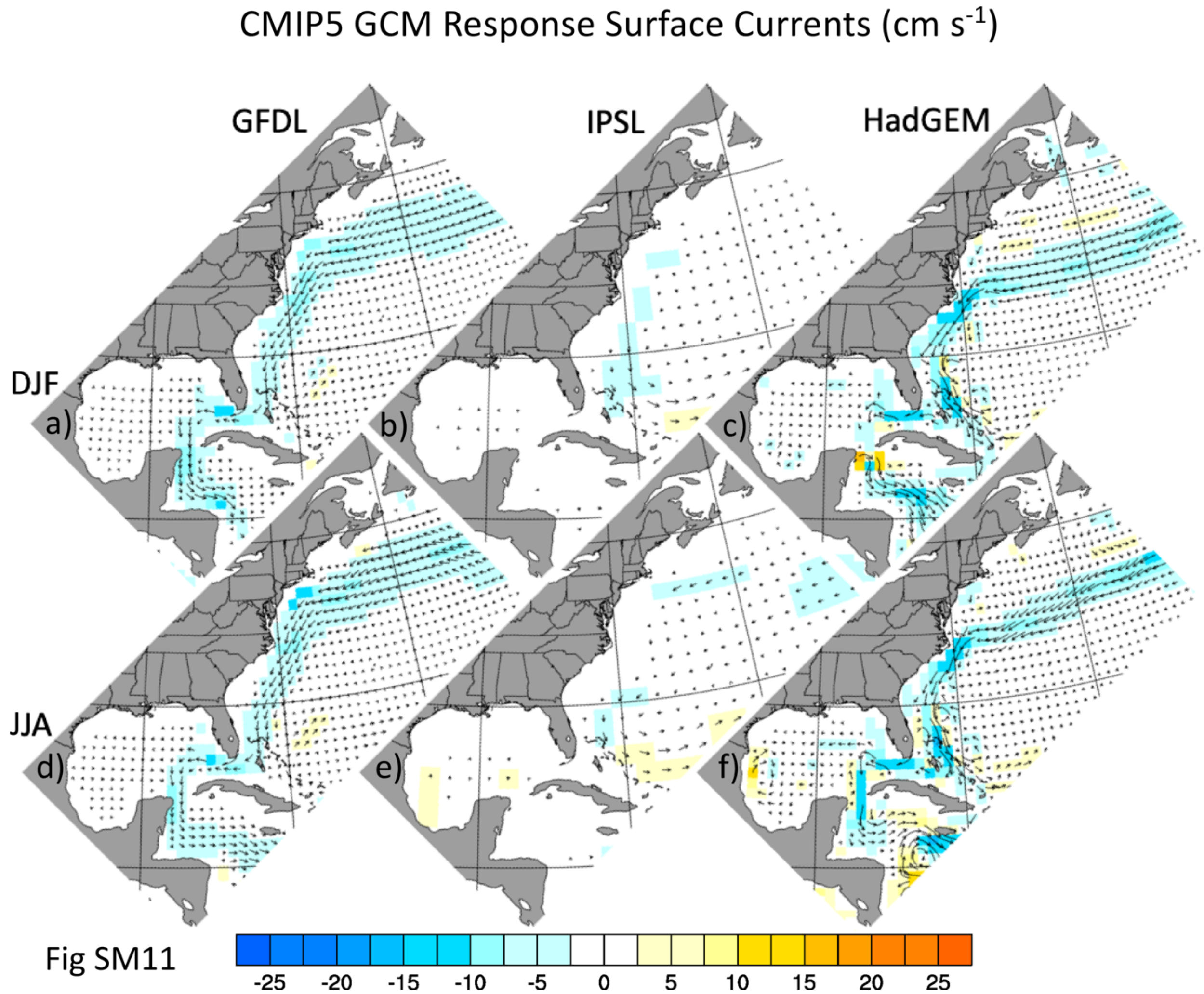

Fig. SM11. The surface current response (RCP8.5 – Historical, speed shaded, interval 2.5 cm s^{-1}) during DJF (top) and JJA (bottom) in the (a) (d) GFDL, (b) (e) IPSL and (c) (f) HadGEM GCMs.

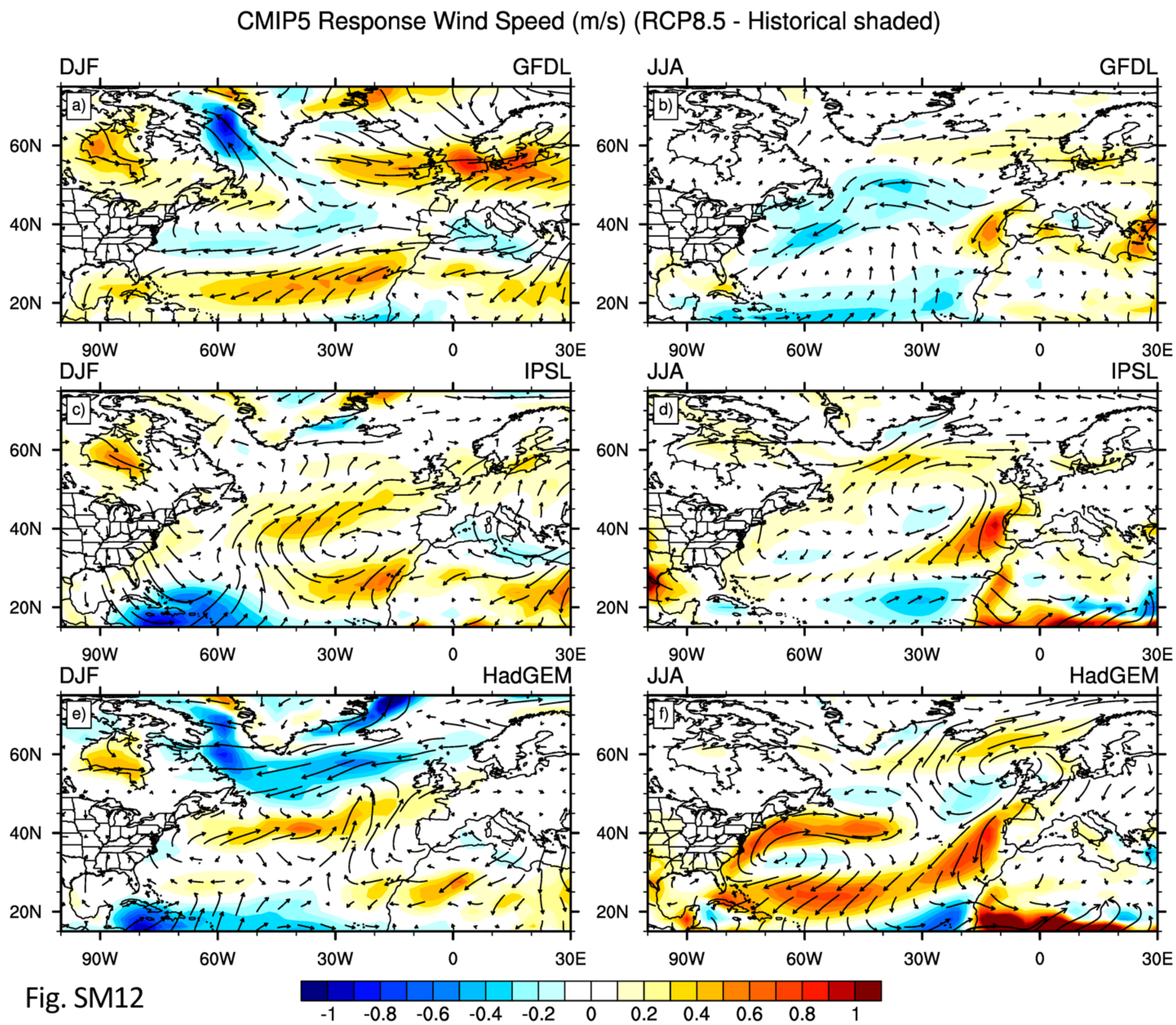

Fig. SM12

Fig. SM12. The surface wind response (RCP8.5 – Historical, speed shaded, interval 0.1 m s^{-1}) during DJF (left) and JJA (right) in the (a) (b) GFDL, (c) (d) IPSL and (e) (f) HadGEM GCMs. The Velocity computed from four times daily zonal and meridional wind components.

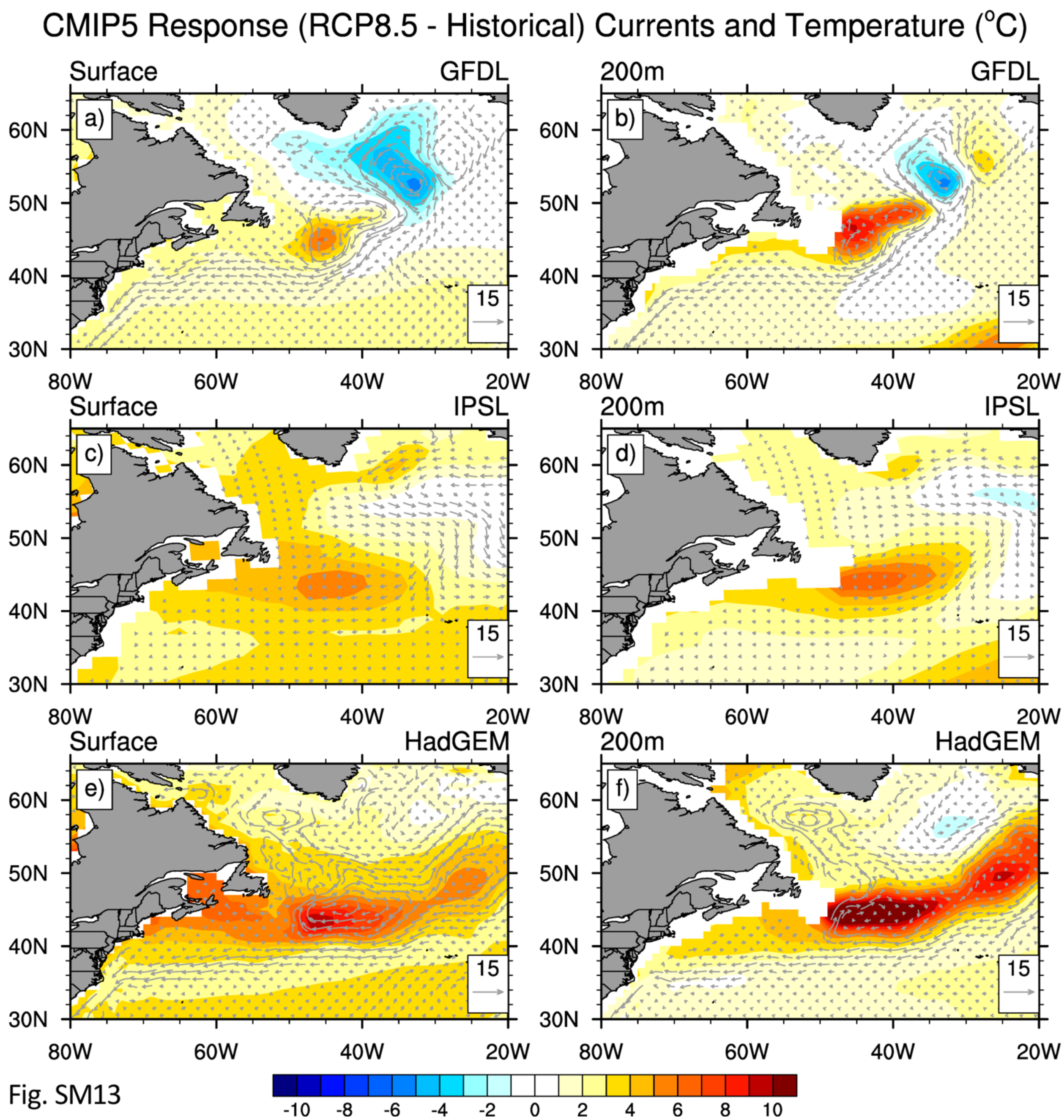

Fig. SM13. The annual mean response (RCP8.5 – Historical) in temperature (shaded, interval 1°C) and currents (cm s^{-1}, scale in lower right) at the surface (top) and 200 m (bottom) in the (a) (b) GFDL, (c) (d) IPSL and (e) (fls) HadGEM GCMs. Velocity computed from 5-day averages of the zonal and meridional currents.