Supplement to Warming effects of reduced sulfur emissions from shipping

Masaru Yoshioka, Daniel Grosvenor, Ben B. B. Booth, Chris Smith, and Ken S. Carslaw
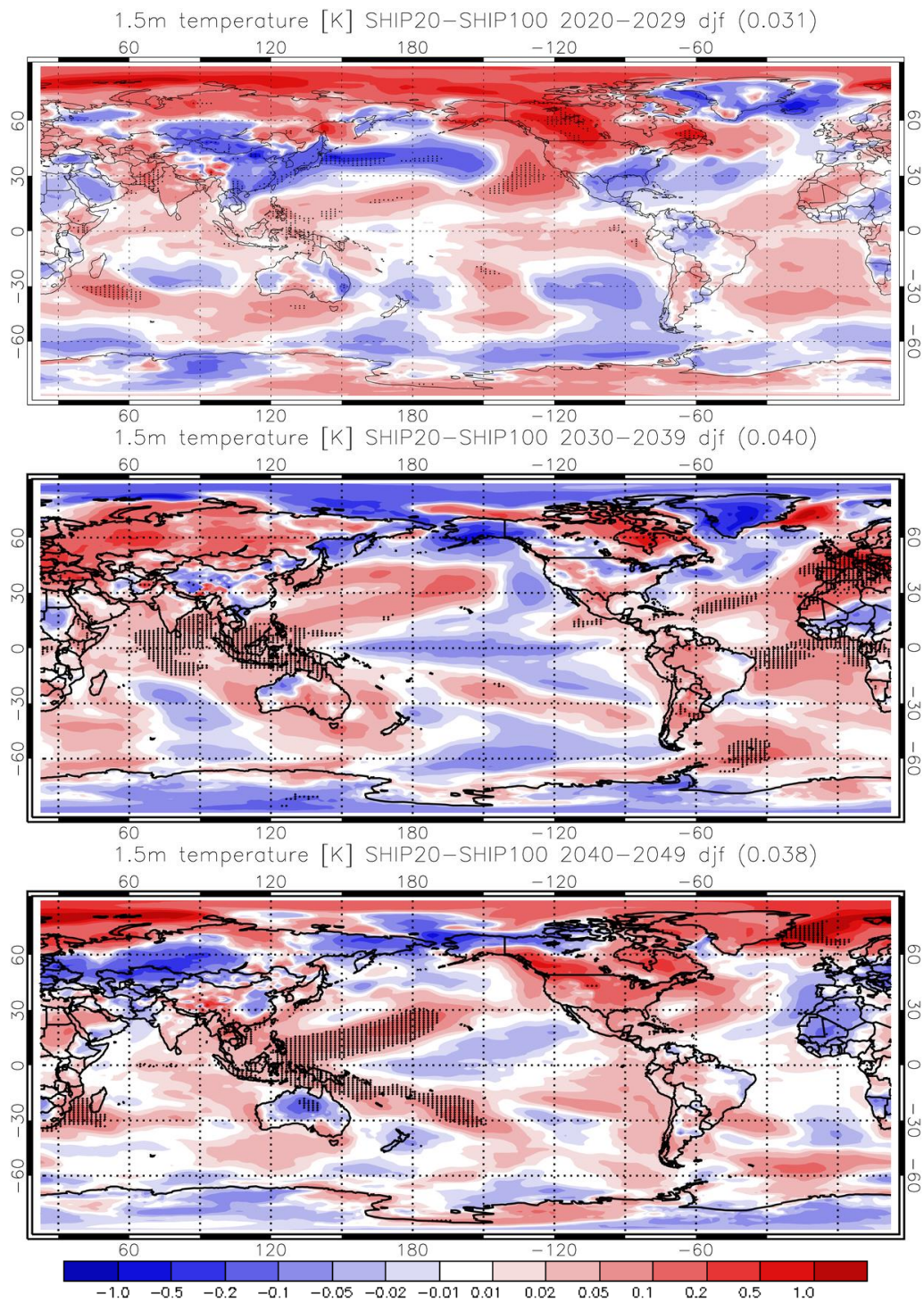
Figure S1. Same as Figure 4 but for DJF.
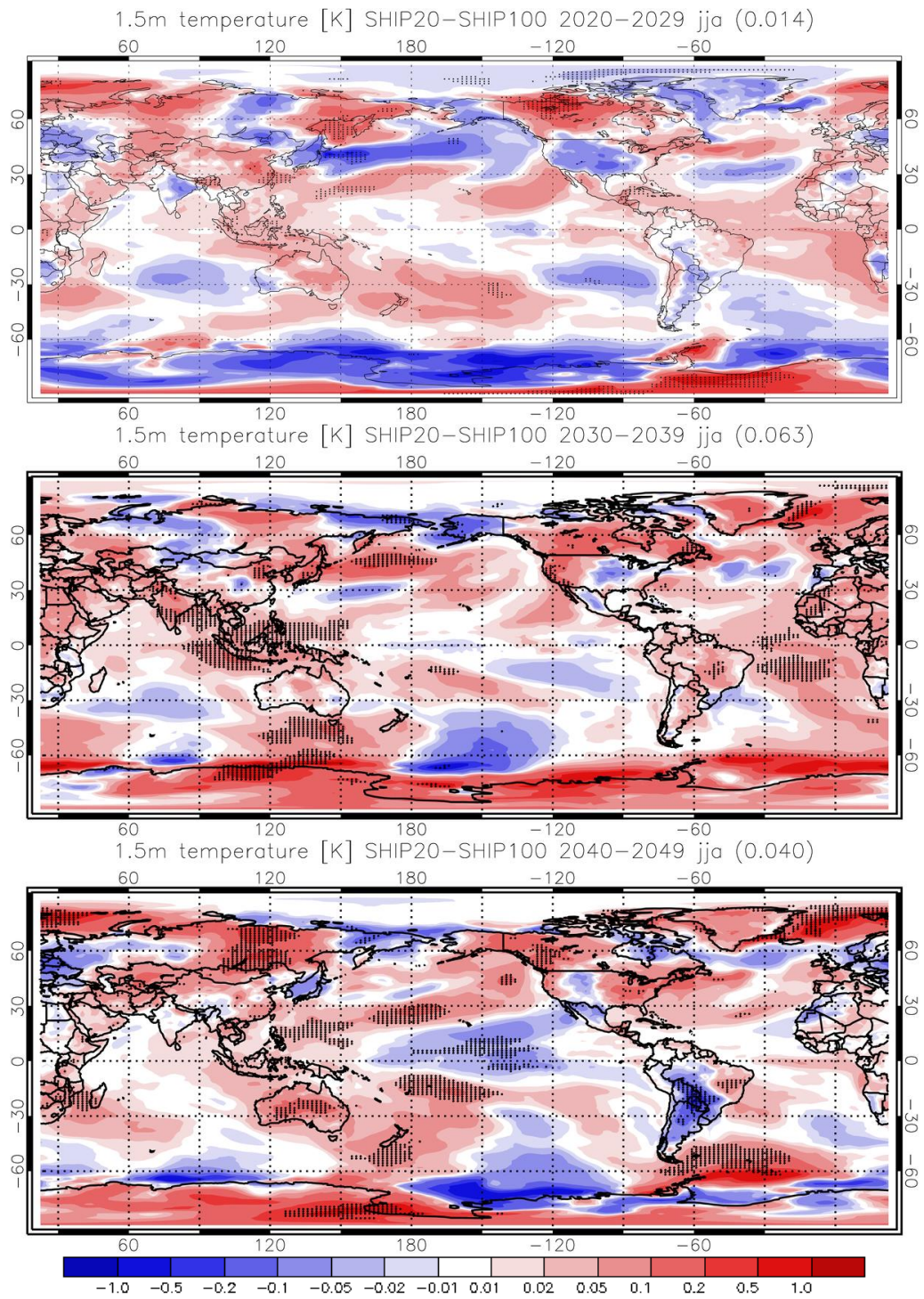
Figure S2. Same as Figure 4 but for JJA.
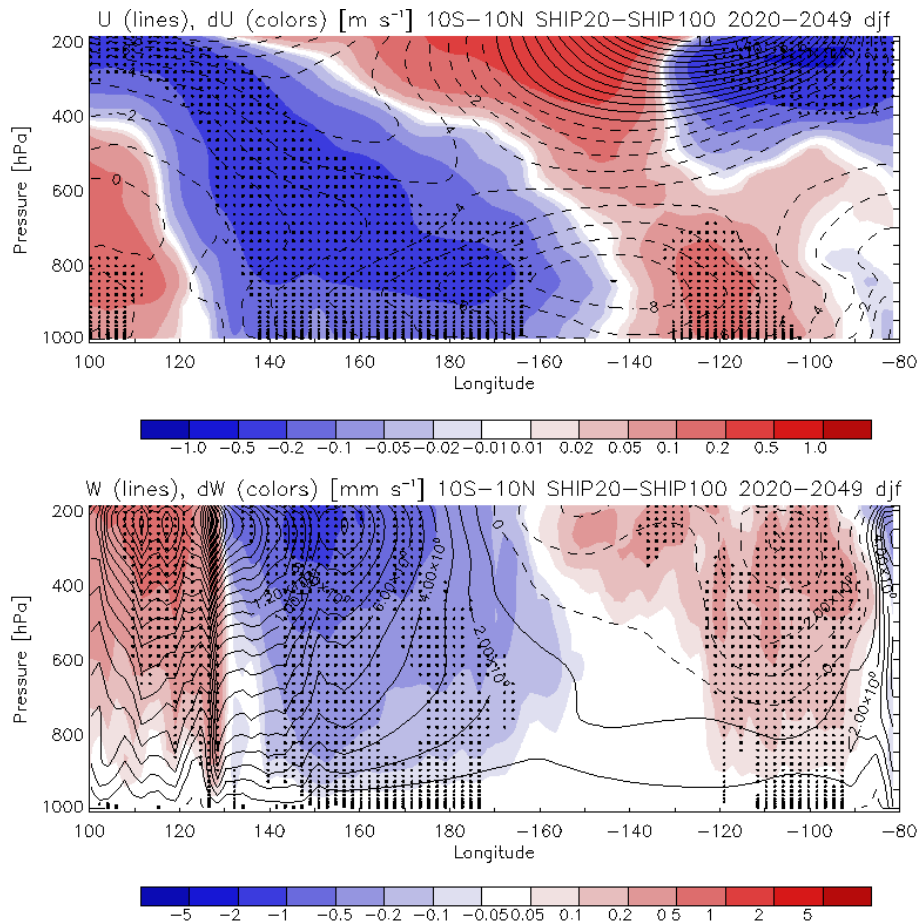
Figure S3. Ensemble mean DJF zonal (positive eastward; U; m s–1; top panel) and vertical (positive upward; W) winds (mm s–1) in SHIP100 (line contours) over the equatorial Pacific (averaged for 10S-10N and shown for 100E-80W and surface-200hPa) and changes in U (ΔU) and W (ΔW) from SHIP100 to SHIP20 (colors). Positive (solid lines and red colors) and negative (dashed lines and blue colors) regions for U (top panel) show eastward and westward motions, respectively, whereas for W (bottom panels) they show upward and downward motions, respectively. Hatching indicates areas where the differences are statistically significant at a 95% confidence level.
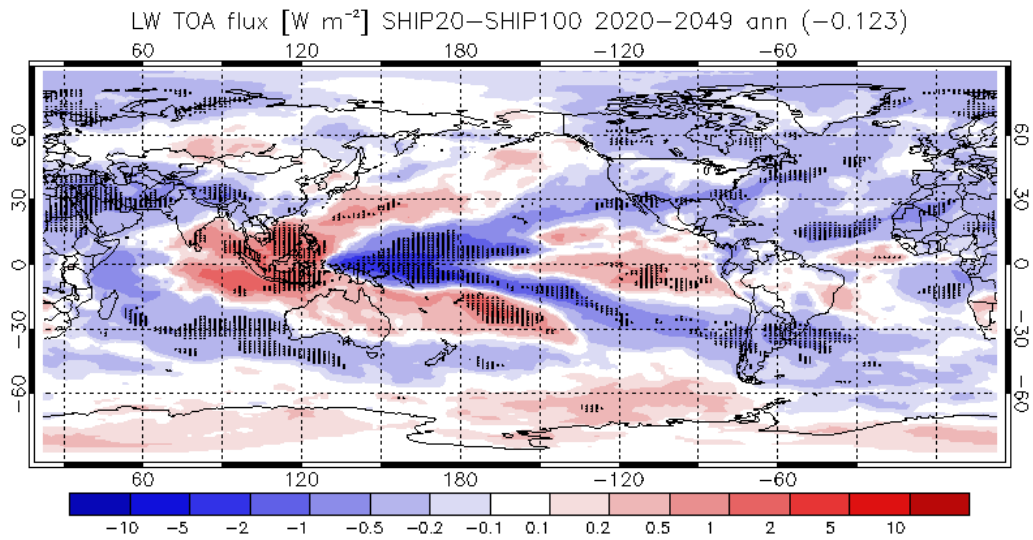
Figure S4. Difference (SHIP20-SHIP100) in ensemble mean LW radiative flux (W m–2) at the top of the atmosphere. Respectively, blue and red colours indicate cooling and warming effects induced by the reduction of shipping sulfur emission.
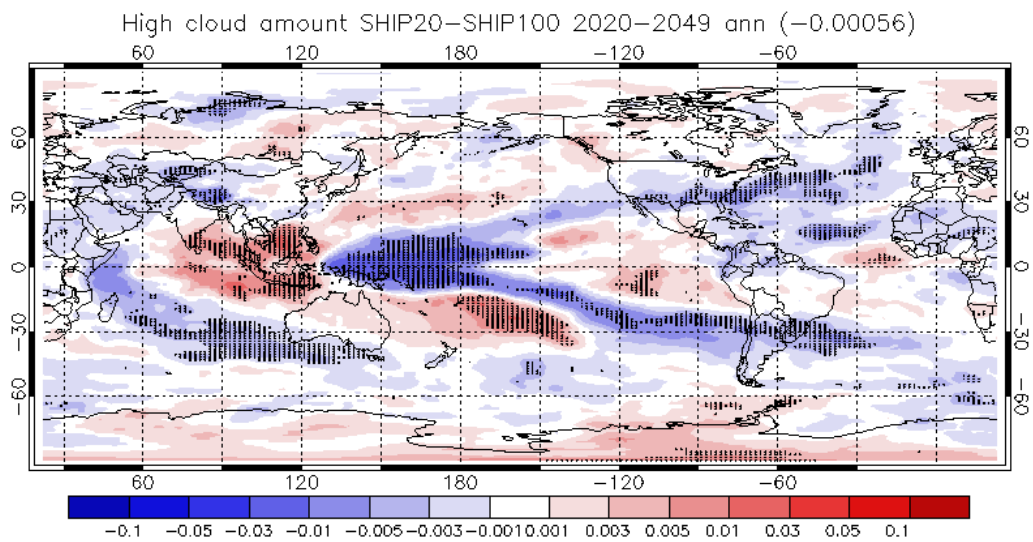
Figure S5. Difference (SHIP20-SHIP100) in ensemble annual means of high-level cloud fractions. High-level clouds indicate clouds in the levels approximately 5600-13600m.
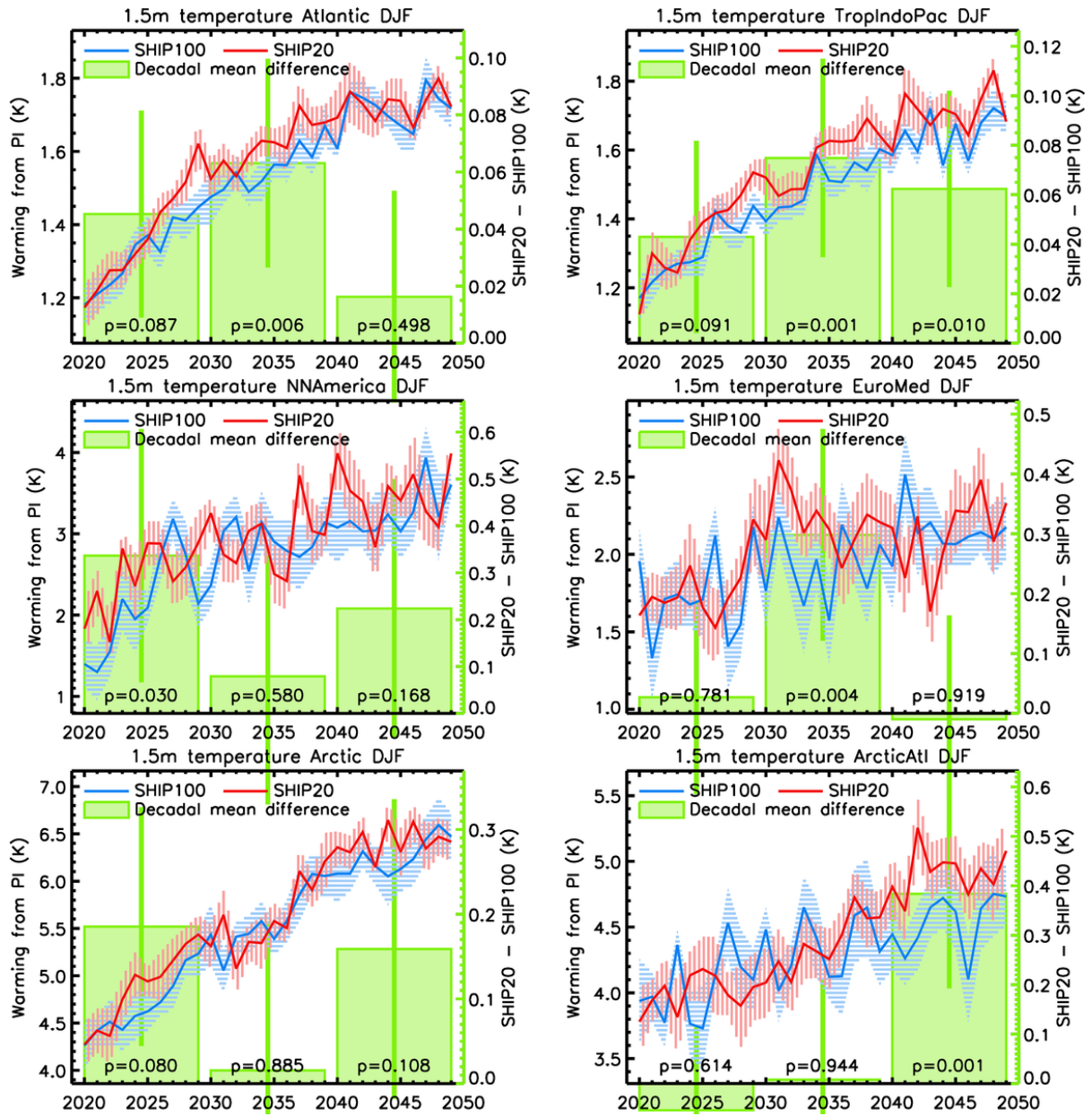
Figure S6. Same as Figure 7 but for DJF averages
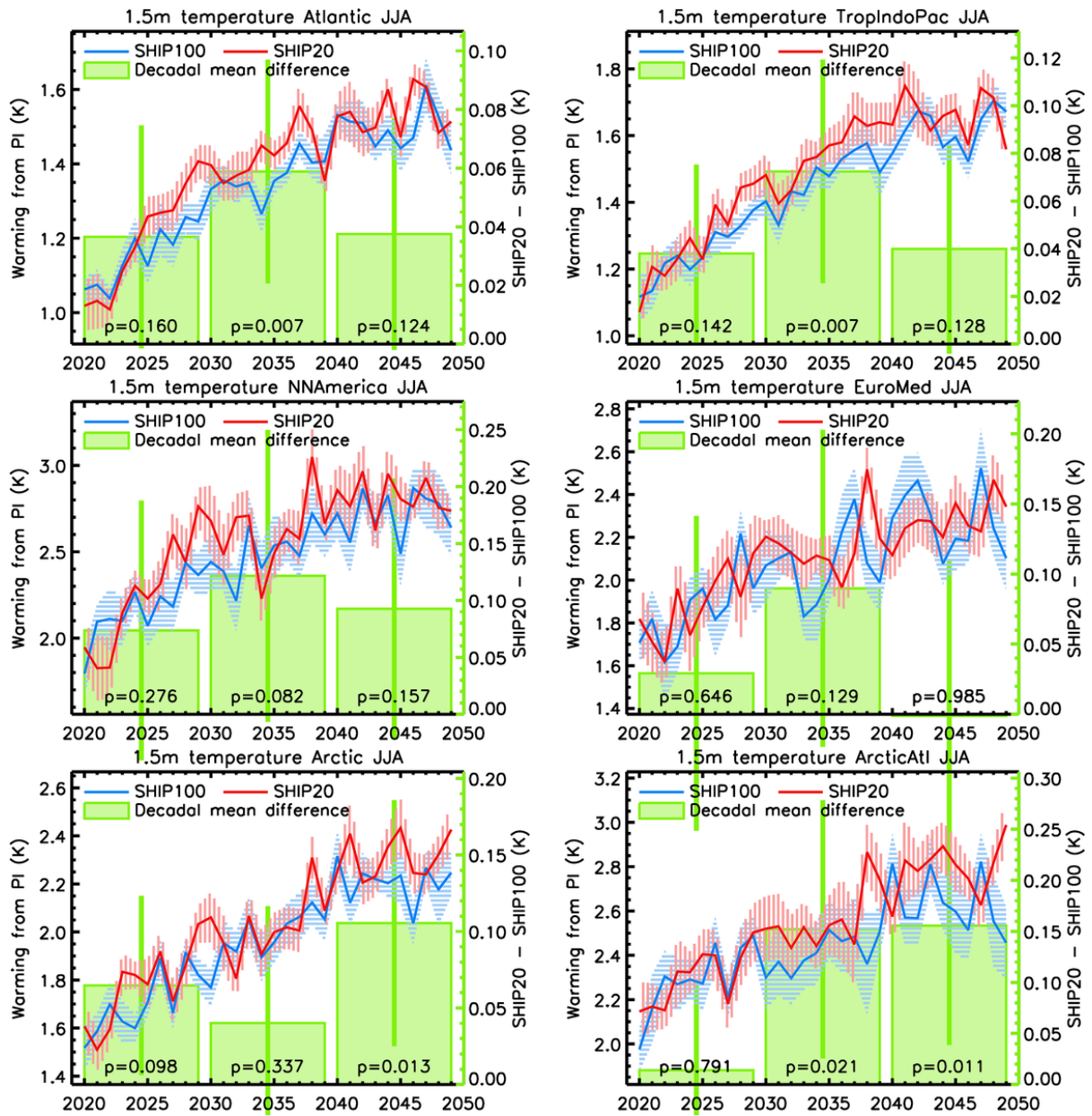
Figure S7. Same as Figure 7 but for JJA averages