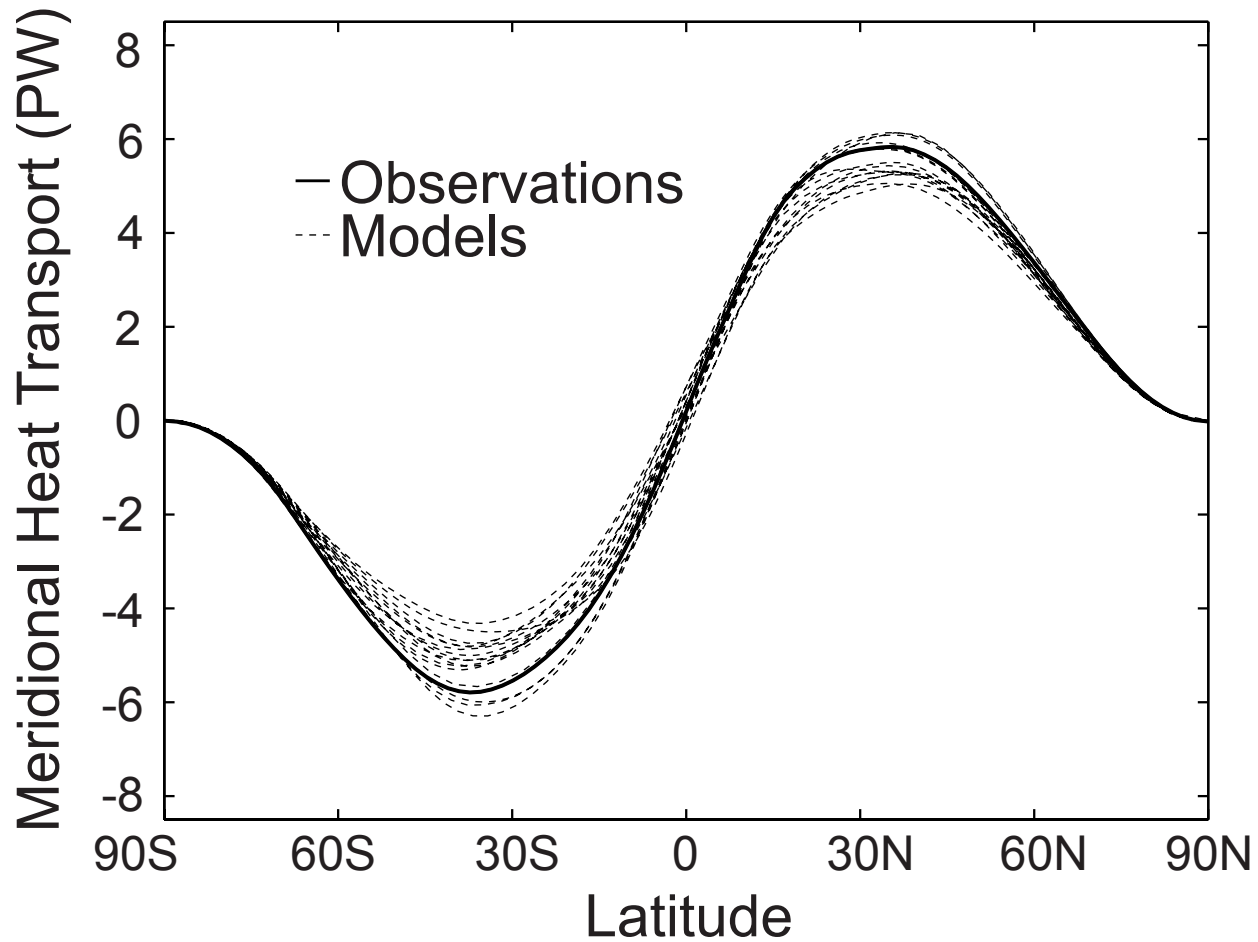


FIG. 1. Graphical demonstration of the calculations of (A) MHT_{MAX} , (B) ASR^* , and (C) OLR^* from the CERES annual average data. The x axis is sine of latitude in all panels. (A) The zonal average ASR (red line) and OLR (green line). The blue (red) shaded area is the spatially integrated net radiative deficit (surplus) in the extra tropics (tropics) and equals the meridional heat import (export) from each region (MHT_{MAX}). (B) The zonal average ASR co-plotted with the global average ASR; the shaded area equals ASR^* . (C) As is (B) except for OLR and OLR^* . The black circles denote the latitude where $ASR' = 0$ in each hemisphere.

Meridional Heat Transport



Maximum Heat Transport Histograms Northern Hemisphere

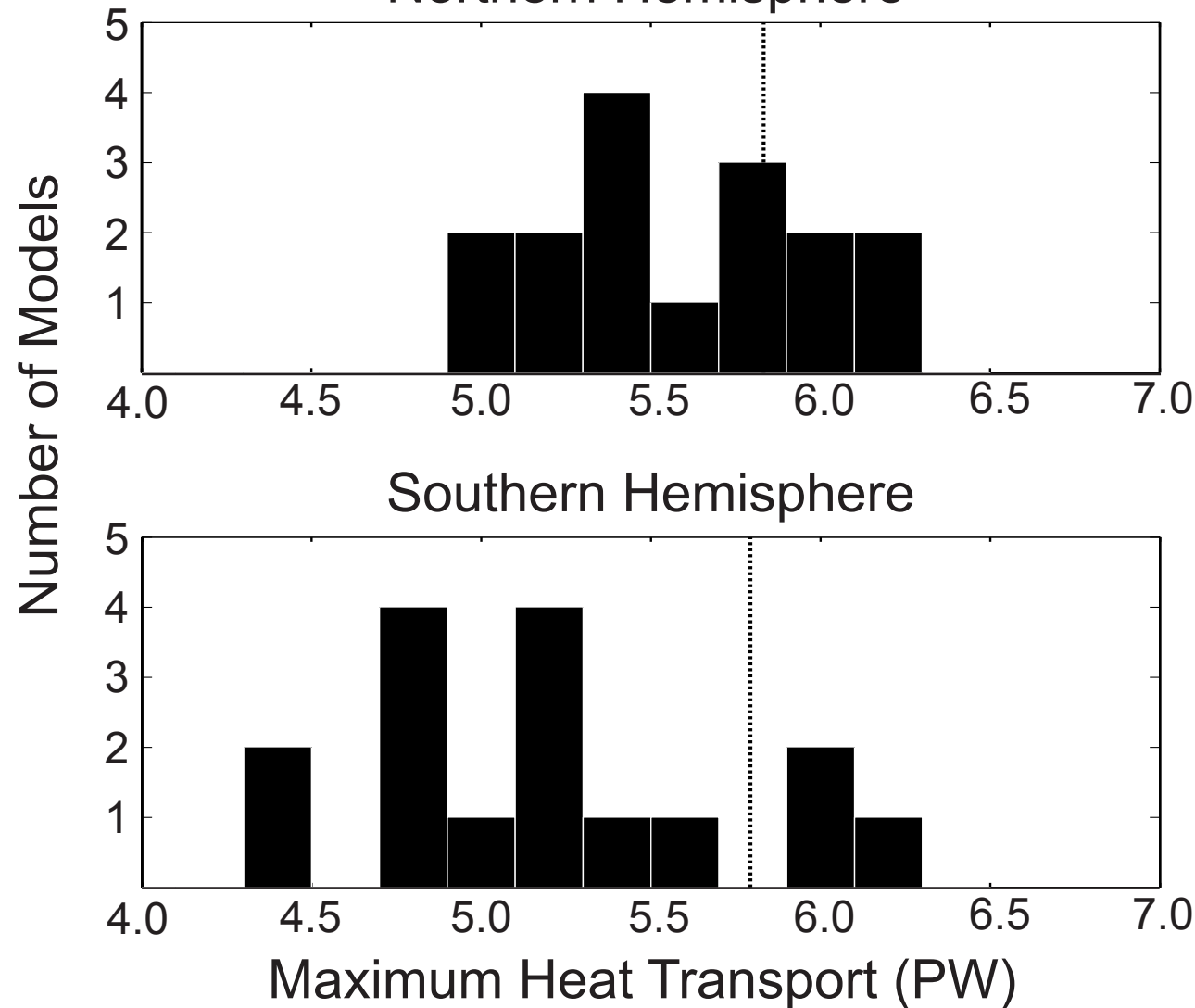


FIG. 2. (A) Meridional structure of meridional heat transport for the observations (thick-solid line) and each of the CMIP3 PI simulations (thin-dashed lines). (B) Histogram of maximum heat transport (MHT_{MAX}) in the Northern Hemisphere (NH). The observational value is shown by the dashed vertical line. (C) As in (B) except for the Southern Hemisphere (SH).

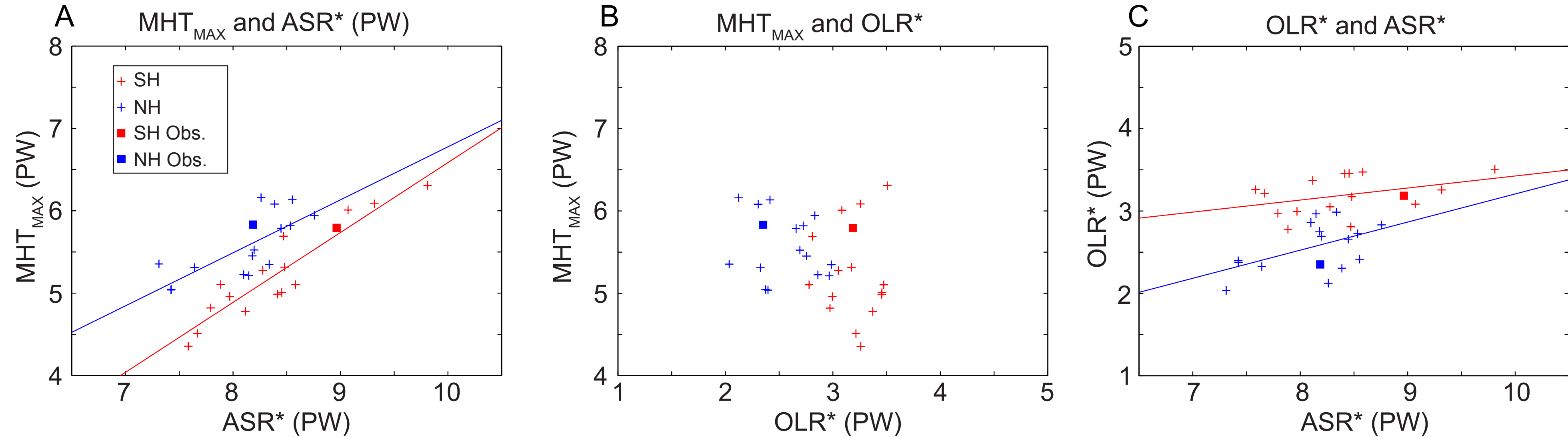


FIG. 3. (A) Maximum heat transport (MHT_{MAX}) versus ASR^* in each the NH and SH (blue and red plus signs) of the CMIP3 PI model ensemble and observations (filled squares). (B) As in (A) except for MHT_{MAX} versus OLR^* . (C) As in (A) except for OLR^* versus ASR^* . The blue and red lines are the linear best fits in the SH and NH and are only shown where significant.

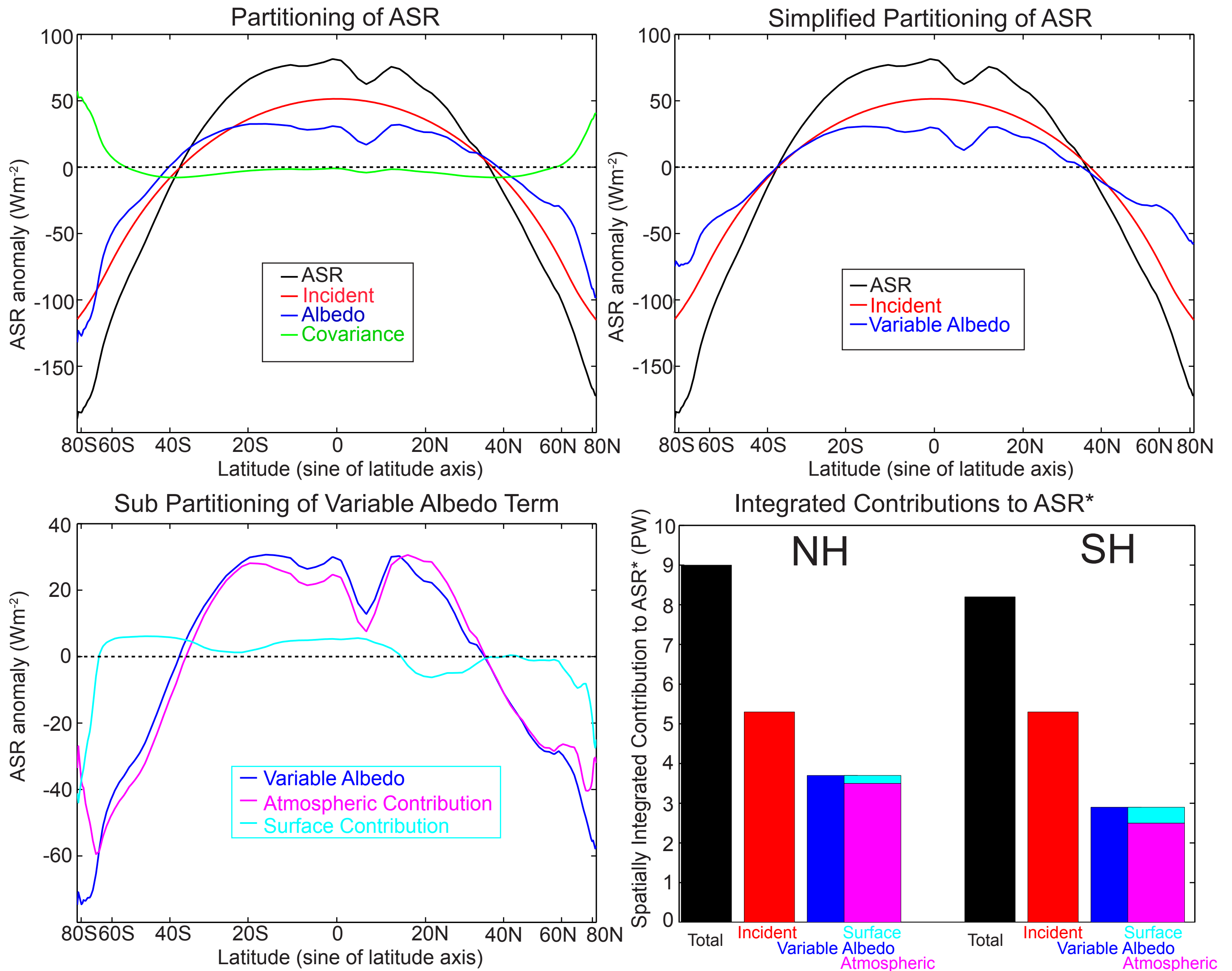


FIG.4. (A) CERES Zonal average ASR anomalies from the global average (black) partitioned into incident (red), albedo (blue), and covariance (green) terms via Eq. 10. (B) As in (A), except combining the albedo and covariance terms into a variable albedo term (blue) as discussed in the text. (C) The subdivision of the variable albedo term into atmospheric (magenta line) and surface reflection (cyan line) terms as discussed in section 3B. (D) The contribution of each of the terms to ASR* in each hemisphere, calculated from the spatial integral of the curves over the extra-tropics (colors are the same as the curves in the previous panels).

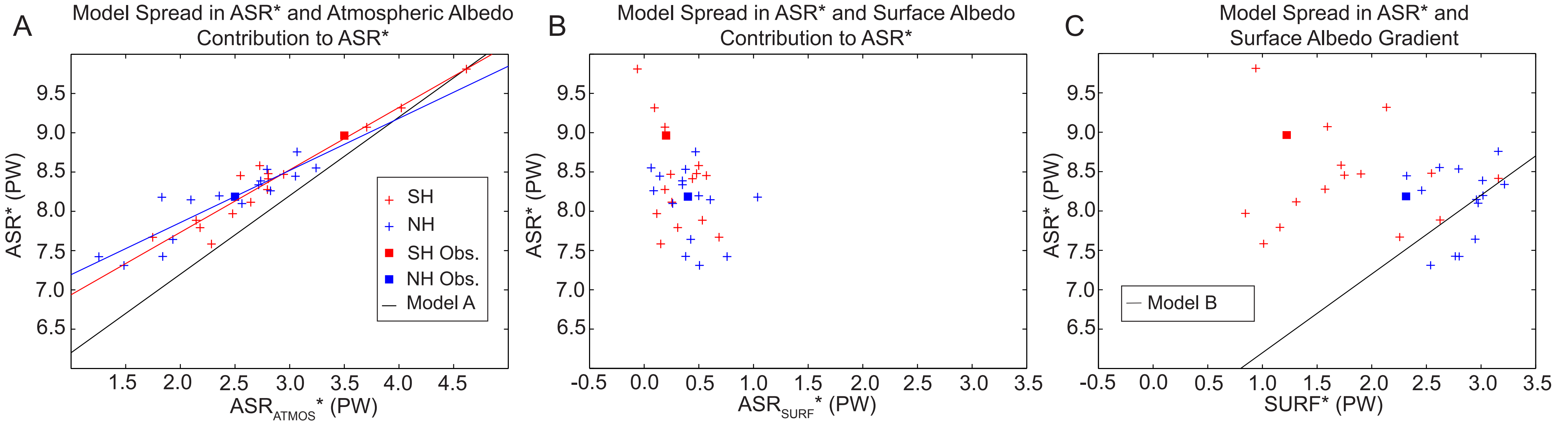


FIG.5. (A) ASR* versus atmospheric reflection contribution to ASR*(ASR*_{ATMOS}) in each the NH and SH (blue and red plus signs) of the CMIP3 PI model ensemble and observations (filled squares). The theoretical prediction of “Model A”, as discussed in the text, is given by the black line. (B) As in (A) except plotted against surface albedo contribution to ASR* (ASR*_{SURF}). (C) As in (B) except for the surface albedo gradient (SURF*). The theoretical prediction of “Model B”, as discussed in the text, is given by the black line. The blue and red lines are the linear best fits in the SH and NH and are only shown where significant.

Model spread in peak MHT and Atmospheric contribution to ASR*

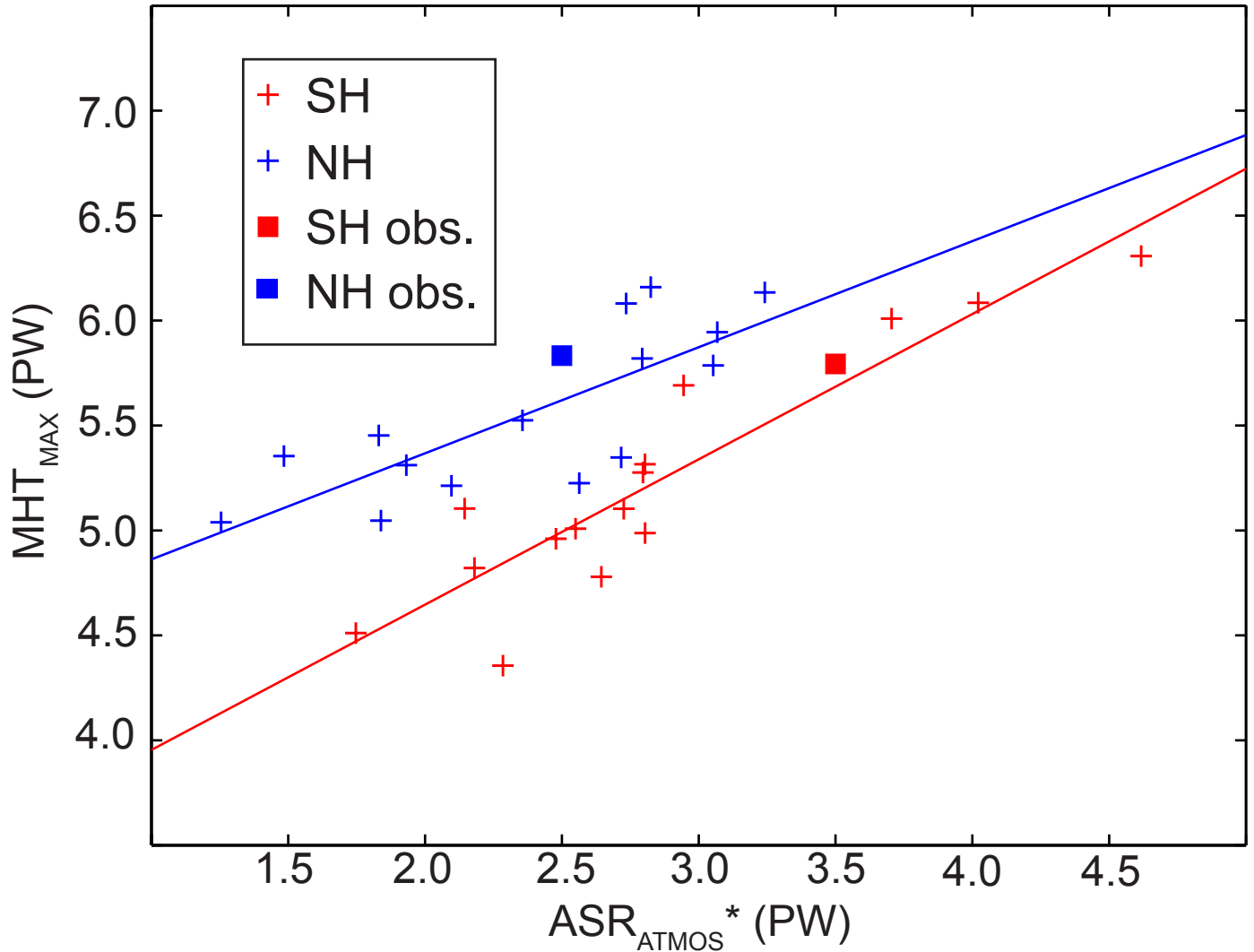


Figure 6. MHT_{MAX} versus atmospheric reflection contribution to ASR* (ASR_{ATMOS}^*) in each the NH and SH (blue and red plus signs) of the CMIP3 PI model ensemble and observations (filled squares). The blue and red lines are the linear best fits in the SH and NH and are only shown where significant.

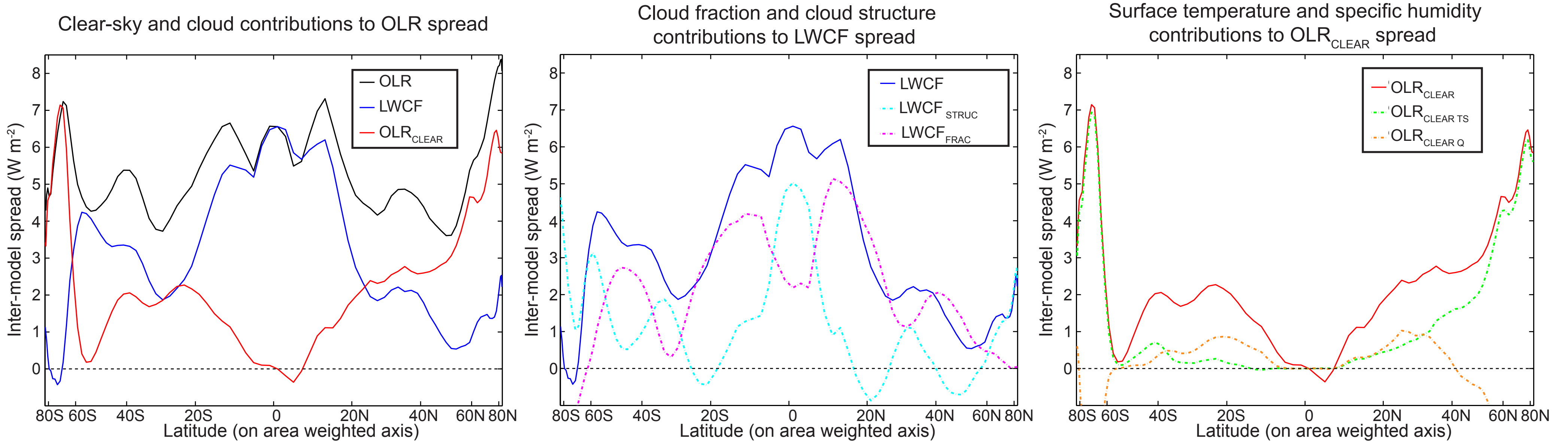


FIG. 7. (A) CMIP3 inter-model spread in OLR decomposed in cloud (LWCF) and clear sky ($\text{OLR}_{\text{CLEAR}}$) components as described in the text. (B) The LWCF contribution to the inter-model spread in OLR decomposed into cloud fraction ($\text{LWCF}_{\text{FRAC}}$) and cloud structure ($\text{LWCF}_{\text{STRUC}}$) components. (C) The $\text{OLR}_{\text{CLEAR}}$ contribution to the inter-model spread in OLR decomposed into components that are linearly congruent with the surface temperature spread ($\text{OLR}_{\text{CLEAR TS}}$) and the vertically integrated specific humidity spread ($\text{OLR}_{\text{CLEAR Q}}$).

Regression of normalized ASR* onto radiative anomalies

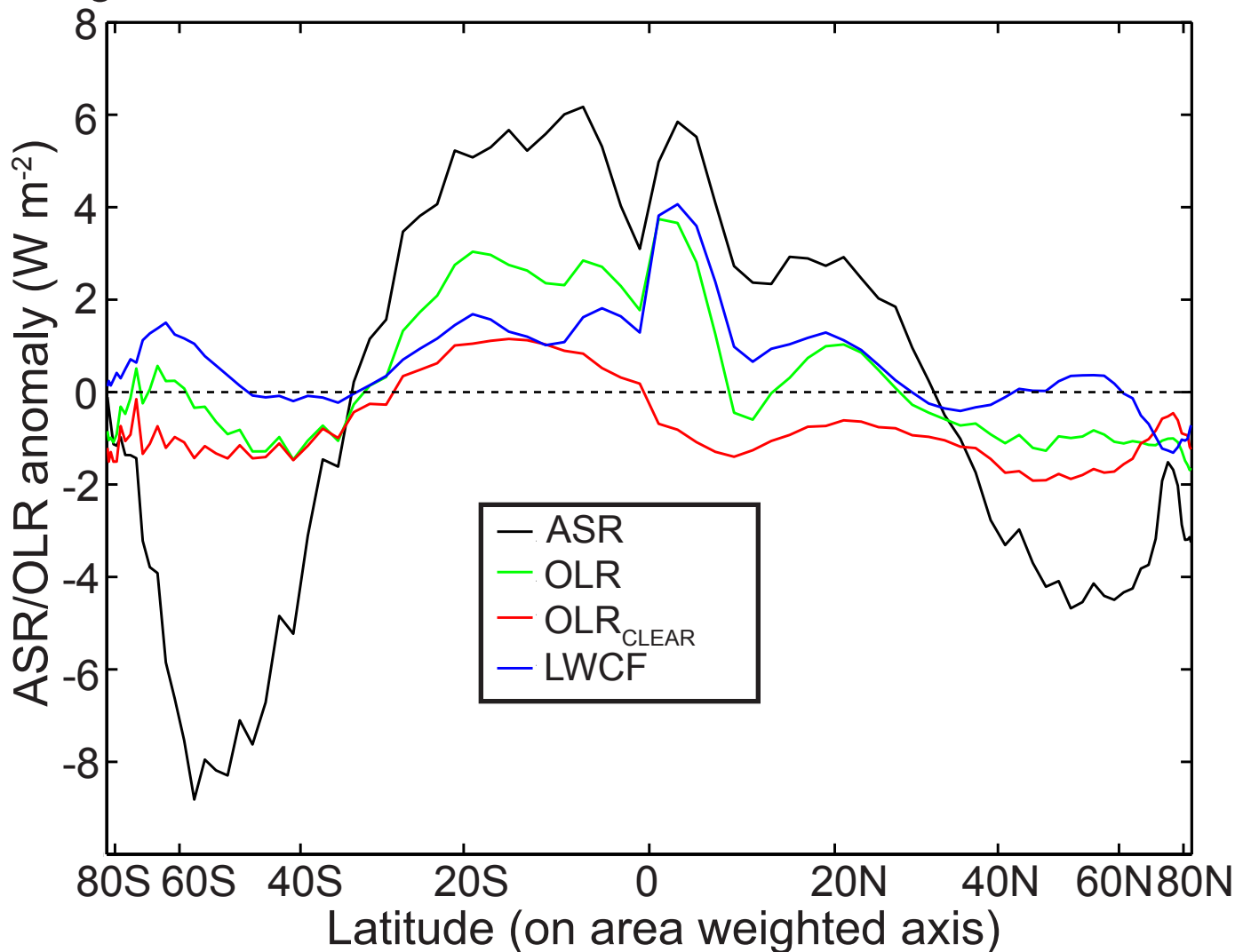


FIG. 8. Regression of the normalized inter-model spread in ASR* on to the inter-model anomalies of ASR (black), OLR (green), OLR_{CLEAR} (red), and LWCF (blue). The resulting curves are the radiative anomalies associated with a one-standard deviation ASR* anomaly.