

Supplementary Materials:

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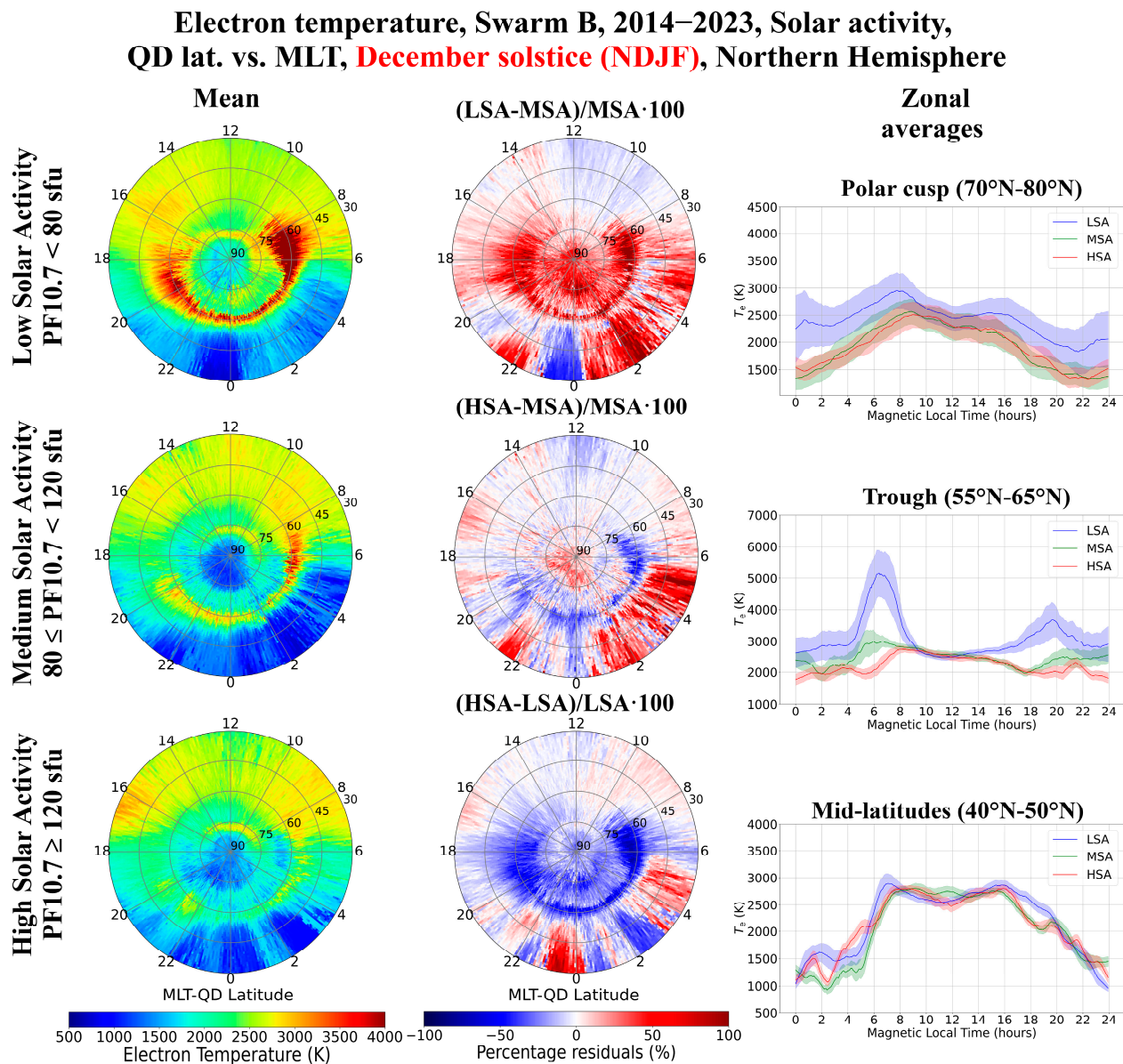


Figure S1. (First column plots) Polar maps in MLT vs. QD latitude of the mean electron temperature from Swarm B LP observations recorded in the period of 2014–2023, for the December solstice season (November, December, January, February) and the Northern hemisphere, as a function of solar activity level. Polar maps encompass the QD latitudes from 30°N to the North geomagnetic pole. First row plot for low solar activity, second row for medium solar activity, and third row for high solar activity. (Second column plots) Polar maps of percentage residuals between mean electron temperature recorded at a different solar activity level. Specifically, top plot for the percentage residuals between low and mid solar activity level, middle plot for the percentage residuals between high and mid solar activity level, and bottom plot for the percentage residuals between high and low solar activity level. (Third column plots) Mean zonal, i.e., latitudinal, (solid lines) and standard deviation (shaded area) electron temperature values for three different latitudinal ranges and for different solar activity levels (blue for low, green for medium, and red for high solar activity). From top to bottom: polar cusp, mid-latitude ionospheric trough, and mid latitudes.

Electron temperature, Swarm B, 2014–2023, Solar activity, QD lat. vs. MLT, **June solstice (MJJA), Northern Hemisphere**

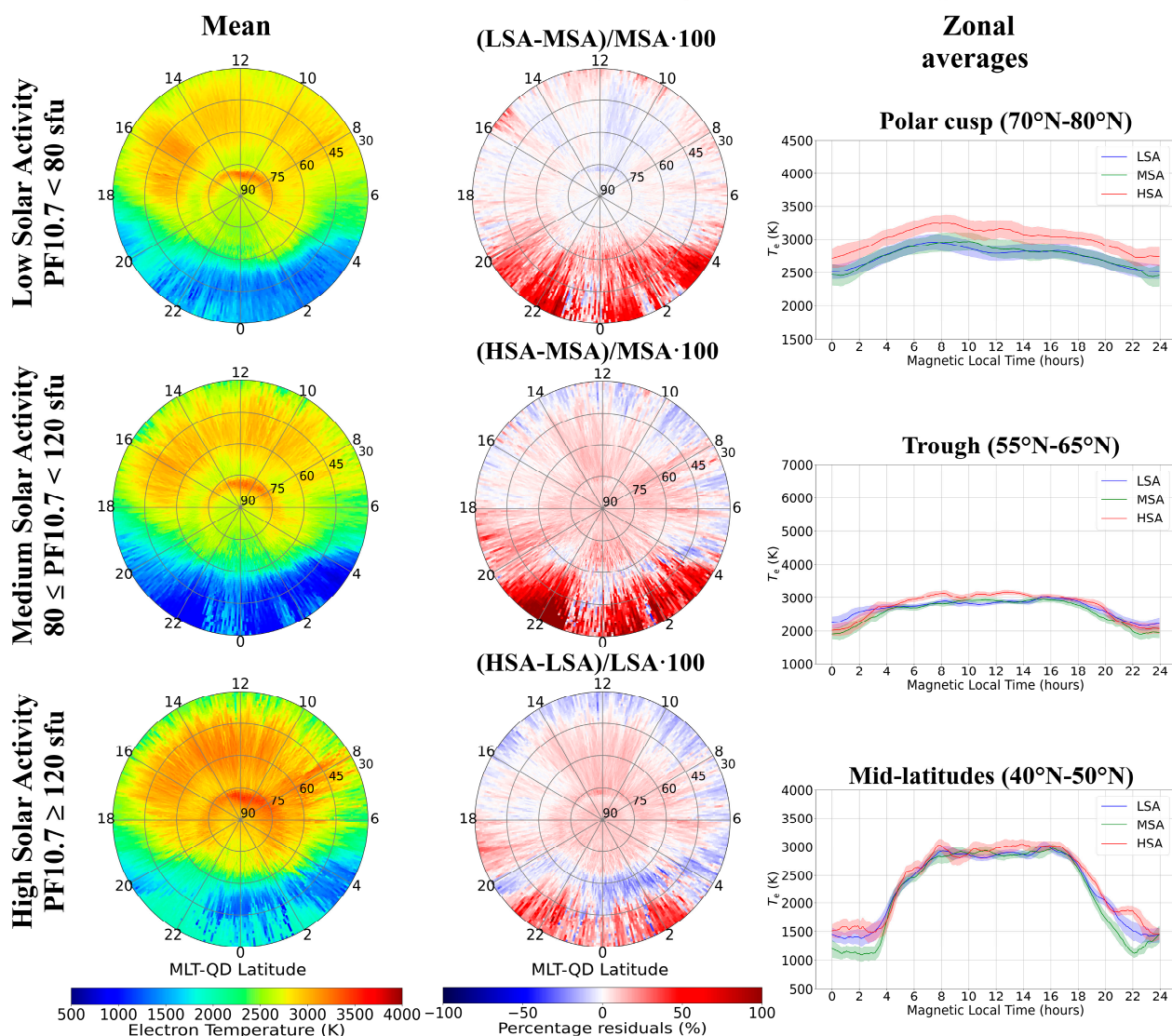


Figure S2. Same as Figure S1 but for the June solstice season (May, June, July, August).

Electron temperature, Swarm B, 2014–2023, Solar activity, QD lat. vs. MLT, **Equinoxes (MASO)**, Northern Hemisphere

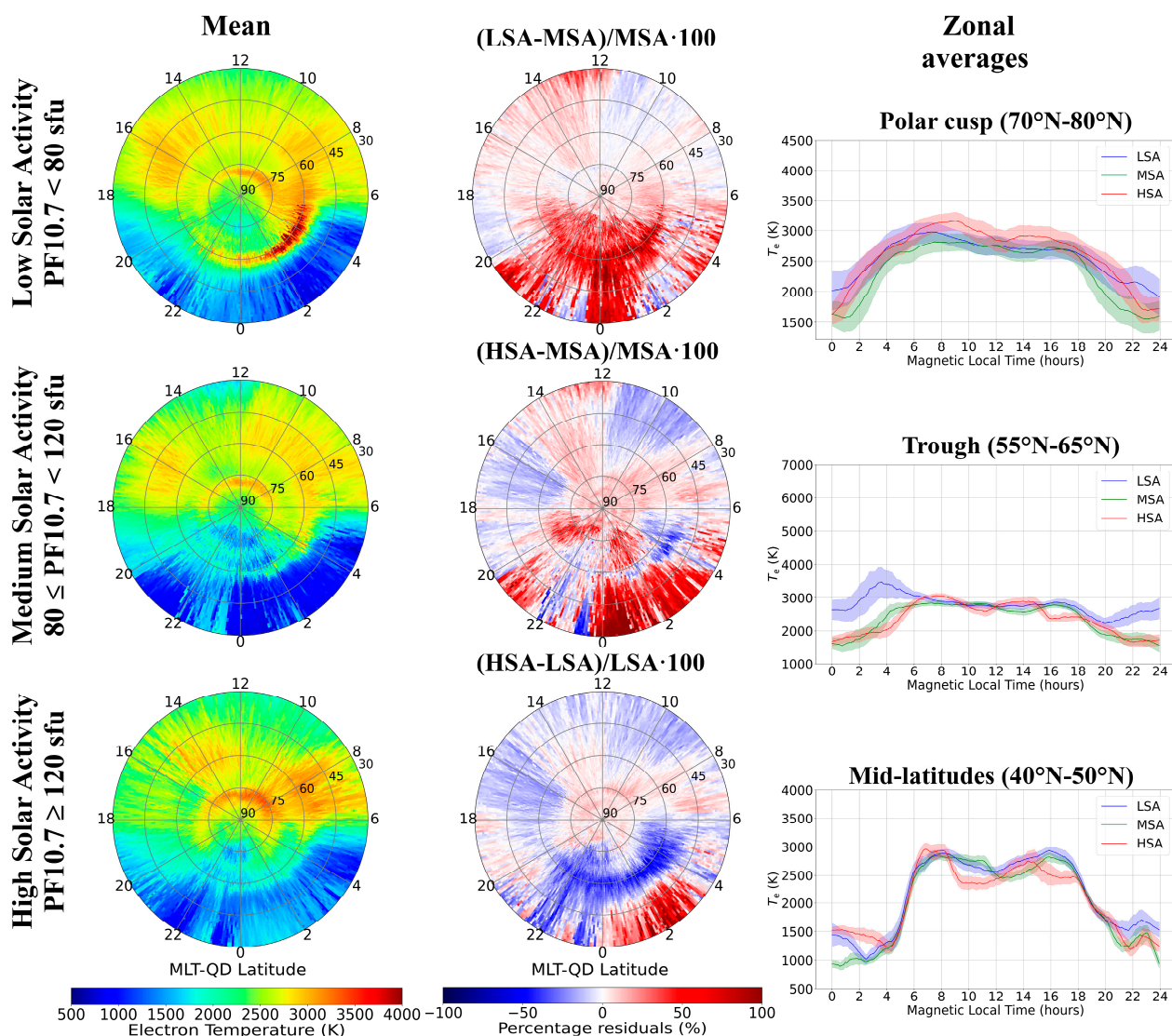


Figure S3. Same as Figure S1 but for the Equinoxes season (March, April, September, October).

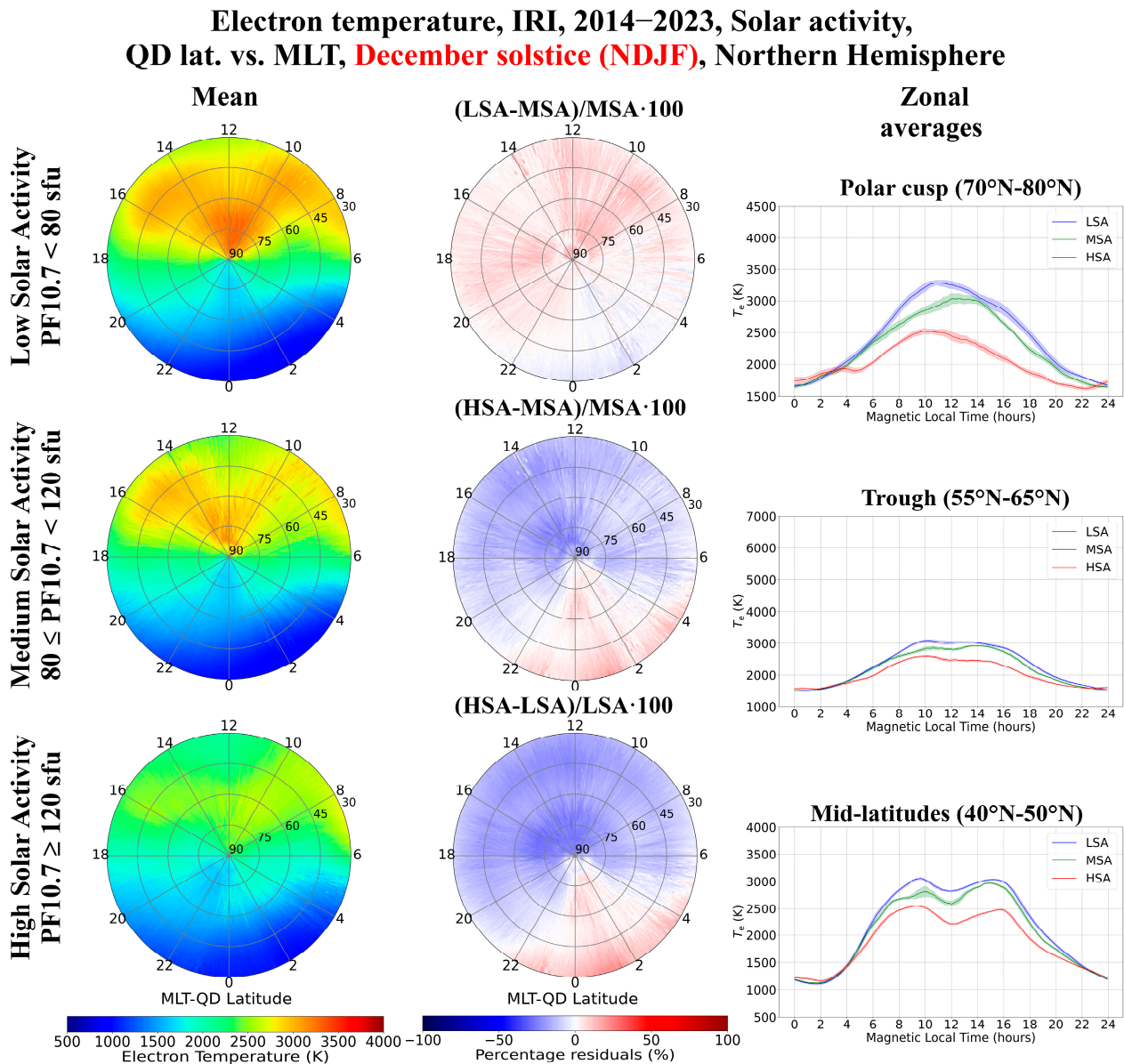


Figure S4. (First column plots) Polar maps in MLT vs. QD latitude of the mean electron temperature modeled by IRI along the Swarm B orbits recorded in the period of 2014–2023, for the December solstice season (November, December, January, February) and the Northern hemisphere, as a function of solar activity level. Polar maps encompass the QD latitudes from 30°N to the North geomagnetic pole. First row plot for low solar activity, second row for medium solar activity, and third row for high solar activity. (Second column plots) Polar maps of percentage residuals between mean electron temperature recorded at a different solar activity level. Specifically, top plot for the percentage residuals between low and mid solar activity level, middle plot for the percentage residuals between high and mid solar activity level, and bottom plot for the percentage residuals between high and low solar activity level. (Third column plots) Mean zonal, i.e., latitudinal (solid lines) and standard deviation (shaded area) electron temperature values for four different latitudinal ranges and for different solar activity levels (blue for low, green for medium, and red for high solar activity). From top to bottom: polar cusp, mid-latitude ionospheric trough, and mid-latitudes.



Electron temperature, IRI, 2014–2023, Solar activity, QD lat. vs. MLT, **Equinoxes (MASO), Northern Hemisphere**

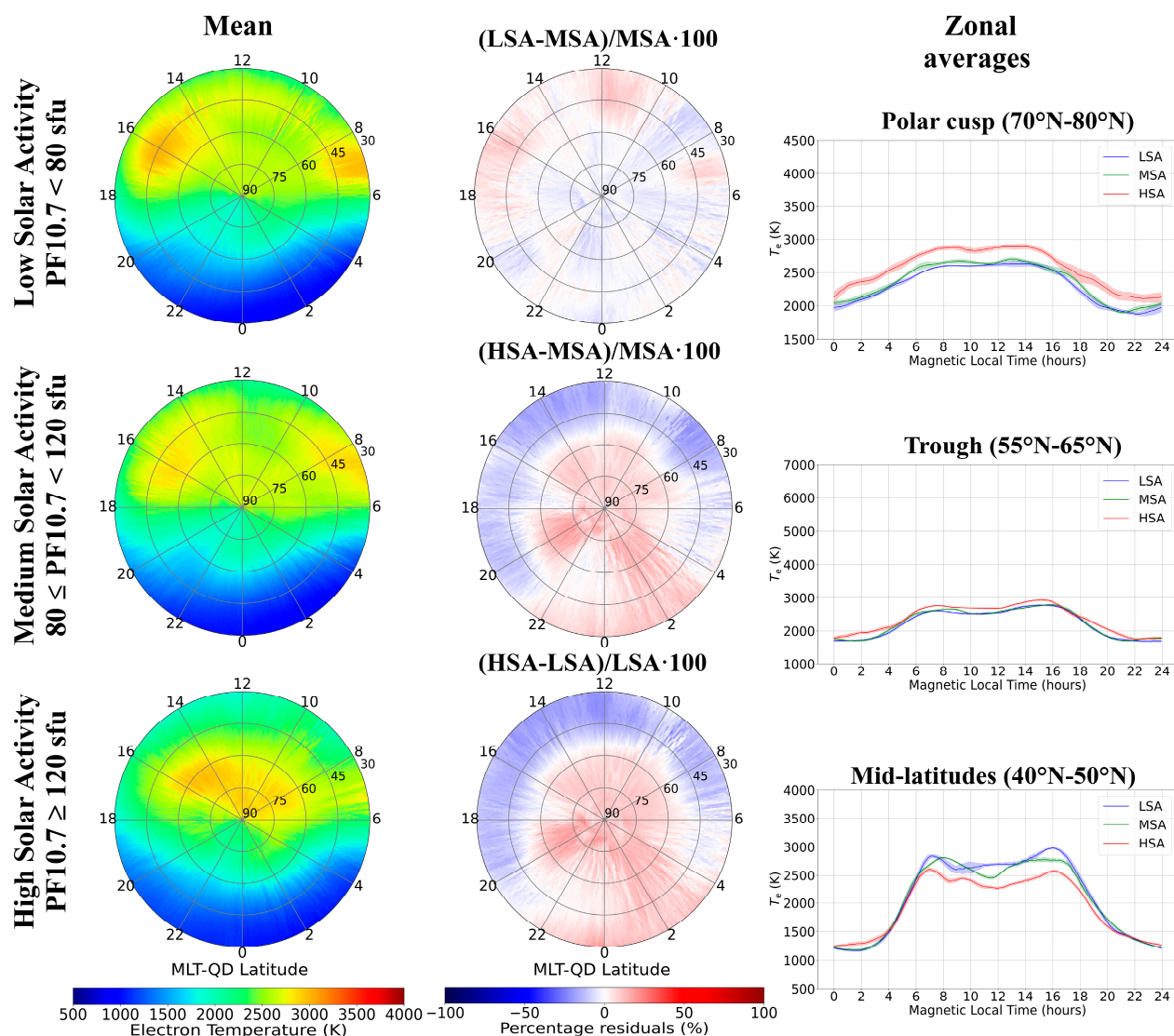


Figure S6. Same as Figure S4 but for the Equinoxes season (March, April, September, October).