

Figure S1. Equatorial omnidirectional fluxes of 56 keV electrons for a) the run with  $B_y < 0$  b)  $B_y > 0$ . The fluxes are shown for the last timesteps (8.00 h) of the two runs. Sun is from the left. Labels indicate magnetic local time and radial distance (in Earth radii).

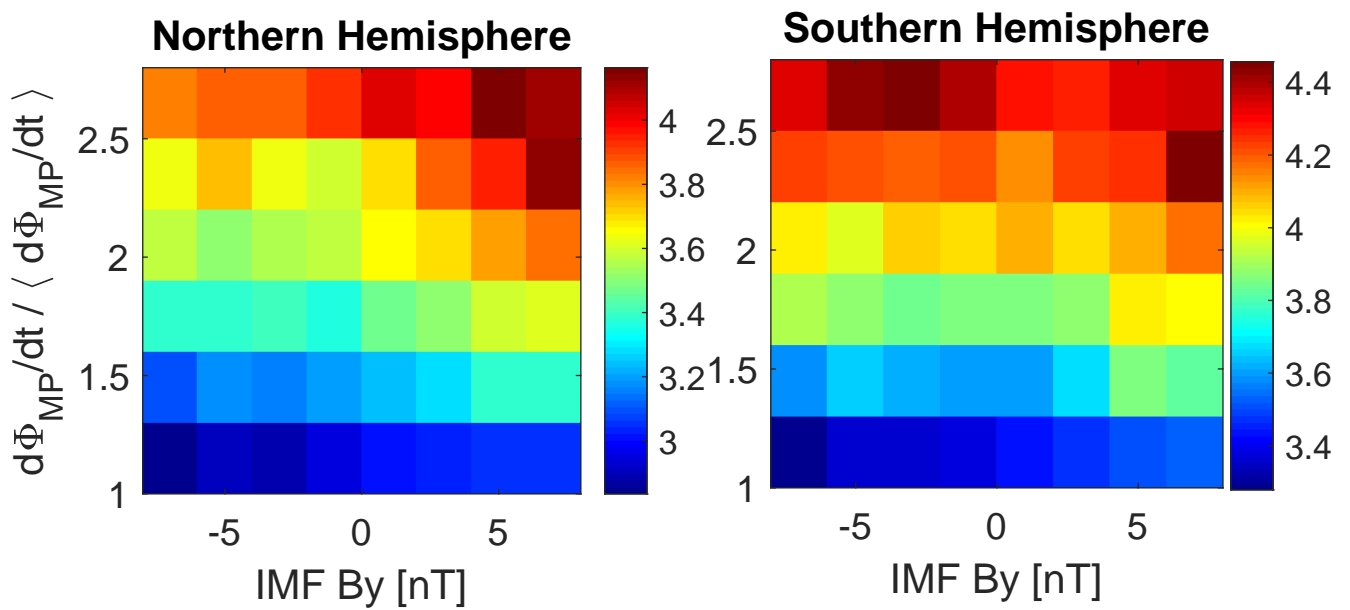


Figure S2. Flux of 30-80 keV protons measured by NOAA POES satellites as a function of 3-hour means of the Newell coupling function and IMF By during NH winter conditions (dipole tilt < -20 degrees) a) in Northern Hemisphere (55...75 degrees corrected geomagnetic latitude) b) Southern Hemisphere (55...75 degrees corrected geomagnetic latitude).

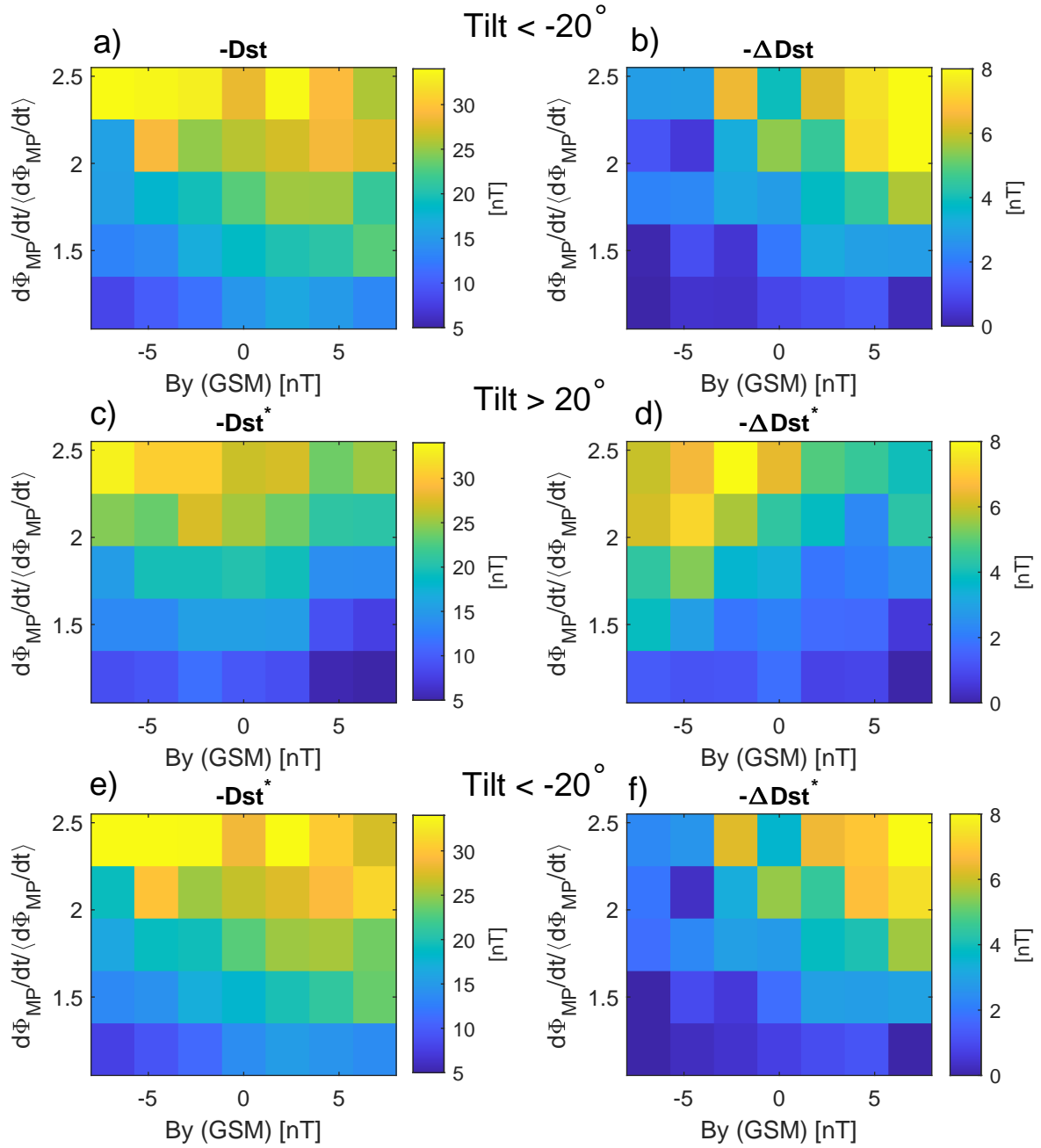


Figure S3. a) The Dst index as a function of 3-hour means of the Newell coupling function and IMF By in NH winter (dipole tilt < -20 degrees). b) The change of the Dst index during the same three-hour intervals as in the panel a). Panels c-d) are similar to panels a-b) but are calculated for positive (>20 degrees) dipole tilt and for the pressure-corrected Dst index (Dst\*). Panels e-f) are similar to panels c-d) but are calculated for negative dipole tilt (< -20 degrees).