

Supporting Information for “Statistical Analysis of Discrete Aurora on Mars: Variability with Magnetic Topology, Local Time and Season”

Krishnaprasad Chirakkil^{1,2,3}, Robert J. Lillis³, Justin Deighan¹, Michael S.

Chaffin¹, Sonal K. Jain¹, David A. Brain¹, Matthew O. Fillingim³,

Raghuram Susarla^{1,2}, Greg Holsclaw¹, Xiaohua Fang¹, Nick M. Schneider¹,

Hoor AlMazmi⁴, Hessa AlMatroushi⁵, Marko Gacesa^{2,6}, Nayla El-Kork^{2,6}

¹Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO, USA

²Space and Planetary Science Center, Khalifa University, Abu Dhabi, UAE

³Space Sciences Laboratory, University of California, Berkeley, CA, USA

⁴United Arab Emirates Space Agency, Abu Dhabi, UAE

⁵Mohammed Bin Rashid Space Centre, Dubai, UAE

⁶Department of Physics, Khalifa University, Abu Dhabi, UAE

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Aurora occurrence difference maps comparing local time bins

Figure S1 shows the percentage of difference in aurora occurrence for the four different local time ranges shown in Figure 9. Figure S1a shows the difference between dusk (19 - 22 hours) and dawn (2 - 5 hours) local times, and Figure S1b shows the difference between pre-midnight (22 - 0 hours) and post-midnight (0 - 2 hours) local times. We can see regions on the planet that activate during different local times. The strong crustal field region in the southern hemisphere exhibits a local time control with north/south (dusk/dawn) and east/west (pre-midnight/post-midnight) preferred activations, possibly related to the different magnetic field configurations at these locations.

Variability of aurora occurrence with subsolar longitude and subsolar latitude

Figure S2 shows the aurora occurrence as a function of subsolar longitude and subsolar latitude. The subsolar longitude, which corresponds to the longitude on Mars where the sun is directly overhead at any given moment, changes as the planet rotates (varying between 0 to 360 degrees), making it analogous to local time. The subsolar latitude however is the latitude on Mars where the sun is directly overhead at noon, and its variation over a Mars year is primarily determined by the axial tilt of Mars (the subsolar latitude varies between approximately +25.19 degrees and -25.19 degrees for Mars). Hence, this is analogous to the concept of seasons on Mars. Higher aurora occurrence is observed when the subsolar longitude is between ~ 140 and 320 degrees and subsolar latitude is between ~ -15 to -25 degrees. This corresponds to perihelion season, and is consistent with the seasonal dependence seen in Figure 10.

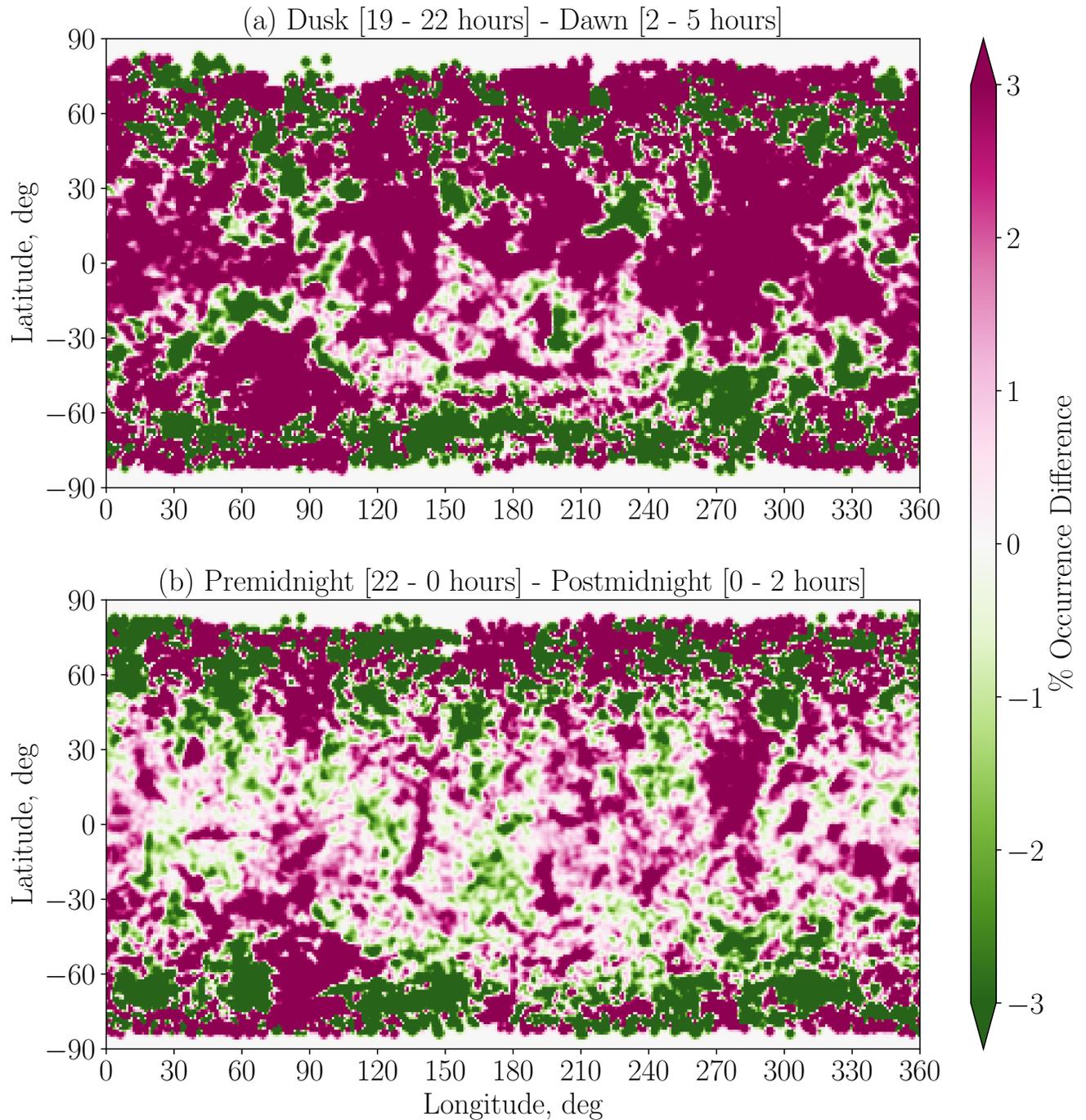


Figure S1. Geographic maps showing percentage of difference in aurora occurrence for the four different local time ranges shown in Figure 9. a) Difference between dusk (19 - 22 hours) and dawn (2 - 5 hours) local times, and b) difference between pre-midnight (22 - 0 hours) and post-midnight (0 - 2 hours) local times.

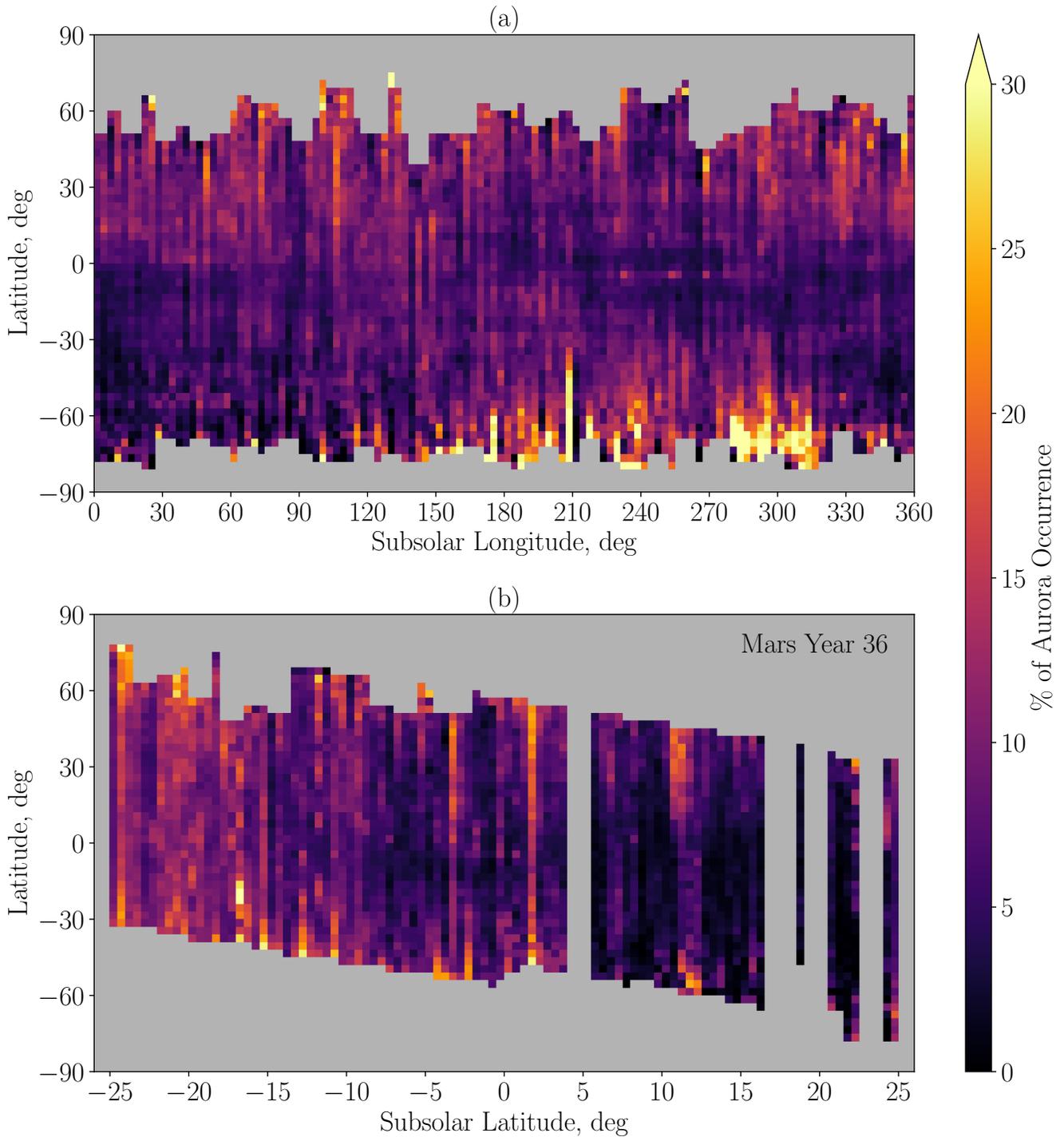


Figure S2. Aurora occurrence as a function of a) subsolar longitude and geographic latitude (all data from MY 36 and MY 37), and b) subsolar latitude and geographic latitude (only MY 36 data).