# Tracing Equator Positions to Poles

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Using the VIP4+Khurana magnetic field model
This model has external currents that are local-time-dependent
We explored mapping from a location in the jovigraphic equator to Jupiter's ionosphere
Took 4 occasions with the dipole pointed at 4 local times – noon, midnight, dawn, dusk

- # Corotation breakdown ~20 RJ
- # Aurora Does Not Trace to 20 R$_J$
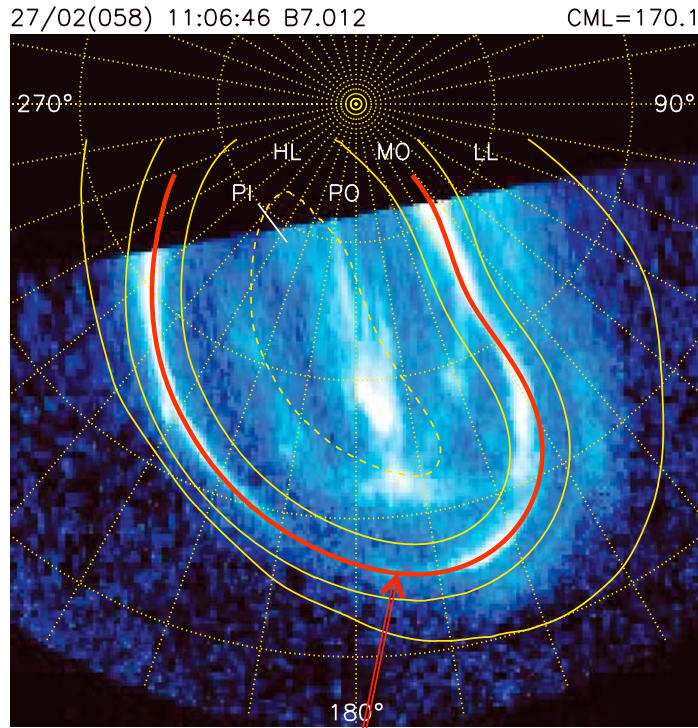
Average location of center of main aurora
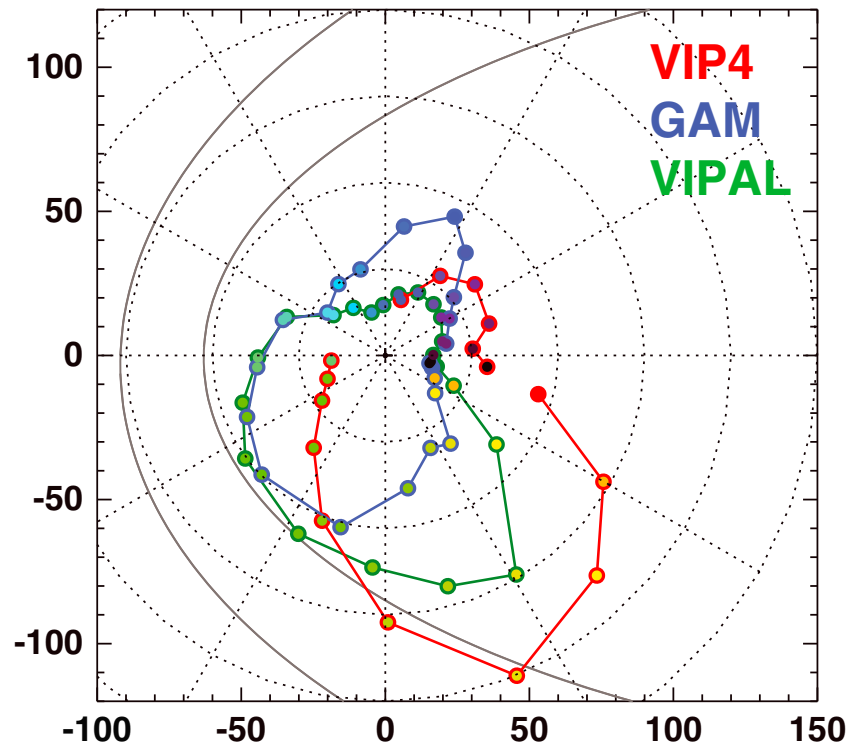
Vogt et al. (2015)

Figure 7. (left) An HST image of Jupiter's northern aurora, shown here in a polar projection. The red line is a reference main emission based on the average location in nearly 1000 HST images taken in 2007. Modified from Nichols et al. [2009, Figure 1]. (right) Mapped equatorial positions of Nichols et al.'s [2009] reference main emission contour for VIP4 (red), GAM (blue), and VIPAL (green), assuming subsolar longitude 180°. The small circles are drawn for each coordinate listed in Table 1 of Nichols et al. [2009], and the fill color varies from black to red for comparison among the three models. The black lines show the compressed and expanded magnetopause locations of Joy et al. [2002]. The Sun is to the left.

Next - try going from the equator to the poles

- Using the VIP4+Khurana magnetic field model

- This model has external currents that are local-time-dependent

- We explored mapping from a location in the jovigraphic equator to Jupiter's ionosphere

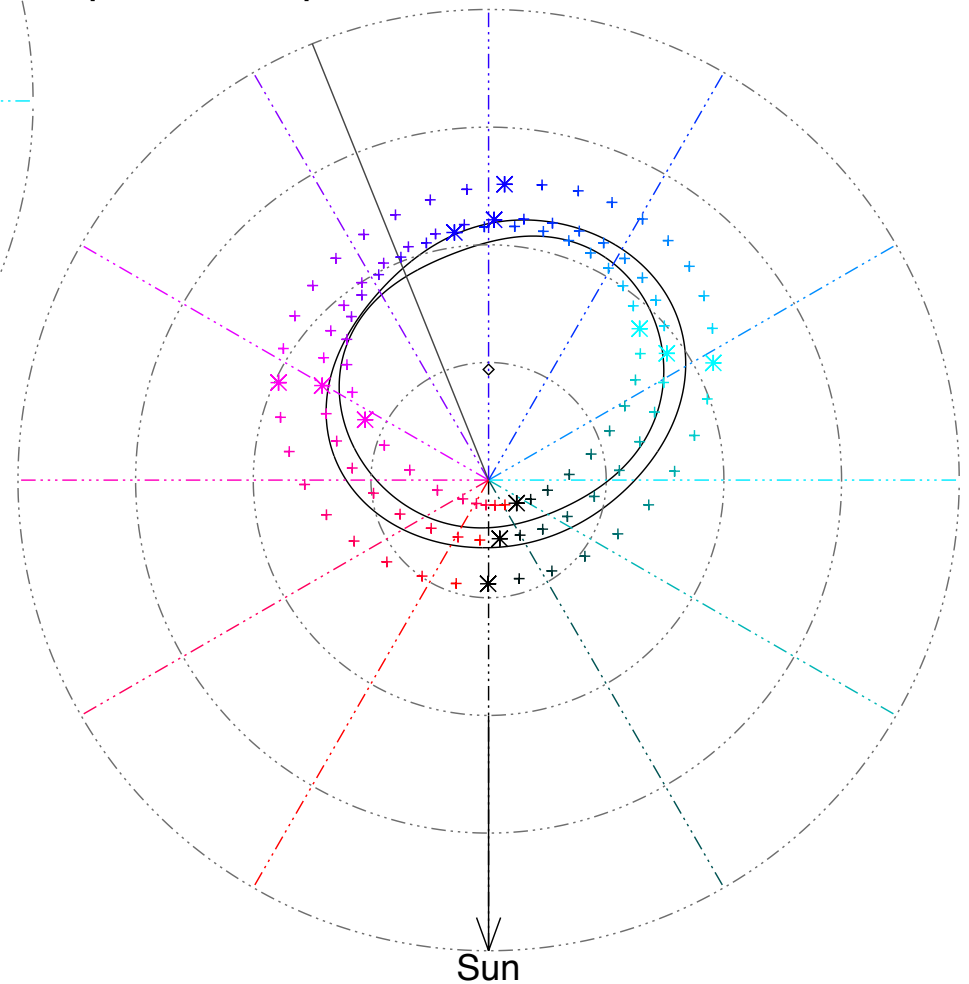- Took 4 occasions with the dipole pointed at 4 local times – noon, midnight, dawn, dusk

Equator Footpoints, Local Time = 12h, North

- Traces from Equator to Poles
- Outer ring from 10 R$_J$
- Middle ring from 30 R$_J$
- Inner Ring from 80 R$_J$

Equator Footpoints, Local Time = 12h, South

Sun

Sun
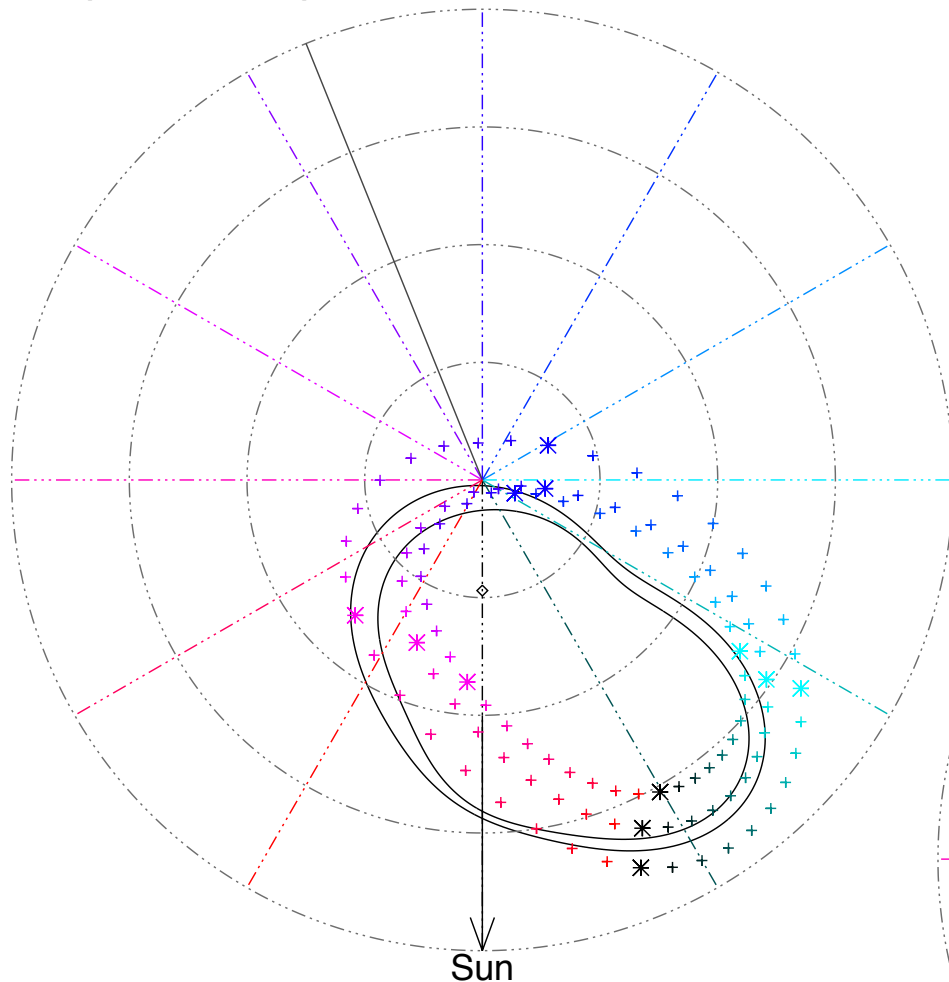
- Colors show local time
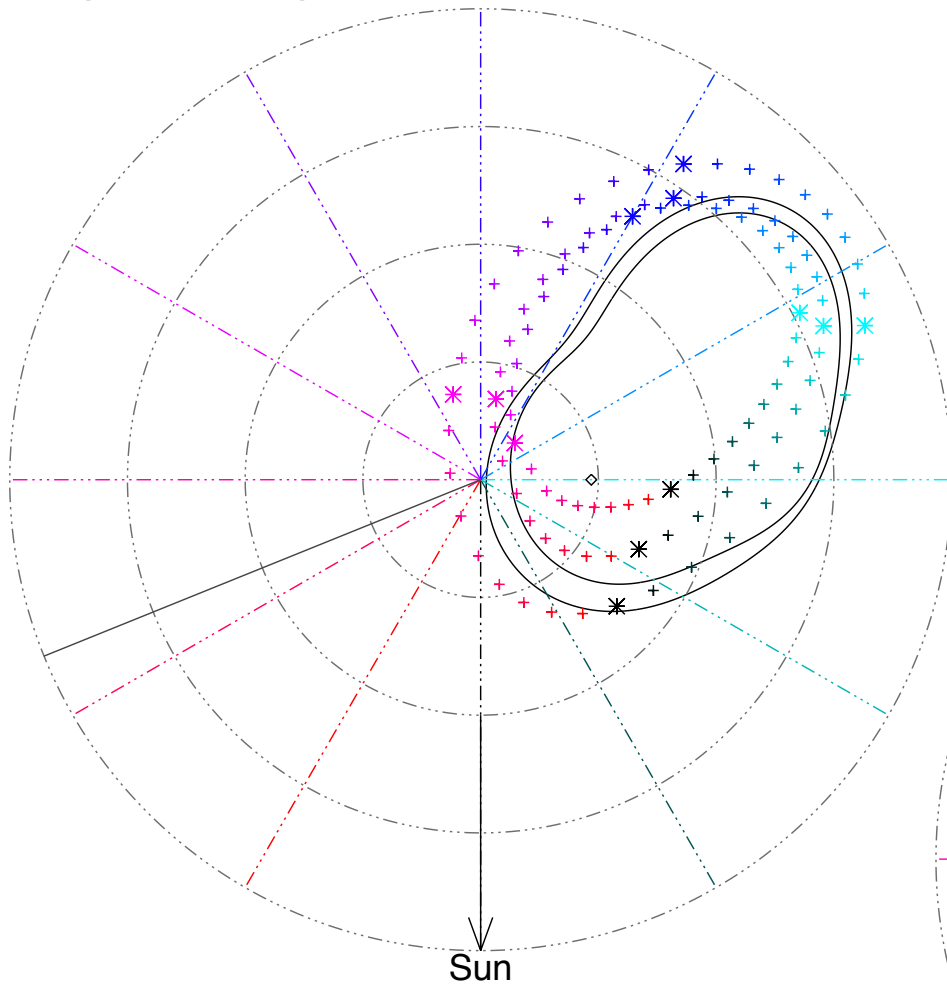- Asterisks from noon, dusk, midnight, and dawn

Equator Footpoints, Local Time = 18h, North

- Traces from Equator to Poles
- Outer ring from 10 R$_J$
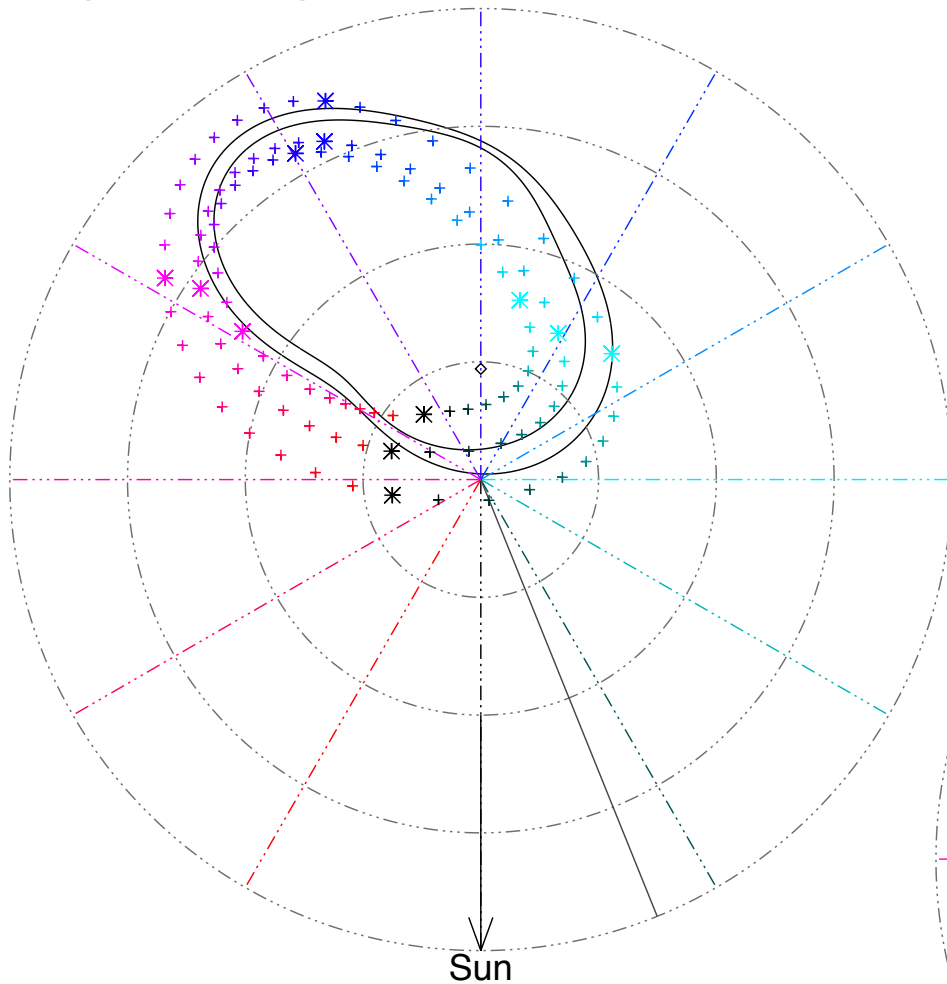- Middle ring from 30 R$_J$
- Inner Ring from 80 R$_J$

Equator Footpoints, Local Time = 18h, South

Sun

- Colors show local time
- Asterisks from noon, dusk, midnight, and dawn
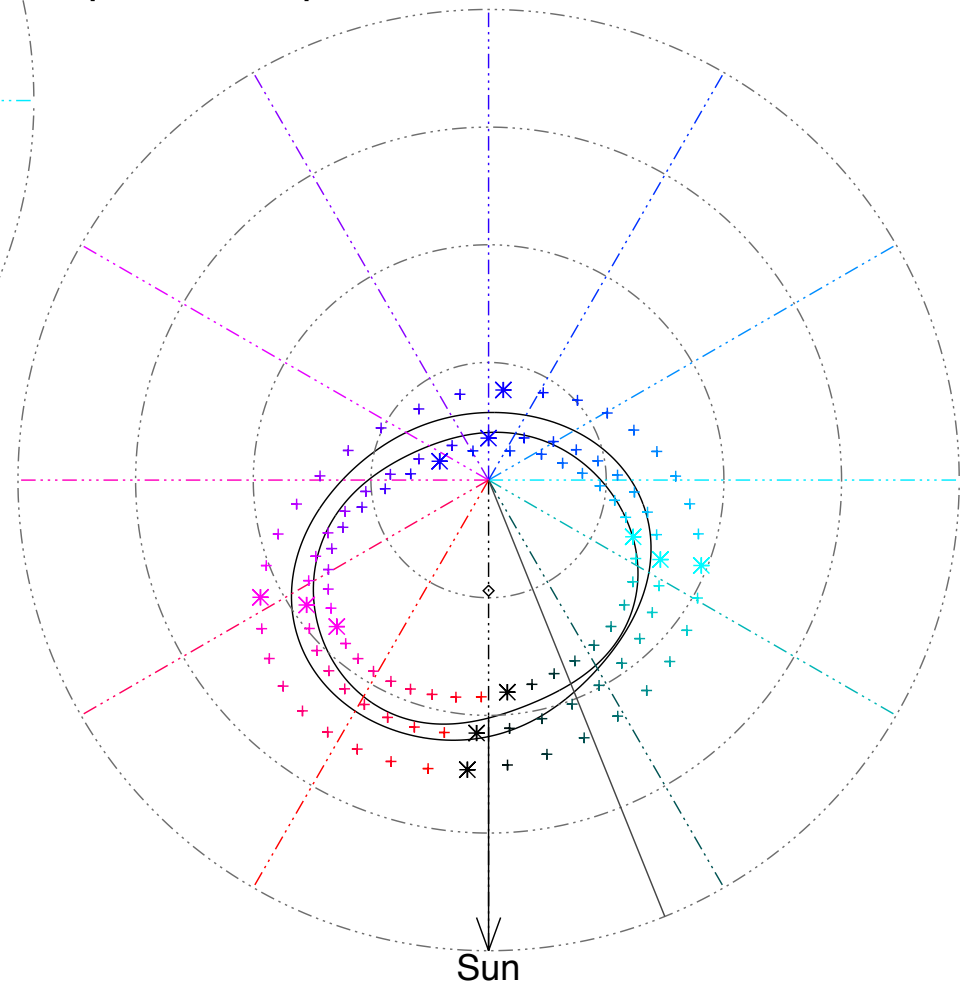
Sun
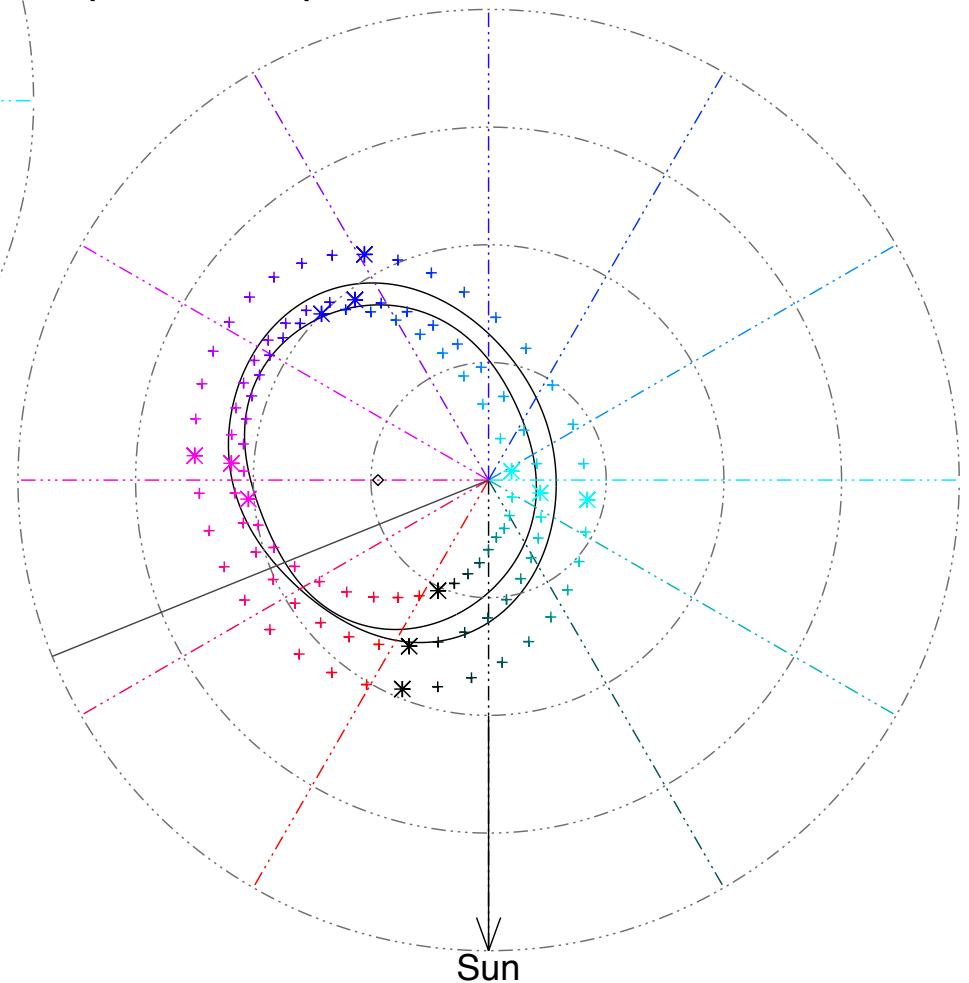
Equator Footpoints, Local Time = 00h, North

Equator Footpoints, Local Time = 00h, South

- Traces from Equator to Poles
- Outer ring from 10 R_J
- Middle ring from 30 R_J
- Inner Ring from 80 R_J

- Colors show local time
- Asterisks from noon, dusk, midnight, and dawn

Sun

Sun

Equator Footpoints, Local Time = 06h, North

Equator Footpoints, Local Time = 06h, South

- Traces from Equator to Poles
- Outer ring from 10 R_J
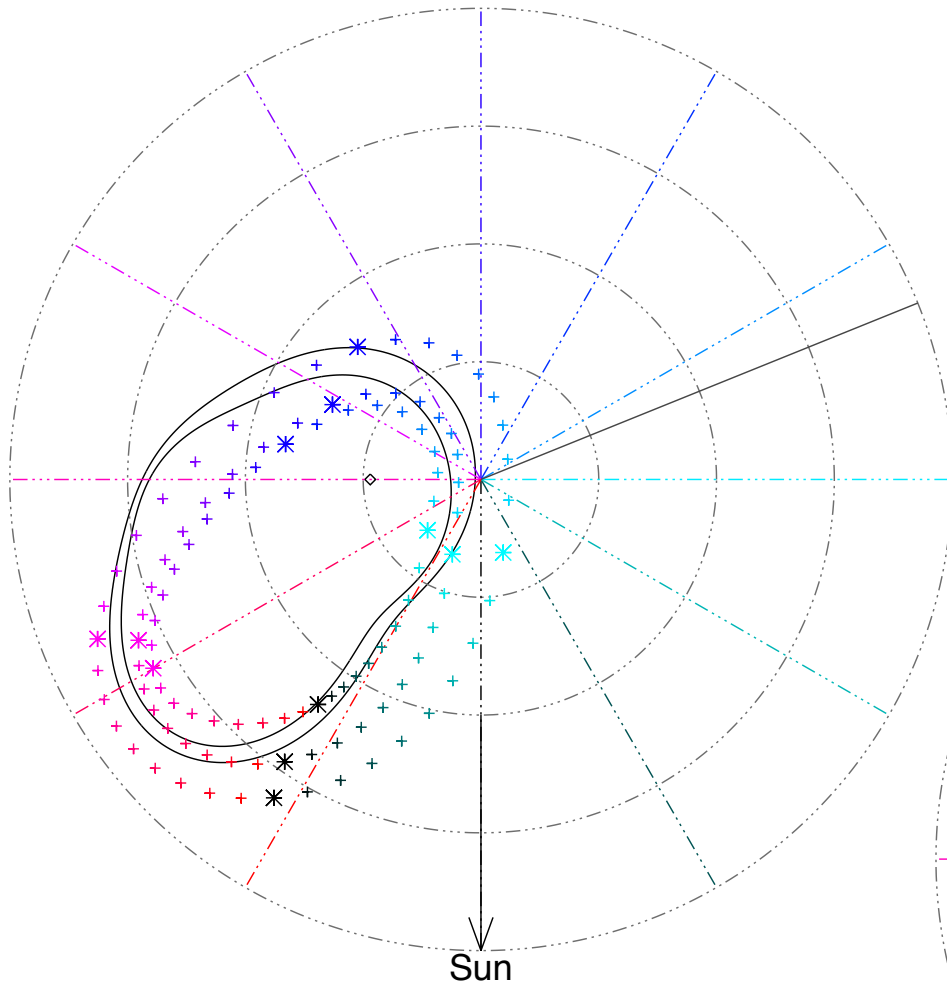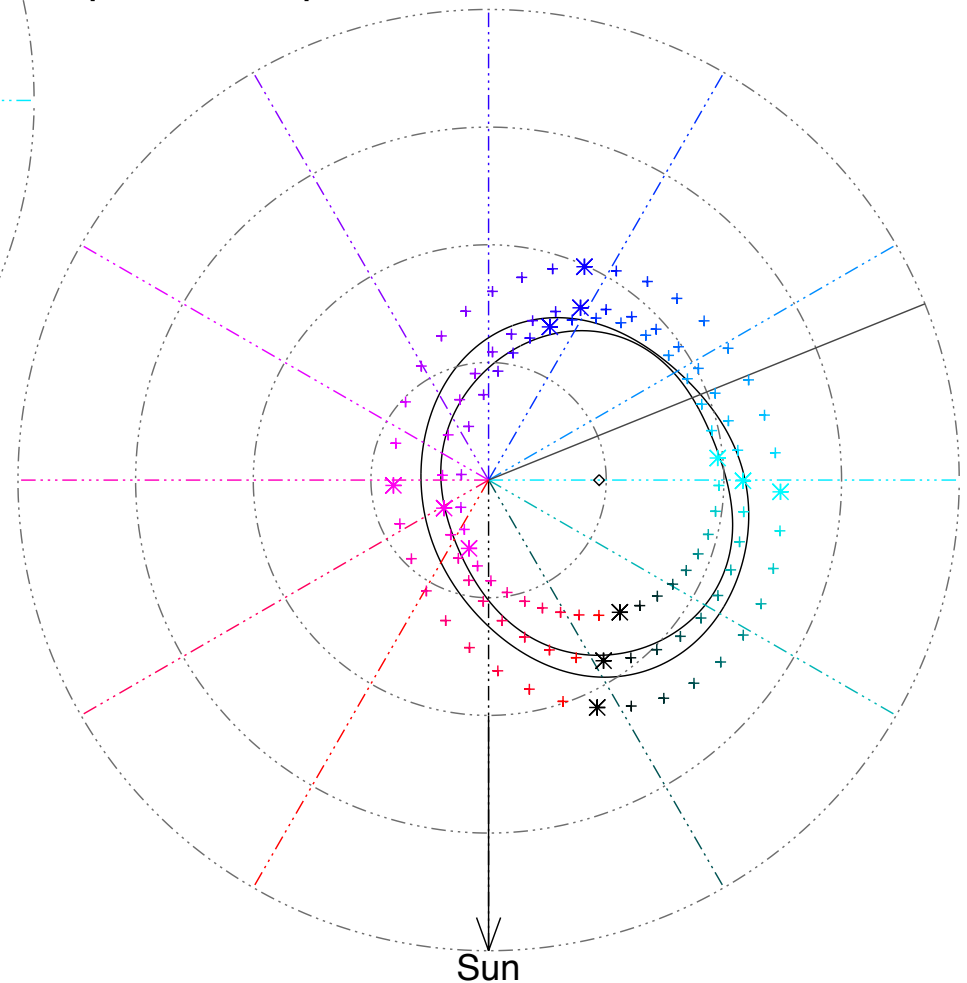- Middle ring from 30 R_J
- Inner Ring from 80 R_J

- Colors show local time
- Asterisks from noon, dusk, midnight, and dawn

Sun

Conclusions

- Local times on equator can map to very different local time in the ionosphere – and varies with where "dipole" is pointing.

- The main aurora maps to different equator distances depending on local time and longitude