Starlink satellite loss and a knowledge gap in thermosphere

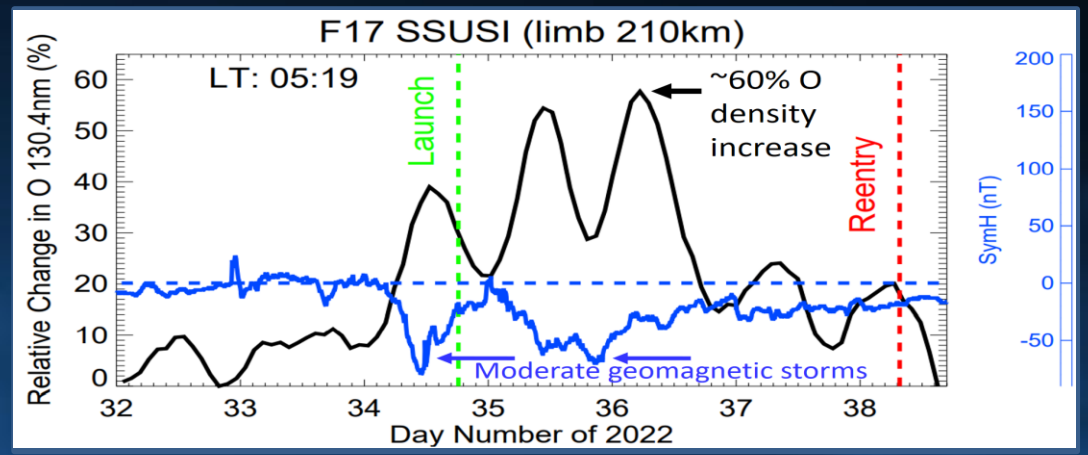

Figure 1. O 130.4 nm limb radiance changes at 210 km, geomagnetic index SymH, Starlink launch (Feb 3) to an initial orbit at 210 km and reentry (Feb 7).

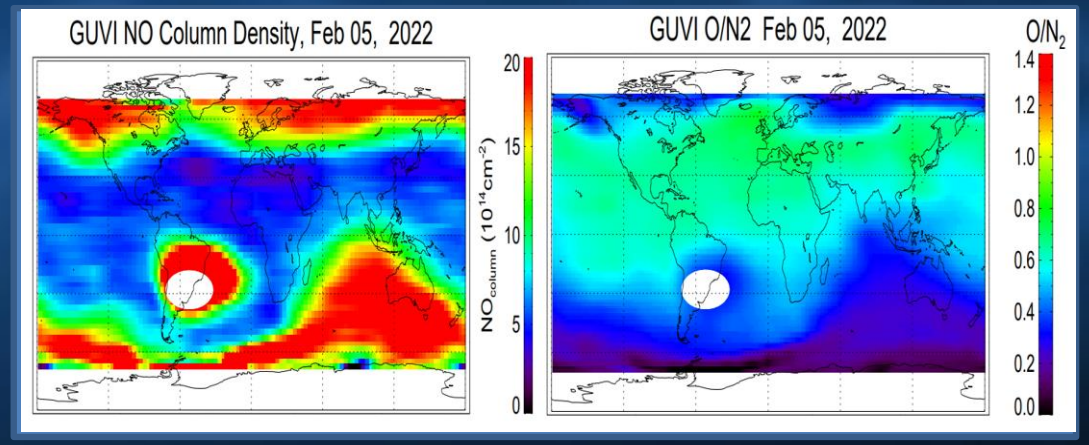

Figure 2. High thermospheric temperature/density revealed by significantly enhanced nitric oxide (left) and decrease in O/N2 ratio.

Significant thermospheric density increase directly caused the loss of ~40 Starlink satellites during moderate geomagnetic storms in early February, 2022.

- APL built FUV instruments revealed up to ~60% neutral density enhancements around 210 km during the geomagnetic storms: A new knowledge.
- A Climatology model showed only ~5-6% density increase at 210 km during the storms.
- In addition to the density increase, the storms also caused significant increase and decrease in column nitric oxide (NO) density and O/N2 column density ratio, respectively.

Zhang et al., (2022) *Space Weather, e2022SW003168*