

S1 Supplementary information

Figure C1 in the main text illustrates the altitude profiles of all quantities needed for the calculation of \mathbf{U}_H and \mathbf{U}_P for the MIST rocket launch at 09:52 UT on January 26, 2015. Here we provide additional figures in the same format as Figure C1, one for each of the remaining rocket launches listed in Table 1 of the main text.

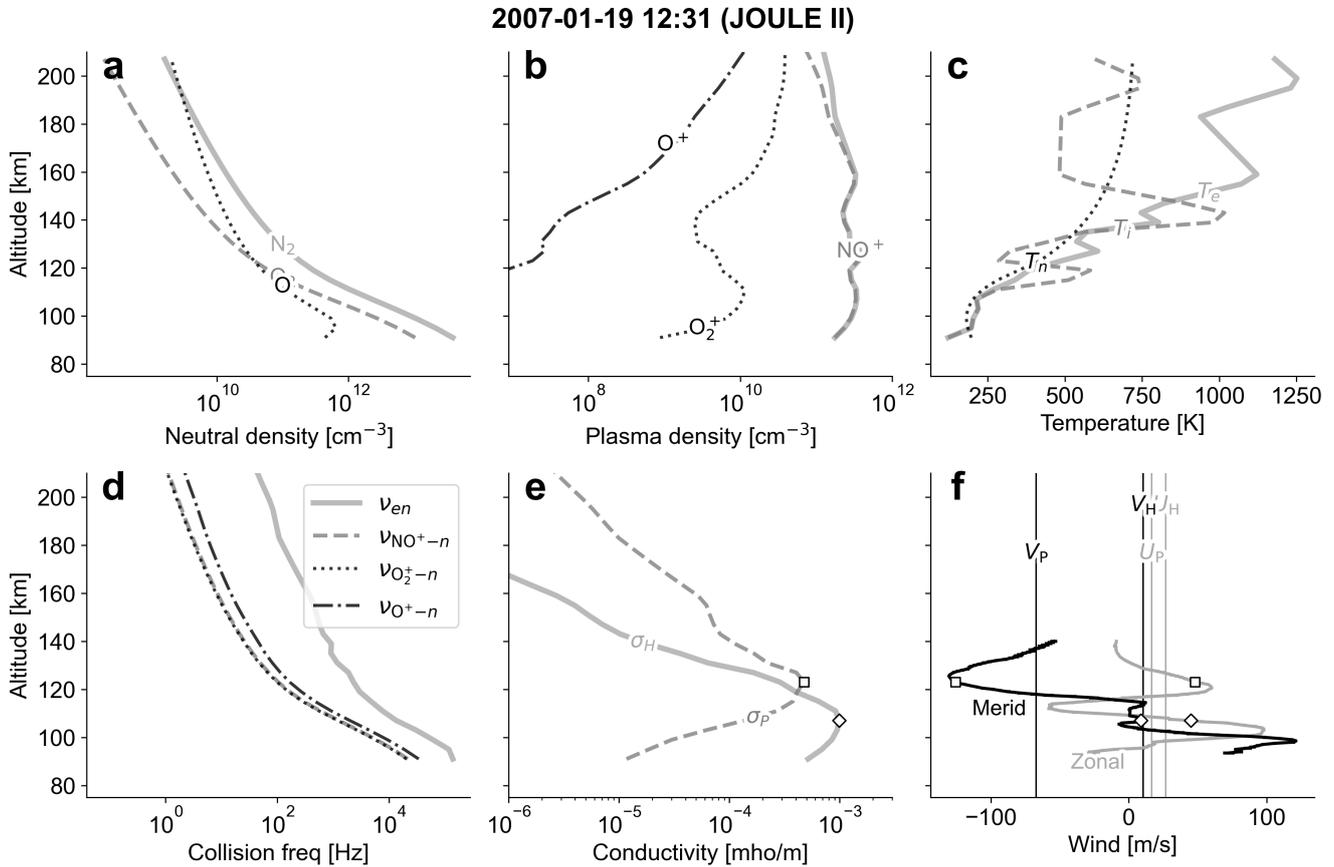


Figure S1. Illustration of altitude profiles needed for calculation of zonal and meridional components of the Hall- and Pedersen-weighted winds, in the same layout as Figure C1 of the main text. These profiles correspond to the JOULE II rocket launched 2007-01-19 at 12:31 UT. (a) Neutral density profiles from NRLMSIS@2.0 model. (b) PFISR plasma density profile (e^-) with fractional ion species densities given by IRI 2016. (c) PFISR electron and ion temperature profiles, and IRI 2016 neutral temperature profile. (d) Ion-neutral collision frequencies calculated from profiles in panels a–c. (e) Hall and Pedersen conductivity profiles (solid and dashed lines). The peaks of the Hall and Pedersen conductivity profiles are respectively indicated by a diamond and a square. (f) Neutral wind profiles. Zonal (U_H and U_P) and meridional (V_H and V_P) components of the Hall- and Pedersen-weighted neutral winds are indicated with vertical lines. Neutral wind components at peaks of the Hall and Pedersen conductivity profiles respectively also indicated by diamond and square symbols.

2007-01-19 12:47 (JOULE II)

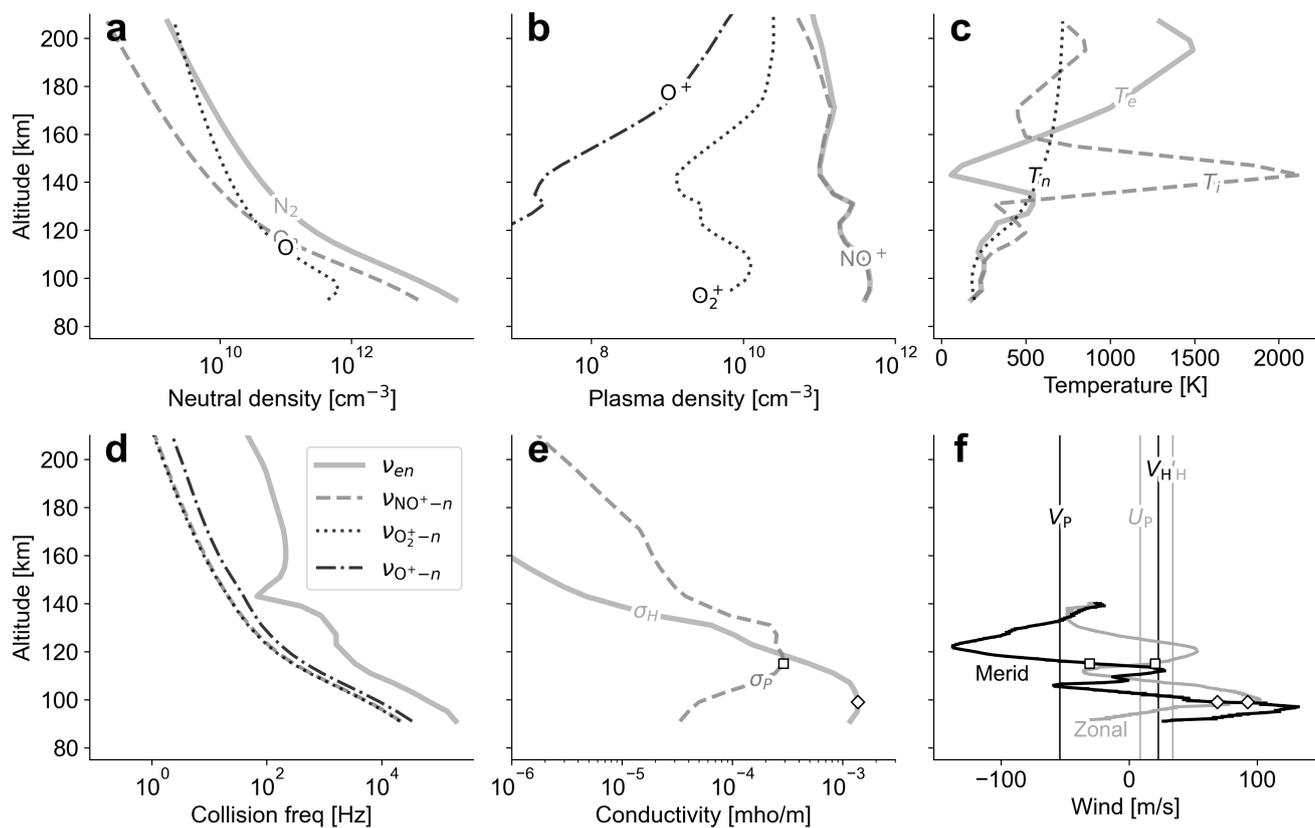


Figure S2. Illustration of altitude profiles associated with the JOULE II rocket launched 2007-01-19 at 12:47 UT, in the same layout as Figure C1 of the main text.

2007-01-19 12:48 (JOULE II)

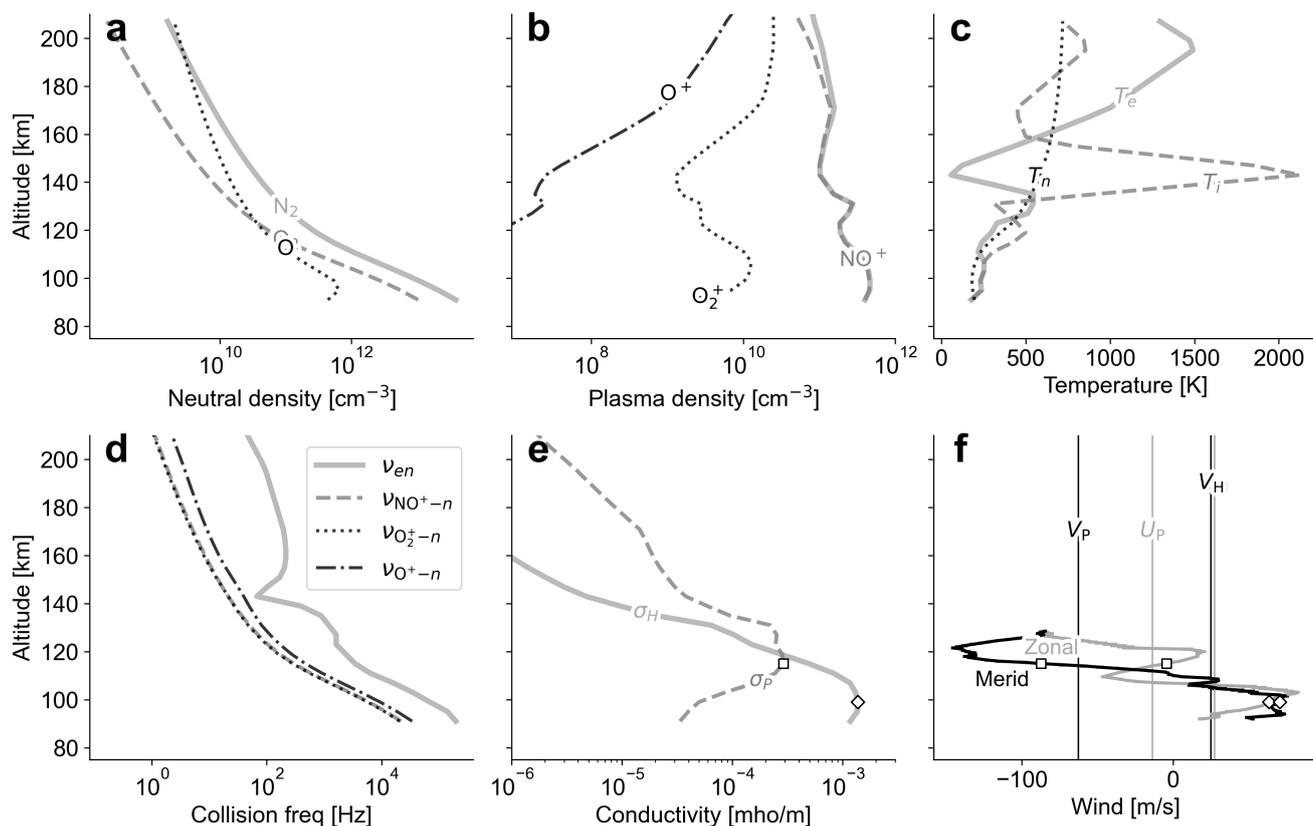


Figure S3. Illustration of altitude profiles associated with the JOULE II rocket launched 2007-01-19 at 12:48 UT, in the same layout as Figure C1 of the main text.

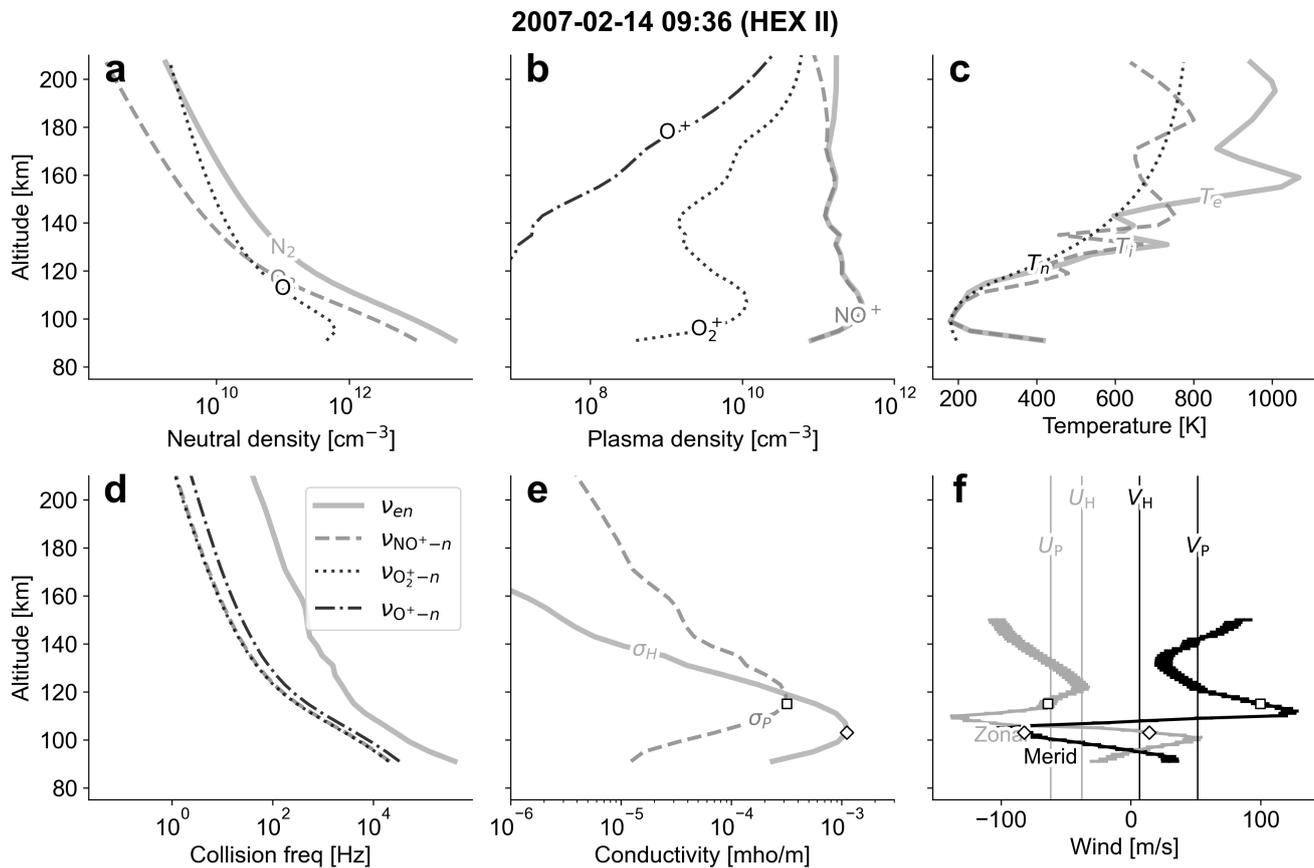


Figure S4. Illustration of altitude profiles associated with the HEX II rocket launched 2007-02-14 at 09:36 UT, in the same layout as Figure C1 of the main text.

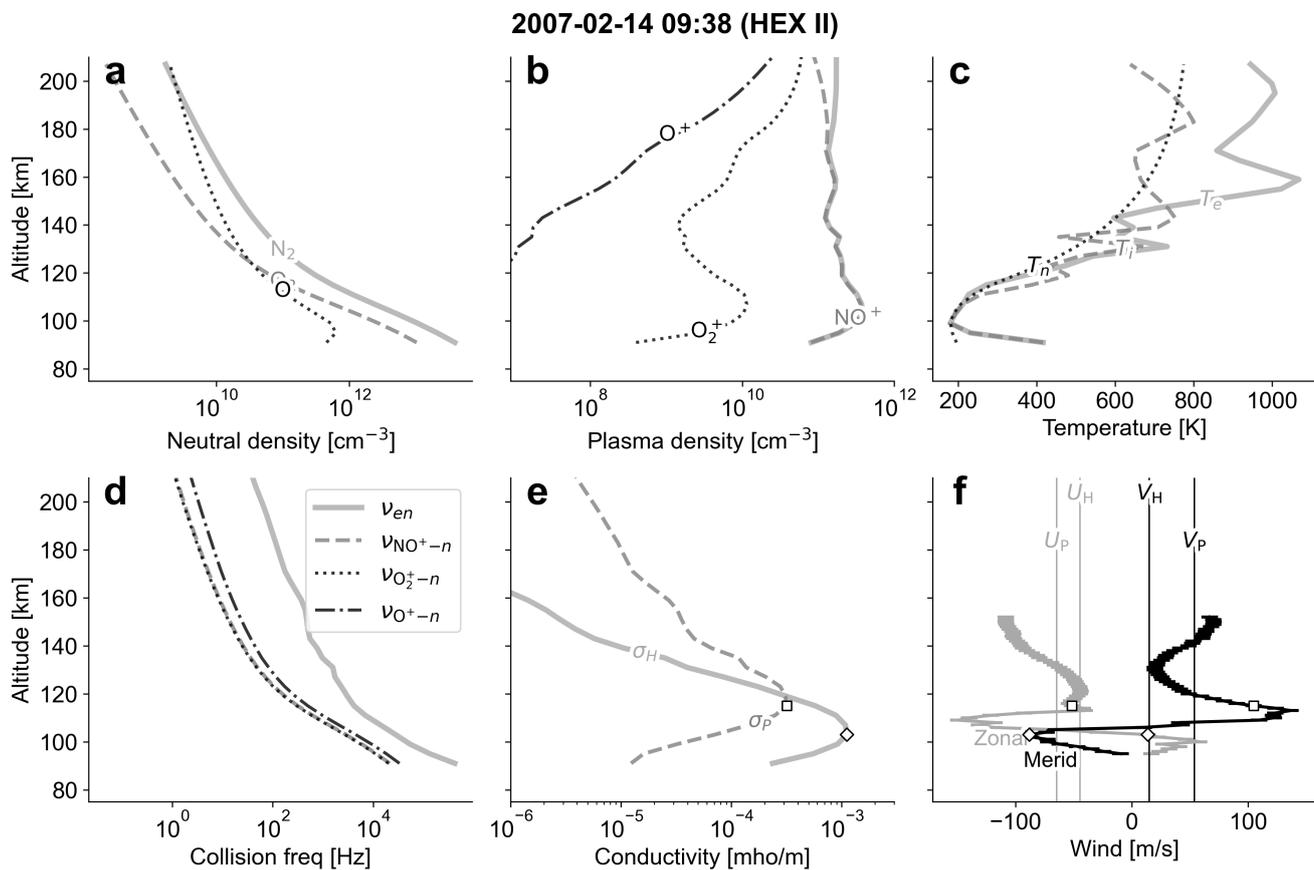


Figure S5. Illustration of altitude profiles associated with the HEX II rocket launched 2007-02-14 at 09:38 UT, in the same layout as Figure C1 of the main text.

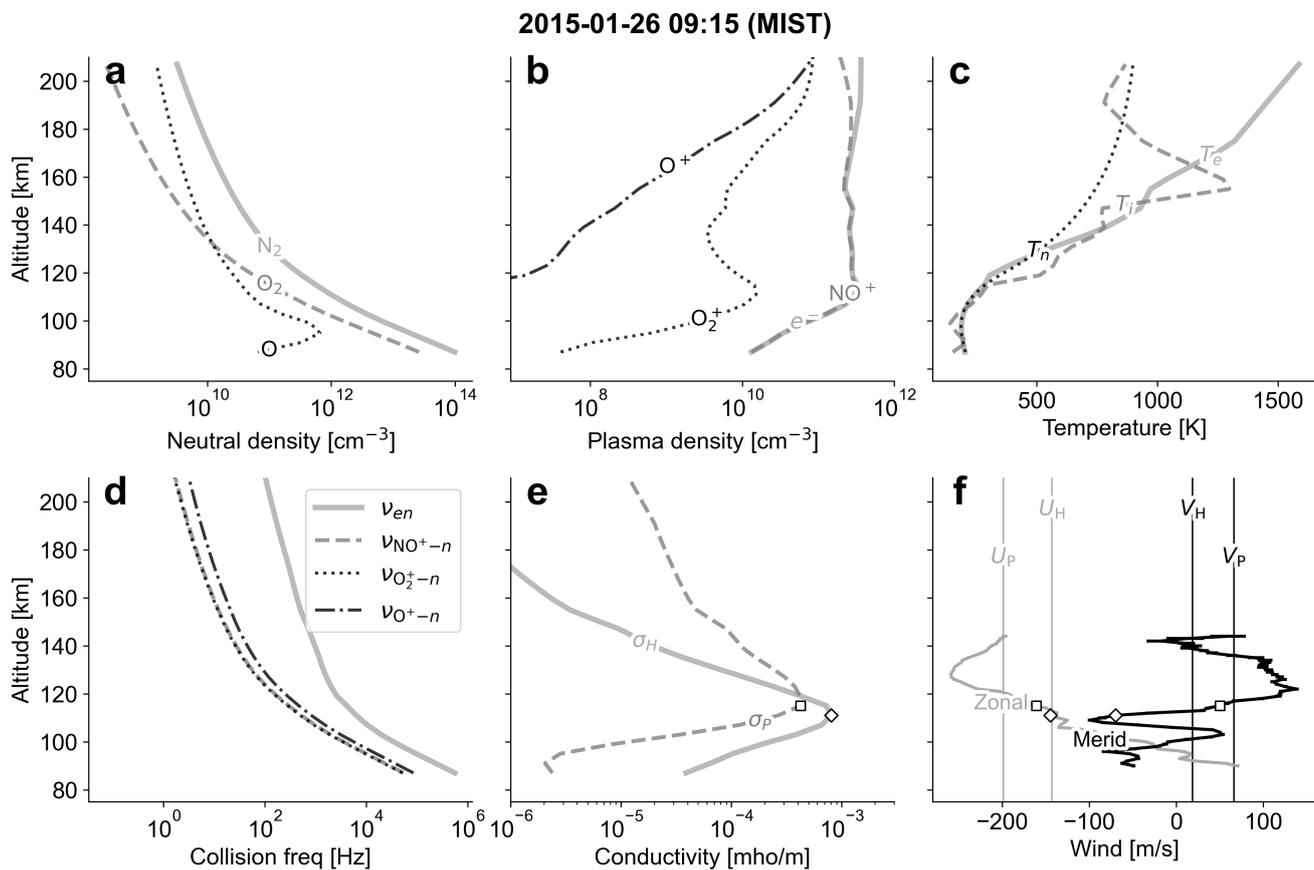


Figure S6. Illustration of altitude profiles associated with the MIST rocket launched 2015-01-26 at 09:15 UT, in the same layout as Figure C1 of the main text.

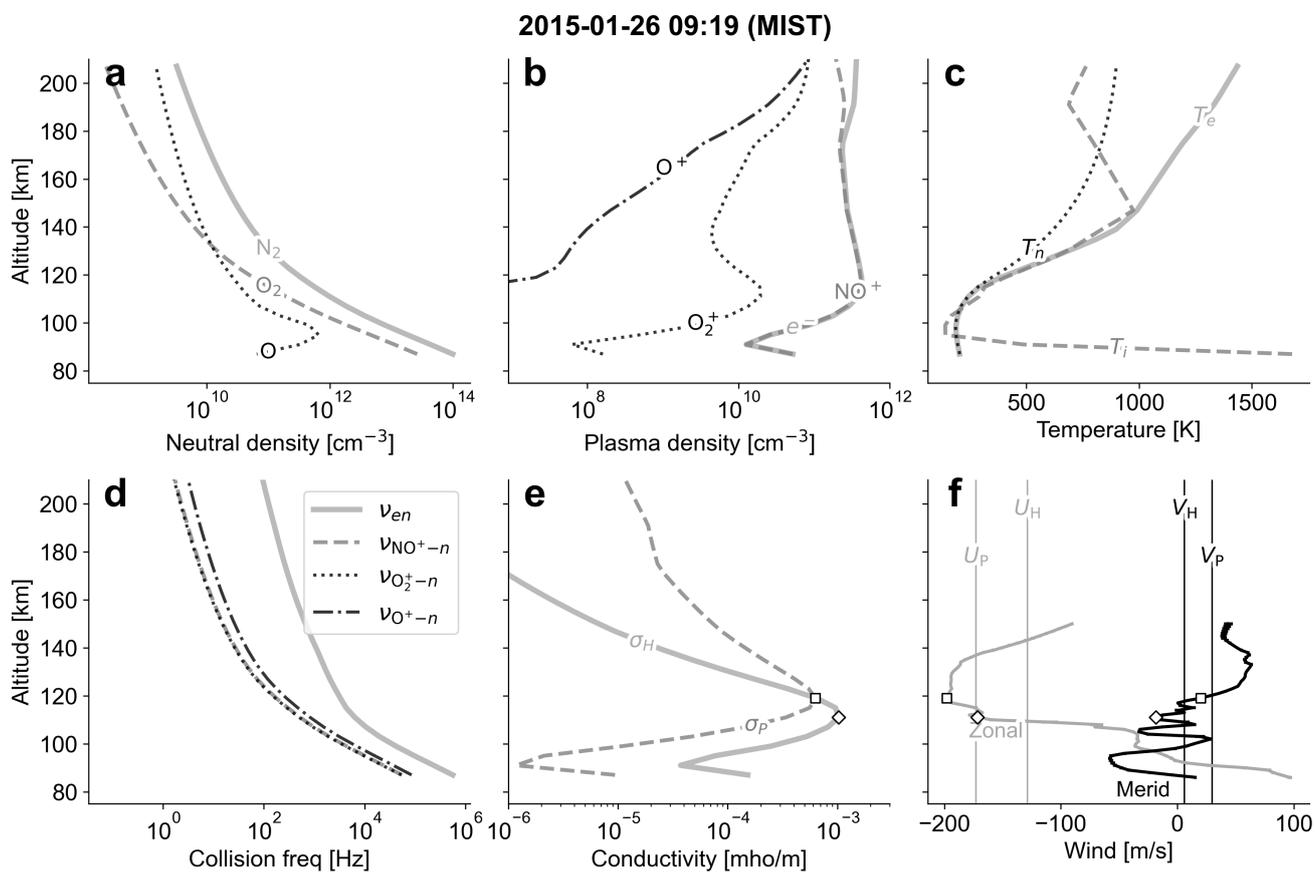


Figure S7. Illustration of altitude profiles associated with the MIST rocket launched 2015-01-26 at 09:19 UT, in the same layout as Figure C1 of the main text.

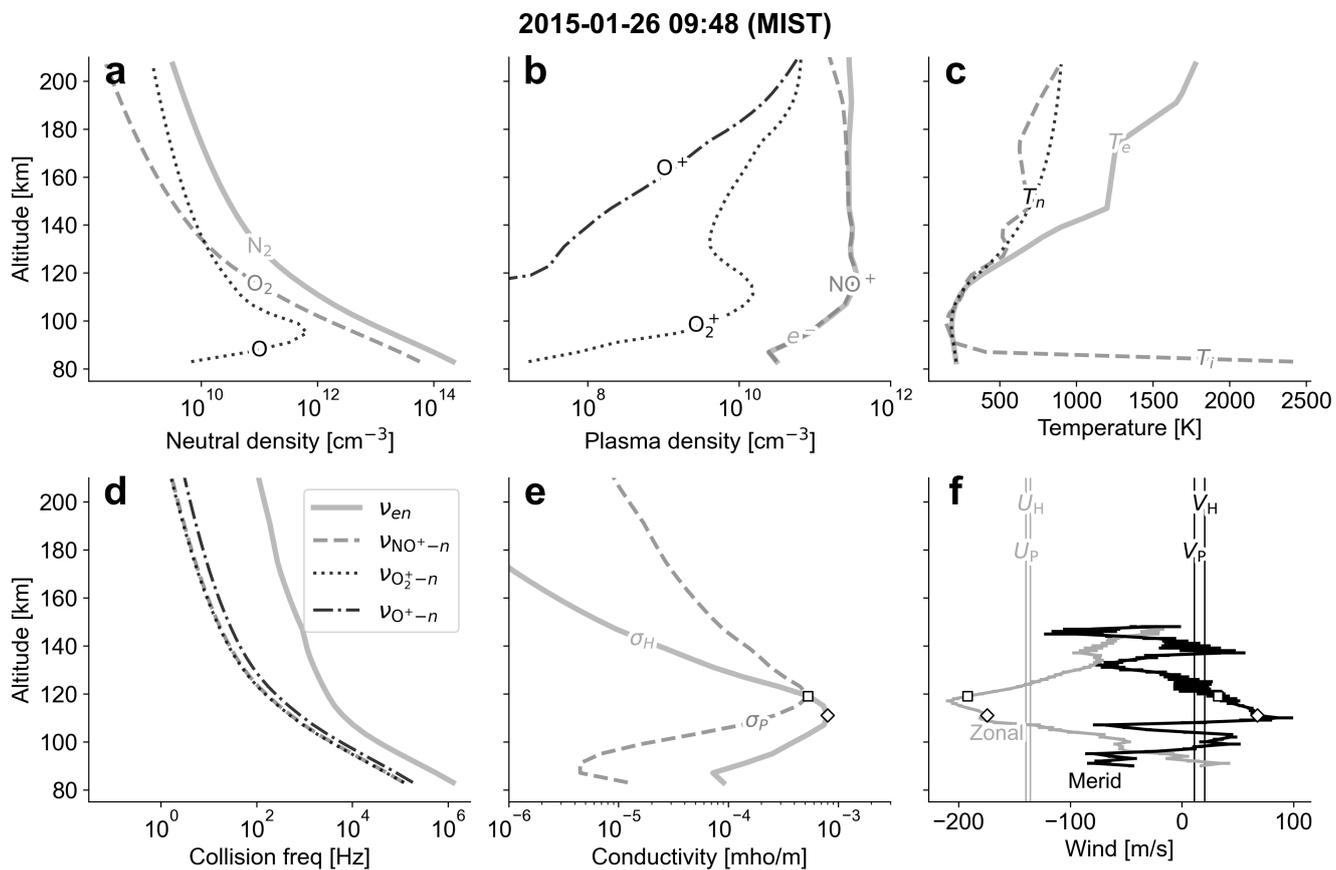


Figure S8. Illustration of altitude profiles associated with the MIST rocket launched 2015-01-26 at 09:48 UT, in the same layout as Figure C1 of the main text.

2017-03-02 05:44 (Auroral Jets)

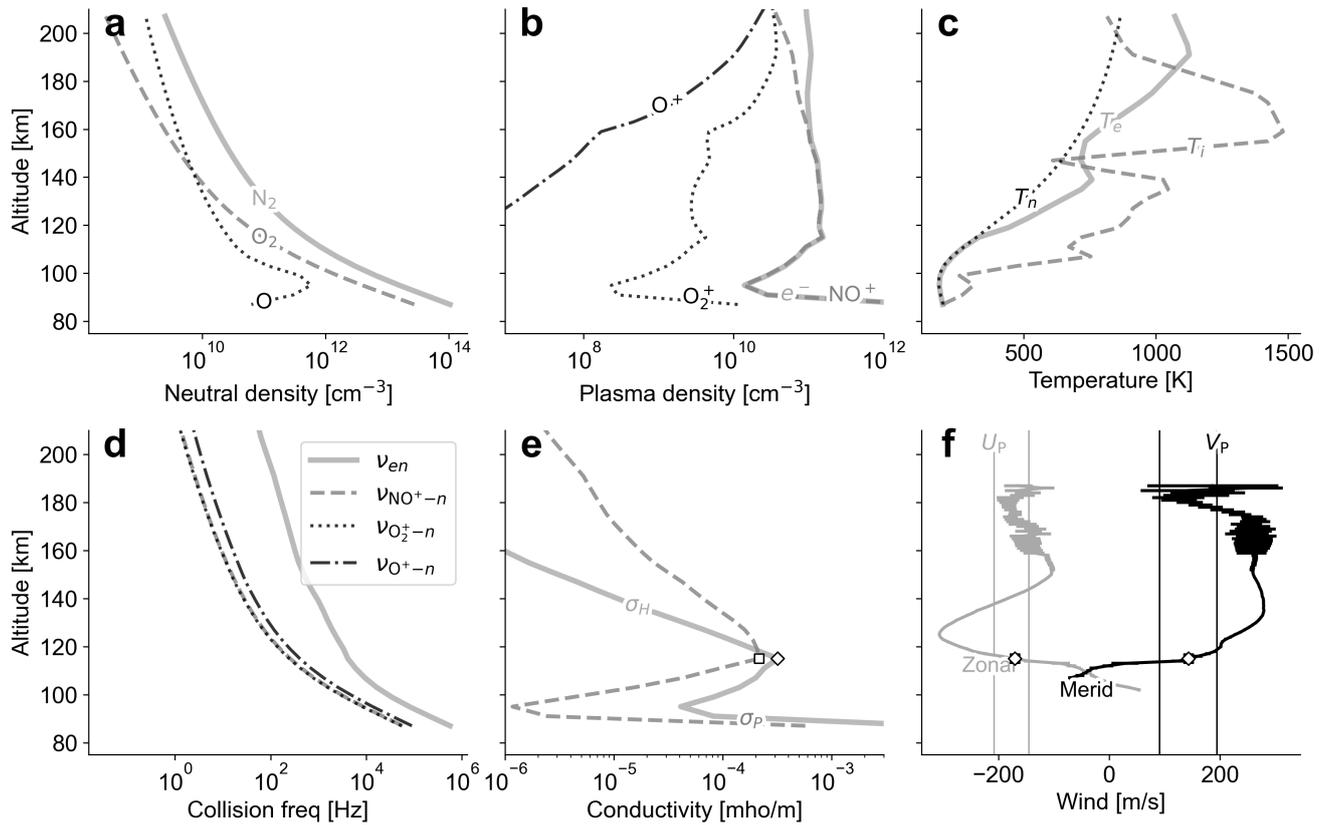


Figure S9. Illustration of altitude profiles associated with the Auroral Jets rocket launched 2017-03-02 at 05:44 UT, in the same layout as Figure C1 of the main text.

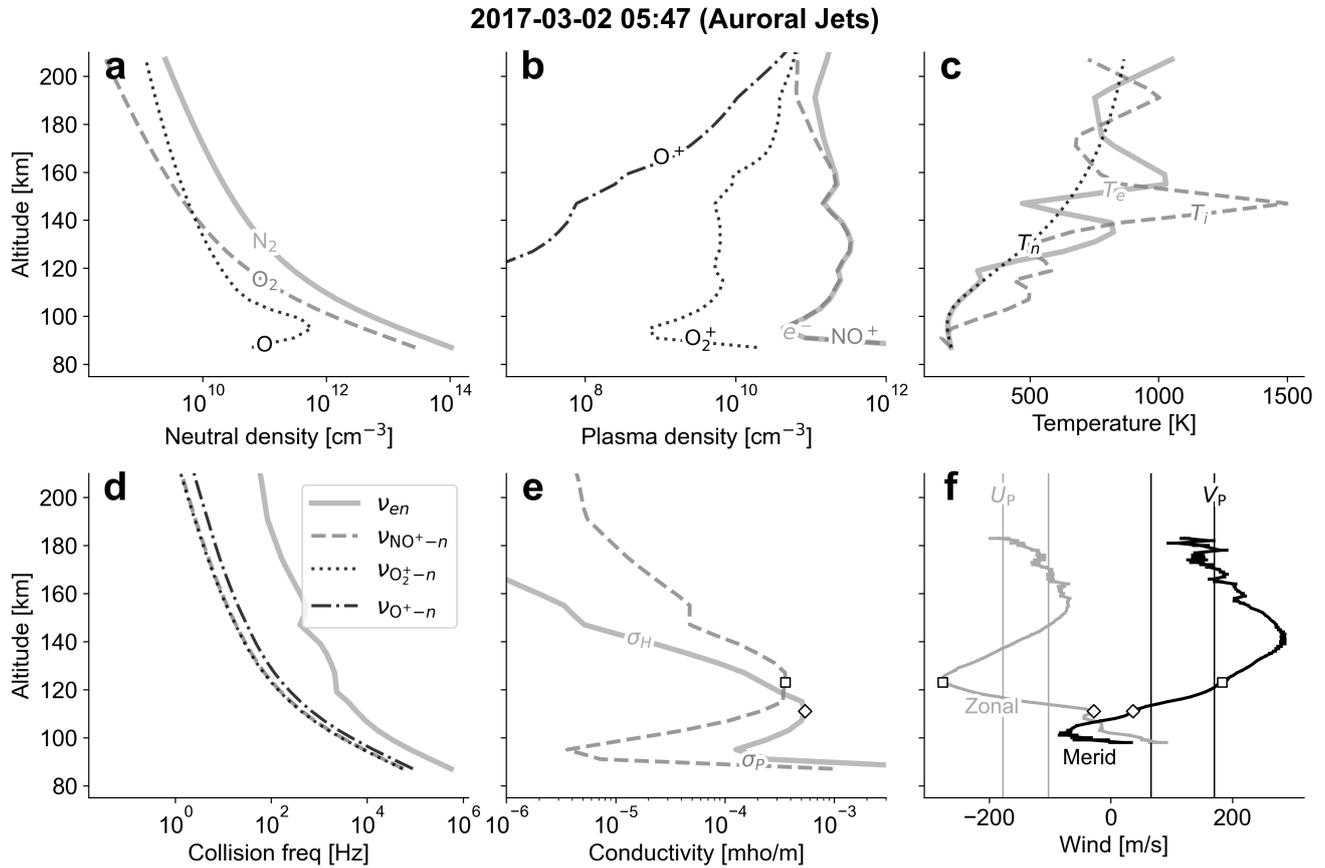


Figure S10. Illustration of altitude profiles associated with the Auroral Jets rocket launched 2017-03-02 at 05:47 UT, in the same layout as Figure C1 of the main text.

2018-01-26 14:12 (Super Soaker)

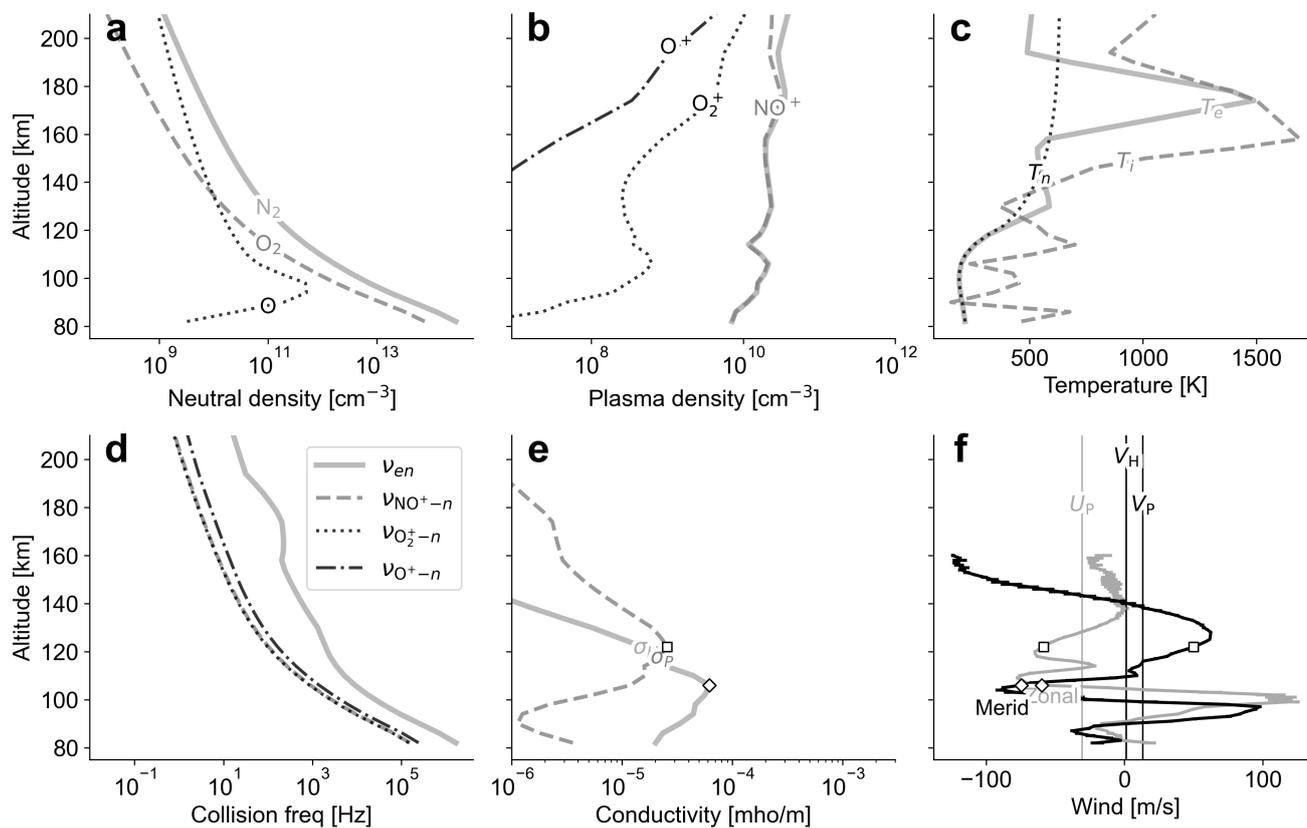


Figure S11. Illustration of altitude profiles associated with the Super Soaker rocket launched 2018-01-26 at 14:12 UT, in the same layout as Figure C1 of the main text.

2018-01-26 14:16 (Super Soaker)

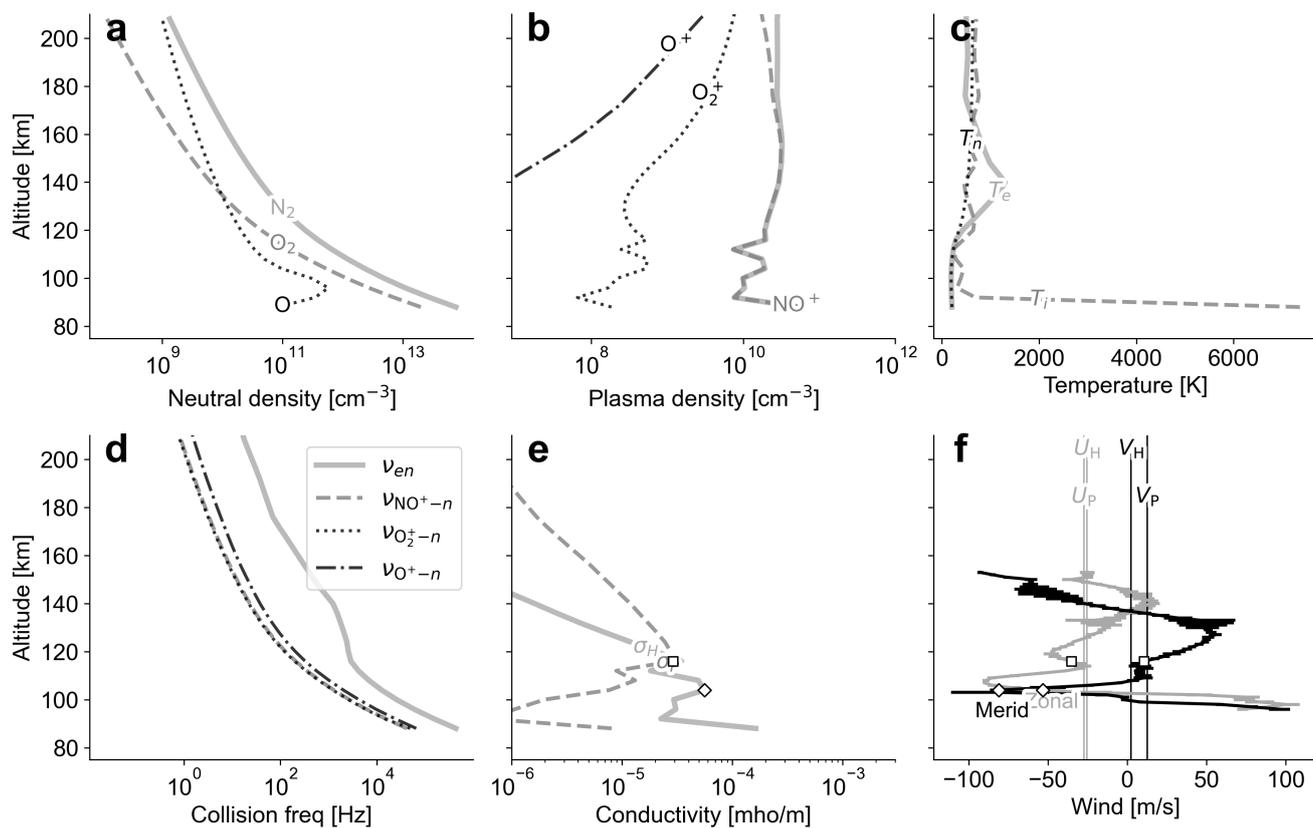


Figure S12. Illustration of altitude profiles associated with the Super Soaker rocket launched 2018-01-26 at 14:16 UT, in the same layout as Figure C1 of the main text.

2018-01-26 14:49 (Super Soaker)

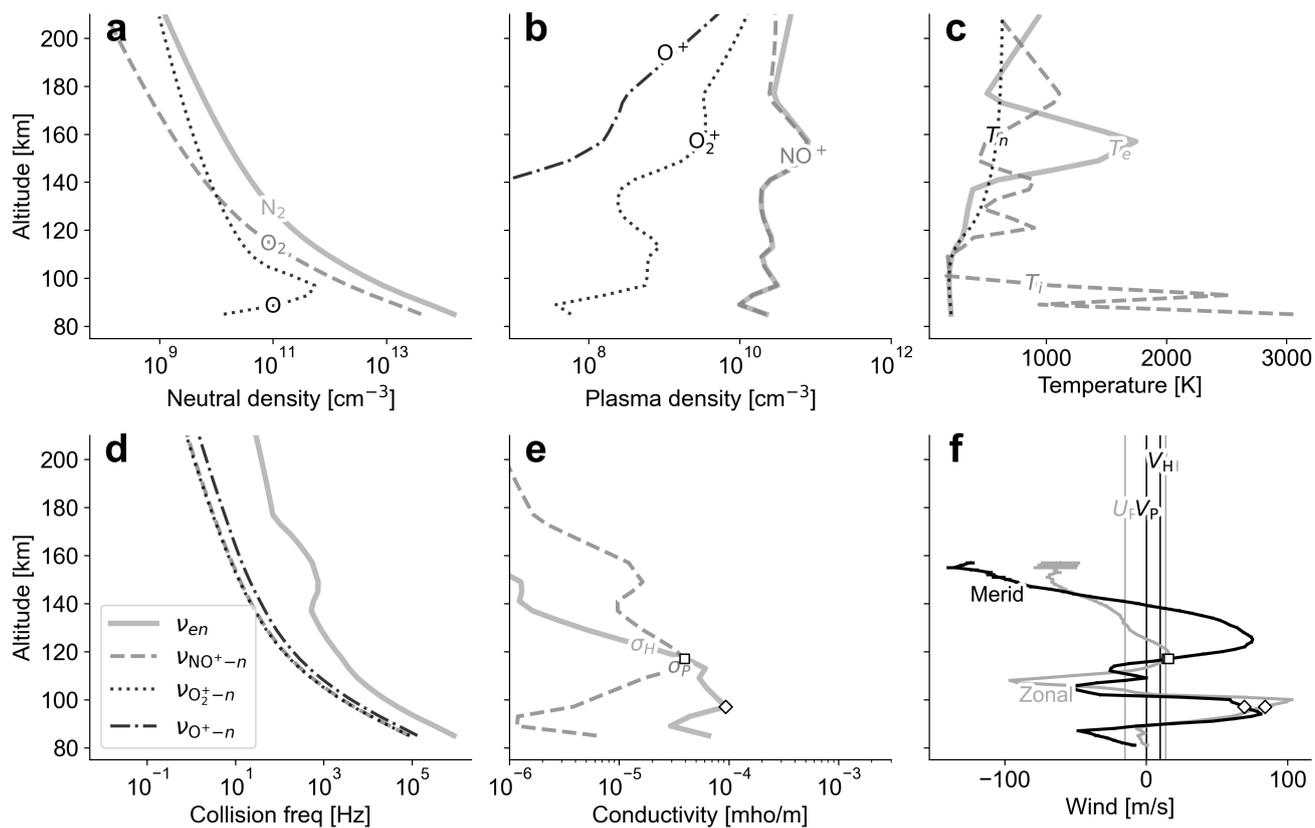


Figure S13. Illustration of altitude profiles associated with the Super Soaker rocket launched 2018-01-26 at 14:49 UT, in the same layout as Figure C1 of the main text.

2018-01-26 14:52 (Super Soaker)

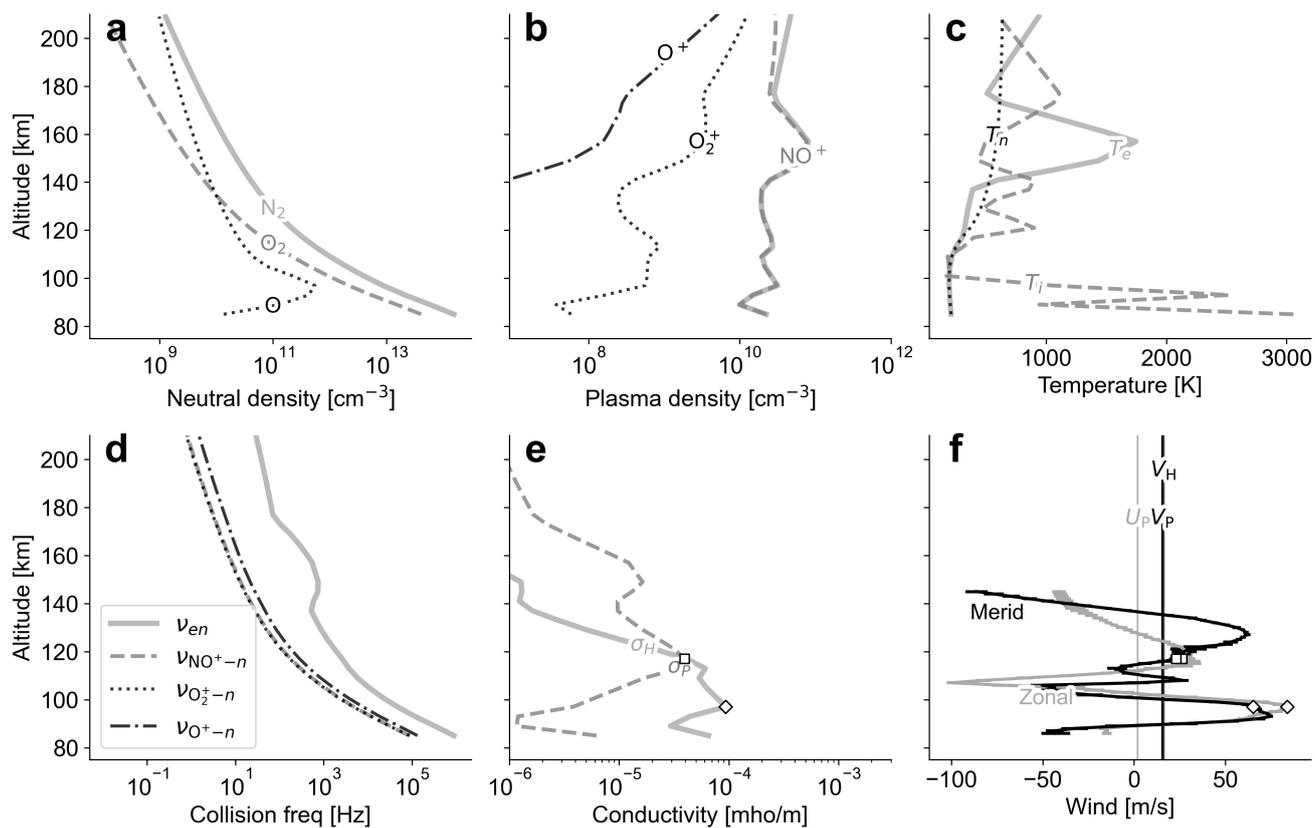


Figure S14. Illustration of altitude profiles associated with the Super Soaker rocket launched 2018-01-26 at 14:52 UT, in the same layout as Figure C1 of the main text.