Reviewer #2:

The authors have effectively addressed my previous comments, and I appreciate their efforts in revising the manuscript. However, I am concerned that the narrative remains overly detailed in places, which may make it difficult for readers to follow the main findings. I recommend a thorough revision to streamline the manuscript before it can be considered for publication in Atmospheric Chemistry and Physics (ACP).

For example, in lines 420-442 and 580-605 of Sections 3.2.1 and 3.2.2, the manuscript provides extensive descriptions of Figures 3 and 5, listing numerous numerical values at dense time points to illustrate the temporal changes in NS and total VCD. I suggest condensing these sections by highlighting the most important information and key messages conveyed by each figure. Highlighting representative data and key trends will help readers to better understand the key findings.

Responds: We have shortened the description of figures to be more accessible, as you suggested. The revisions to the manuscript are as follows:

Line 421-429: NS concentrations showed diurnal variation, decreasing from midnight (0.11 mg m^{-3}) to morning (0.065 mg m^{-3} at 10:30), followed by an afternoon increase and strong evening fluctuations (0.04-0.175 mg m^{-3}) likely associated with rush hour emissions and domestic heating. During the limited observation window (10:30-15:30) for Pandora, both VCD and NS concentrations initially showed similar behavior with minimal variation. However, their temporal patterns diverged after 13:00 while NS concentrations plateaued, VCD exhibited rapid growth (40 to 72 mg m^{-2} between 12:00-15:00), nearly doubling before declining slightly.

Line 451-464: The lidar observations in Fig. 3c revealed a complex boundary layer structure with distinct aerosol layers. The data show a well-mixed shallow boundary layer between midnight and 03:00 and the formation of an internal boundary layer after about 04:00, disconnected from the layer above. The internal boundary layer rises gradually until about 11:00 (up to about 400 m), with the clean layer above (between 400 and 500 m), and a new layer (at heights of approximately 800 to 900 m) appears around 07:00, probably due to advection. This vertical variation indicates a disconnected boundary structure with two disconnected layers, likely caused by nocturnal cooling (Stull, 1988). The temperature gradient prohibited material exchange between these layers, leading to the accumulation of near-surface emissions and the trapping of trace gases and aerosols in the upper layer. The occurrence of such a situation is consistent with the observations discussed in Section 3.1 and Fig. 2, with low wind speed, lowest air temperature during period I (-12^{o}C) and enhanced RH (indicating trapping of water vapor together with decreased air temperature).

Line 564-575: The observational data for 18 January reveal distinct diurnal patterns in NO_2 dynamics, with NS concentrations exhibiting higher baseline levels than on 14 January while following a similar initial decreasing trend until 11:30. Subsequently, NS concentrations demonstrated nonlinear growth, plateauing at 0.12 mg m^{-3} (about 1 hour after 14:30) before further increasing to 0.16 mg m^{-3} by 21:00, attributed to combined rush-hour emissions and reduced photochemical dissipation. Concurrently, total vertical column density (VCD) displayed accelerated morning depletion (from 54 to 36 mg m^{-2} between 08:30 and 12:30), but in contrast to the 14^{th}, after 11:30 the total VCD of NO_2 concentrations continued to decrease while the NS NO_2 concentrations increased. Hence, in this situation, it may be difficult to determine NS NO_2 concentrations from the relationship (R=0.40) before 13:00 (Fig 5b).