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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The observation of chemiluminescent NiO* emissions in the laboratory and in the night airglow" *by* W. F. J. Evans et al.

Anonymous Referee #1

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As noted by the authors, a major problem with this paper is the fact that the ratio of NiO to FeO emission is so variable. The NiO emission is not discernible in the earlier OH nightglow paper of Cosby and Slanger [2007], in which the FeO emission is quite clear, as originally pointed out by Evans et al. [2010].

The paper by Jenniskens et al. [2000] clearly shows the FeO emission in a meteor train, but the departure from a flat continuum begins at 480-500 nm, not at 440 nm as the analysis of the GLO spectrum indicates. In the work of Broadfoot and Kendall [1968], the continuum actually falls from 440 to 465 nm, before commencing a rise to 482 nm. It would seem that there is too much variation here to reach any firm

conclusions concerning NiO emission, whereas the FeO emission now seems to be on a much firmer footing. The argument is made that the NiO emission is more easily detected from orbit, in limb-viewing geometry, but as FeO is readily detected from the ground, the same should be true for NiO, particularly if at times it is more intense than FeO.

The question of the nature of the continuum has occupied aeronomers for decades, and NO2 is the emitter most often invoked. The authors mention this continuum, and that it is most apparent at high latitudes. However, if there are wild swings in the NiO case, one could argue that the same is true for NO2, yet there is no attempt to include NO2 in the picture. For instance, in Figure 2C an NO2 spectrum is shown, and it approximately fits the subtracted plot, whereas in the subtracted OSIRIS plot in Figure 5C it is absent. Is it not possible that the variability is due to NO2, and not to NiO?

For the [Fe]/[Ni] ratio in the atmosphere to be as variable as implied suggests that the lifetimes in the atmosphere of these metals is very short, and that their concentrations are strongly dependent on the influx of Ni-rich or Ni-poor interplanetary dust. What is the Fe content of the atmosphere compared to the influx of meteorites? My back-of-the-envelope calculation suggests that it's less than a day, so that within that period of time, the Earth moves from a nickel-rich to a nickel-poor environment, or vice versa. That just seems unrealistic.

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