

Interactive comment on “Metal concentrations in the upper atmosphere during meteor showers” by J. Correira et al.

Anonymous Referee #1

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This paper describes an important piece of work. The authors have made a careful and comprehensive investigation of a long-standing problem: do meteor showers significantly increase the input of ablated metals into the upper atmosphere, compared with the sporadic background? The question is answered in two ways. First, the authors compute the sporadic input, obtaining an input averaged over a week of about 20 t/day, which is in sensible agreement with the input required to model the layers of metals such as Na and Fe which occur around 90 km. They then compute the input from individual showers, using observations of hourly meteor rates and integrating over the appropriate solar longitude. This exercise reveals that there are only two showers - the Quadrantids and Geminids - where the input is likely to exceed the background sporadic rate and be potentially observable.

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The second part of answering the question is to use near-global observations of the Mg and Mg⁺ layers, made by the GOME satellite instrument. The authors bin these observations to latitudes and solar longitudes where the influence of these two meteor showers should be maximum - but show that there is no statistical enhancement in either Mg or Mg⁺.

They are thus able to reach the robust and well-argued conclusion that meteor showers do not make an important contribution to metallic species in the upper atmosphere, compared with the sporadic background.

Apart from two typos listed below, I found the paper extremely well written and appropriately illustrated.

I have one suggestion which the authors might want to consider adding to their discussion about why they do not see an observable perturbation by the two showers. The lifetime of metallic species above 80 km, where they are in the atomic form (ions and neutrals), is about 6-10 days based on vertical transport by turbulent eddy diffusion (see a discussion on this in Plane, ACP 2004). Thus, the metallic layers “integrate” variations in the daily input function, and so short-term perturbations by intense meteor showers will to a large extent be “washed out”.

18713, line 3: “likely to create” 18714, line 26: modeled

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