

# ***Interactive comment on “A Livestock Trampling Function for Potential Emission Rate of Wind-blown Dust in a Mongolian Temperate Grassland” by Erdenebayar Munkhtsetseg et al.***

**Anonymous Referee #2**

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This paper examines the effect of livestock trampling on the potential for dust emissions from Mongolian Steppe grass landscape. The basic approach is to use wind tunnel measurements (PI-SWERL) to measure windblown emissions on background (untrampled) surfaces and subsequently trampled surfaces. Two types of measurements are conducted. The first is in a controlled pen where livestock grazing was not allowed for some time. This area was apparently used to obtain background (undisturbed/untrampled) levels of dust emissions. The area was then grazed by livestock (estimated density of 250 head per hectare) and re-measured for emissions. In separate tests, a transect of wind tunnel measurements was conducted in 2009 and again in 2010 through an area of actual livestock grazing with estimated densities of 201 and

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241 head per hectare. The results are analyzed for dust emissions increases due to livestock grazing at different values of friction velocity.

Overall, this information is very valuable to the understanding of wind erosion, especially in the Mongolian Steppe. These kind of data are lacking from the literature and can be very helpful for estimating anthropogenic impacts on the dust problems within Asia. I have two major concerns with the manuscript. The first is that it can be rather difficult to follow the discussion because the presentation is not always clear. I found myself having to guess the meaning of a lot of sentences and infer information where I would have liked to know for sure that the authors were conveying a specific point. The second is that while the data collected are quite valuable, the variation in conditions is rather limited and it is not clear that the extensive development of functional relationships is warranted or justified. These include somewhat limited temperature, relative humidity, and antecedent soil moisture information. They also include a limited range of livestock trampling which span from 201 to 250 head per hectare and are based on necessarily coarse estimates since it is difficult to know precisely how many sheep trampled over what area during what period of time.

In my view, both of these concerns can be addressed by substantially shortening the manuscript and sticking strictly to the main findings. Organizationally, I suggest greatly shortening the introductory and background information to the minimum necessary to convey the importance of livestock grazing to Asian dust. Technically, I recommend that rather than fitting a function of  $u^*$  and  $N$ , it would be better to simply provide an enhancement factor of emission due to livestock trampling at different values of  $u^*$  and stating that the information applies to  $N \sim 250$  head per hectare. The exact representation is up to the authors, but one option would be a curve that has  $u^*$  on the x-axis and enhanced emissions on the y-axis ( $FN/FREF$  in the notation of the manuscript, similar to what is now depicted in Figure 5a and b). This would also help show that there is apparently a  $u^*$  below which there appears to be little difference in emissions between trampled and untrampled steppe soil. Perhaps the discussion can then focus on the

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limited nature of the study and where additional information would be most helpful in future work.

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