

Interactive comment on “Waterfalls as sources of small charged aerosol particles” by L. Laakso et al.

Anonymous Referee #1

Received and published: 7 November 2006

General:

In “Waterfall as a source of small charged droplets”, Lauri Laakso and co-workers measure the size distributions of charged nanometer sized particles near a river waterfall outside of Helsinki. On two different days, the authors use commercial differential mobility analyzers to compare the number of 0.3 nm to 40 nm charged particles found near the waterfall to the number of particles found 100 metres away, crosswind from the waterfall. To place their findings in an atmospheric context, the authors discuss mechanisms of droplet / nanoparticle formation in a waterfall.

Specific:

I think that the data and the results from this work are interesting and deserve to be

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reported, however I feel the presentation has problems in its current format. First, I found the title misleading as the manuscript reported the observation of charged particles near a waterfall. The title conjured images of performing mass spectrometry or ion chromatography directly on a waterfall, thus using the waterfall as a source.

In general the Introduction and Theoretical Background sections lacked the necessary depth. The authors begin the background section by stating “The phenomenon how waterfall produces ions far from being completely understood”. Beyond missing a verb (discussed later) the statement implies that less is known than actually is known. There have been numerous papers describing the formation of sea spray and the mechanical shearing forces that result in droplets following wind and wave action. There are many papers that discuss how wind generates sea spray (see, e.g., Donald E. Spiel’s work, or this: A New Sea Spray Generation Function for Wind Speeds up to 32 m s⁻¹, Edgar L. Andreas, *J. Phys. Oceanography*, vol 28 page 2175). Additionally, Reiter undertook a thorough study of both the charge and size of particles formed by a waterfall in Switzerland and by surf bubbles in the Italian Mediterranean Sea (see R. Reiter, *J. Geophys. Res. - Atmospheres*, vol 99, issue D5, page 10807.) I strongly recommend the authors read this literature and their references, and then revising their Theoretical Background section accordingly.

The Results and Discussion section also lacked a certain depth, but I believe some of the aforementioned literature may help guide the analysis of the data.

It is a minor issue, but being in an atmospheric journal, I would like to see further discussion on the atmospheric implications. Could these small charged particles have evaporated from significantly larger droplets near the waterfall? Could these particles turn around and become a significant source of cloud condensation nuclei? What is the suspected physical nature and composition of these particles (besides size) relative to the particles measured 100 metres away from the waterfall?

Lastly, I believe the manuscript would benefit from additional attention to grammar and

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spelling. There are numerous mistakes that must be corrected the next time around.

These are interesting experiments, and they certainly bear reporting. However, I believe the authors should revise their background section with a deeper discussion of the current knowledge in the field, and apply this as they discuss their findings. As such, I think this paper requires major revisions and should be reviewed after resubmission and before final publication.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 9297, 2006.

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