

Interactive comment on “Black carbon concentration and deposition estimations in Finland by the regional aerosol-climate model REMO-HAM” by A. I. Hienola et al.

Anonymous Referee #1

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This paper compares modeled BC in Finland against measurements, and concludes that there are problems with the inventory. On reading the paper I suspect that there are major problems with the model setup, and a lack of knowledge (or at least discussion) of other studies of BC in Europe, including those from Finland.

The main model problem seems to be its small domain. Actually, the model description is rather unusual in not giving any information on the model domain and its vertical resolution at all. All maps show Finland only, so early on in the manuscript one starts to suspect that the domain covers only this one country, with the domain being that shown in Fig.1. This impression is strengthened when reading the text concerning

C8471

wind-direction and attempting to ascertain sources. Notably, the possible source area to the south-west of Hyytiälä is said to be Tampere. I would have suspected Germany, Poland, the Benelux or other countries.

The possibility of transport from outside Finland is not even mentioned, something which is unacceptable in my opinion. It has been known for decades that air pollution over the Nordic countries can be strongly affected by neighboring countries. BC particles have a low dry-deposition rate, and the potential to travel 100s or even 1000s of km is well known. The Finnish Meteorological Institute has in fact published many very good papers (e.g. Saarikoski et al., Atmos. Env. 2007, Saarnio et al., Sci. Tot. Env., 2010, Aurela et al., Atmos. Env., 2011), on long-range transport of pollutants to Finland - why do the authors ignore such evidence?

The use of wind-direction as an indicator of sources areas is also not acceptable, trajectory methods are needed for anything other than very local transport.

The paper claims that no other regional model studies regarding black carbon have been conducted in recent years. This is clearly wrong. Schaap et al (JGR, 2004) studied EC over all of Europe, including results for Hyytiälä. Simpson et al. (JGR, 2007) and Tysro et al. (JGR, 2007) presented results for Finland also. The issues surrounding BC deposition to snow are again addressed lightly, with no comparison to other relevant studies (e.g. Skeie et al., ACP, 2011).

The possibility of uncertainty in the emissions is of course real (though not demonstrated here), which makes it also worrying that the authors do not discuss the more recent BC inventories for Finland produced by Kupianen and Klimont (Atmos. Env., 2007) and the EUCAARI project. There is no demonstration, or discussion of, this model's ability with any pollutant, so we are left with the possibility that the lack of model agreement might be emissions, or domain size, or vertical dispersion or a combination of these and many other factors.