



Soot on Snow 2011 & 2012

Niku Kivekäs¹, Aki Virkkula¹, Onni Järvinen², Jonas Svensson^{1,3}, Antti Aarva¹, Outi Meinender¹, Anu Heikkilä¹, Antti Hyvärinen¹, David Brus¹ & Heikki Lihavainen¹

¹Finnish Meteorological Institute, Helsinki, Finland

²University of Helsinki, Helsinki, Finland

³University of Stockholm, Stockholm, Sweden

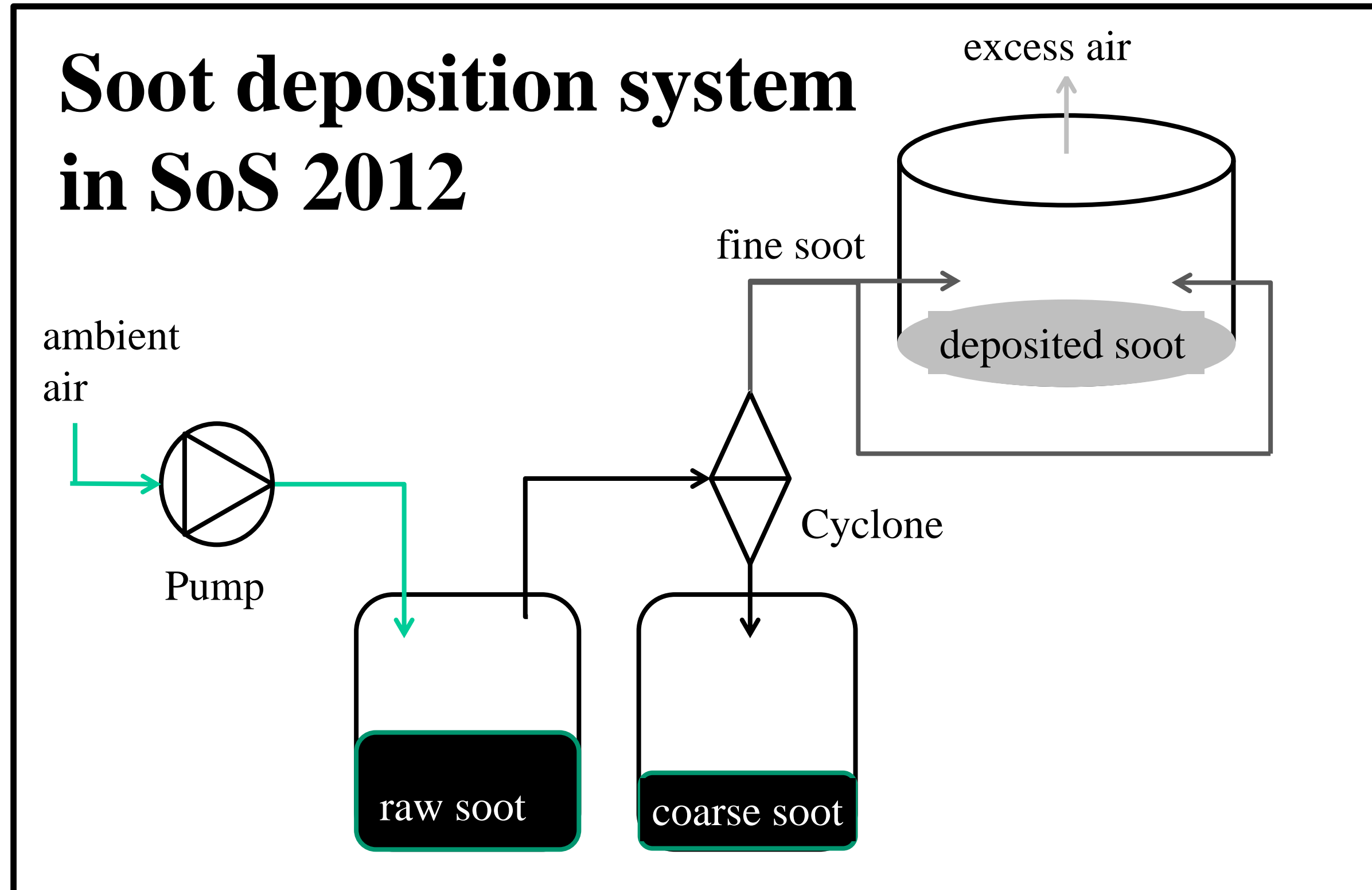
The Soot on Snow (SoS) experiments

The Finnish Meteorological Institute has conducted a series of experiments to quantify the effect of soot on the albedo and melting of snow. This is important for estimating the effects of long range transported and ship induced soot emissions to the Arctic climate.

The SoS 2011 was conducted at Nurmijärvi, Finland in spring 2011. We produced soot by burning rubber and let it deposit on snow at a semi-defined area. The albedo of snow and snow depth were monitored at two locations, one inside and the other outside the soot area. Snow samples were also taken from both areas.

The SoS 2012 was conducted at Jokioinen, Finland in spring 2012. This time we used soot collected by chimney cleaners in Helsinki. We produced four spots (4m diameter each) with different soot concentrations on snow. The albedo and snow depth, as well as the transmittance of light through the snow were monitored over the entire melting season, and snow samples were taken and analyzed for organic and elemental carbon.

SoS 2013 is planned to take place at Finnish Lapland in spring 2013.



...and how it really looks like



The main results

In SoS 2011 we could see a clear difference in the albedo of the snow pack until the first snowfall. Even after that the albedo of the dirty snow was lower than that of the clean one. This resulted the dirty snow to melt approximately one week before the clean one. Also the temperature gradient was less steep in the dirty snow.

In SoS 2012 we experienced snow fall right after the soot spots were made, and a heavy snow storm a couple of days later. The new snow covered the soot areas unevenly, and we could not observe significant differences in the albedo or melting of snow, that we could connect to the different concentrations of soot. This was despite of the soot concentrations varying over almost two orders of magnitude. Even though this was not the result we were looking for, this demonstrates that weather phenomena can mask the effects of short time soot intrusions in the Arctic. The analysis of the SoS 2012 data is still ongoing, and more results are to come.

