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Observations of black carbon in Arctic snow

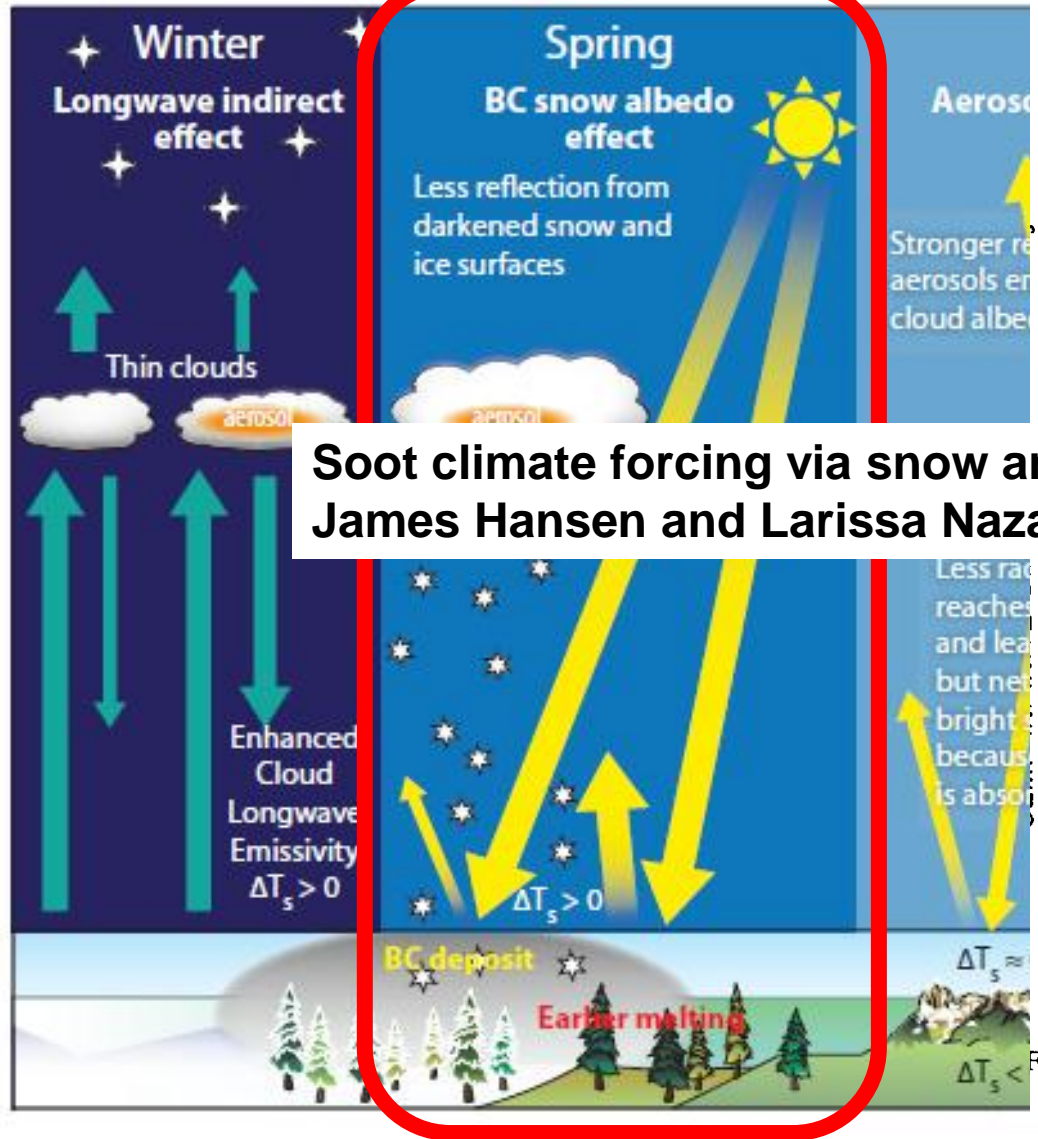
**Jonas Svensson, David Brus, Antti Hyvärinen, Heikki Lihavainen,
Eija Asmi, Ari Laaksonen**

Black carbon (BC) will have an effect on the Arctic climate throughout the seasons



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BC originates from the incomplete combustion of fossil fuels and biomass



Soot climate forcing via snow and ice albedos
James Hansen and Larissa Nazarenko, PNAS, 2004

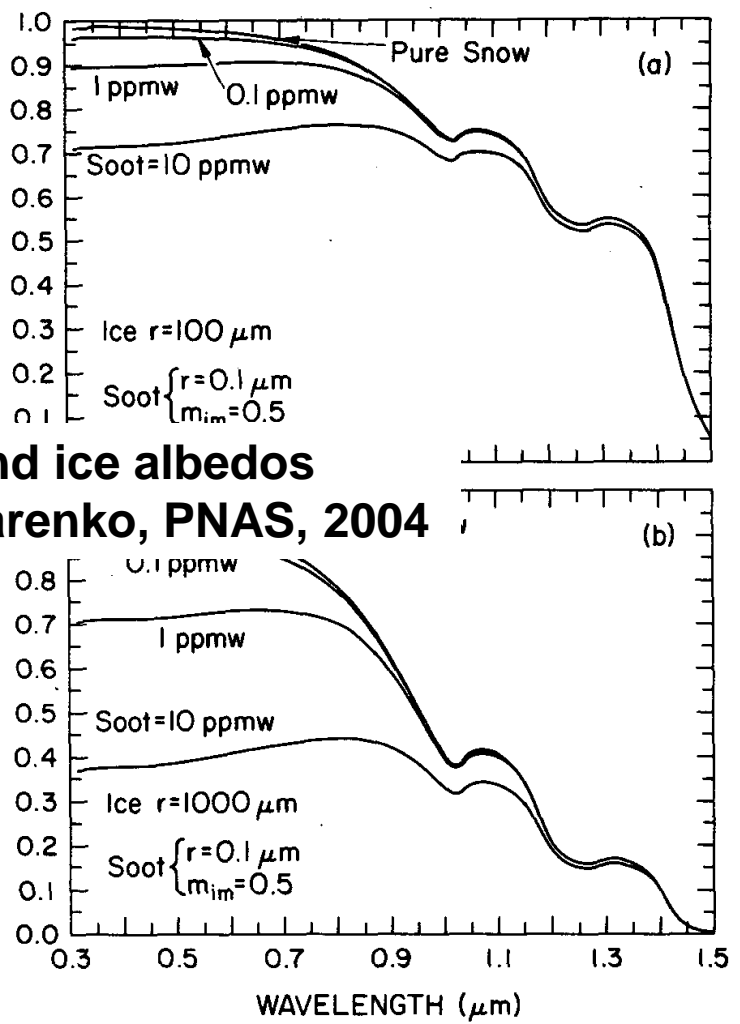
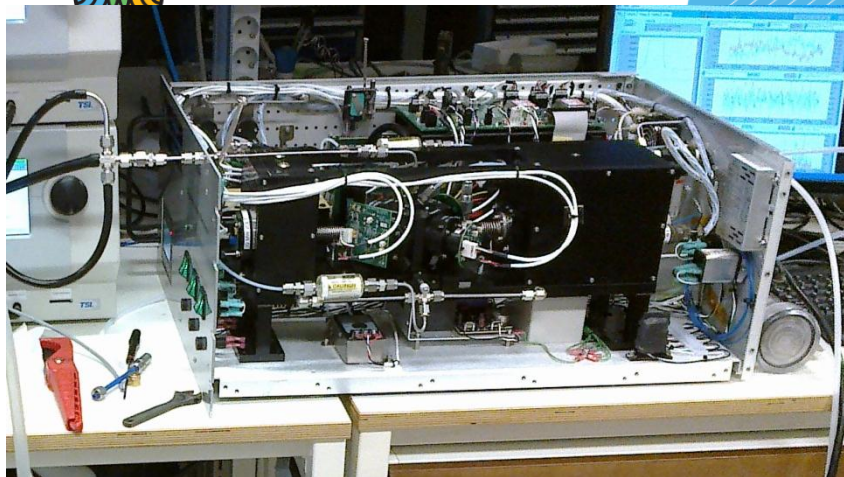


FIG. 7. Effect of soot concentration on albedo a_s^∞ ($\mu_0 = 0.5$).
(a) $r_{ice} = 100 \mu m$, (b) $r_{ice} = 1000 \mu m$.

BC or elemental carbon (EC) in the snow? At FMI both methods are used!



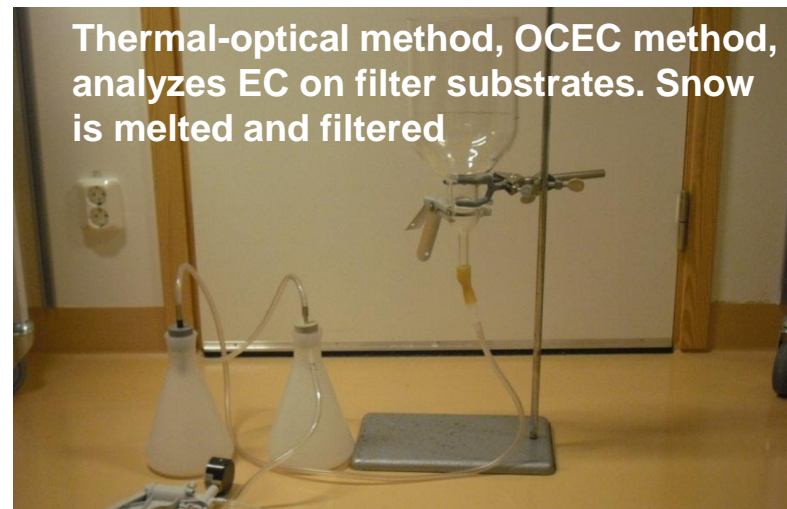
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SP2 (single particle soot photometer) Laser-incandescence method, with the ability to quantify BC mass concentration and BC size distribution in ambient aerosol



Currently, working method development and estimating losses from CETAC nebulizer (+other nebulizers)

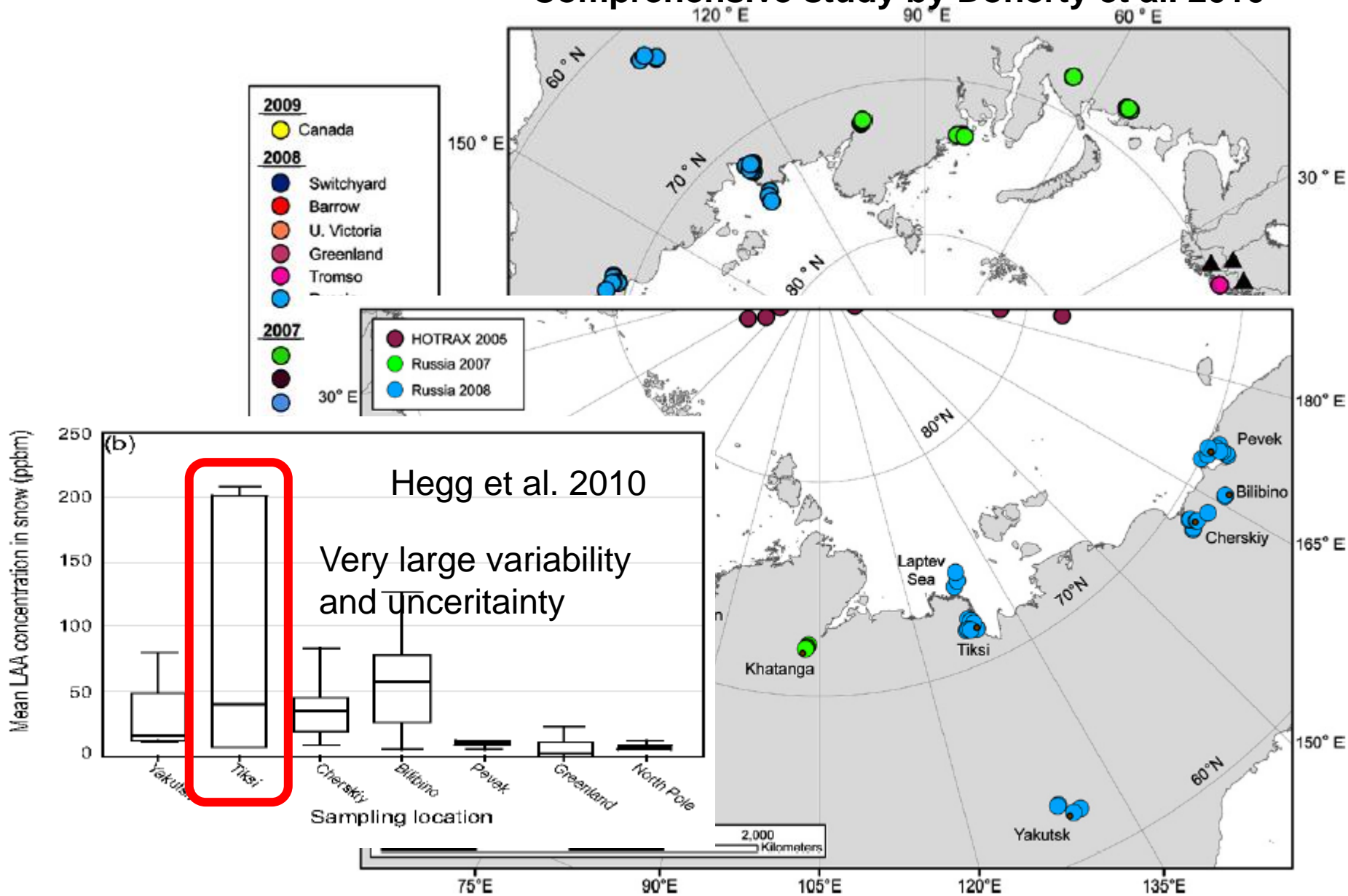




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Previous work in Arctic and Russian Arctic, consists of one published paper...

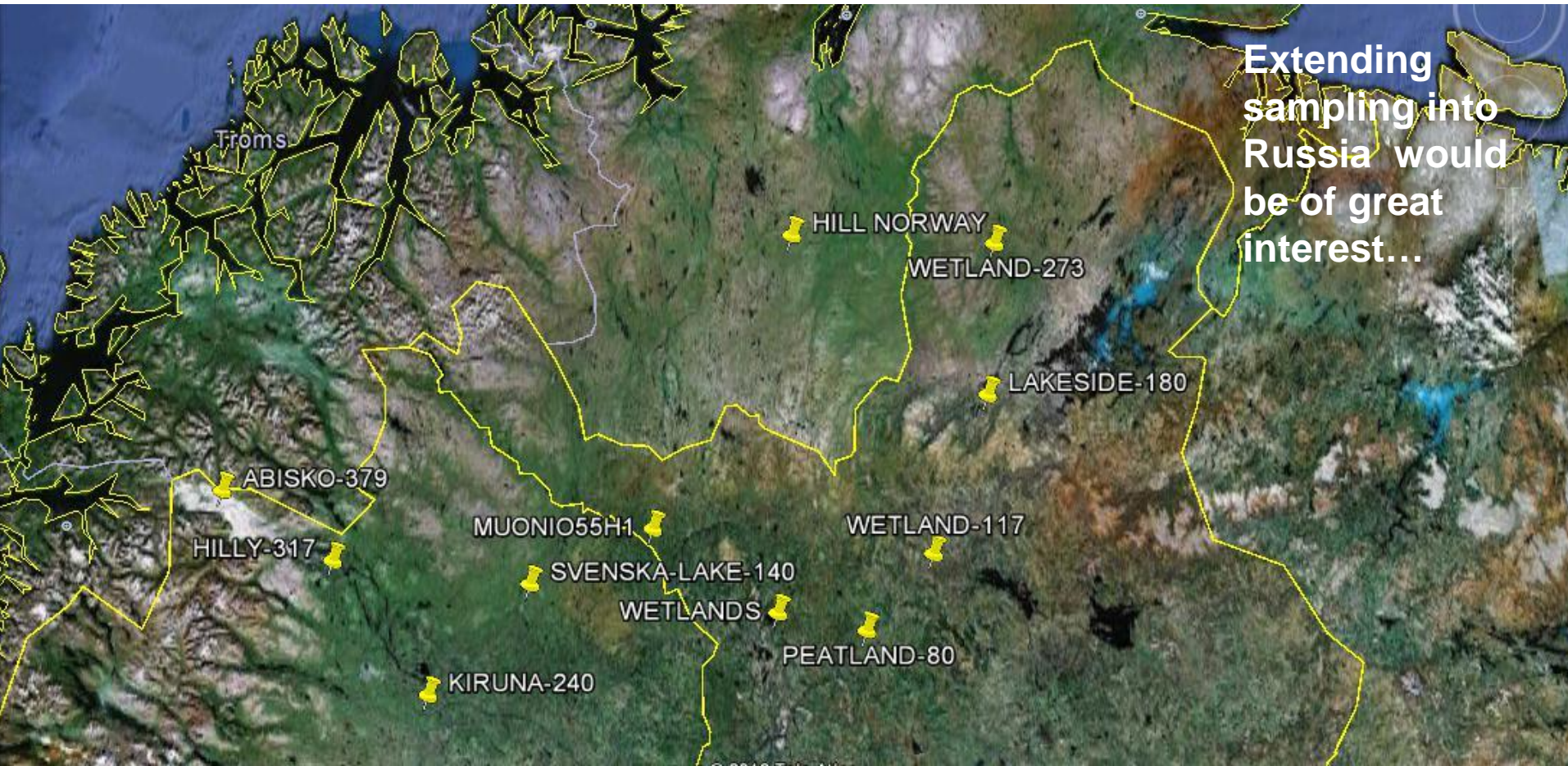
Comprehensive study by Doherty et al. 2010





Pilot study: Elemental carbon in Arctic Scandinavian snow 2012

Modeling studies estimate high concentrations of BC in Arctic Scandinavia and Arctic Russia, compared to rest of the Arctic. Remains to be verified by observations

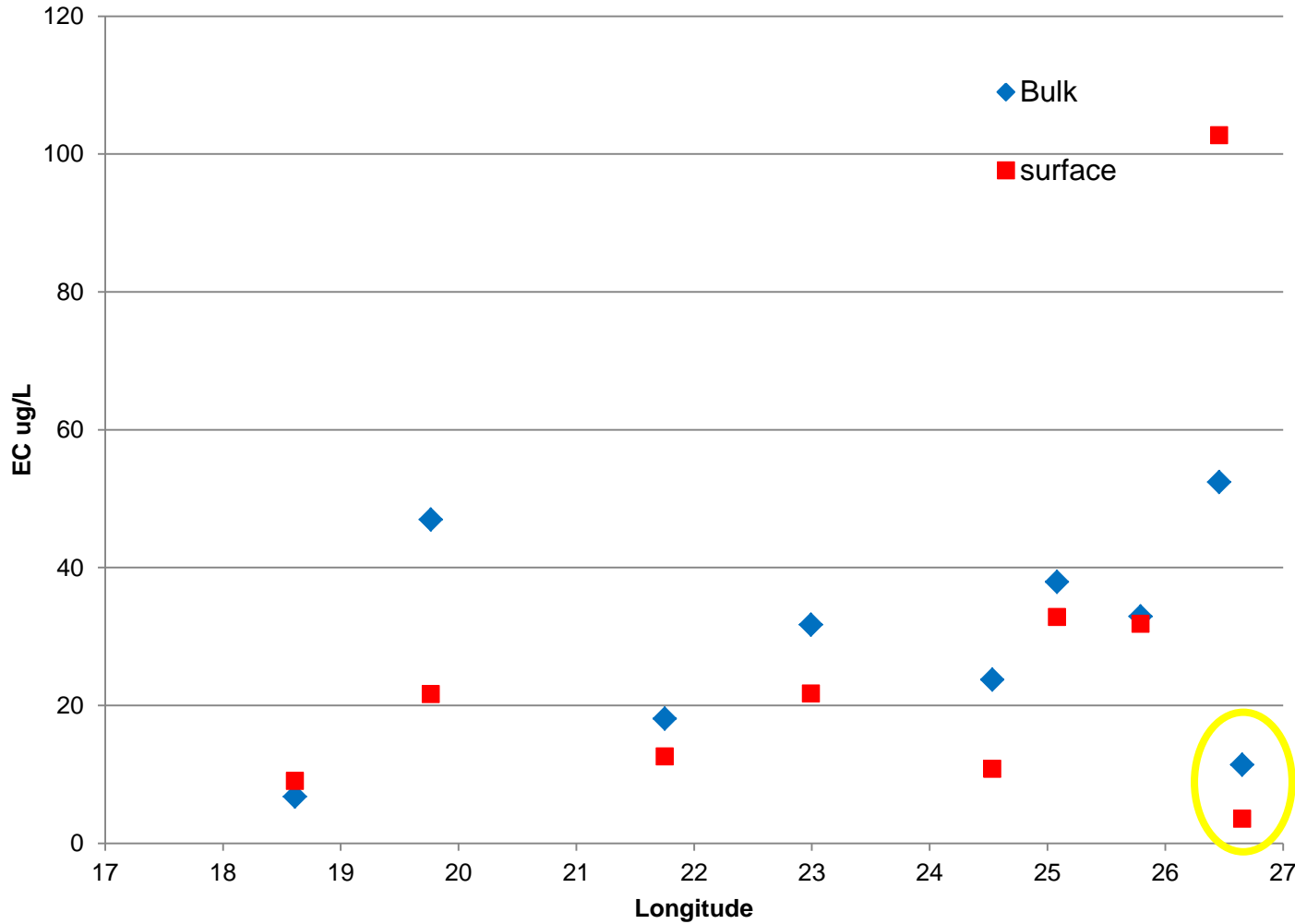


Higher concentrations of EC in the snow closer to the Russian border?



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Maybe... more measurements are necessary to confirm this!



Samples from northern Norway. North-south gradient in Arctic also?



Future research:

- **Would like to extend Scandinavian survey 2013 into Eastern Arctic Russia, to see influence of industrialized Kola Peninsula.**

Questions?

- **Have the ability to do both SP2 ambient aerosol measurements of BC in snow and thermal-optical method (filter based method).**
- **Tiksi, only one publication so far on BC in snow. More measurements in Tiksi and in the vicinity of Tiksi (greater than 100km away) would be of great interest. Important with spatial and temporal studies of BC, many questions still remain!**