# The distribution of atmospheric black carbon in marine boundary layer over the seas of the western part of the Russian Arctic in September – October 2011

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**Introduction**

Black or elemental carbon (BC, EC) aerosol is one of atmospheric constituents considered to be an important contributor to climate change in Arctic regions [Eleftheriadis et al., 2009; Hegg et al., 2010]. It has been shown that BC aerosols can decrease the albedo of snow/ice and heating of the atmosphere [Hansen et al., 2004; Vignati et al., 2010]. Black carbon (BC) is the most efficient atmospheric particulate species at absorbing visible light. The data on the distribution of the BC in atmosphere over the seas of the Russian Arctic are scarce. New data are presented in this work.

*Fig. 1. RV "Akademik Mstislav Keldysh"*

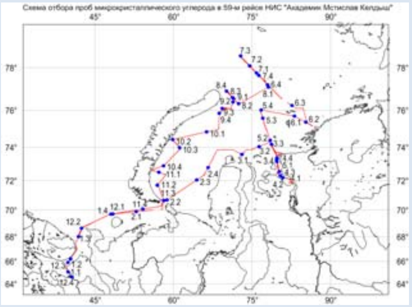


*Fig.2 Map of sampling sites*

**Materials and methods**

The distribution of black carbon in the atmosphere in marine boundary layer in the White, Barents and Kara seas has been measured from September 12 to October 7, 2011 during the 59-th cruise of the RV "Akademik Mstislav Keldysh"(Fig. 1). Separate samples were being collected during 10 – 14 hours approximately. Map of sampling sites is on Fig. 2.

To obtain mass concentrations of BC we used filtration method on the open deck at the height of 9 m above sea surface. (Fig.3) Then filters were analyzed in Institute of Atmospheric Phisics. The method of aethalometry was used to define BC content. Backwards trajectories of air masses were calculated using NOAA HYSPLIT model (http://www.arl.noaa.gov/ready.html).

*Fig. 3 Deck of the RV* "Akademik Mstislav Keldysh"

**Results**

The highest values of BC concentrations were recorded in the atmosphere near port of Arkhangelsk (600–830 ng/cub.m). In the background areas the BC concentrations varied from 10 to 470 ng/cub.m (120 ng/cub.m in average, standard deviation is 110 ng/cub.m, n=45 measurements) (Fig. 4). These values are at the level of background values for the Russian Arctic seas. The lowest values were recorded after rains and when air masses came from the Central Arctic (Fig. 5a). Relatively high BC concentrations in the Kara Sea were in air massed arrived from the NW Siberia and in the Barents Sea in air masses arrived from the Arkhangelsk industrial area (Fig. 5 b). High BC concentration in air massed arrived from the NW Siberia possibly are related to gas flaring on fields of NW Siberia (Fig. 6)

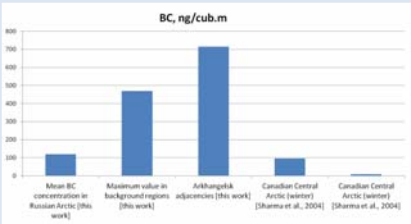
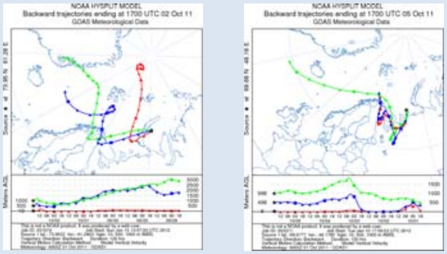



*Fig.4 BC concentrations in Arctic aerosols*



a. b.

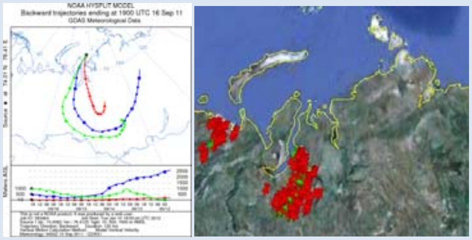
*Fig. 5 Back trajectories from the end points of sampling sites: a. sample 10-3, BC concentration 30 ng/cub.m; b. sample 12-1, BC concentration 470 ng/cub.m*

**Conclusion**

•Mean concentration of BC in atmosphere over the seas of the western part of the Russian Arctic in September – October 2011 was 120 ng/cub.m. BC concentrations depend on both site of sampling and meteorological conditions and way of air masses following;

• Relatively high BC concentrations in the Kara Sea were in air massed arrived from the NW Siberia, that possibly is related to gas flares there;

•Local high values in the Dvina Bay of the White Sea are related to influence of Arkhangelsk city.



a. b.

*Fig. 6 a. Back trajectory from the end point of sampling site 3-2 (BC concentration 330 ng/cub.m); b. sites of gas flare from satellite data (http://www.ngdc.noaa.gov/dmsp/interest/gas_flares_countries_kmz.html)*

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