The paper presents a modelling study of the impact of shipping emissions in the Canadian Arctic. The work consist of two parts: Establishing of the national Canadian marine shipping inventory for 2010 and two projection for 2030, which was used as in put for the second part: atmospheric modelling of air quality by using the GEN-MACH model system in order to study the performance of the model system and the impacts of shipping emissions to the air quality.

The paper is generally well written and I recommend it to publish in ACP after revision.

General comments:

1. Major concern: The model runs have only been done for a short period March-October 2010 and only results for the shipping period (June –September) were presented. That is weakness of the paper, also because there are large seasonal variability in the arctic of air quality. It could be nice to see the model system performance a whole year, nice the see the overall contribution from shipping activities over a whole year, not only when shipping activities peaks. Especially in the section about deposition it is a problem, because the results covers only 25% of a whole year and there are large seasonal variability of the deposition of N and S. In line 19-20 on page 20 there are a statement that these deposition levels are in general accordance with previous estimates e.g in Hole et al, 2009, which are a whole year estimate. It is a problem to extrapolate 3 month model results of deposition to a whole year deposition especially in the Northern part of Canada due the large seasonal variability of concentrations, surface conditions (snow-ice-forest-tundra) and the type and amount of precipitation.
2. Two kind of boundary conditions are used: The MACC-IFS for the arctic boundaries and the operational GEM-MACH forecast archives for the southern boundary, because the later should better represent transport from North America. It is little confusing to use to different boundary conditions. It could be nice to see how important the use GEM-MACH for the southern boundary are for the model performance is compared to use the global MACC-IFS 3-hour resolution input (is MACC-IFS so bad for the southern boundary?). It is actual mention in the text line 28-31 page 12 that some of the over prediction in the southern part of the model domain could be related to the boundary conditions.

Specific comments:

Page 2 line 27: large part of the particular matter is SO4 and is therefore a primary emission of SO4 in the shipping source area.

Page 4 line 1: the discussion of instant dilution of ship NOx emissions in global models. It is not only due the course spatial but also coarse temporal (monthly) because of the low number of ships in the arctic. Some models (.e.g. EMEP model) have special ship_NOX tracers which do not contribute to Ozone production only to HNO3.

Page 4 line 30: is the temporal emission from shipping really hourly so you can tracking the individual ships (see also my comment above)?

Page 5 line 26-page 6 line 18: I am missing figure (f.ex. of CO2 in order to avoid changes in emissions factors due to ECA) which shows the spatial distribution for 2030 which could be compared to 2010 of the ships emission and more information assumptions for the 2030 emissions inventory, e.g. the increase for the different ships sectors, emissions factors etc, so it is easier to compare the 2030 inventories with others.

Page 17 line 14: median and maximum percentage. Is it median and maximum of the 3 months average of the individual grid points inside the sectors or is it other spatial/temporal averaged concentrations?