

Interactive comment on “Quantifying importance and scaling effects of atmospheric deposition of inorganic fixed nitrogen for the eutrophic Black Sea” by A. Varenik et al.

Anonymous Referee #1

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General comment:

This manuscript describes a new and long-term dataset of the inorganic fixed nitrogen (IFN; nitrate, nitrite and ammonium) content in the wet atmospheric deposition at two coastal stations near the Black Sea. Using concentration measured at these two locations, a regression equation has been validated and IFN concentration has been extrapolated over the Black Sea. Authors have also discussed inter and intra annual variability of the IFN at these sites and highlighted the significance of influx of IFN via wet deposition on mesoscale processes. This dataset will make an important contribution towards improving our understanding of nitrogen cycling at regional scale. However, there are number of problems with the current version. In general, there is

C4483

room for grammatical improvement (few mentioned in below comments) as well as rewording/rearrangement of texts. I found some of the text to be repetitive and suggest that the authors make a concerted effort to eliminate such things. The manuscript is of interest in the context of role of atmospheric inputs to the surface ocean and its impact, and I think suitable for publication in Biogeosciences after some modest revision, as detailed below. My specific comments are listed in the order they appear in the manuscript:

Specific comments:

- 1) Page 11160, Line 23-24: “This input of IFN can potentially double the level of primary production.” Can be reworded as “The input of IFN to Black Sea has potential to enhance level of primary production”.
- 2) Page 11161, Line 6-8: “Yet, this data is exceptionally important for understanding, modeling, and fighting negative effects of anthropogenic eutrophication and other effects in the Black Sea ecosystem.” Can be reworded as “Such data are very important for understanding, modelling and assessing negative impacts of anthropogenic eutrophication as well as other effects in the Black Sea ecosystem.”
- 3) Page 11161, Line 17: “Yet, when it comes to...” can be replaced by “However, in case of ...”
- 4) Page 11161, Line 19-24: Too long statement. Can be reworded as “Black Sea being surrounded by industrialized areas (or countries), it is obvious as well as highlighted by few studies ((Kubilay et al., 1995; Chaykina et al., 2006; Medinets and Medinets, 2012), the significant influx of IFN via atmospheric wet deposition. However, till date, neither basin-wide magnitude, nor spatial and temporal variations, or aftereffects of this input to the Black Sea has been ever evaluated.”
- 5) Page 11162, Line 8-14: Again, it's too long statement. Can be divided into two lines.
- 6) Page 11162, Line 18: Kubilay et al. (2013) is missing in the reference list.

C4484

- 7) Page 11163, Line 4-6: Repeated here from Page 11161, Line 22-24.
- 8) Page 11163, Line 9-11: 19 % of air parcels are derived from local region. How they can contribute to long-range transport?
- 9) Page 11163, Line 11-14: What I understand here that 90 % of precipitation events have back-trajectories associated with long-range transport (which are crossing anthropogenic IFN emission regions). However, in the next line, the local processes are highlighted. I think, both play significant role in bringing pollutants (in this case IFN) and their delivery to the surface ocean.
- 10) Page 11163, Line 17-22: Objectives can be reworded as: (i) to present multi-annual observational dataset of IFN (. . . .) via wet atmospheric deposition...(ii) . . . (iii) . . . and (iv) to evaluate impact of IFN deposition to the Black Sea on various time scales.
- 11) Data and Methods: It will be useful to mention rainfall pattern and sample collection procedure at the sampling site. What is the collection period of each samples? Collected sample represent a single or multiple event in a day?
- 12) Page 11165, Line 5-18: This should go to Result and discussions.
- 13) Page 11165, Line 19-21: Briefly discuss meteorological parameter and their seasonality as they will be used in regression analyses.
- 14) Page 11168, Line 14-19: Can be reworded.
- 15) Page 11169, Line 10-11: Why there is a seasonal variation in the fuel consumption? Is this a local phenomenon near sampling site (Sevastopol)? Or is it attributed to any socio-economic activity?
- 16) Page 11170, Line 4: Are concentration same for both sites?
- 17) Page 11171, Line 19-23: How the concentrations are calculated on spatial scale over Black Sea? Does the contribution from other source region (especially near coast) are considered while extrapolating the IFN concentration?

C4485

Technical comments: There are several grammatical errors and typo. Few are mentioned below.

- 1) Page 11161, Line 2: “.marine environments has. . . . Should be “. . . .marine environment have. . . .”
- 2) Page 11163, Line 8: “. . .below clouds on. . .” should be “. . . below clouds during. . .”.
- 3) Page 11165, Line 6: “. . . .April 2005, accordingly. . . .” Should be “.April 2005, respectively. . . .”
- 4) Page 11167, Line 19: chlorophyll. . .
- 5) Page 11168, Line 8: Remove region.

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C4486