

Interactive comment on “Holocene atmospheric iodine evolution over the North Atlantic” by Juan Pablo Corella et al.

Anonymous Referee #2

Received and published: 12 August 2019

In this study, the first ice core iodine record spanning the Holocene is presented. Iodine levels were high during the early Holocene and industrialization relative to the late Holocene. Chemical transport model results of inorganic iodine sources and transport are compared to ice core iodine levels. This comparison suggests that marine biogenic sources of iodine were higher during the early Holocene relative to the late Holocene. This increase in biogenic sources is reasonable in the early Holocene given that other reconstructions show that sea surface temperatures in the North Atlantic were warmer, salinity was higher, sea ice extent was lower, and primary productivity of subpolar planktonic species was higher. This study is well-written and well-organized. It should be published because it is the first record iodine covering the early Holocene and provides strong links to climatic factors that could explain the unexpectedly high

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levels of early Holocene iodine. Hopefully, it will inspire future study of iodine species in ice cores.

Major comments

Section 1, lines 36-37: This sentence is confusing. What exactly is meant by “has a global contribution of up to 27% of the total rate of ozone loss?”

Section 1, lines 58-68: Two ice cores are reported as having the only iodine records, but further in the paragraph, a third ice core record is discussed. Please clarify.

Section 2.1, line 91-96. Please discuss the depth-age scale in more detail because (it is not yet published?). Perhaps include a depth-age scale in the supplement. Which volcanic markers were used and how well-spaced are they throughout the record? What are the uncertainties?

Section 2.2, lines 99-100. Please include the sampling resolution at various depths. Clearly, several more samples were analysed in more recent years which makes sense as the fractions were collected via the CFA system. The easiest way to do this may be to include a mean sampling resolution for the time periods discussed in each section (results).

Section 3: Please use the same units when possible. It is difficult for the reader to understand readily the comparisons between different periods of time and the model versus the observations when the units are changed.

Section 3: It would be useful to discuss the relationship between concentration and flux here. Did the flux calculation confirm that remobilization processes were not consequential? Are there any important differences when flux is used?

Line 141: Start a new paragraph here? How does the second part of this paragraph relate to the first part?

Correlation coefficients of sodium and calcium are shown in Table S3 and in section

3.1, lines 182-183 the authors state that there is no correlation. Is it possible to also include a time series of calcium and sodium measurements in the supplement?

Lines 191: Please use the same units throughout the manuscript when possible.

Lines 192-193: How would the ssa contribution change over time? Is the lack of a correlation during the early Holocene purely due to the biogenic contribution overwhelming the other signals? Are they still there?

Lines 205-208: Please include the ice core values here and clarify how this conclusion was made, given the values provided.

Lines 221-223: Replace “a higher frequency” with “higher frequency variability.” I agree that this is pretty clearly due to increased sampling resolution. If anything, averaging or smoothing could be used to compare the late Holocene to the early Holocene. The late Holocene levels may only appear to show higher frequency variability because there are more samples.

The focus of this study is iodine and should remain iodine. Do other halogens, like bromine, that were measured in the ReCAP ice core (Maffezzoli et al., 2018, in review), also show the same high levels during the early Holocene? Are the processes governing the sources, transport, and deposition of other halogens so different that they should not be included in the supplement?

Consider adding a section about the modelling results. These results are used to explain the interpretation of the ice core record, but it would be useful to have an understanding of the results prior to the comparison.

Figures and tables

fig. 1 add mapping software reference and color bar if going to include bathymetry fig. 2 add indication of detection limits to iodine concentrations Table S1: Please consider moving table S1 to the main text. Please add more to this caption. What are the sources (ice core versus model inputs/outputs) in each column?

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Minor Comments: Abstract, line 22: change to: “in the record were found” line 30: “allows for the detailed” line 32: “key factor for understanding” line 42: change to “involve” line 59: “Ice core” line 66: “allow for a” Rename section 2.1 “Study site and dating” or “Study site and age scale” Line 108: “with the stability of the instrumental” Line 126: remove “The model” Line 129: “all of the” Line 138: add comma before “respectively” Line 141: remove “thus” before “Holocene” Line 146: remove “occurring” before “before” Line 203: change to “algal” Line 205: change to “both of these processes” Line 207, 220: “concentrations” Line 221: commas before and after “respectively” Line 241: comma before “resulting” Line 251: “to accelerate considerably”

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-71>, 2019.

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