

We thank the reviewer for her/his careful reading of our manuscript and for her/his additional comments. We highly appreciate the time she/he invested into helping us to improve the paper.

Responses to Reviewer #1 (in blue) with Reviewers' comments in black.

The manuscript by Ivana Kolmasova and colleagues analyses lightning occurrences over the northern Atlantic and the North Sea during the winter season 2014/2015. It is found that intense lightning discharges, named superbolts, are predominantly found at nighttime in the morning hours as single stroke flashes. The manuscript is extremely well written, easy to follow, logically constructed and the figures support the text. The content of the paper is enjoyable to read. Particularly interesting is the explanation of the authors how the North Atlantic Oscillation might have contributed to the production of more severe electrified storms when compared to other meteorological processes that produce abundant lightning. Although not specifically mentioned in the manuscript, the findings might have a significant impact by informing lightning protection measures for the rapidly increasing number of wind turbines in the North Sea and existing oil platforms. As a result, I have only a few very minor comments to improve the quality of the manuscript which the authors might want to consider prior to publication. Thanks to the recommendation of the reviewer, we added following sentence related to lightning protection at the end of the summary section. *“Based on the distribution, strength and intensity of lightning —and especially superbolts— presented in our study, our findings might have an impact on the applications of lightning protection measures because of the rapidly increasing number of wind turbines and existing oil platforms in the North Sea.”*

(1)l119 - Explain what is meant by ‘huge’. Relatively large spatial scale or long duration, or both, or number of customers affected?

By huge power outages, we meant both large areas and number of customers affected. We modified the text accordingly and now it reads as follows on line 120:

„During the winter 2014/2015, UK, Germany, Poland, and Scandinavia suffered from extremely strong storms, which caused power outages in large areas, damages of buildings, and collapses of traffic paralyzing the daily life.“

A few links illustrating the exceptionality of the weather conditions are below:

<https://www.welt.de/vermishtes/weltgeschehen/article136239231/Das-verrueckteste-Wetter-seit-100-Jahren.html>

<https://www.dailyrecord.co.uk/news/scottish-news/thousands-homes-north-scotland-remain-4961335>

<https://www.express.co.uk/news/nature/551859/UK-weather-latest-thundersnow-Britain-Storm-Rachel>

<https://www.theguardian.com/uk-news/2015/jan/11/thousands-homes-without-power-scotland-uk-weather-warning>

(2)l129 - The excellent and exhaustive literature review could be supplemented by a recent publication from Ripoll et al., in Nature Communications, 2021, for comparison.

We added the recommended reference and corresponding text on lines 135-138:

“Interestingly, this huge electromagnetic energy seems to have difficulties to leave the atmosphere: the superbolts with energies at least 1000 times larger than the mean energy of all lightning strokes detected by WWLLN were recently found by Ripoll et al., (2021) to transmit only 10–1000 times more powerful electromagnetic waves into the space in comparison with typical strokes. This discrepancy—, which has been unnoticed and unexplained— implies that remote sensing of superbolts from space might be useless and we have to rely on ground based observations.”

(3)|142 - Clarify whether the ~70 stations existed now, or already in 2014/2015.

There have been about 70 WWLLN sensors operational already since 2013 as reported in Hutchins et al. (2013). We added the information to the text on line 152 and added the relevant reference.

(4)|163 - Add the southern boundary and explain why an extension to 60 deg East is of interest, which seems far from the northern Atlantic and the North Sea. Use 9,066 and 53,182.

The southern boundary is 50°N, it is already mentioned in the manuscript. The northern boundary was not mentioned, as it is 90°N. The eastern boundary was set to 60°E to cover the northern part of European continent up to the border between Europe and Asia. We modified the text accordingly on lines 172-173: “... the area of our interest limited from the south by 50°N, and from the west by 20°W. The eastern boundary of 60°E was chosen to cover the northern part of the European continent up to the Ural Mountains.”

The format of numbers was changed.

(5)|167 - Clarify what is dangerous about superbolts, when compared to lightning protection guidelines, if that is what is meant.

To illustrate hazards related to superbolts we added following text on lines 131-135: “*Their peak currents reach above 3 MA when using an empirical formula 2 in Hutchins et al. (2012b), which was, however, derived considering all lightning and not specifically superbolts. Such extraordinary high peak currents, if they are real, would be by one order of magnitude larger than the highest lightning protection level (200 kA) recommended for protection of wind turbine rotor blades against lightning (Brondsted and Nijssen, 2013).*”

(6)|168 - 10,742

Done on line 180.

(7)|252 - Replace the acronym ‘TD’ by thunderstorm days, to enhance readability.

Done on line 262.

(8)|272 - change

Done on line 282.

(9)|301 - Explain in one sentence what the NAO index measures for the unfamiliar reader.

We added an explanation on lines 313-314: “*The monthly NAO index describes the strength of NAO. Its calculation is based on the difference between normalized mean sea-level pressure strengths of the Azores High and the Icelandic Low.*”