This paper has analyzed the characteristic features of a major two-step geomagnetic storm during 23–24 April 2023 based on the data available at the INTERMAGNET magnetometer network. This study is interesting and gets meaningful conclusions. This observation of the substorm current wedge phenomenon provides the basis for studies utilizing the datasets collected with ground-based magnetometers. Therefore this work can be acceptable after a major revision. Specific issues are as follows:

1. **Abstract:** The abstract should be organized into five aspects: background, purpose, methods, results, and conclusions. It should particularly emphasize explaining the research background, meaning and main achievements of this manuscript.
2. **Introduction:** There are numerous instances of multiple references cited together, such as

   Line 47: "… a large number of studies (see, e.g., (Gonzalez et al., 1994; Laštovička, 1996; …"

   Line 53: "… affect human health (Daglis, 2001; Freeman, 2001; Song et al., 2001; Carlowicz and Lopez, 2002; Moldwin, 2008)"

   …

   Please provide a detailed explanation of the inspiration each of these references brings to the manuscript.
3. **Introduction:** To explain more clearly, the organizing structure of this paper should be explained at the end of the Introduction.
4. **Figure 1:** To highlight and avoid confusion, it is recommended to represent the site in different colors.
5. Current Section 2 only introduces data sources and observation stations, the title and text is inconsistent. Therefore, I suggest revising the title "2 Instrumentation and techniques" as "2 Data and materials". And a detailed observed instrumentation and its working parameters should be added.
6. **Section 3** presents the results of the second section, and it is recommended to merge them into one section.
7. The main achievement of this study is the issues concerning the threshold condition for the formation of the substorm current wedge; this

accomplishment is at the end of the paper as a conclusion. To highlight this, I suggest renaming the paper as, for instance, “A two-step geospace storm as a new tool for experimentally estimating the threshold condition for the formation of a substorm current wedge”.

8. **Section 4** “Analysis of magnetometer data” is suggested to be moved to the Appendix. This rearrangement puts the principle accomplishment of this study at the center of the text.
9. **Figures 3-11:** Most of the data in the figures are difficult to see clearly. It is recommended to revise the drawing method to be easily seen by readers.
10. Throughout the text two designations of universal time can be found, UT and UTC. This should be fixed somehow. Figures 3-11, horizontal axis: UT (hours) is written, while (hh:mm) is indicated. Figures 12: horizontal axis: Universal Time (hours) is written, while (hh:mm) is indicated.
11. Extensive English editing is required. Such as:

    Line 13: replace “show” with “shows”

    Line 40: replace “in Global Positioning System and in VLF navigation” with “in the Global Positioning System and VLF navigation”

    Line 46: replace “storm” with “storms”

    line 95: replace “coordinares” with “coordinates”

    …