RESPONSE TO REVIEWER RC2

May 26, 2025

Dear Editor,
we thank both Reviewer and the Editor for the time dedicated to reading and revising our manuscript. We have taken great care of answering your comments. Among all modifications, we stress the main ones here. We provide our full answer letter below.

Sincerely,
Lia Rapella,
on behalf of the authors

Main comments

Comment #1

This first comment relates to the analogue method.
As I understand it, the analogue method only considers the time of maximum intensity when looking for similar cyclones in the earlier period. I wonder how different the analogues would be (and therefore also the results) if you took into account the cyclone development. In terms of impacts, particularly for precipitation, the development period of the cyclone may matter more in terms of overall similarity than only the time of maximum intensity. I assume it should not be too difficult to look for analogues at various times before maximum intensity to see if the results are sensitive to this. Finding analogues that remained similar throughout their lifecycle may find cyclones that are more representative of the cyclones from the current period.

We particularly thank the Reviewer for raising this point. It has been shown (e.g., Ginesta et al., 2024) that attribution-based results on analogues are robust also if taking into account time steps related to the cyclone development and not just the time at which the minimum in SLP is observed. However, in the revised version we will assess this point by looking also for analogues at times before and after the defined cyclone time (see Figures 1)-4).

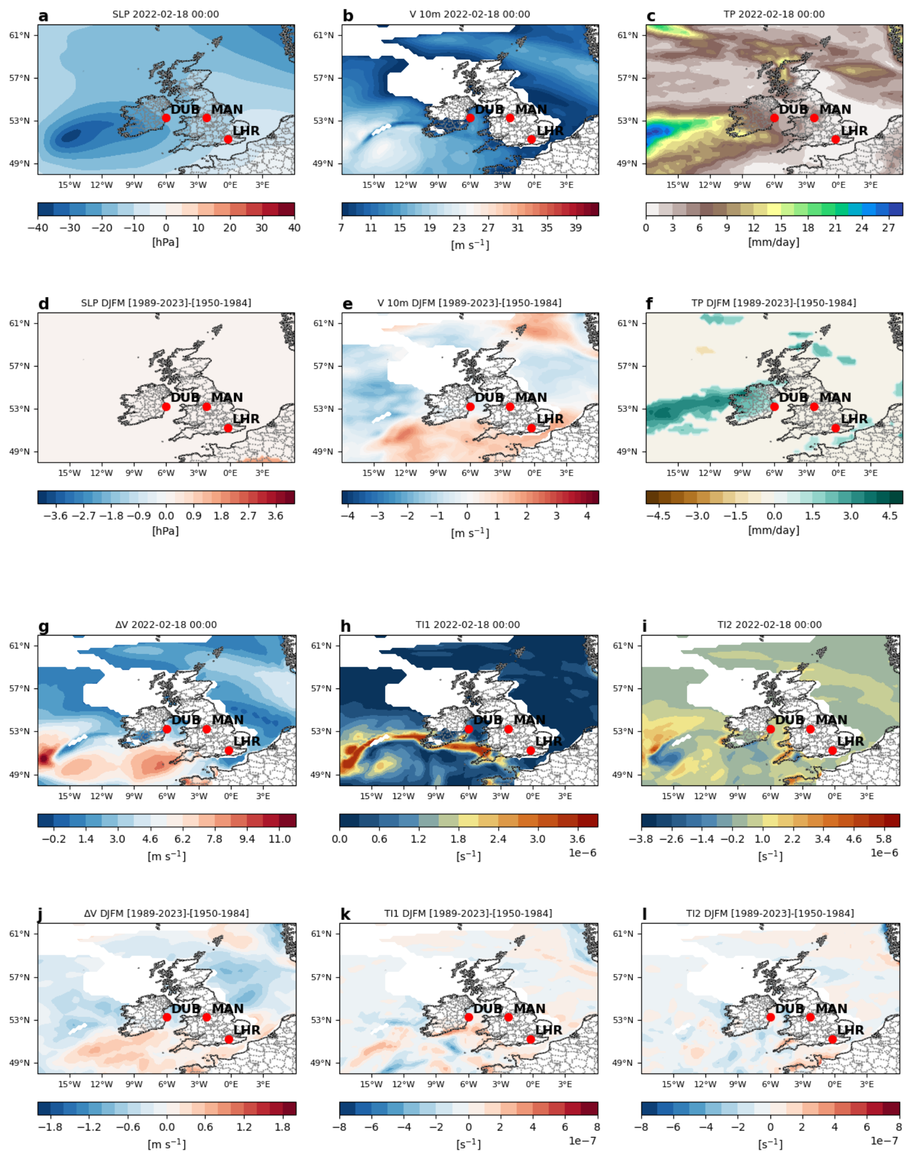

Figure 1: Analogue-based results for the Storm Eunice on 2022-02-18 00:00 (before the cyclone time). SLP **a** anomaly, V 10m **b** and TP **c**. Difference between factual [1989-2023] and counterfactual [1950-1984] period of the average SLP anomalies **d**, V 10m **e** and TP **f**. Bulk wind difference **g**, TI1 **h**, TI2 **i** and difference between factual [1989-2023] and counterfactual [1950-1984] period of the same variables ΔV **j**, TI1 **k** and TI2 **l**. In the second and fourth rows, shadings indicate significant changes. Red dots indicate major airports in the region: Dublin Airport (DUB), Manchester Airport (MAN) and Heathrow Airport (LHR).

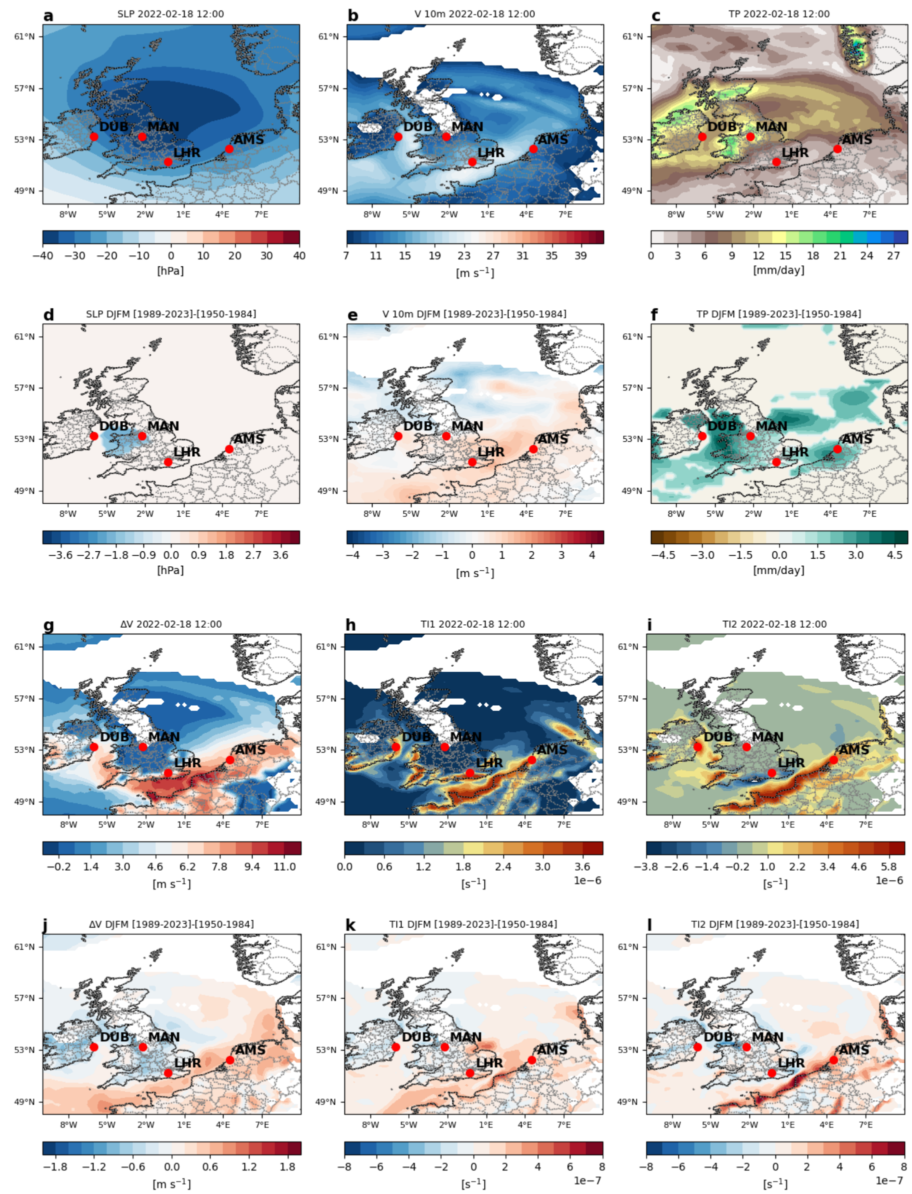

Figure 2: Analogue-based results for the Storm Eunice on 2022-02-18 12:00 (after the cyclone time). SLP **a** anomaly, V 10m **b** and TP **c**. Difference between factual [1989-2023] and counterfactual [1950-1984] period of the average SLP anomalies **d**, V 10m **e** and TP **f**. Bulk wind difference **g**, TI1 **h**, TI2 **i** and difference between factual [1989-2023] and counterfactual [1950-1984] period of the same variables ΔV **j**, TI1 **k** and TI2 **l**. In the second and fourth rows, shadings indicate significant changes. Red dots indicate major airports in the region: Dublin Airport (DUB), Manchester Airport (MAN), Heathrow Airport (LHR) and Amsterdam Airport (AMS).

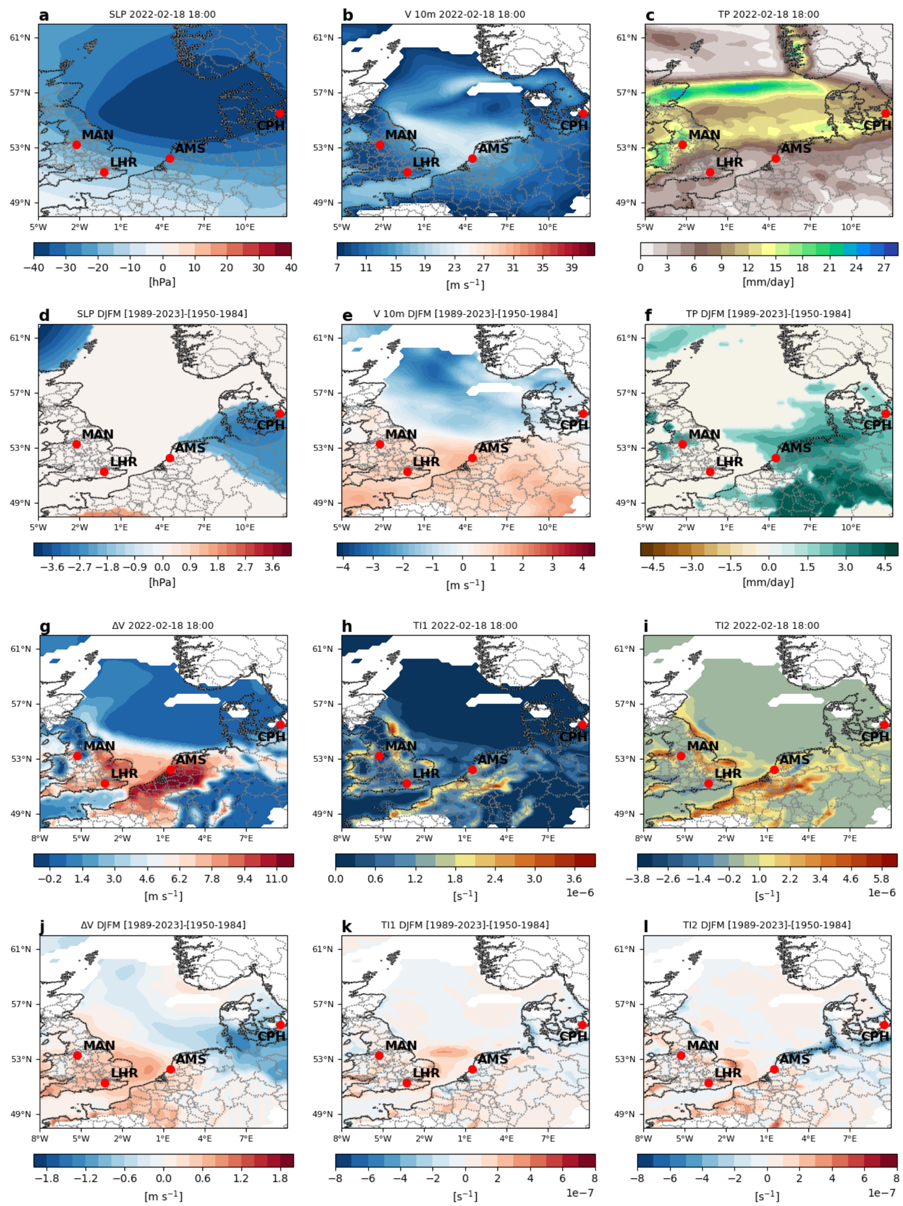

Figure 3: Analogue-based results for the Storm Eunice on 2022-02-18 18:00 (after the cyclone time). SLP **a** anomaly, V 10m **b** and TP **c**. Difference between factual [1989-2023] and counterfactual [1950-1984] period of the average SLP anomalies **d**, V 10m **e** and TP **f**. Bulk wind difference **g**, TI1 **h**, TI2 **i** and difference between factual [1989-2023] and counterfactual [1950-1984] period of the same variables ΔV **j**, TI1 **k** and TI2 **l**. In the second and fourth rows, shadings indicate significant changes. Red dots indicate major airports in the region: Manchester Airport (MAN), Heathrow Airport (LHR), Amsterdam Airport (AMS) and Copenhagen Airport (CPH).

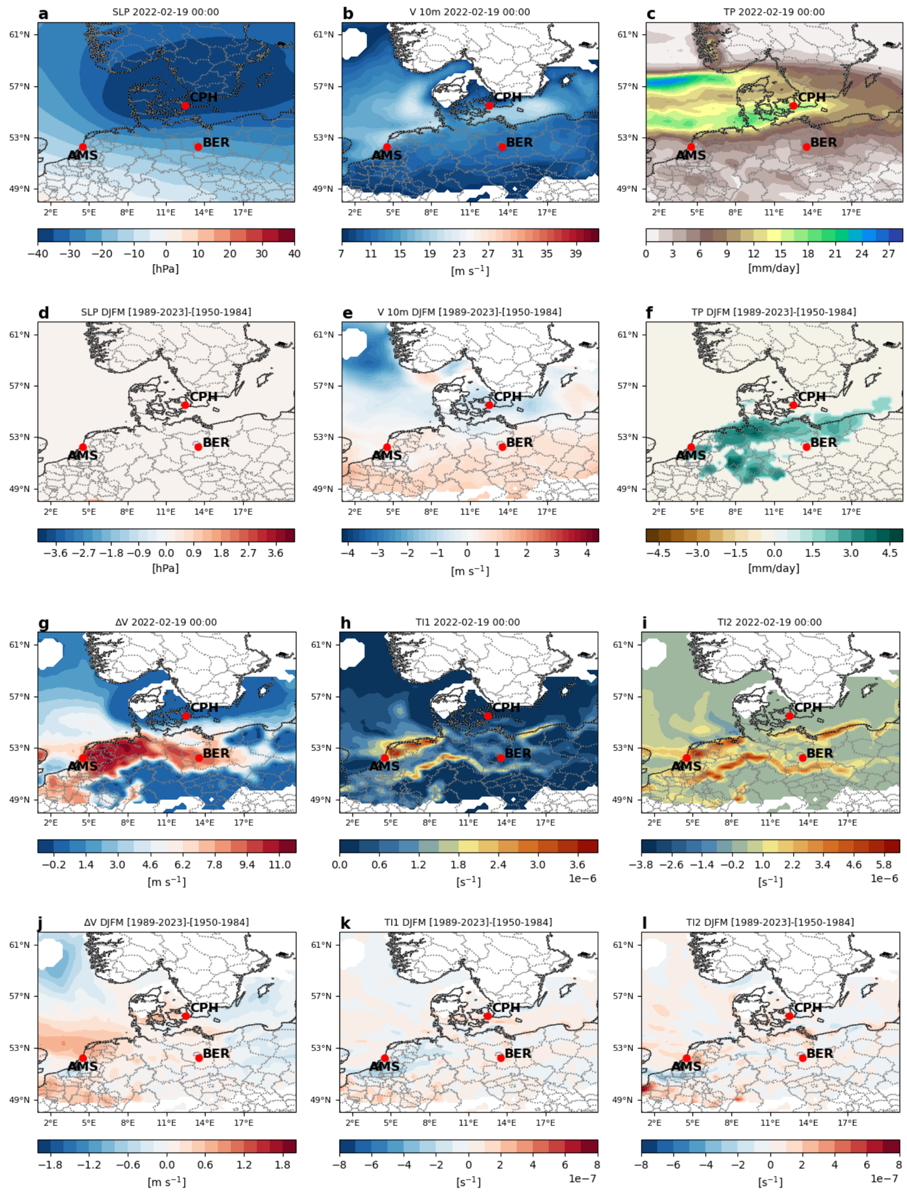

Figure 4: Analogue-based results for the Storm Eunice on 2022-02-19 00:00 (after the cyclone time). SLP **a** anomaly, V 10m **b** and TP **c**. Difference between factual [1989-2023] and counterfactual [1950-1984] period of the average SLP anomalies **d**, V 10m **e** and TP **f**. Bulk wind difference **g**, TI1 **h**, TI2 **i** and difference between factual [1989-2023] and counterfactual [1950-1984] period of the same variables ΔV **j**, TI1 **k** and TI2 **l**. In the second and fourth rows, shadings indicate significant changes. Red dots indicate major airports in the region: Amsterdam Airport (AMS), Copenhagen Airport (CPH) and Berlin Brandenburg Airport (BER).

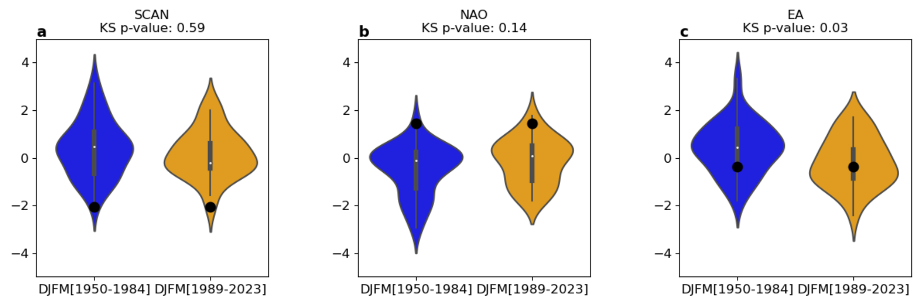

Figure 5: Violin plots showing the distribution of daily index values for SCAN **a**, NAO **b**, and EA **c** during the past (blue) and present (yellow) periods. Values for the peak day of the extreme event are marked by a black dot.

Comment #2

This comment relates to the modes of variability considered.
When accounting for low frequency variability you consider ENSO, the AMO and PDO indices. I was surprised you did not include the NAO as this is well known to greatly impact both the frequency and intensity of extratropical cyclones (granted for the North Atlantic/Europe primarily). Have you tested whether including the NAO in your assessment of natural variability changes your results? Some discussion relating to this is needed regardless.

We particularly thank the Reviewer for raising this point. In the revised version we will assess the low-frequency climate variability also including additional tele-connection indices as the suggested NAO, but also the East Atlantic (EA) and the Scandinavian (SCAN) pattern which are known to influence Euro-Mediterranean weather extremes. By performing statistical tests we note that for the case of Eunice (see Figure 5) only the EA pattern is significant, thus suggesting a very minor role of natural low-frequency variability in this event (one mode over six).

Minor comments

We will implement all corrections related to each minor/technical comment.