Response to the Reviewer's Comments

Manuscript title : Nocturnal variability of total electron content (TEC) at Koudougou (Burkina Faso) during three geomagnetic storms of solar cycle 24 : implications for equatorial ionospheric irregularities.

1. Introduction

We sincerely thank the reviewer for the thorough and constructive evaluation of our manuscript. The comments have significantly improved the scientific clarity and presentation quality of the work. We address each point below.

2. Ionospheric irregularities not directly observed

Reviewer's comment : The manuscript never demonstrates that irregularities actually occurred. This distinction should be clearly stated throughout.

Our response : We fully agree. We have added a clear statement in Section 2.5 acknowledging that σ_TEC does not constitute a direct detection of plasma bubbles or scintillation events. It provides a measure of nocturnal TEC variability that is consistent with but not uniquely attributable to the presence of irregularities. This distinction has been carried consistently throughout our study.

3. Physical justification of σ_TEC as proxy for irregularities

Reviewer's comment : The manuscript does not explain why σ_TEC can be considered a reliable indicator of ionospheric irregularities.

Our response : A dedicated paragraph has been added in Section 2.5 explaining that large hour-to-hour nocturnal TEC fluctuations are generally associated with plasma density structures such as equatorial spread F and plasma bubbles (Pi et al., 1997 ; Basu et al., 2001 ; Kintner et al., 2007), and that the adopted thresholds are consistent with conditions favorable to plasma bubble development (Nishioka et al., 2008).

4. Discussion does not answer the central scientific question

Reviewer's comment : The discussion does not sufficiently address what has been learned about nighttime equatorial ionospheric irregularities over West Africa.

Our response : The discussion and comparative analysis sections have been substantially revised to explicitly address this question. We now demonstrate that intense storms producing near-total plasma depletions create conditions unfavorable to plasma bubble development by eliminating the density gradients required for Rayleigh–Taylor instability growth (Sultan, 1996 ; Abdu, 2016), while the moderate October 2013 storm maintained conditions favorable to irregularity development across all three storm nights. A dedicated paragraph explicitly answering the central scientific question has been added to Section 3.5.

5. **Conclusion too brief**

Reviewer's comment : The conclusion should more clearly highlight the scientific contributions and answer the question posed in the title.

Our response : The conclusion has been substantially expanded. It now explicitly recalls the central objective, summarizes the contrasting responses of the three storms, links σ_TEC evolution to conditions favorable or unfavorable to plasma irregularity development, highlights the inverse relationship between storm intensity and nocturnal variability as the main scientific contribution, and discusses practical implications for GNSS reliability over West Africa.

6. **Figure axis labels : HH:MM format**

Reviewer's comment : The appropriate label in terms of LT is HH:MM, not NNH.

Our response : All figures have been revised to use the HH:MM LT format consistently throughout.

7. **Figure captions**

Reviewer's comment : Figure captions should be written in clear standard scientific English.

Our response: All figure captions have been revised and rewritten in clear standard scientific English. All previously French text has been translated.

8. **SCINDA network attribution (lines 60–62)**

Reviewer's comment : The statement attributing the SCINDA network to ENST-Bretagne is not accurate.

Our response : The sentence has been corrected. The revised text now reads: "This station is part of the SCINDA (Scintillation Network Decision Aid) network, established by the U.S. Air Force Research Laboratory (AFRL) in partnership with Boston College, which provides

real-time monitoring of ionospheric scintillation at equatorial and low-latitude stations worldwide."

9. Magnetic latitude and EIA (lines 60–64)

Reviewer's comment : A station at 2°N magnetic latitude cannot be considered in the vicinity of the northern crest of the EIA, which is located around ±15° magnetic latitude.

Our response : The magnetic latitude of 2°N was erroneous. The correct value derived from the dip angle of +8.24° is approximately 4.1°N. Furthermore, 4.1°N is close to the magnetic equator, not the EIA crest. The revised text now states that Koudougou is located close to the magnetic equator, within the region controlled by the equatorial vertical E×B plasma drift, conferring high sensitivity to storm-time electrodynamic perturbations.

10. Linguistic corrections

Reviewer's comment : Several linguistic corrections were suggested throughout the manuscript.

Our response : All linguistic corrections suggested by the reviewer have been implemented throughout the revised manuscript

11. Conclusion

We hope that the revised manuscript satisfactorily addresses all the reviewer's concerns. We remain available to provide any further clarifications that may be needed. We sincerely thank the reviewer for the time and expertise devoted to improving this work.

Thanks a lot again for allowing us to grow more in this field throught your corrections and Suggestions.