8th Asia-Pacific Conference on Plasma Physics, 3-8 Nov, 2024 at Malacca

Analysis of Geomagnetic Storm Characteristics During Solar Cycle 24 and Ionospheric Disturbance Dynamo Response in the Equatorial Region.

Raja Adibah Raja Halim Shah[1], Nurul Shazana Abdul Hamid[1,2], Mardina Abdullah[2,3], Adlyka Annuar[1], Idahwati Sarudin[4]

[1] Department of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia

[2]Space Science Centre (ANGKASA), Institute of Climate Change, Universiti Kebangsaan Malaysia

[3]Department of Electrical, Electronic and Systems Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia

[4]School of Physics, Universiti Sains Malaysia

e-mail (speaker): zana@ukm.edu.my

A geomagnetic storm is a global space weather event that can exert significant effects on the ionospheric region, including the equatorial sector. This study analyzes geomagnetic storm occurrences and characteristics throughout solar cycle 24, while also exploring variations in the ionospheric disturbance dynamo (Ddyn) phenomenon based on selected storm events. Geomagnetic storms are categorized by type (moderate, intense, severe, or great), duration of the recovery phase (rapid or long), and the step development of the storms. For this analysis, geomagnetic storm occurrences were identified and characterized using the disturbance storm time (Dst) index. Special emphasis was placed on the storm's impact, particularly the Ddyn phenomenon, in the equatorial region, with a focus on Malaysia. The analysis revealed 189 storms, primarily comprising moderate (84%), intense (15%), and severe storms (1%), with no great-type storms recorded during the study period. Additionally, the findings indicate that 55% of storm intervals exhibited rapid recovery, while 45% had a long recovery phase. Furthermore, the analysis identified up to a four-step development in geomagnetic storms (1%). Moreover, only 70 magnetic signatures of the Ddyn phenomenon were observed based on geomagnetic H-component data measured from Langkawi, Malaysia, throughout solar cycle 24.

References

[1] Amory-Mazaudier, C., Bolaji, O.S., & Doumbia, V. (2017). On the historical origins of the CEJ, DP2, and Ddyn current systems and their roles in the predictions of ionospheric responses to geomagnetic storms at equatorial latitudes. In *Journal of Geophysical Research: Space Physics* (Vol. 122, Issue 7, pp. 7827–7833). Blackwell Publishing Ltd. https://doi.org/10.1002/2017JA024132

[2] Shah, R.A.R.H., Hamid N.S.A., Abdullah, M., Annuar, A., Kamarudin, F., & Sarudin, I. (2024). An Occurrence Rate Analysis of Geomagnetic Storms and Coronal Mass Ejection Over the Solar Cycle-24. In *Jurnal Fizik Malaysia* (Vol. 45).

[3] Shah, R.A.R.H., Hamid N.S.A., Abdullah, M., Annuar, A., Sarudin, I., Radzi, Z.M., & Yoshikawa, A. (2024). A Comprehensive Classification and Analysis of Geomagnetic Storms Over Solar Cycle 24. *Research in Astronomy and Astrophysics*. https://doi.org/10.1088/1674-4527/ad5b34

[4] Telloni, D., D'Amicis, R., Bruno, R., Perrone, D., Sorriso-Valvo, L., Raghav, A. N., & Choraghe, K. (2021). Alfvénicity-related Long Recovery Phases of Geomagnetic Storms: A Space Weather Perspective. *The Astrophysical Journal*, *916*(2), 64. https://doi.org/10.3847/1538-4357/ac071f