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Exploring Long-term trends in total electron content over South Africa.

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The ionosphere is a dynamic, inhomogeneous and conductive plasma formed from the interaction of solar Extreme Ultraviolet (EUV) and X-ray radiation with the quasi-neutral atmosphere of the Earth, found at 60 – 1000 km above sea level. With different peak levels of ionization, it is predominantly studied by determining the total number of particles that pass through a square meter area between a ground-based station and a GPS satellite –Total Electron Content (TEC). The importance of TEC is owed by its effect in radio communication, position, telemetry and tracking. An abundance of free electron gas in the ionosphere causes a delay of signals in the radio band. This study explores the long-term trends in TEC over South Africa at 2 GPS stations located 1000 km apart. TEC was computed using the IONOLAB software over SUTH and HRAO stations for a period of 25 years. The TEC trend analysis was performed using 3 solar proxies (sunspot numbers, MgII and F10.7). Preliminary results show a negative TEC trend between 1998 and 2023 over these mid-latitudes stations in South Africa. This is consistent with related global studies reported in the literature.

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