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Projected Influence of increasing CO_2 levels on Sporadic E Formation Based on GAIA Simulations

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We utilized the Ground-to-topside Atmosphere – Ionosphere Model for Aeronomy (GAIA) to investigate how increasing CO2 levels could affect the development of sporadic E (Es) layers. By analyzing the vertical ion convergence (VIC), we found that doubling the CO_2 level results in a strengthening of VIC within the 100 – 120 km altitude range, suggesting the future downward shift of Es formation altitudes. These changes point toward a potential shift in the occurrence patterns of Es in a warming climate. The enhancement of VIC is primarily attributed to the reduction in the ion-neutral collision frequency, alongside changes in zonal wind shear at these altitudes. Overall, our results suggest that climate change could intensify ion convergence processes and, consequently, increase the likelihood of Es events in the future.