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The PUNCH mission provides unprecedented observations of the solar corona while also offering a unique opportunity to investigate magnetospheric and ionospheric phenomena, including high-altitude aurora. Such auroral emissions were previously reported by the Solar Mass Ejection Imager (SMEI) onboard the Coriolis satellite. These observations were unexpected not only for the solar physics community, but also for the magnetospheric and ionospheric communities. SMEI results suggest the presence of auroral emissions at altitudes above ~800 km, a region where auroral emissions have not been systematically reported.
To understand the physical mechanisms responsible for these structures, it is first necessary to determine whether these emissions are produced through processes analogous to conventional aurora driven by particle precipitation, and to identify the atmospheric species involved. In this work, we explore PUNCH observations to investigate the occurrence of high-altitude aurora. In addition, we examine complementary satellite and ground-based observations to assess the generation mechanisms and observational characteristics of these potential high-altitude emissions.
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