電離圏における光電子による電子加熱率の電子密度依存性

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Dependency of heating rate of electron by photoelectron on ambient electron density in the ionosphere

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Energetic electrons are created by solar EUV when neutral atmosphere in the thermosphere is ionized. The energetic electrons, which are named photoelectrons, heat ambient thermal electrons through the collision. The photoelectron is primary heat source for the electron in the ionosphere. Since the heating rate of electron is proportion to 0.97 power of electron density (Ne) and cooling rate of electron through the Column collision with ions is proportion to square of Ne, it has been thought that electron temperature (Te) gets close to ion temperature and neutral temperature with increase of Ne. That indicates Te decreases with increase of Ne in general. However, Te enhancement which was not related neutral temperature was reported in the topside ionosphere. Similar trend was also observed in ion temperature (Ti) in the topside ionosphere. To investigate the cause of the Te enhancement in the high Ne region, simultaneous observation of Te and Ti is required. Te and Ti observed with Jicamarca incoherent scatter radar are employed for the analysis. Similar trends which were observed in satellites observation are found in both Te and Ti above 300 km. The cooling rate of the Column collision with ions, and inelastic collision with neutral spices for electron are estimated using the observations, and Tn and neutral density calculated with MSIS. Further, the heat conductions along the magnetic field line are estimated using IRI and IGRF model. The results indicate that photoelectron heating rate is much higher than well-known heating rate.