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On the validation of Swarm TII and LP data

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The Thermal Ion Imagers (TII) on the Swarm satellites measure ion distribution functions which carry information about ion temperature in the topside ionosphere. Ion temperature, which is obtained from the second moments of the imaged ion distribution, requires validation. One way to evaluate the accuracy of the TII ion temperature, as well as electron temperatures and densities measured by the Langmuir probes (LP), is to study their consistency with a physics-based model of energy exchange between electrons, ions, and neutrals. We first assess the validity and accuracy of the method of topside ion temperature estimation from the energy balance equation using a physics-based ionosphere model at low and middle latitudes. Next, since the method depends on the LP data, the measurements of electron density and temperature are compared with corresponding measurements from incoherent scatter radars. In addition, the electron density data are compared with those obtained from COSMIC GPS radio occultation globally. Possible adjustments to the data are proposed.

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