



The Ionosphere of Uranus as Revealed by JWST

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The charged particle ionosphere is the interface-region between the atmosphere below and the space environment beyond. Observations from James Webb Space Telescope (JWST) have revealed the ionosphere with unprecedented sensitivity, revealing features of this region that were hitherto undetectable using existing facilities. Here, we present the spectral analysis of JWST NIRSpec Integral Field Unit (IFU) observation obtained in January 2023 that covered most of the disk of Uranus at three separate rotational phases, providing complete longitudinal coverage. Via the spectral analysis of the discrete H3⁺ emission lines contained in the near-infrared spectrum, we derive maps of temperature and density of the ionosphere across the visible portion of the planet. The H3⁺ reveal a host of intricate structures: 1) Northern and southern auroral emission, with the southern being very confined, and the northern more extended. 2) A dark band appears along the magnetic equator, analogous to the terrestrial equatorial plasma fountain 3) the H3⁺ radiance distribution across the disk, which is expected to be produced primarily via the ionisation of molecular hydrogen by solar photons, show a distribution that is intricate. Overall, we see the coolest temperatures at the geometric pole, no heating associated with the southern auroral oval, and very limited heating at the northern oval. This puts stringent limits on the amount of energy at the auroral process can contribute to the overall energy budget.