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Low-latitude Ionospheric Research using the CIRCE Mission

The Coordinated Ionospheric Reconstruction Cubesat Experiment (CIRCE) is a dual-satellite mission consisting of two 6U CubeSats actively maintaining a lead-follow configuration in the same orbit with a launch planned for the 2018-2019 time-frame. These nanosatellites will each feature two 1U ultraviolet photometers, observing the 135.6 nm emission of atomic oxygen at nighttime. The primary objective is to characterize the two-dimensional distribution of electrons in the Equatorial Ionization Anomaly (EIA). The methodology used to reconstruct the nighttime ionosphere employs continuous UV photometry from four distinct viewing angles in combination with an additional data source, such as in situ plasma density measurements or a wide-band beacon data, with advanced image space reconstruction algorithm tomography techniques. The COSMIC/FORMOSAT-3 (CF3) constellation featured six Tiny Ionospheric Photometers, a compact UV sensor design which served as the pathfinder for the CIRCE instruments. The TIP instruments on the CF3 satellites demonstrated detection of ionospheric bubbles before they had penetrated the peak of the F-region ionosphere. We present our mission concept, simulations illustrating the imaging capability of the sensor suite, and a range of science questions addressable using such a system.