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Detection of the OI 630nm emission from Enceladus torus

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It has been known that there exists H2O molecules and their dissociative products from rings and icy moon around Saturn. Cassini mission discovered a plume on Saturn's icy moon, Enceladus. This small moon supplies molecules and ice grains to the Saturn's magnetosphere. Distribution of these particles is such like as a torus making it called the Enceladus-torus. Remote sensing of the Enceladus torus have been made by space mission [Shemansky et al., 1993, Esposito et al 2005]. But there have been no observation from the ground yet.
If we can monitor distribution and time variation of the Enceladus torus continuously, we can get more clear understanding about Saturn's magnetosphere and its variability. In order to accomplish remote-sensing of the Enceladus for a long period, we made ground-based observation of OI630nm emission of the Enceladus torus for the first time.
The observation was made at Haleakala observatory using a high-dispersion echelle spectrograph(R$\sim$37,000 with 2-pixel binning) coupled to a 40-cm Schmidt Cassegrain telescope in Dec. 2009-Jan. 2010. The slit was aligned to N-S direction and positioned at a distance of 4 Saturn's radii from its center. Exposure time of single frames was 40-minutes.
As a result, we could detect torus emission of a few Rayleighs at S/N$\sim$3 with total exposure of 1200-minutes.
The result is consistent with estimated intensity of OI 630nm emission by electron impact excitation considering expected distribution of atomic oxygen, electron density and temperature (Melin et al., 2009, Schippers et al., 2008).