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Ground-based observations of Saturn's auroral H_3^+: short- and long-term trends in thermospheric temperature

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Abstract

The observations presented here used the 10-m Keck telescope situated on Mauna Kea, Hawaii. They were designed to be an integral part of the Saturn Auroral Observing Campaign of April-May 2013 (to be published in the Icarus special issue of 2014). These overlap with observations performed by the Cassini spacecraft, Hubble space telescope and the NASA infrared telescope facility (IRTF). During the observations, Saturn's sub-solar latitude was 18 degrees, i.e. Saturn was well into northern springtime / southern autumn.

In three nights of data we have found 1) the northern hemisphere is on average ~50 K cooler than the southern. This is consistent with previous work, which suggests that magnetic field strength is inversely proportional to the total heating rate. 2) the combined northern and southern temperatures range typically between 380 and 500 K on time-scales of hours/days. 3) there may be a correlation between planetary period oscillation (PPO) phase and temperature in the northern main auroral oval.