First results from the São José dos Campos temperature LIDAR

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In 2006 we started to integrate a new laser into our LIDAR. It uses a 1064 nm Nd:YAG seeded oscillator mixed with a 1319 nm Nd:YAG laser consisting of a seeded oscillator, pre-amplifier and a 2 stage amplifier to generate narrow band (~0.2 pm) 589 nm output. Thermal tuning of the 1064 nm seeder is used to change the wavelength in order to make temperature measurements. During 2007 we had 83 nights with both density and temperature data. The most interesting night was 20070824 which had a large localized temperature peak at 2428 hrs. Based on 5 point running means (height and time) the peak value of temperature was 435 º K at 85.18 km. The temperature pulse lasted about 20 min. Just after the temperature spike ends a density increase starts very near the peak height of the temperature maximum at 86.67 km and increases in density until 2506 during which time there was a temperature increase from 220 to 240 º K which coincided with the peak density at this time. This may have been a long-lived meteor trail. A somewhat similar event occurred on 20071011 at 2339 hrs and 96.5 km with a temperature rise from a background of around 190 º K to 265 º K in approximately 5 min, decaying back to a background of about 200 º K in about the same time. Approximately 20 min later there was a sporadic sodium layer at essentially the same height with a strength factor of 7 and a peak density of 21.5 $x10^{-9}$ $m^{-3:}$ Several nights showed descending temperature isopleths associated with rapid density changes later in the night when the descending isopleths went below 90 km. There were a few instances of sporadic sodium layers which appear to be associated with temperature changes. On 20070730 at about 2330, for example, a strong sporadic layer at 96 km was associated with a temperature increase of about 40 º K. On the other hand there are cases where substantial temperature changes appear to be unrelated to density. Near the beginning of the data on the night of 20070815 there were three sporadic layers above the principal layer in the region of 97 to 108 km. At 1928 hrs these layers were above 100 km, with strength factors of 4.3, 2.2 and 3.5: There was no correlation with temperature variations for this region.

Zonal structure in the equatorial ionosphere: both sides of the GPS radio occultation story

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Atmospheric thermal tides appear to have significant interaction with the E and F regions of the equatorial ionosphere, based on results from the NASA TIMED-GUVI and IMAGE-FUV instruments [*e.g.*, *Sagawa et al.*, 2005; *Immel et al.*, 2006; *England et al.*, 2006], electron density from FORMOSAT-3/COSMIC GPS radio occultation measurements [*Lin et al.*, 2007], GSWM and TIME-GCM simulations [*Hagan et al.*, 2007], and magnetometer measurements of the EEJ [*Alken et al.*, 2007]. In particular, TIME-GCM results indicate that the zonal wave-4 structure observed by the UV imagers near the spring equinox of 2002 is consistent with the structure of an eastward-propagating zonal wavenumber 3 diurnal tide (DE3) that is excited by latent heat release associated with raindrop formation in the tropical troposphere [*Hagan et al.*, 2007].

GPS radio occultation profiles not only yield profiles of electron density in the ionosphere, but also profiles of refractivity in the neutral atmosphere, from which temperature and pressure are derived