## Morphology of Sporadic E Layer Retrieved from COSMIC GPS Radio Occultation Measurements: Wind Shear Theory Examination

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On the basis of COSMIC-measured fluctuations in the signal-to-noise ratio (SNR) and excess phase of the GPS signal piercing through ionospheric sporadic E (Es) layers, the general morphologies of these layers are presented for the period from July 2006 to May 2011. It is found that the latitudinal variation in the Es layer occurrence is substantially geomagnetically controlled, most frequent in the summer hemisphere within the geomagnetic latitude region between 10° and 70° and very rare in the geomagnetic equatorial zone. Model simulations show that the summer maximum (winter minimum) in the Es layer occurrence is very likely attributed to the convergence of the Fe<sup>+</sup> concentration flux driven by the neutral wind. In addition to seasonal and spatial distributions, the height-time variations in the Es layer occurrence in the mid-latitude (>30°) region in summer and spring are primarily dominated by the semidiurnal tides, which start to appear at local time around 6 and 18 hr in the height range 110-120 km and gradually descend at a rate of about 0.9-1.6 km/hr. In the low latitude (<30°) region, the diurnal tide dominates. The HWM07 model indicates that the height-time distribution of Es layers at middle latitude (30°-60°) is highly coincident with the zonal neutral wind shear. However, Es layer occurrences in low-latitude and equatorial regions do not correlate well with the zonal wind shear.