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The FeO Nightglow

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The terrestrial nightglow is composed of atomic lines (O, N, H), banded molecular features (OH, O2), and continua. The identity of the continua has always been controversial, and the NO2* arising from O + NO three-body recombination has often been put forth as the main continuum contributor. We demonstrate here that in the 500 700 nm region, excited FeO is an important part of the total emission, with an intensity that can exceed 100 Rayleighs. Two types of observation have been used for this study – ground-based sky spectra from the Keck II telescope [Saran et al., 2011], and space-based measurements from the OSIRIS spectrometer on the Odin satellite [Evans et al., 2010]. Identification of the quasi-continuous emission is made by comparison with laboratory spectra generated by the reaction of Fe and O3, as well as meteor train spectra, where atomic iron is ablated from the incoming meteor [Jenniskens et al., 2000].

Because the most prominent part of the FeO emission is coincident with both the sodium nightglow lines and the OH 8-2 band, careful analysis is required to quantitatively measure the FeO intensity. The diurnal behavior of the emission seems to vary with season, and the characteristic altitude is close to that of both the Fe layer and the sodium and OH emission layers [Evans et al., 2010]. This is to be expected, as the FeO, OH and Na emissions all depend on reaction with ozone for their production. The appearance of the emission, centered near 590 nm, can resemble that from high-pressure sodium (HPS) lamps, and astronomers at light-polluted sites ought to verify whether their measurements are contaminated by HPS pollution or are a consequence of natural FeO nightglow.

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