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Neutral atmosphere wave forcing of midlatitude sporadic E layers

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The midlatitude sporadic E (E_s) layers are dense layers of metallic ions which form mostly in the lower thermosphere between about 90 and 130 km, that is, in a region characterized by complicated atmospheric dynamics and nonlinear plasma processes. There is now mounting evidence suggesting that E_s is the effect of a deterministic rather than a sporadic process, which involves regular wind shear plasma convergence and downward transport in the context of the global system of thermospheric tides. Also, gravity waves with periods from a few hours down to the Brunt-Vaisala period of 5 minutes must also play a role on E_s formation which, however, it is difficult to quantify. The gravity waves can alter the regular tidal forcing of E_s since their confluence with the tidal waves can reinforce or disrupt the convergence of metallic plasma into a layer and thus contribute to the sporadic character of $E_s$occurrence. In addition to the anticipated effects of atmospheric tides and gravity waves, recent results suggested that planetary waves (PW) must be involved on $E_s$generation as well, a fact that had gone unnoticed in the long-going research of sporadic E. In this presentation we review our present knowledge on the close relationship between neutral wave dynamics and midlatitude sporadic E layer formation and variability, and discuss its implications. In addition we update what we consider as the remaining problems of this topic that need more study.