



Detection of infrasound in the Earth's upper atmosphere by observing nightglow emissions

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Many of us are familiar with the regular wave-type pattern formed in clouds by the passage of waves through the cloud layer: this is often seen in calm morning or evening conditions. The cloud layer allows us to “observe” the passage of the waves. Earth's atmosphere (and that of planets such as Venus and Mars) exhibit well-defined layers of luminescence far above the cloud layer known collectively as airglow. Atoms and molecules produced in excited states either by chemical reactions or by photo-excitation relax by emitting photons in the visible and infrared part of the spectrum. These layers provide a means by which we might observe the passage of waves at higher altitudes. Upward propagating gravity waves generated in the troposphere have been studied for over half a century by recording the modulation of specific airglow layers. The goal of this study is to determine if it is possible to observe infrasound using this same technique. We report our efforts to develop a ground-based instrument capable of detecting modulation of airglow layers at infrasonic frequencies which originate from earth-based events like earthquakes, tsunamis, and explosions. The particular airglow emission used in this study is the infrared radiation (1.0-1.5 μm) from vibrationally-excited OH radicals in the altitude region 80-90 km.