



Modulation of O₃ and CO in the UTLS induced by mountain waves during T_{REX}

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Ozone, CO and potential temperature obtained from aircraft measurements during the Terrain-Induced Rotor Experiment (T-REX) in the UTLS region show fluctuations with modulations in phases and amplitudes. The phase relation between ozone and potential temperature varies in the horizontal along the trajectory of the aircraft. In some legs of this trajectory, ozone and temperature are positively correlated while in other legs the correlation is negative. The vertical profile of ozone exhibits unusual decreases within a layer in the lower stratosphere, with positive gradients above and below. It is demonstrated from observations as well as simulations that the phase and amplitude modulations in ozone, CO and potential temperature are produced by interactions of mountains waves with different wavenumbers. A wave with a larger wavelength displaces the air column, causing horizontal variations in the vertical gradients. The small waves evolving in these modulated gradients induce wave-signatures in ozone and CO, with amplitudes and phase relationships that depend on the vertical gradients encountered along the path of the aircraft. This explanation is confirmed by reconstructed tracer variations deduced under this dynamical hypothesis.