Tropospheric gravity waves and the ABL

WAVE°**TURBULENCE**

ATMOSPHERIC BOUNDARY LAYERS

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INTERACTIONS

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Tropospheric gravity waves can interact with the ABL in many ways:

1. Downward propagating waves will be partially absorbed by the ABL as they reflect from the earth's surface. Trapped waves decay downstream.

2. Terrain-generated waves will be partially absorbed by the ABL as they are launched into the troposphere

3. Localized surface friction (e.g. a wind farm) will thicken the ABL and launch waves into the troposphere.

4. Steep terrain or resonant lee waves will cause BL separation leading to form drag and/or rotors

The common element in all these examples is the response of the ABL to horizontal pressure gradients. In general, in both aerodynamic and geophysical BLs, pressure gradients modify the shear in the BL and the turbulence responds to restore the original condition. The efficacy of the turbulent restoration is quicker in the convective daytime ABL than in the stable nighttime ABL.

In this presentation, we show numerical solutions to the disturbed ABL and a simple two-layer ABL formulation that allows closed-form two-way interactions between tropospheric gravity waves and ABL response.