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Perspectives on re-intepretation of a gravity wave event recorded by ground-based lidar

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The characterization of gravity waves is one of the crucial elements for understanding middle atmospheric dynamics. Although advanced models exist, linear wave theory is still an attractive option as the first step towards data interpretation due to its simplicity.
In this paper, we will review some common literature, and attempt to bring clarity into the nomenclature of wave frequencies in different frames of reference. We specifically relate the speed of the obstacle that act as a source to the phase speed of the excited wave. Using linear wave theory under steady horizontally uniform background conditions, a framework is established to re-interpret the wave pattern that has been previously recorded by lidar in Dörnbrack et al. (2017). The event can be explained by a simple quasi-monochromatic wave influenced by the change in the shear of mean wind, instead of an interaction between wave packets as has previously been suggested. The results are then compared to realistic wind data to confirm that the mean wind condition has indeed changed dramatically and that the assumed source speed around 60 m/s is a sound estimate. Furthermore, the wave possibly has traveled towards south south east direction.