A nonlinear response of an emission layers to gravity wave propagation through the mesopause region

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A one-dimensional model is developed to simulate the wave induced response of $O(1S)$, $O_2(b,0-0)$ and $OH(8-3)$ emissions. The results of the digital experiments, which simulate response of emission layers to gravity wave perturbation, demonstrate that in addition to variable components, the wave disturbance of the observed brightness field has a constant component. This component is the enhancement/depletion of the "all sky" brightness of an emission layer. This brightness jump can be considered a measure of the nonlinear response of an emission layer to a wave disturbance. This study indicates that the nonlinear response of the above mentioned emission layers critically depends on the wave amplitude and assumed form of the atomic oxygen profile. The relative magnitude of the brightness jump can reach more than 10% for large wave amplitudes and sharp O-profiles.