Analysis of a secondary 16-day planetary wave generation through nonlinear interactions in the atmosphere

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Using a nonlinear model of the general circulation of the middle and upper atmosphere (MUAM), spatio-temporal structures of planetary waves (PWs) during boreal winter were studied. Modeling of global atmospheric circulation was performed for January-February. Despite the tropospheric PW sources shaped in the model, the phenomenon of 16-day PW excitation arise out of internal atmospheric sources in the southern lower thermosphere was discovered. In order to explain the observed phenomenon, a number of numerical experiments were carried out according to different scenarios with a selective turning (on/off) tropospheric sources of PW individual modes (having periods of 4-16 days). Also, the evolution of perturbed potential enstrophy for a 16-day PW, as well as the contribution of nonlinear interactions between individual PW to it, was studied. This made it possible for the first time to demonstrate explicitly the process of generating a secondary 16-day PW as a result of the nonlinear interconnection of 4-day and 5-day PWs.

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