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Effect of local stratospheric gravity wave forcing on the circulation of the middle atmosphere

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A profound knowledge of atmospheric waves is essential to understand the processes in the middle atmosphere. The most important characteristic of waves is their ability to transport and deposit energy and momentum from their origin. In particular internal gravity waves (IGWs) distribute energy and momentum throughout the whole atmosphere thereby maintaining the circulation of the upper atmosphere. On the basis of density variance profiles derived from GPS radio occultation data a localized area of enhanced IGW breaking in the lower stratosphere over the East Asian region (32.5-62.5°N/118-169°E) has been discovered. By using MUAM, a 3D mechanistic non-linear global circulation model for the middle and upper atmosphere, the impact of such a non-zonal IGW forcing on the stratospheric and mesospheric dynamics was examined. The performance of a sensitivity study with regard to the spatial distribution of the IGW hotspot shows that the additional planetary waves (PWs) can interfere destructively or even constructively with the at the lower boundary forced PWs in MUAM. Especially, with regard to the stability of the polar vortex the dynamics of the middle atmosphere is highly affected by these PWs.