

Okui, H., and K. Sato (2020), Characteristics and sources of gravity waves in the summer stratosphere based on long-term and high-resolution radiosonde observations

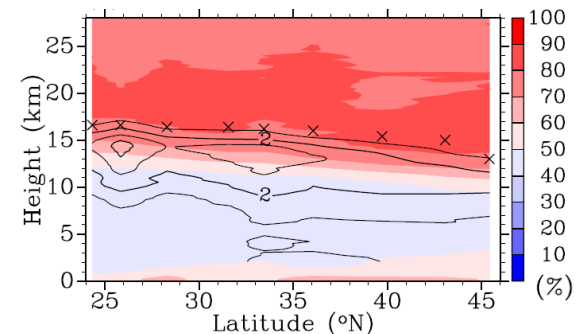
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Introduction Gravity waves (GWs) are mainly generated in the troposphere and propagate into the middle atmosphere. Bühler et al. [1999] and Bühler & McIntyre [1999] theoretically suggested that **shear instability (SI) above the upper-tropospheric jet** is one of the possible sources of summer stratospheric GWs. However, the jet in summer is weak and hence observational studies are needed to confirm this.

Method Using radiosonde observation data over 23 years at 9 stations in Japan, GW characteristics were examined by hodograph analysis.

Results & Discussion

1. The GW kinetic energy (KE) has its peak slightly below the tropopause.
 2. Eastward propagation is dominant.
 3. The percentage of GWs propagating energy upward (downward) is high above (below) the height region with high SI ($Ri < 0.25$) occurrence frequency.
 4. At 30°N - 37°N , the GW KE at $z=20$ - 25km is highly correlated with the SI frequency at $z=6$ - 17km .
- ➔ These facts strongly suggest that SI above the jet is an important source of summer stratospheric GWs. The possible reasons for the high SI frequency at 30°N - 37°N / 12 - 15km are the larger $\partial u / \partial z$ at higher latitudes and the lower N^2 at lower latitudes.



▲ The latitude-height section of the SI frequency (contours, interval=1%) and the ratio of GWs with $c_{gz} > 0$ (colors) in JJA. "X" shows the height of the tropopause.