Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AAS020-P01 会場:コンベンションホール 時間:5 月 23 日 16:15-18:45

圏界面付近での赤道ケルビン波の速度と周期
Phase speed and period of equatorial Kelvin waves around the tropopause

西 憲敬 [1*], 鈴木 順子 [2], 濱田 篤 [3], 塩谷 雅人 [4]
Noriyuki Nishi[1*], Junko Suzuki[2], Atsushi Hamada[3], Masato Shiotani[4]

[1] 京都大学大学院理学研究科, [2] 海洋開発研究機構, [3] 東京大学大気海洋研究所, [4] 京都大学生存圏研究所
[1]Kyoto University, [2]JAMSTEC, [3]University of Tokyo, [4]Kyoto University

We investigated period and phase speed of equatorial Kelvin waves around the tropopause. Typical cases of Kelvin waves with extremely large amplitude have different speed and period from those which are detected as a spectral peak in widely-used (e.g. Suzuki and Shiotani 2008, JGR) k-omega spectral diagram; in these cases, the period of the wave is longer (10-30 days) and speed is smaller (around 15 m/s) than those in spectral diagrams (5-10 days and 20-30 m/s).

We analyzed zonal wind at 100 hPa in re-analysis data made by European Centre for Medium-range Weather Forecast (ERA-40, 1979-2001). We can explain the difference in period by plotting the power value above the background value, instead of the significance defined by the ratio of power to the background. Peak of wave energy was found to be located in the lower frequency range than that of the significance. However, this alteration still does not account for the difference in phase speed. We traced zonal propagation of every Kelvin-wave case by using the method of Suzuki et al. (2010, JGR) and calculated the speed of waves. The average of speed is around 12-16 m/s at all longitude. The number of cases with the speed of larger than 20m/s, which corresponds to the spectral peak in a diagram, is very small.

We examined relationship between faster waves and slower waves. We found that slower waves (<20m/s) have shorter zonal wavelength, which results in a sharp shape in a zonal direction, and that they are rather confined in zonally smaller packet than faster waves (>20m/s). Therefore, they can be well traced regardless of their rather smaller power in climatological spectral diagram. In longitude-time section, both modes are seen to propagate rather independently and to be superposed almost linearly. On the other hand, Suzuki et al. (2010) has shown that both speeds are observed in a lifecycle of each wave case: slower waves initially coupled with convective activity at 200 hPa have faster speed in the eastern longitude after losing coupling several days later. The faster waves propagate further eastward and upward, and then re-couple with convection at 100 hPa and have smaller speed again. Our results indicate that, when investigating the mechanism of propagation and amplification of Kelvin waves, the relationship between two kinds of waves with different speed should be carefully examined.

キーワード: ケルビン波, 熱帯波動
Keywords: Kelvin wave, equatorial wave