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Propagation of Planetary Waves in the Horizontal Non-uniform Basic Flow

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Although the planetary waves propagation has been studied a lot, most of them were based on the zonal symmetric basic flow in which planetary waves are trapped by the zero line of zonal wind. For this reason, the characteristics of stationary and non-stationary wave propagation in the horizontal non-uniform basic flow are researched separately in theory. Some interesting results are as follows. Stationary waves can propagate through the easterlies with a weak meridional wind, so the interactions between the easterlies and westerlies can be turned out in the view of planetary waves. Besides, the variation of the amplitude also depends on the meridional wind and the latitude. The periodic characteristics of non-stationary waves are discussed based on the necessary and sufficient condition of three and one real solutions of the dispersion relationship respectively. In the case of three real solutions, phases tend to propagate westward (eastward) in the easterlies (westerlies). Given the zonal basic flow, the differences in the phase speed and period of these three propagating waves may be larger with the strengthened meridional basic flow. Three propagating waves are low-frequency over both the Australian and Asian monsoon regions in 850 hPa during boreal summertime.