Steady Response of the Subtropical Circulation to the Condensation Heating in a Quasigeostrophic System

Yimin LIU¹, Yani ZHANG² and Guoxiong WU¹

¹ LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences r ² Beijing Meteorological Center r

There is limitation when using linear quasi-geostrophic model to study the open and diffusion subtropical circulation. A new linear quasi-geostrophic model including the temperature equation and with adjustments to the basic flow, static stability and friction has been constructed and is used to study the characteristics of subtropical circulation. The results show that basic flow is very important to the forced stationary waves by the condensation heating. With a forcing of released condensation heating, the advection is much stronger with westerly basic states than with easterly basic states and shows asymmetry. The centers of the forced cyclone and anticyclone are located on the north of the heating center due to f-effects, the second order shears of basic flow both in longitude and in the vertical, and the asymmetry of advection of westerly and easterly basic flow. It is further shown there is a limitation to study subtropical anticyclone near surface by simply using the traditional linear model. It is the improper lower boundary condition and lack of adjustment processes of basic flow and static stability that result in that the center of lower anticyclone forced by latent heating appearing at the sea surface in previous studies.