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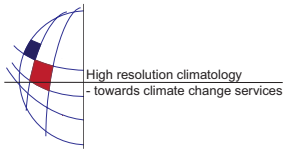

Two Dimension Larger-Scale Stability and Subtropical High Meridian Behaviours

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There is a conjecture that meridian motion of subtropical High (SH) should link closely to some larger-scale earth' parameters or constant, such as earth' radius or velocity of earth' rotation etc because of behaviours of SH possessing hemisphere-scale characteristics. The goal of paper is to search for formulas which should be comprised of such lager-scale parameters. so as to reach this aim and to evaluate accurately latitude of Subtropical High Ridge(SHR), the mathematical and physical model called "Postulate Zonal Equilibrium is put forward to deduce those formulas depending completely on a group of equations containing Integral Equation of Angular Momentum Balance ; Geostrophic Equilibrium Equation; Thermal-Wind Equation; Static Equilibrium Equation and Equation of State, finally some significant formulas are figured out like bellow through analysing and emphasis on distinct meridian differences and perpendicular discrepancy of physics quality at scale of hemisphere.

$$\hat{\varphi} = 1/2[1 + R^2(T_H - T_L)(T_N - T_S)/f\Omega R_e g\Delta z\Delta y]$$

$$\hat{\varphi} = 1/2[1 + (u_H - u_L)/\Omega R_e]$$

$$u_H - u_L = R^2(T_H - T_L)(T_N - T_S)/fg\Delta z\Delta y$$

Here $\hat{\varphi}$ is latitude of SHR, unit is radian,z the vertical coordinate,y the meridian coordinate,R_e is radius of earth ,g being the acceleration of gravity, Ω is velocity of earth' angular rotation ,f is Coriolis parameter, R is gas constant (=287$m^2s^{-2}k^{-1}$), T is temperature, but subscripts of N, H etc denote the position of Trespectively, for instance, in T_N foot"N" means the temperature of north orientation in atmosphere, similarly subscripts of $H$and L in zonal wind u denote high level and low level respectively. Therefore $(T_H - T_L)/\Delta z$ is vertical temperature gradient, $(T_N - T_S)/\Delta y$ is south-north temperature gradient,ΩR_e is earth self-rotation speed at its equator ,$g\Delta z = \Delta\Phi$ is different gravitational potential from high level to low level .Moreover, here it deserve stressing that$R^2(T_H - T_L)(T_N - T_S)/f\Omega R_e g\Delta z\Delta y$ is non-dimensional number, in addition to,$u_H - u_L$ is zonal wind vertical shear. more important, $(R(T_H - T_L)/\Delta z)/g$ is the static stability(non-dimensional number), standing for the ratio of perpendicular thermal expansion force to gravity ,correspondingly $(R(T_N - T_S)/\Delta y)/f\Omega R_e$ is the meridian stability(similarly non-dimensional number), also denoting the ratio of meridian thermal expansion force to larger-scale geostrophic force as well, here $f\Omega R_e$ possibly represents one kind of hemisphere -scale geostrophic force. In order to calculate easily $\hat{\varphi}$ latitude value of SHR, the formula are further ameliorated by β flat approximate, so

$$\hat{\varphi} = 1/2[1 + R^2(T_H - T_L)(T_N - T_S)/2\Omega^2 g\Delta z(\Delta y)^2]$$

Conclusions (1) the meridian shift degree of SH is proportional to size of two Dimension Larger-Scale Stability involving meridian stability and static stability as a whole. (2) If $(T_N - T_S)$or $(T_H - T_L)$either equal zero, $\hat{\varphi}$ value is 28.65 degree or so around which SHR oscillates seasonally.(3) generally SHR meridian seasonal jump also corresponds to some summer monsoon or winter monsoon circulation with opposite zonal wind vertical shear .(4) non-dimensional number would be used as a measure of meridian baroclinic instability of atmosphere, even in comparison with Eady growth rate $0.31(f/N)\,|dv/dz\,|$,$N^2 = (g/\theta)(\partial\theta/\partial z))$,Then it is uncovered non-dimensional number not only estimate meridian baroclinic instability of atmosphere but also reveals some information of atmospheric circulation such as "seasonally turning-over circulation". (5) Formula in other form is expressed as $\hat{\varphi} = 1/2[1 + (u_H - u_L)R_e/\Omega R_e^2]$, this formula above could be explained by total angular momentum balance

occurring in the atmosphere-solid earth system ,$(u_H - u_L)R_e$ is Relative Angular Momentum,ΩR_e^2 is the Axis' Angular Momentum at earth equator, thus on the premise without variety of Ω ,SHR will leap into lower (higher) latitude when $(u_H - u_L)R_e$ increases (decrease) , simultaneously solid earth angular momentum increase (decrease) due to increasing(decreasing) $R_e \cos\hat{\varphi}$, also on assumption without variety of *west* wind speed , SH will take pole (equator)-toward movement if the earth' rotation speed becomes faster (slower). (6) If it was supposed that

$$R^2(T_H - T_L)(T_N - T_S)\big/(u_H - u_L)\Delta y = const(m^2 s^{-3})$$

then

$$fg\Delta z = f\Delta\Phi \approx f\bar{\Phi} = const(m^2 s^{-3})$$

Which is very useful to be utilized to interpret why west (east) section of SH usually is consistent to uplifting (descending) motion, there an overbar represents averaged geopotential height between high level and low level. In a word, to some extent at least, this mathematical and physical model could improve our understanding of SH features in meridian direction.

Note: zonal is referred to in west-east or east-west direction and meridian means in north-south or south-north direction in this paper.

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