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Atmospheric Circulation's Energy Balance and its Possible Responses to Globe Warming

w.-l. wang
Wuhan Regional climate Center,CMA.Wuhan, China (xiaowanw2002@yahoo.com)

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Abstract text :

According to traditional and classic atmospheric energy balance equation (shown below)

$$\frac{1}{2}V^2 + C_pT + Lq + gz = const$$

it is very easily seen that if both of latent heat energy and kinetic energy keeps invariant, then potential energy will **decrease** once the interior energy increase and vice versa ,here $C_pT$is interior energy ; $V^2/2$ kinetic energy; Lqlatent heat energy;gzpotential energy.evidently, the relationship between the potential energy and the interior energy is just reverse linear response, here question is that is this relationship described above perfect in real(rotation) atmosphere? Surprisingly, our researching result indicates that in ***rotation atmosphere*** potential energy will **increase** when the interior energy increase and vice versa, the relationship between the potential energy and the interior energy is just proportional nolinear response. The consequence is completely opposite to that of classic atmospheric energy balance equation. Why will be explained below.

According to the basic equations including Integral Equation of Angular Momentum Balance ; Geostrophic Equilibrium Equation; Thermal-Wind Equation; Static Equilibrium Equation ;Equation of State and Absolute Vorticity Conservative Equation , the relationships among of wind field temperature field and potential field is expressed as below

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

$$v_H - v_L = \frac{R^2(T_L - T_H)(T_E - T_W)}{fg\Delta z\Delta x}$$

Through further deal for the two formulas above then the relations among of atmosphereic internior energy, atmosphereic potential energy and atmosphereic kinetic energy will be finally shown below which indicates their relations are the **nonlinear**:

$$\overline{gz} \approx \frac{\overline{C_PT_V} \cdot \overline{C_PT_M}}{170\frac{\overline{u^2}}{2}}, \overline{gz} \approx \frac{\overline{C_pT_V} \cdot \overline{C_pT_Z}}{85\frac{\overline{v^2}}{2}}$$

The formula above reveals one very significant and important outcome that ***potential energy will at least increase with 1 unite*** (m^2s^{-2}) ***when internior energy enlarge with same 1 unite in rotation atmosphere of earth, however, kinetic energy only increase 0.01 unite simultaneously.*** Noticeably increase in kinetic energy is negligible compared with that in potential energy when air heated;so ***the increase of averaged temperature will directly causes potential energy becoming great.*** Here $\bar{T}_V\bar{T}_M\bar{T}_Z$ is perpendicular averaged temperaturelatitudinal averaged temperaturezonal averaged temperature, respectively. $C_P$is specific heat at given pressure,$\bar{g}\bar{z}$is mean potential energy ;$\overline{u^2/2}$ is mean kinetic energy in longitudinal direction;$\overline{C_PT_V}$ is vertical mean internior energy , $\overline{C_PT_M}$is latitudinal mean energy, the rest symbol means can be said by analogy.

Main conclusions : (1) the atmospheric internior energy will increase alogn with rising of atmospheric avreaged temperature; (2) by identical magnitude,the increase of atmospheric potential energy result from the adding of atmospheric interior energy in the context of globe scale; (3) due to the potential height of specific pressue levels and the its potential energy commensurate;so increasing of potential averaged height at some pressure level can be directly caused by its increasing averaged temperaure,for instance at 500hPa ; (4) the increasing potential height of various pressue levels should sharply modifies atmospheric circulation and finally could make re-distribution

of traditional weather pattern;(5)in one word, the rising of atmospheric avreaged temperature eventually lead to adjustments of atmospheric circulation from views of atmospheric averaged states; (6) although most potential field of globe become great owning to globe warming ,however the polar regions of winter hemisphere acquirring smallest sun ray by comparison with summer hemisphere even with other rest region of total earth doing, so atmosphereic potential height gradient bewteen winter polar and summer polar should enhance,then this possible further exacerbate background of extrem climate occurrence, in the end extrem climate (weather) intensifies happens in other area as properties of atmospheric continuous medium and its propagation characters ; (7) according to raifall machnism the increase of potential height in weather map would result in reduction in total annual rainfall because of intensitifies of descend and divergence in atmospher,in addition,intensifies of potential height gradient also will produce an increase in the avarge intensity of tropical cyclone.(8) increase in atmospheric interior energy is mainly balanced by adding of atmospheric potential energy, the High prefer to move toward the place of big value of atmospheric interior energy ,so globe warming directly lead to increasing of potential averaged height at some pressure level (for example at 500hPa).

Finally,perhaps the analysis above should bring out us extra solidity evidence that global warming may be main one of components of causing shorter of averaged water resources and also one of main cause of extrem climate.

Corresponding author: Wang Wan-Li(Wang w.-l.), Main research field: Climate Dynamics,Meteorology Dynamics and the probability distribution function. Wuhan Regional Climate Centre. School of Resource and Environmental Science of Wuhan University.

Email: **xiaowanw2002@yahoo.com**

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