 https://doi.org/10.53964/jmge.2023008

Clarifications on the Concept of "Dynamic Thermal Heat"

For rivers, it is well known that their warming up takes longer the higher their flow rate. This is particularly visible in the mountains where, as reported by Bocquet[36] with the same exposure, a very similar altitude and the same origin of the water by the melting of the ice, a low-flow watercourse can reach 20°C in the hottest hours of summer while the temperature of a nearby torrent does not exceed 7°C.

This author explains the phenomenon as follows:

The flow, in fact, introduces an essential variable. The higher the flow, the less the temperature rise will be rapid because, one of two things, for an increase in flow at a point, either the speed increases (if the wetted section does not change) and the heat exchanges do not have time to be fully realized, or else the speed remains constant but the section increases and the same quantity of calories available in this place is distributed in a greater volume of water. In both cases, the variation in flow leads to less marked heating.

This of course also applies to the water of the oceans, which is constantly stirred by multiple currents and whose surface is roughed up by the winds. But this also applies to the atmosphere, itself in perpetual motion due to winds and vertical convections, whether like the trade winds caused largely by the rotation of the Earth or caused by differences in density or atmospheric pressure of the fluids involved. In both areas, oceanic or atmospheric, warming is for this reason much slower than if everything were static. Therefore, for the rise of one degree Celsius, these two media will have to absorb many more calories than their "classic" heat capacity predicts. Hence the necessary introduction into our modeling of this concept of "dynamic heat capacity". The evaluation that we have made, for the two environments, was obtained by "calibrating" our model with the temperature observations obtained using the anomalies transmitted by the NOAA.

For a column of one square meter, we obtained for the dynamic heat capacity of the oceans the estimate $C_{dyn}=4\times10^{11}$J/K and for that of the troposphere also $C'_{dyn}= 4\times10^{11}$J/K.

For the first, the ratio is one to one thousand compared to the classic heat capacity, and for the second one to four thousand. It seems normal to us that the ratio is greater for the Troposphere, because overall it is less stable than the oceans.

Finally, let us note again that even if it is in a very rudimentary way, this concept of dynamic heat capacity makes it possible to implicitly integrate into our model many oceanic and atmospheric phenomena playing an important role in the evolution of temperatures. Indirectly, C'_{dyn} even makes it possible to integrate the contribution of the land into the evolution of the global average temperature of the Troposphere.