

## ***Interactive comment on “Volume and temperature transports through the main Arctic Gateways: A comparative study between an ocean reanalysis and mooring-derived data” by Marianne Pietschnig et al.***

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According to the title, the authors compare “temperature transports”. There is, however, no such thing as a temperature transport. Temperature is a state variable which cannot be transported.

In the introduction, page 3, the authors introduce the “temperature transport” as being just a semantic trick to conceal a wrong conception of heat transport. They compare a quantity with the unit of a heat transport which is computed for individual passages.

C1

They note correctly that heat transport (divergence) can only be computed for a boundary that encloses a particular volume with no net volume flow. They also note correctly that for single passages heat transports cannot be derived because the derived numbers depend on an arbitrarily chosen temperature reference. Nevertheless, in the following the authors produce exactly such numbers and just give them a different name. This seems to me not a suitable way of working around physics.

The authors further state that - despite these quantities are meaningless - they will use them for comparison (it is probably difficult to find any other reason than comparison for computing numbers at all). However, the arbitrariness of heat transports through non-closed boundaries holds of course also for comparisons, as can be seen from a simple exercise for which the authors might use their raw data of Table 1, i.e. temperatures and velocities (or transports). They will find that they can produce every result they want - equal values for model and observations, or one of them being either larger or smaller than the other - by the appropriate choice of the reference temperature. The same holds for comparisons between straits or along time series. Such insight also follows from the conservation laws describing thermodynamics of fluids, in which only differences of temperatures appear. On the other hand, for determination of a correct heat transport (divergence), the reference temperature does not matter at all.

Consequently, all heat/temperature related comparisons in the paper, presented in figures, tables and text, and thus the conclusions are arbitrary and they could as well look entirely different \*).

The authors might argue that the same misconception of heat transport can be found in several other publications and indeed, they refer to a whole suite of them. I find it very regrettable that results based on wrong physics sometimes pass the review process. However, it does not help repeating these errors and adding even more publications conveying false physics and thus false results for important features of the climate system.

C2

False physics in climate research is very worrying, particularly so in times of climate research being exposed to growing pressure by climate change deniers.

To compare model and observation results, the presented fields of temperature and velocity (or transports) might be very suitable.

This ms is almost the same as it was before; therefore I had to raise the same concern again.

\*) with the exception of the comparison of Arctic-wide net values (last line in table 1 and the black line in Figure 2.)

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C3