



Is the Standard Definition of Poleward Heat Transport Appropriate in Climate Research?

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In this paper, a problem with the standard definition of poleward heat transport is highlighted. This, we argue, arises because of the dependence of the standard definition on an arbitrary reference state for moist static energy. This dependence may result in large uncertainty in the estimates of ocean-atmosphere coupling, the signature in heat transport of the atmospheric storm track and annular modes of variability.

A new definition is proposed to address the problem, which removes unrealistically large fluctuations (4PW) found when using the standard definition. A practical way to implement the new formulation is also discussed.

The new heat transport definition is shown to lead to better correlations with climate indices compared to the traditional definition. In particular a clear relationship between the AO, El Niño and heat transport emerges in our analysis. In addition, it also produces different time sequence of event with large/weak poleward heat transport.

It is hoped that the new heat transport definition may shed light on studies exploring the link between energy transport and climate variability.