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Abstract View

Heat Budget of Tropical Ocean and Atmosphere

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ABSTRACT

Heat budget estimates for the global tropics are derived from recent calculations of the oceanic heat budget and satellite measurements of net radiation at the top of the atmosphere. Annual mean heat export from the zone 30°N–30°S amounts to $\sim 101 \times 10^{14}$ W (=100 units). Of this total 39 and 61 units are performed within the oceanic water body and the atmospheric column over sea and land, respectively. In the zone 0–10°N, to which the planetary cloud band (ITCZ) is essentially limited throughout the year, atmospheric heat export reaches only 13 units, as compared to an oceanic export of 18 units from the zone 0–10°S. In particular, oceanic export in the belt 0–5°S alone contributes 11 units which is 90% of the net radiative heat gain at the top of the atmosphere in this latitude zone. Accordingly, the atmospheric heat export from the realm of the ITCZ related to hot tower mechanisms seems to play a more, modest *relative* role in the global heat budget than heretofore believed. By comparison, oceanic export from the cold water zones immediately to the south of the Atlantic and Pacific equator emerges as an important factor in global energetics.

Oceanic meridional heat transport in the Pacific is directed from the tropics into either hemisphere; in the Atlantic it is northward from high southern latitudes all the way to the arctic; and it is directed south-ward in the Indian Ocean. Oceanic heat gain in the Pacific offsets deficits in the higher southern latitudes of the Atlantic and Indian Ocean sectors, as well as in the Atlantic as a whole. Meridional heat transport for all oceans combined is largest around 30° N and 25°S, where it accounts for 53 and 35% of the total poleward transport. Atmospheric transport is largest and effects the bulk of the total transport in midlatitudes.

Appreciably different estimates of net radiation at the top of the atmosphere, and of oceanic and atmospheric heat export must be regarded as compatible within the broad error limits indicated at present for all three terms.

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