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[Volume 6, Issue 6 \(November 1976\)](#)

Journal of Physical Oceanography

Article: pp. 781–800 | [Abstract](#) | [PDF \(1.57M\)](#)

On the Observed Annual Cycle in the Ocean-Atmosphere Heat Balance Over the Northern Hemisphere

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(Manuscript received March 22, 1976, in final form July 1, 1976)

DOI: 10.1175/1520-0485(1976)006<0781:OTOACI>2.0.CO;2

ABSTRACT

Based on the best presently available satellite radiation, atmospheric and oceanic data sets the long-term mean heat balance of the earth and its normal seasonal variation are investigated over the Northern Hemisphere. Quantitative estimates for the various flux and storage terms in the atmospheric and terrestrial branches of the heat balance are given for 10° wide latitude belts and for each calendar month. The results are presented in both graphical and tabular form. As was known before, the storage of heat in the oceans is found to dominate the energy storage in the combined atmosphere-ocean-land-cryosphere system. In the tropics, large changes in oceanic heat storage are found in the 10°N–20°N belt with a maximum in spring and a minimum in late summer. The main new finding of this study is that the inferred oceanic heat transports appear to undergo very large seasonal variations especially in the tropics. Between 10°N and 20°N, maximum northward oceanic transports of 4 to 5×10^{15} W were computed in spring and late fall, which are as large as or larger than the corresponding mid-latitude atmospheric transports. Near the equator the oceanic fluxes were found to reverse seasonally and be directed generally toward the winter hemisphere with an absolute maximum of -8×10^{15} W in August.

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