

Estimating the Indonesian throughflow from the Indo-Pacific tritium concentration gradient

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The Indonesian throughflow is a major feature of the Indian and Pacific oceans equatorial circulation and an important component of world ocean circulation (Gordon, 1986). It results from the pressure gradient which exists between the Indian and Pacific oceans, as the mean sea level is higher on the Pacific side than on the Indian side. The various methods used to estimate its strength lead to much scatter, with values comprised between -2.6 ± 9 Sv and 18.6 ± 7 Sv.

Here, we focus on the tritium (^3H) distribution. ^3H was injected in the atmosphere by atmospheric thermonuclear weapons tests during the 1950s and 1960s. First, the ratio of thermonuclear ^{14}C to ^3H inventories is used to trace the North Pacific origin of the throughflow waters. Then, the comparison of the ^3H inventory on both sides of the Indonesian seas, in Pacific and Indian oceans, allows us to derive a new estimate of the Indonesian throughflow. Unlike direct current measurements or geostrophy, the present approach gives a value which is averaged over the transit time of the waters through the Indonesian archipelago (i.e., over several years) and makes it possible to remove much of the seasonal and interannual variability of the throughflow.