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Simulation of the distribution of tritium in the global ocean general circulation model

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A global ocean general circulation model (OGCM) is used to estimate the distribution and storage of tritium, and simulated results are used to study the physical processes in the ocean and to assess the performance of OGCM. This OGCM is based on LICOM developed by our Institute, which can well reproduce the observed physical fields, including circulation and water mass. Tritium mainly enters the ocean from the atmosphere via precipitation and vapor exchange. Tritium concentrations in precipitation over the model domain are reconstructed by spatial interpolation. The OGCM with tritium is run from 1953 to 1997 under the forcing of atmospheric tritium from an equilibrium physical field with zero tritium content. Results show that the deposition of tritium input by vapor exchange was generally larger than that by precipitation before 1975. The largest input appeared in 1963, with the input by vapor exchange being 2.52◊1016 TU97m3/a that was about 3 times as much as input by precipitation. After 1975, these two kinds of inputs dropped quickly, and became much close to each other. The global ocean contained 54.95 kg of tritium (decay corrected to 1997) during 1973-1974, in which the North Pacific contained 22 kg that is in agreement with the data-based estimate of 21.1±4.7kg. The simulated global tritium inventory was 65.96 kg during the WOCE of 1989, of which 22.8 kg of tritium was stored in the North Pacific. The storage amount in the North Pacific is also consistent with the data-based estimate of 23.4±2.0. The comparison of tritium distributions at many sections is made. The model generally generates the gradient of tritium distributions from the high latitude to low latitude in the Northern Hemisphere. A large amount of tritium is still reserved north of the equator, indicating that high tritium waters in the Northern Hemisphere have not crossed the equator to spread southward. It can be obtained from the tritium distribution and surface concentrations that the transport of tritium absorbed in the higher-latitude region to the lower-latitude region is not strong enough, compared with the observations.