LETTER TO THE EDITOR

Comments on

E. Eriksson's "Major pulses of tritium in the atmosphere"

In a recent paper (Eriksson, 1965) Eriksson comments on calculations made by this writer (Bainbridge, 1963) of the mixing time of water in the North Pacific based on tritium measurements. Unfortunately Eriksson has misinterpreted the method of computation used by Bainbridge since he states "Bainbridge estimates I [the annual tritium input by rains to the oceans] for different years from available data on tritium in precipitation and computes that $1/K$ must be 3.5 years if the depth of the mixed layer is taken to be 75 m and half of the precipitated tritium reaches the oceans". However, the calculations that were made uniquely define $1/K$ and determine an additional ratio F/D.

The factor F relates the amount of tritium deposited in coastal rains at the latitude 45–50° N to the deposition averaged over the North Pacific. From estimates based on the meagre prebomb latitudinal distribution this was estimated to be about 0.5. That is, about twice as much tritium was deposited in rains at say Vancouver (atoms T cm^{-2} yr^{-1}) as was deposited per cm^2 in the Pacific averaged over the whole area of the ocean. More recent calculations (Bainbridge, in preparation) show that this estimate was within 20%. However, the ratio D/F calculated was 75 meters giving a value for D of about 40 meters. But since D is known to be about 75 meters the conclusion was drawn that either F must be unity or "the depth *in* the mixed layer to which the tritium *is mixed* is less than 75 but greater than 40 meters (Bainbridge, 1963)". If F is unity then "we might assume that only half of the T input is by precipitation and that rivers, direct exchange and surface ocean testing (surface shots) contribute an equal amount". Using Eriksson's terminology then Bainbridge estimated that F (total)/F (precipitation) = 2.

Eriksson derives a factor of 2.5 for this ratio in an earlier section of his paper. Libby (1963) also arrives at this figure by independent methods and attributes the higher tritium input to the oceans to a rainfall higher by this factor but this cannot be the case, and the higher input must be due to, as Bolin (Bolin, 1958) states, eddy transfer of water vapor which is the same as Bainbridge calls direct exchange.

Eriksson's attempt at defining the input function is very arbitrary, especially since the exact method of estimation is not given. His indirect approach depends critically on such unknown factors as the stratospheric hold-up time and the efficiency of tritium production by weapons. Bainbridge used the more direct measure of tritiated water in the troposphere and correlated the input to the oceans with the activity in rains.

Finally, since the average tritium content of the Pacific (based on the author's measurements) decreased from 7.3 to 6.2 TU from 1960 to 1961, an upper limit of $1/K = 9$ years can be estimated assuming no input to the system during this time whereas Eriksson has estimated 22 years.

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