ISOTOPIC COMPOSITION OF ATMOSPHERIC METHANE IN THE SOUTHERN HEMISPHERE

D C LOWE, C A M BRENINKMEIJER, M R MANNING, R J SPARKS, G W WALLACE

DSIR Physical Sciences, Lower Hutt, New Zealand

and

S C TYLER

NCAR, Atmospheric Chemistry Division, Boulder, Colorado 80307 USA

Measurements in both the northern and southern hemispheres show that the concentration of atmospheric methane is increasing at about 1% per year. This increase is of concern because methane plays a significant role in the radiative properties of the atmosphere and in tropospheric and stratospheric chemistry. Isotopic determinations of atmospheric methane and its sources can provide important constraints on source strengths and sinks of the gas. We present methane isotopic data from the Antarctic and Baring Head, New Zealand. The measurements show small but significant gradients in $^{13}$CH$_4$ and $^{14}$CH$_4$ when compared to similar data collected in the northern hemisphere. The data are interpreted in terms of current models of tropospheric atmospheric chemistry, and $^{14}$CH$_4$ determinations are used to evaluate levels of fossil methane in the atmosphere.

TRAVERTIINE RADIOCARBON DATING: AN APPROACH FROM THE STUDY OF RECENT TRAVERTIINE ISOTOPIC COMPOSITION

JOSEP MAS, JOSEP TRILLA and MARIA LLUÏSA VALLS

Departament de Geologia, Universitat Autònoma de Barcelona, 08193 Bellaterra, Catalonia, Spain

The travertine complex of Llorà (Girona, Spain) shows continuous development during the Holocene, related to spring-fed streams along a hill slope. To date the travertine, we use recently precipitated travertine isotopic composition to evaluate the initial $^{14}$C activity, instead of considering values obtained by indirect methods. The purpose of this method is to understand every process that determines the $^{14}$C activity of travertine, and to justify the measured values as well as their variations. We undertook the following steps:

- Hydrochemical and isotopic analyses of water from springs and from several points along streams. Data show chemical and isotopic reequilibrium of spring waters under atmospheric conditions, ie, under open-system conditions.
- Isotopic analyses of recently precipitated travertines. Their $\delta^{13}$C values agree with the $\delta^{13}$C of dissolved inorganic carbon. As a result of the aforementioned reequilibrium, the $^{14}$C activity increases notably as water flows far from springs.
- Isotopic analyses of ancient travertines. Samples rigorously selected yield $\delta^{13}$C and $\delta^{18}$O values similar to those of recently precipitated carbonates. This similitude allows us to apply the measured $^{14}$C activity in recent travertines as the initial $^{14}$C activity of ancient travertines after correcting for present atmospheric $^{14}$C enrichment.

Finally, the concordance of ages among several samples of the youngest layer of the ancient travertine formation (~ 4000 BP) leads us to conclude that we can offer a highly reliable method of travertine $^{14}$C dating.