

A Note on Comparative Methane Measurements on an Antarctic Air Sample

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Abstract

Methane concentration measurements in the air samples was carried out for three samples including one from Antarctica collected during the Fifth Indian Expedition. The Antarctic air sample was collected on 28/12/85 and 27/2/86, coinciding with the beginning and end, respectively, of the summer work. The comparative results of the three analyses are presented in this short note, with future plans for such work at Antarctica.

Introduction

Methane measurements of air samples from rice paddy field were started at Indian Agricultural Research Institute, Pusa, New Delhi during September 1985. Portable Gas Chromatograph was used for methane measurements. Gas samples containing 1 ppm or higher concentrations of methane were prepared by static dilution. Gas samplers fabricated at NPL, gas tight syringes (imported from USA) and methane and nitrogen gases procured from Indian Oxygen Ltd. were used for making the gas mixture standards. Slash and burn experiment was conducted at Laithmawsiang near Cherrapunji in the hills of Meghalaya in April, 1986. CH₄, CO, NO, and SO₂ concentrations were measured before and after slash and burn. Usual chemical methods involving trapping the gas in suitable solutions in impinger followed by formation of characteristic coloured complex were used for NO₂ and SO₂. SO₂ and NO₂ measurements were done at the site and CO, CH₄ were measured in samples collected in teflon bags and stainless steel containers and analysed by gas chromatograph in the laboratory. These results were reported at the IMAPC meeting held in July, 1986.

Present Work

Measurement of the methane concentration in the grab samples obtained from Antarctica, Ajabpur in Dehradun and Muratipur in Nadia district of West Bengal (about 2 km north of Kalyani University) were made.

Stainless steel containers were evacuated to 1×10^{-5} mm Hg while being degassed at 200°C. These were checked for any possible leakage over a period

of one month and also when subjected to low temperature down to -70°C . The samples from Antarctica were collected by Mr. D.R. Nakra, Scientist, NPL on 28.12.85 and 27.2.86, i.e. in the beginning and end of his stay in Fifth Antarctic Expedition. These samples were analysed at NPL. The samples from Nadia and Dehradun were collected in evacuated stainless steel containers as well as in teflon bags and analysed at Kalyani University and NPL, respectively. Methane efflux measurements were also performed in the Nadia paddy fields. Portable Gas Chromatograph (A.I.D. Inc., USA, model 511) with flame ionisation detector and 6 feet long Molecular Sieve 5A column was used for these measurements. Results obtained are summarised below:

Sample Site	CH ₄ concentration in the Ambient	Methane Efflux
Antarctica 28.12.85 and 27.2.86	1.5 ppm	—
Nadia 5.8.86 to 8.8.86	2.0 ppm	0.21 to 0.44 g m ⁻² d ⁻¹
Dehradun 24.9.86	1.6 ppm	

The high concentration of methane in the ambient at Nadia may be due to natural fertilizer and alkaline discharge from the adjoining paper factory.

Future Plans

Evacuated stainless steel containers and portable gas chromatograph have been sent in the sixth Antarctic expedition for the evaluation for methane concentration *in situ* and to study its variation during the year. Work is being done to measure nitrous oxide in addition to methane in the grab samples to be procured from the sixth Antarctic Expedition.

A versatile gas chromatograph (Perkin Elmer Sigma 2000) with flame ionisation, thermal conductivity and electron capture detectors has been commissioned. Matheson Gas blender has also been received and will enable the preparation of standard gas mixtures to calibrate the GC for ppb and lower concentrations of various minor constituents of the atmosphere. Measurement facilities for freons are expected to be established during this year.

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