Photochemistry of ozone over the Western Pacific in Winter and Spring

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Aircraft measurements of precursors of ozone, including NO_x, CO, and non-methane hydrocarbons (NMHCs), were made over the western Pacific in January and April-May, 2002. A photochemical box model was used to calculate ozone production (P) and loss (L) rates constrained by the observed NO_x, H_2O, CO, and NMHCs values. In addition, 3-D chemical transport models were used to investigate the spatial distributions of ozone precursors over the western Pacific. The values of NO_x, CO, and NMHCs were much higher in winter than in spring, due to stronger winds and lower oxidation rates of these species by OH. The mixing ratios of NO_x, CO, and O_3 predicted by the 3-D models agree with the observed values, enabling the quantitative investigation of chemical and transport processes of the pollutants from the Asian continent. The tendency of ozone production predicted by the box model was largely positive in the lower troposphere in winter and much reduced in late spring. The ozone production rate was especially high in the boundary layer in winter, due to the enhanced NO_x and NMHCs values.

Permeability of amino acids through archaeal lipid membrane

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Lipid membrane probably played an essential role for development of some functions necessary for life activity (Ourisson and Nakatani, 1999). Specificity of compound transfer through lipid membrane without aid of protein may have greatly contributed to initiation of primitive life. Analogues of polar ether lipid of acidothermophilic archaea are candidates of the lipid that worked in hot acidic ocean at primitive earth. In this work, we examined permeability of some amino acids through membrane formed with the total polar lipid of archaea, *Sulfolobus acidocaldarius* (JCM8929).

The amounts of amino acids (glycine, valine and glutamic acid) leaked out at 45°C and 60°C from porous nylon capsules coated with the archaeal lipid membrane were determined by GLC. Although most amount of glycine was kept inside of the capsule at 45°C, remarkable amount of glycine leaked out quickly at 60°C (Fig. 1). Leakage pattern of valine was similar to that of glycine. The alkyl side chain of neutral amino acids did not seem to affect the transferring rate through the lipid membrane. In contrast, the leaking pattern of glutamic acid did not depend on temperature (Fig. 2). The pattern may indicate the presence of some interaction between the polar side chain of glutamic acid and the polar head groups of the archaeal ether lipid. The analogues of archaeal ether lipids may have contributed to concentration of specified amino acids and formation of specific peptides in the primitive earth conditions.

Fig.1 archaeal lipid liposome (pH7.0)

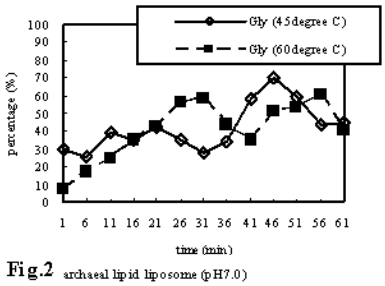
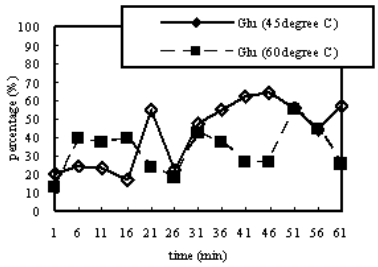


Fig.2 archaeal lipid liposome (pH7.0)



References

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