

Global Monitoring of Atmospheric Methane Sources by Satellite

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Abstract : A greenhouse gas is a gas in atmosphere that absorbs and emits radiation within the thermal infrared range. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and ozone (O₃). Which from four of the principal greenhouses gases are human activities results. Atmospheric CH₄ is the second most important anthropogenic greenhouse gas after CO₂. CH₄'s mixing ratio has increased by a factor of 2.5 compared to preindustrial levels and reached almost 1,800 ppb today.

In this study, we examined separately the changes in methane concentration in land and sea areas using a time series SCIMACHY. Paddy field in Southeast Asia showed the highest among the CH₄ concentration areas by 1780ppb. According to the MODIS NDVI comparison, the CH₄ concentration increases by the paddy growth. And in the harvest time, the CH₄ concentration raises to its maximum. CH₄ concentration in the sea becomes higher gradually during 9 years. It reaches its maximum at the mid-latitude of the northern hemisphere. Assuming that CH₄ does not emit in the sea, the increase in CH₄ concentration of sea areas is caused by the flowing CH₄ emitted in land. The difference of land and sea methane concentration is the emission of land CH₄ concentration. According to the land CH₄ emission concentration, the high CH₄ emission concentration areas are not only in paddy fields(80ppb/year) but also broadleaf evergreen areas in South America and Central Africa(50- 80ppb/year). Finally, we removed the seasonal variation of CH₄ concentration from land during 9 years to investigate the CH₄ growth rate. As a result, in most of land areas, the growth rate of CH₄ concentration is 3-5ppb/year, but in some areas in Brazil, Indonesia and China is more than 6ppb/year.

Keyword : Greenhouse gases, Methane, Sources, SCIMACHY