

波照間島における大気中CH₄の観測から推定された中国からのCH₄放出量の継続的な増加

Continued increase in CH₄ emissions from China estimated from atmospheric CH₄ observation at Hateruma Island

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There are growing concerns about acceleration of global warming caused by the increase of atmospheric methane (CH₄) because it is the second most important anthropogenic greenhouse gas in the atmosphere. Nevertheless, global CH₄ cycles including the geographical flux distributions and their temporal variations remain poorly understood to explain the recent atmospheric increasing trend and to predict the future atmospheric levels. To deepen our understanding of the global CH₄ cycle, the National Institute of Environmental Studies (NIES) has been carrying out in-situ observations of atmospheric CH₄ at Hateruma Island (HAT; lat. 24.1°N, long. 123.8°E) since 1996 by using gas chromatographic system. In this study, we present 20-year record (1996-2017) of CH₄ at HAT and examine the temporal change in the synoptic-scale variability. The CH₄ concentrations at HAT showed elevated peaks with amplitudes of more than several tens ppb when the air masses were transported from the continental regions. The frequency of such CH₄ elevation events increase during a winter 5-month period (Nov.-Mar.) because of the East Asian monsoon. Model simulations based on a Lagrangian Particle Dispersion Model (LPDM) revealed that the most of the elevated CH₄ during the winter 5-month are mainly attributed to emissions from China. The simulated CH₄ increments ($\Delta\text{CH}_{4\text{sim}}$) based on the LPDM and fixed climatological monthly flux maps generally well explain the observed CH₄ increment ($\Delta\text{CH}_{4\text{obs}}$), which is obtained by subtracting the estimated baseline from the observation. The regression slopes between the observed and simulated CH₄ increments ($\Delta\text{CH}_{4\text{obs}}/\Delta\text{CH}_{4\text{sim}}$) for the winter 5-month periods show steady increase after the middle of 2000s. These results suggest that the CH₄ emissions from China during the winter 5-month period, probably abiogenic CH₄ emissions, steadily increased after the middle of 2000s.

キーワード：大気中メタン、温室効果ガス、LPDM

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