

Forward and backward model analyses on high CH₄ events observed over the western North Pacific

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Methane (CH₄) is one of important greenhouse gases and a large part of the global total CH₄ emission exists in Asia. Over the western North Pacific, which locates at the downwind side of the Asia continent, enhanced CH₄ concentrations are frequently observed not only at surface stations but also by aircraft in the mid- to upper-troposphere. Especially, high CH₄ events observed by aircraft during summer are noteworthy because they are likely emitted through highly uncertain biogenic processes and such observational data could provide valuable constraints on biogenic CH₄ emission estimates in inverse modeling. However, its transport mechanism and the model uncertainty should be investigated for an effective use of those observational data. In this study, we have conducted forward and backward model analyses using the atmospheric transport model NICAM-TM and its adjoint mode in order to evaluate the transport model uncertainties and also to investigate the detailed transport pathway from the continent to the western North Pacific. The aircraft observational data we use are from the research project of Comprehensive Observation Network for Trace gases by Airliner (CONTRAIL) and from the operational observation program by Japan Meteorological Agency (JMA). The CONTRAIL project uses commercial airliners connecting Japan and Australia/Bangkok, and the JMA aircraft observation is conducted with the C-130 aircraft connecting the Japan main island and Minamitorishima.

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