Tohjima, Y., Y. Niwa, K. Tsuboi, and K. Saito, 2022: Did Atmospheric CO_2 and CH_4 observation at Yonagunijima detect fossil-fuel CO_2 reduction due to COVID-19 lockdown? J. Meteor. Soc. Japan, 100, 437-444.

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Plain Language Summary: Atmospheric observation at Yonagunijima is generally influenced by air masses from the Asian continent during winter because of the East Asian monsoon. The atmospheric carbon dioxide and methane observed at Yonagunijima during a period from January to March in 1998-2020 were analyzed. After the influences of the local biotic emissions on the short-term variability were reduced, the variability ratios ($\Delta CO_2/\Delta CH_4$) showed a marked decrease in February 2020 associated with the considerable reduction of the fossil fuel-derived CO₂ emission in China presumably caused by the COVID-19 lockdown. This result convinced us that the variability ratio could be useful to investigate the relative emission changes in the upwind region.



Fig. 1 (Top, left Y-axis) Temporal variations in the 30-day moving average of the $\Delta CO_2/\Delta CH_4$ ratio for Yonagunijima (red) and Hateruma Island (blue) from January to March 2020. The $\Delta CO_2/\Delta CH_4$ ratios for YON are modified so as to reduce the influenced of the local biotic fluxes on the short-term variations. The grey line with vertical bars represents the preceding 9-year (2011-2019) average of the 30-day moving average for YON with the range of the uncertainties (1 σ). (Bottom, right Y-axis): the estimated temporal change in the fossil fuel-derived CO₂ emissions from China.

- Monthly means of synoptic-scale variability ratios of the atmospheric CO₂ and CH₄ (Δ CO₂/ Δ CH₄) observed at Yonagunijima, after influences of the local biotic fluxes on the short-term variations are reduced, well trace the changes in the relative emissions from the continental Asia.
- The ΔCO₂/ΔCH₄ ratio at Yonagunijima also showed a marked decrease associated with the COVID-19 lockdown in China in February 2020 as that at Hateruma Island, which is located to about 100 km east of Yonagunijima, did.
- Because Yonagunijima and Hateruma Island are located at the downwind side of the Asian continent that is the biggest CO₂ emitter in the world, the atmospheric observations at both sites would continue to provide valid information on emission changes over the continent.