Temporal variations of CH4 concentration and its dD observed at Ny-Alesund, Svalbard

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Although systematic observations of atmospheric CH_4 concentration have been made at many ground based stations around the world for last decades, our understanding concerned with contributions of individual CH_4 sources and sinks to the concentration variations is still incomplete. Carbon and hydrogen isotopic ratios ($d^{13}C$ and dD) of CH_4 provide useful constraints on quantifying CH4 sources and sinks because of characteristic isotopic values for individual sources and of distinctive kinetic isotope effects occurring in CH_4 destructions. Therefore, the observations of $d^{13}C$ and dD as well as CH_4 concentration will allow us to estimate the cause of CH_4 variations. A lot of $d^{13}C$ observations have been made at ground based stations or by using ships, aircrafts, and balloons, while dD measurements are quite limited. A dD record with seasonal variation observed at Tenerife, Canary islands (28.18N, 16.30W) (Bergamaschi et al., 2000) is the unique long-term data so far.

We have been continued measurement of CH_4 concentration by using a grab sampling method since 1991 at Ny-Alesund, Svalbard (78.55N, 11.56E). Measurements of $d^{13}C$ and dD were newly added in the observation program since 1996 and 2005, respectively. In this study, we present relationship between CH_4 concentration and dD observed at the station. As described in Morimoto et al. (2006), CH_4 concentration at this station showed clear seasonal cycles with a maximum in winter and a minimum in summer. In 2006, a sharp decrease and a sharp increase of CH_4 concentration were observable during April-July and August-December, respectively, and relatively high values with large variability were seen for the rest of the year. The peak-to-peak amplitude of the seasonal CH_4 cycle was 31ppb, which was comparable to that observed at Canary islands. A significant seasonal cycle was also observed for dD, of which variations were well anticorrelated with CH_4 concentration. In 2006, the peak-to-peak amplitude of the seasonal dD cycle was 7.1 per mil, which was twice as large as that observed at Canary Islands. The amplitude dissimilarity for the seasonal dD cycles may be due to difference in local CH_4 sources between Ny-Alesund and Canary islands. To investigate the cause of the dissimilarity, we will combine $d^{13}C$ data for further analysis.