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# $N_2O$ emission from a drained paddy field

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The seasonal courses of nitrous oxide ($N_2O$) fluxes from a drained paddy field were measured over one and a half years from 2002 to 2003, using an automated monitoring system with closed chambers and gas analyzing equipment. The experimental paddy field with Gray lowland soil was drained and cultivated with upland crops. Two cropping systems, single cropping of upland rice cultivation (UR) and double cropping of soybean and wheat cultivations (SW), were examined. Unlike many of the previous studies, the increase in $N_2O$ flux which resulted in an increase in soil nitrate nitrogen content after fertilizer application was not distinctive, which suggests that the contribution of nitrification to the $N_2O$ emission is relatively small in this field. Temporal peaks of $N_2O$ flux were often observed after heavy rainfalls, which lasted for several days. Other temporal peaks of $N_2O$ flux were also observed after the harvest of upland rice or wheat. These temporal increase in $N_2O$ flux suggest the dominance of denitrification as the process for $N_2O$ production. Significantly high peaks of $N_2O$ fluxes were observed from late-July to mid-August, 2002 in both the UR and SW plots, when upland rice and soybean are in the flowering to ripening stages. In the SW plots, another peak of $N_2O$ flux was also observed from late-April to mid-May, 2003, when wheat was in the flowering to ripening stages. These peaks of $N_2O$ flux suggest the significant influence of the crops during the flowering to ripening stages on the increase in $N_2O$ emission. Although the detailed mechanisms of the $N_2O$ production and transport remain uncertain, the influence of plants on $N_2O$ emission, such as $N_2O$ production in the rhizosphere or possible pathway for $N_2O$ transport through the plant body, is indicated to be significant and will become an important subject in future studies. Annual cumulative $N_2O$ emission in 2002 was 2.41 kg N $ha^{-1}$ in the UR plots, whereas cumulative $N_2O$ emission during the whole one cycle of the double cropping was 3.19 kg N $ha^{-1}$ in the SW plots. The ratio of the emitted $N_2O$-nitrogen

to the applied fertilizer nitrogen was 4.02 % in the UR plots, whereas they were 13.25 % and 0.54 % in the SW plots (soybean and wheat cultivation periods, respectively).