Diurnal pattern of nitrous oxide emissions from a sewage-enriched river : references to IPCC indirect emission factor

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ronomidae and Culicidae (Ikeshoji *et al.*, 1980; Simpson *et al.*, 1994).

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There remains considerable uncertainty in the magnitude of indirect nitrous oxide (N_2O) emitted from streams or rivers by the Intergovernmental Panel on Climate Change's (IPCC) methodology. The uncertainty is partially due to a lack of onsite data and great variability of N_2O production, especially on high temporal pattern. Therefore, we measured the N_2O emission rates, concentrations of dissolved N_2O, and potential controlling variables on an hourly basis over one site in a typical sewage enriched river in the Taihu Lake region, China. Results showed that distinct diurnal patterns were observed in N_2O emission, concentrations of dissolved N_2O, and river physicals and chemicals during a 72 h period. N_2O emission and dissolved N_2O saturation averaged 56.1μg N_2O-N m^{-2} h^{-1} (ranged from 41.1 to 87.7μg N_2O-N m^{-2} h^{-1}) and 813% (ranged from 597% to 1 372%), respectively. Correlative analysis indicate that dissolved N_2O, pH, DO, NH_4^+, SO_4^{2-}, air temperature, and water temperature operate as important controls on N_2O production, while TN, Cl^-, DOC, and NO_3^- seems less important. The patterns of N_2O production may contribute to coupled nitrification-denitrification processes and the rates might be greater during day than those at night. The results suggested the compounds of salinity such as SO_4^{2-} concentration would expect to be a more reliable factor than salinity in accounting for N_2O variation in aquatic systems.

To include individually explicit N_2O emission in rivers or river sections, we suggest a more constrained emission factor considering river length (EFL):

$$EFL = \frac{N_2O}{Nr \times L}$$

where EFL is the mean emission factor of N_2O from river surface water per unit length of river (kg N_2O-N kg inorganic-N km^{-1}); Nr is inorganic N inputs (kg N yr^{-1}); L is river length (km); Using the EFL metholodogy, we calculated that 0.28 Tg yr^{-1} of reactive N inputs to N_2O-N in river networks globally, lower than the results of the IPCC methodology and a global river network model.

Our resulting emission factor was 0.24%, very close to the revised IPCC value of 0.25% .Thus our study strongly support the recent revision of EF5-r from 0.75% to 0.25%. Although the revised value of EF5-r agrees well with our results, our EFL methodology is more applicable in reducing uncertainty and simplifying calculation and validation.