

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-65

Anonymous Referee #2

Referee comment on "Estimation of ship emission rates at a major shipping lane by long path DOAS measurements" by Kai Krause et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2021-65-RC2>, 2021

The paper presented by Krause et al. reported a novel approach to derive ship emission rates of NO₂, NO_x and SO₂ from LP-DOAS measurements combining a Gaussian plume model. It falls into the scope of AMT journal and well written. It can be accepted after addressing the following concerns.

Sect. 2.4.: Please describe generally the spectral analysis performance, e.g. how about the residual and the fit errors for each species? And any filtering applied for measured data before introducing the inversion program.

Sect. 2.4.1: If there were averagely 110 ship passages per day and >200 days measured data were analyzed, does it mean that only 30% success rate of the identification, e.g. $7402/(110 \times 233)$. I think the authors could discuss more details about this or any explanations, which may be related the performance of the identification algorithm.

Sect. 2.4.2: If I do understand correctly, the authors used NO₂/NO_x ratio is provide by the in-situ measurement at river side, which is the aged plume rather than the fresh plume at the chimney. The difference of NO₂/NO_x ratio between fresh and aged plume will result in the larger uncertainties on the conversion of NO₂ to NO_x. In addition, the authors need to check the dependence of in-situ measured NO₂/NO_x on the ship position and wind direction.

Sect. 2.4.3: Any introduction for Equation 6 and relevant parameters? Moreover, considering the movements of ships and continuous emission of chimney, the detected plume by LP-DOAS at given time is not only the pure emission of the start point, but also mixed with the subsequent ship plume during the cruise. Did the authors consider this condition in the Gaussian plume model estimation? If not, at least the authors should take an example to evaluate the effects on the model evaluation.

Table 2, please specify the temperature of the used absorption cross section