EGU24-21289, updated on 25 Jan 2025
https://doi.org/10.5194/egusphere-egu24-21289
EGU General Assembly 2024

Analytical Propagation of Emission Uncertainties into CAMS Policy Products

Lewis Blake[1], Peter Wind[1], Hilde Fagerli[1], Alvaro Valdebenito[1], Ingrid Super[2], and Jeroen Kuenen[2]
[1]Norwegian Meteorological Institute, Norway
[2]Netherlands Organisation for Applied Scientific Research (TNO), The Netherlands

We present a methodology and first results for analytical propagation of emissions uncertainties through the EMEP MSC-W chemical transport model (CTM) and an application of these uncertainty estimates to policy products provided by the Copernicus Atmosphere Monitoring Service (CAMS) for European cities. CTMs are widely employed in atmospheric modeling to simulate the transport and transformation of pollutants, but uncertainties in emission estimates can significantly impact the accuracy of air quality predictions. Our study systematically analyzes the propagation of uncertainties arising from emissions. The emissions' uncertainties are consistent
with the CAMS regional emissions product and are calculated using detailed, countryspecific uncertainty estimates in activity data and generic emission factor uncertainties. The uncertainties are calculated per source sector and country. The Local Fractions/Sensibilities [1] methodology available in the EMEP MSC-W model is a tool that allows computation of sourcereceptor
relationships more efficiently. In conjunction with analytical methods for uncertainty propagation, we deliver air quality predictions with uncertainty estimates at a fraction of the computational cost and with increased traceability compared to modern surrogate modeling techniques. In our study we focus on PM2.5 and PM10, and first results will be presented for the impact of emission uncertainties on forecasted PM concentrations in European cities, as well as uncertainties in contributions from different source sectors and countries. By integrating emission uncertainty propagation, our study aims to provide decision-makers with a more accurate assessment of the reliability of CAMS policy products under various atmospheric conditions and in the future provide these estimates as part of their operational delivery.

References

[1] P. Wind, B. Rolstad Denby, and M. Gauss, "Local fractions – a method for the calculation of local source contributions to air pollution, illustrated by examples using the emep msc-w model (rv4 33)," Geoscientific Model Development, vol. 13, no. 3, pp. 1623–1634,

2020. [Online]. Available: https://gmd.copernicus.org/articles/13/1623/2020/