

EGU21-8208

<https://doi.org/10.5194/egusphere-egu21-8208>

EGU General Assembly 2021

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Downscaling EDGAR emissions to local emission sectors for Switzerland

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The fifth version of the Emission Database for Global Atmospheric Research (EDGAR 5.0) provides an impressive inventory of various pollutants. Pollutants from different emission sectors are available with daily, monthly and yearly temporal profiles at a high global resolution of $0.1^{\circ} \times 0.1^{\circ}$. Although this resolution has been sufficient for regional air quality studies, the emissions appeared to be too coarse for local air quality studies in areas with complex topography. With Switzerland as a case study, we present our approach for downscaling EDGAR emission data to a much finer resolution of $0.02^{\circ} \times 0.02^{\circ}$ with the aim of modelling local air quality.

We downscaled the EDGAR emissions using a combination of GIS tools including QGIS, ArcGIS, and a series of python scripts. We obtained the surface coverage of different land use features within the defined EDGAR emission sectors from Open Street Map (OSM) using the *QuickOSM* tool in QGIS. With the calculated local surface area coverage of the emissions sectors, we downscaled the EDGAR inventory data within ArcGIS using a set of developed Arcpy script tools.

The outcome was a much finer resolved emission dataset which we fed into the WRF-CHEM air quality model within a pilot project. A comparison of the modelled pollutant concentrations using the two datasets (original EDGAR data and the downscaled data) shows an improved agreement between the downscaled dataset and the measurement data.

Studies investigating the impact of urbanization, land use change or traffic pattern on air quality may benefit from our downscaling solution, which, thanks to the global coverage of OSM, can be globally applied.