New Master Thesis Topic

Title: The impact of model and emission resolution on atmospheric chemistry modelling

Short description (with picture if possible):

Atmospheric chemistry models require data to represent the input of emissions into the atmosphere. One of the current global state-of-the-art dataset is the CAMS anthropogenic emissions' dataset which has a resolution of 0.1°. Although high-enough for large-scale simulations, this is restrictive when carrying out simulations over smaller regions. National datasets exist at higher resolution that can be used to theoretically improve model accuracy. One example is the EAGrid-Japan dataset, which has a 1-km resolution over Japan. Through the project you will use a regional chemistry model (WRF-Chem) to assess how the resolution of both the anthropogenic emission data and the model influence atmospheric chemistry simulations. It involves carrying out winter and summer simulations for two Japanese cities (Osaka and Kagoshima), utilizing the two anthropogenic emissions datasets: CAMS and EAGrid-Japan. The study aims to evaluate the performance of WRF-Chem at varying resolutions, providing insights into the effects of input dataset choices on model output accuracy. This research has implications for improving air quality forecasting and policy decision-making.

Skills needed:
Good understanding of meteorology and atmospheric chemistry
Familiarity with numerical modelling, good understanding of the fundamentals
Experience with data analysis and programming (e.g. Python)
Ability to process and analyze large datasets
Strong problem-solving and analytical skills

Name of the IUP research group incl. two-line description of the research area
The Laboratory for Modeling and Observation of the Earth System (LAMOS; AG Vrekoussis) focuses on understanding the emission, transport, transformation, and deposition of atmospheric pollutants. Our research emphasizes the impact

of anthropogenic and natural emissions on air quality and the quantification of sources and sinks of various atmospheric species using atmospheric chemistry models and satellite observations.

Topic for students of

☒ M.Sc. Environmental Physics

☒ M.Sc. Space Sciences and Technologies

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