



TM related modeling activities in LAMOS

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1. Inverse modeling

- CO (Rasmus)
- CH₄ inversions (Juyeon)

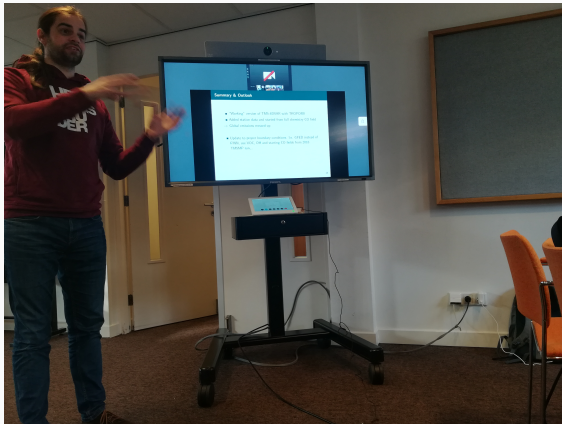
2. Forward modeling

- TM4-ECPL validation w/ satellites (Nikos/Andreas)
- Using TM{4,5} fields as boundary conditions for WRFChem simulations (Andreas)
- Emissions scheme of the model (Sarah)
- CH₄ emissions in TM5-MP (Alexandra)
- Impact of El-Niño to O₃ and CO concentrations in Southern Pacific Ocean. (Rafaella)
- online dust on TM4-ECPL and application on air quality (Medea)
- TM5-MP OH and CO fields for use in TM5-4dvar (Sofía)
- Use of TM5-MP field in FLEXPART forward (and backward) simulations (Ruben)

Inverse Modeling

Ph.D. thesis, ongoing

See presentation from yesterday!

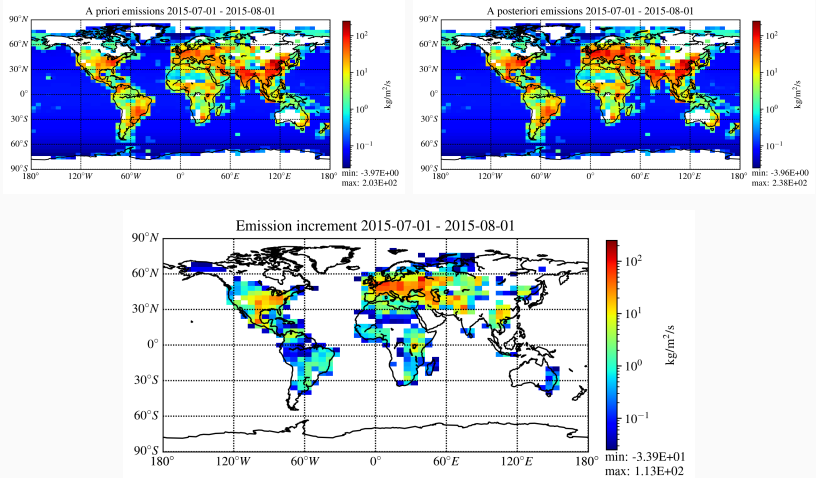




Master thesis focusing on CH₄ inversions

- use of the TM54dvar model (Arjo's branch with utopya)
- plan to develop TROPOMI on top of that version
- use in-house TROPOMI CH₄ data to perform inversions (focus on wetlands)

Test case successfully run!

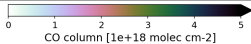
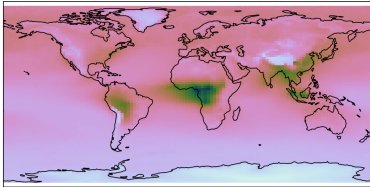


Forward Modeling

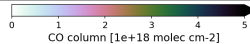
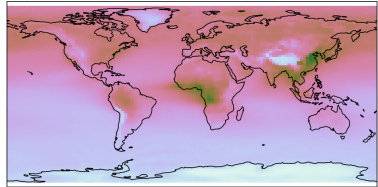
TM4-ECPL validation w/ satellites (Nikos/Andreas)

CO columns / MOPITT

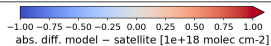
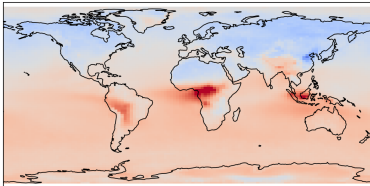
Model (satellite w/ AK and model as reality)



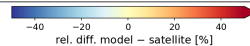
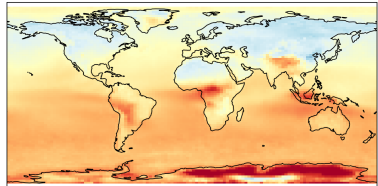
Satellite (orig.)



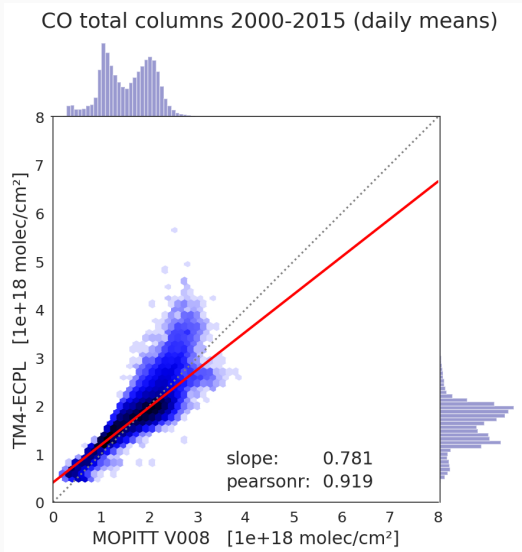
abs. diff. model - satellite



rel. diff. model - satellite



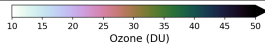
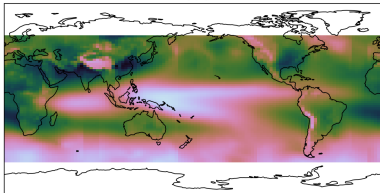
TM4-ECPL validation w/ satellites (Nikos/Andreas)



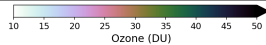
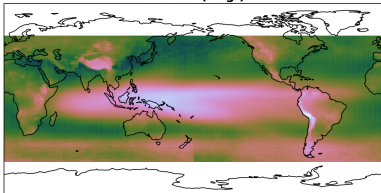
TM4-ECPL validation w/ satellites (Nikos/Andreas)

Ozone tropospheric columns / OMI

Model



Satellite (orig.)





Side project by Andreas Hilboll

- develop a tool-chain/pre-processor for the WRFChem model that takes TM4/TM5 concentration fields and prepares boundary conditions for WRFChem model

Ph.D. thesis, ongoing



Ph.D. thesis, ongoing

- Use of long simulations of TM4-ECPL
- Check concentrations and “shifts” because of El-Niño events (1997, 2016)
- Check impact on lifetimes for O₃ and CO



Ph.D. thesis to begin early 2020

- Update the emissions framework of the TM5-MP model so that emissions are pre-processed and provided to the model in a standard, predefined format.
- Use the HERMESv3 emission tool (Guevara et al., GMD, 2019) to produce the emissions for the model
- Use the newly developed tool on different scenarios for air-quality studies.



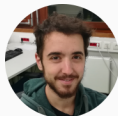
Master thesis, just started

- (re-)develop the online dust scheme from Myriokefalitakis et al., BG, 2016
- (re-)evaluate against measurements
- use the model results to assess the impact of dust in air-quality of major population hubs, compared to the established maximum values



Master thesis, just started

- get OH fields from the TM5-MP model (all chemistry versions)
- calculate OH climatology based on the model data and compare to the most commonly used Spivakovsky et al., 2000
- calculate pCO from the TM5-MP model (all chemistry versions)
- compare and evaluate “best possible” for use in i) TM5-4dvar
ii) FLEXPART



Master thesis, just started

- run FLEXPART with TM5 produced OH fields instead of Spivakovsky and evaluate the impact
- couple a KPP produced chemical scheme to FLEXPART for online calculations of chemistry based on:
 - quantities of species of interest as calculated by FLEXPART
 - rest of chemically relevant quantities as provided by TM5-MP
- Attempt also backward trajectories using this setup

Thank you for your attention!

The computations/simulations were performed on the
HPC cluster Aether at the University of Bremen,
financed by DFG within the scope of the Excellence