Ongoing projects at ECPL and LAMOS/IUP

Maria Kanakidou, Nikos Daskalakis, Mihalis Vrekousis

TM5 meeting, 23 October 2020

Preparation for the interannual simulations with TM model

Historical interannual variability of aerosol, CCN and IN and its main drivers

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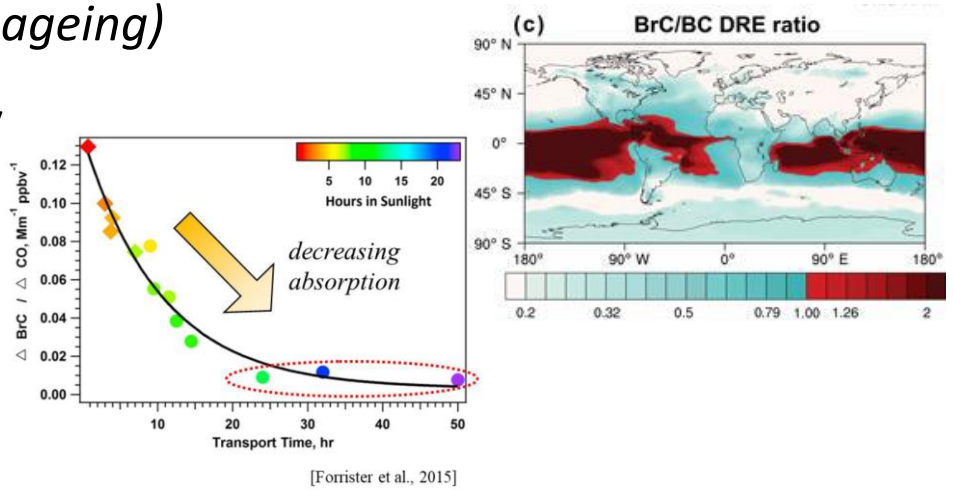
Further development in TM4-ECPL/TM5 model

- ✓ 1- (Marios *PhD on PANACEA- Greek project*) : Ice Nuclei testing the importance of Quartz versus Feldspar for Ice Nuclei – IN- (move all IN parameterizations from TM4-ECPL → to TM5)
- ✓ 2- (Angelos PhD *on FORCES)* use of the TM5-ISORROPIA II (or light) version in which Stelios has introduced NO_3^- and NH_4^+ - coarse mode (kinetic limitation consideration for HNO_3 and NH_3 on particles of different sizes *Pringle et al., GMD, 2010; Karydis et al., 2016) for more accurate calculations of aerosol pH and relevant processes (e.g. aerosol ageing)*
- ✓ BrC in TM5 (started- account for primary emissions, secondary emissions from aromatics, multiphase chemistry & ageing)
- ✓ 3- Nikos use of ERA5 (to be done)



[Forrister et al., 2015]

EMeRGe - Effect of Megacities on the transport and transformation of pollutants on the Regional and Global Scales

- ✓ Use the TM5-MP moguntia chemical scheme in a modified KPP box model
- ✓ Use the measurements acquired from the aircraft campaigns of EMeRGe
- ✓ Simulate the ROx concentrations close to the aircraft, using as measured concentrations of their precursors.

- Aggelos Gouvousis (PhD)

Partner Institutions

Universität Bremen

BERGISCHE UNIVERSITÄT WUPPERTAL

DLR

KIT Karlsruhe Institute of Technology

JÜLICH FORSCHUNGSZENTRUM

JGU JOHANNES GUTENBERG UNIVERSITÄT MAINZ

HALO

UNIVERSITÄT HEIDELBERG

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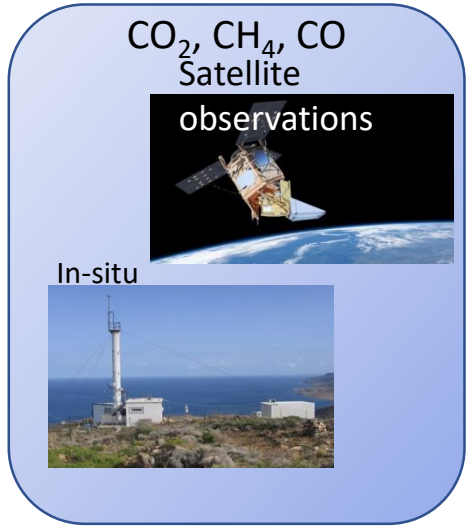
ENVIRONMENTAL CHEMICAL PROCESSES LABORATORY ECPL

CLIMPACT – National Network on Climate Change and its Impacts

- ✓ Localize GHG sources in Greece combining various satellite products of CO_2, NO_2, CO and CH_4 with in-situ observations and modeling
- ✓ Improve anthropogenic emission estimates for CO_2, CH_4 for Greece
- ✓ Improve biomass burning CO emission estimates for Greece



- Nikos Gialesakis (PhD)
- Ioanna Evangelou (MSc)

in collaboration with LAMOS, IUP, Bremen &

After discussion with Sander we plan to use the WRF-GHG-CTDAS model in a collaboration framework with Sander Houweling

Nikos Gialesakis (PhD candidate)

- Study of the temporal change of carbon dioxide and carbon monoxide in the atmosphere of the eastern Mediterranean as recorded by in-situ observations, including at Finokalia station, and satellite observations.

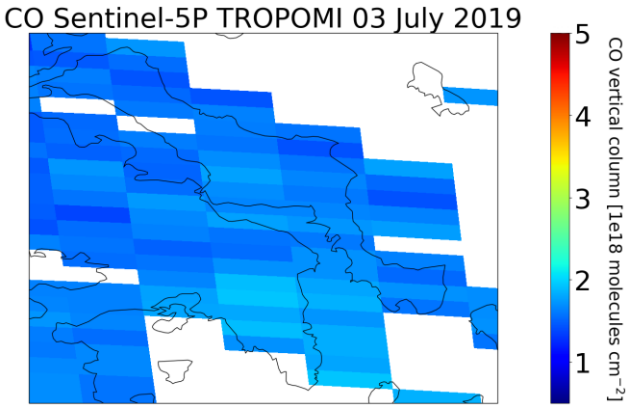
- Collection and archiving of high definition satellite data for CO_2, NO_2 and CO using OCO-2 and TROPOMI-S5P satellite respectively.

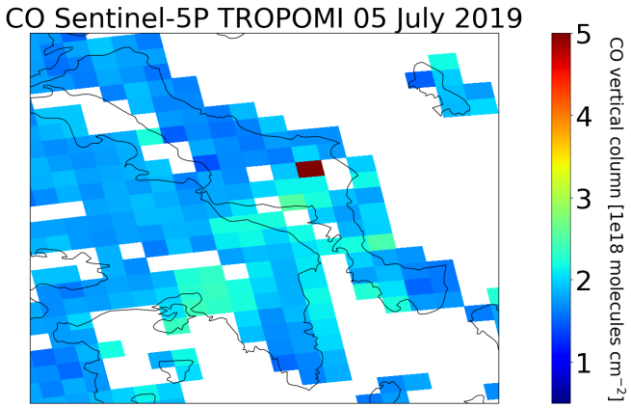
- Correlation of satellite observations of CO_2, NO_2 and CO for the location of their sources and comparison with the existing emission data in the area.

- Inverse simulations using WRF-GHG (Weather Research Forecast- GreenHouse Gases) coupled with CTDAS (CarbonTracker Data Assimilation Shell), to estimate the sources of CO and CO_2 in the area.

- Estimation of carbon monoxide sources from wildfires

MODIS Terra and Aqua
https://worldview.earthdata.nasa.gov/





Excellence chair IUP-UniBremen

- 4 year project (started January 2020)
- Collaboration between UoC (ECPL) and Uni-Bremen (LAMOS)
- Main objective:

  optimize estimates of the surface fluxes i.e., emission or deposition of greenhouse gases and other climate-relevant pollutants that are needed for the evaluation of their impacts on climate and ecosystems, respectively, using Earth System Models.
- Group (hosted by Profs. M Vrekoussis, J P Burrows and J Notholt, IUP)
  - Prof. Maria Kanakidou
  - Dr. Nikos Daskalakis
  - PhD1 (to start Jan 2021)
  - PhD2 (to start Jan 2021)

Excellence Chair Projects

- Nutrients deposition fluxes (PhD)
  - Planned to start Jan 2021
  - Data assimilation of NO_2 and NH_3 in TM5
- Inverse modelling of CH_4 from permafrost (PhD)
  - Planned to start Jan 2021
  - Use of SCHIAMACHY/GOSAT/TROPOMI in TM5-4dvar
- Inverse modelling of short-lived chemically reactive pollutants (ND)
  - Delayed start (due to unforeseen circumstances)
  - Add simplified chemistry on TM54dvar for CHOCHO and HCHO for use as proxies for isoprene and other VOC

Other projects

- Change the emissions scheme of TM5-MP
  - Sarah-Lena Meyer (PhD)
  - Use of the HERMESv3 tool to preprocess emissions and provide to the model
- TM5-MP vs Spivakovsky
  - Sofia Gomez Maqueo Anaya (MSc thesis defended 14/10/2020)
  - Presentation today at 12:00
- Dust in TM4-ECPL
  - Medea Zanoli (MSc)
  - Validation of the online scheme
  - Use of the model in air quality assessment for the impact of Saharan dust
- TM5-4dvar CH_4 inversions
  - Juyeon Bae (MSc)
  - Use of TROPOMI CH_4 data in TM5-4dvar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Thank you…