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CAMAERA

WP8

Updating Biogenic VOC - activities and current status

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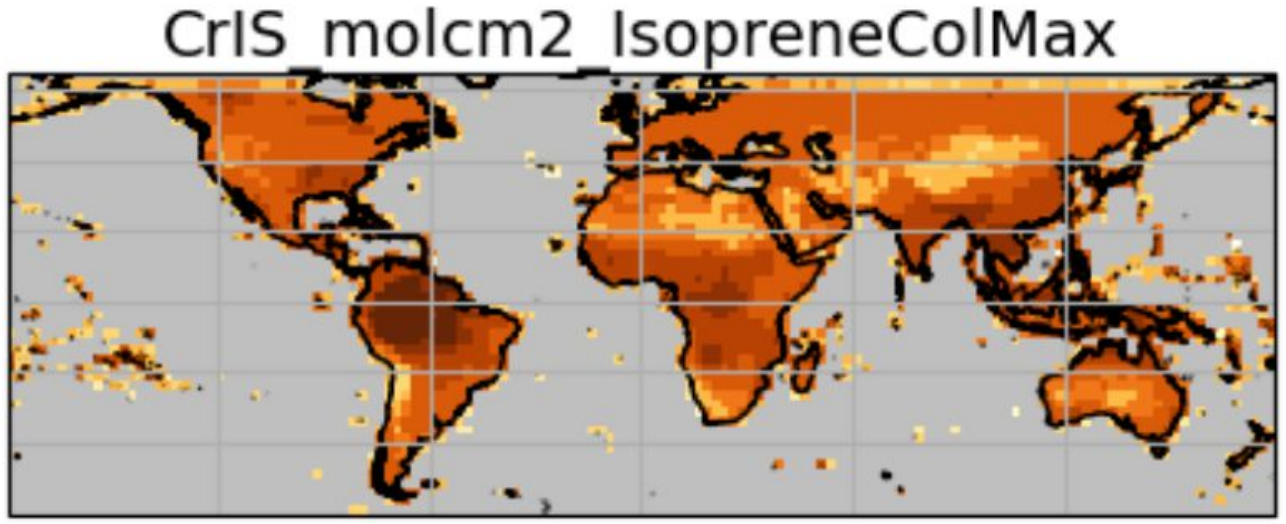
CAMAERA meeting 15-05-2026

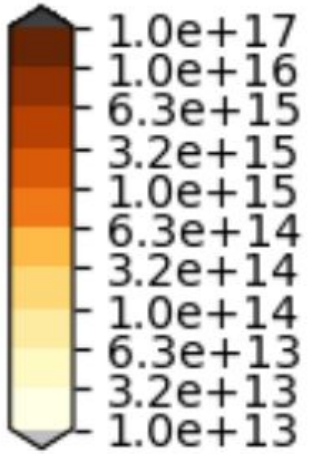
WP8 Reminder: NEW LAND-COVER SYSTEM (via python scripts)

Flexible hierarchy:

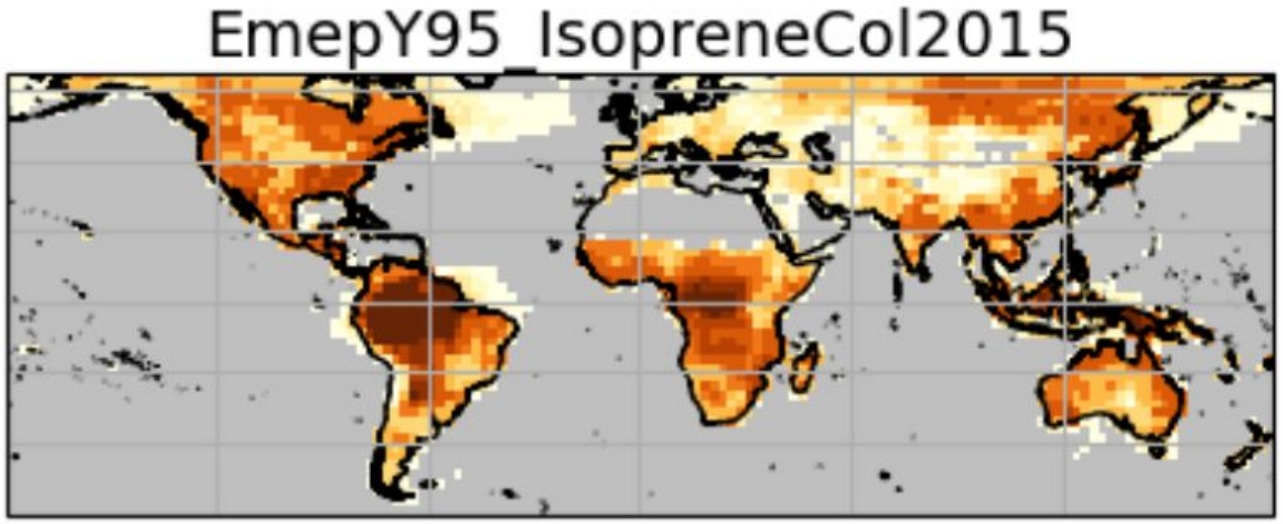
- Top = **ESA** or **ECOCLIMMAP-SG**
- + Koeppen or Olson => Steppe, boreal, desert etc
- + EMEP/SEI or CORINE
  => Tundra, Med. Scrub, moorland
  => Med. broadleaves
- Allows uniform system from km-level to global
- Allows EMEP-level detail where available
- Avoids cross-walk tables
- Remaining issue: crops growing season, LAI :-(

EMEP vs satellites 2: CrIS = direct measurement of noon-ish Isoprene (Wells et al, 2022)





molec/cm^2



Looks OK-ish in Tropics

Not so good in Europe!

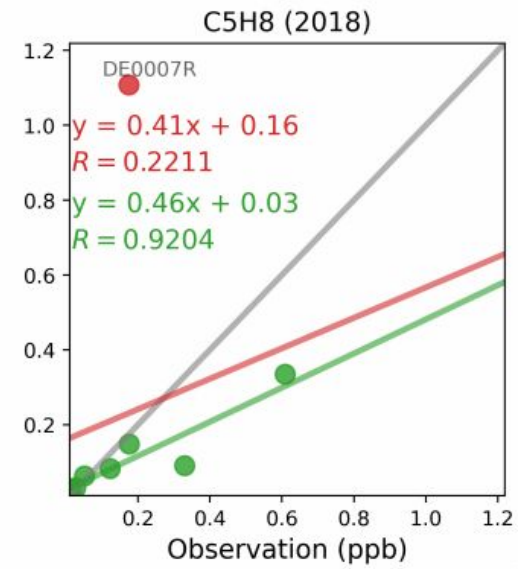
How can things be so far wrong? Can they?

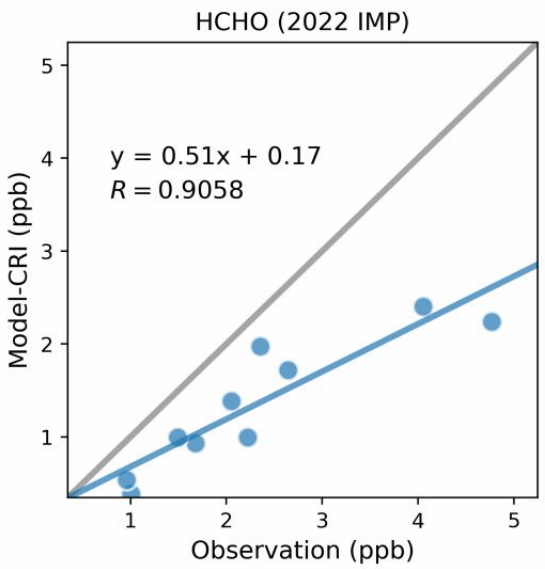
Answer: Europe is below DL (3e15) of CrIS!

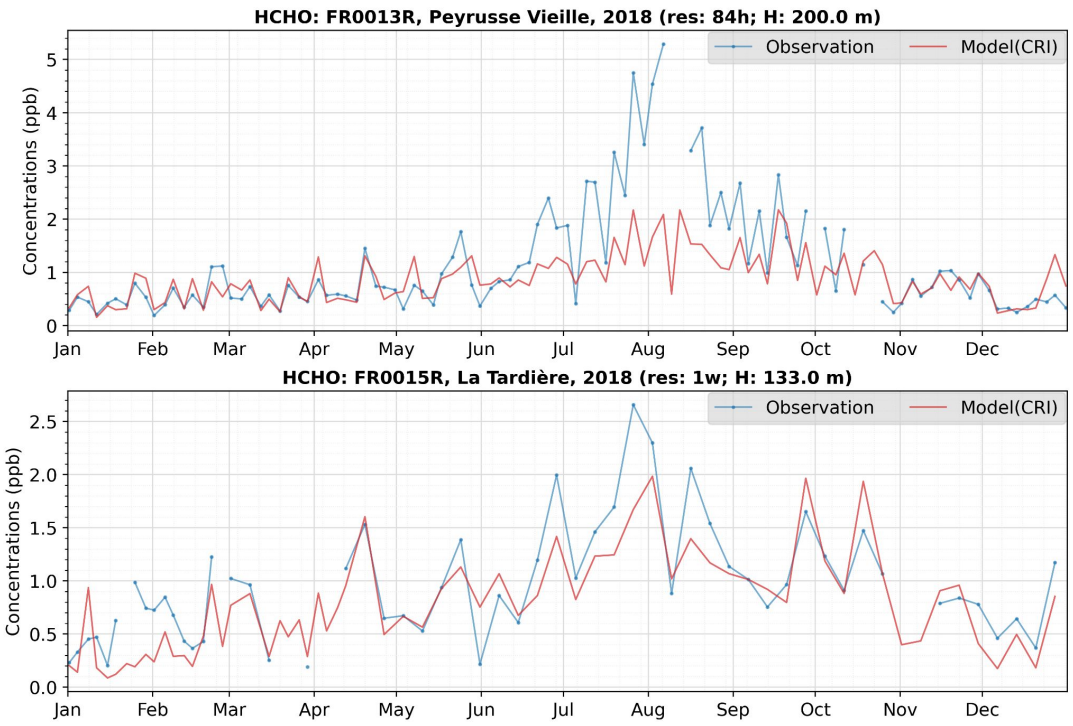
(Data show maximum monthly average, aggregated to 2.5x2.5 degree cells.)

EMEP vs. surface observations - quite okay!

Comparisons with surface data?





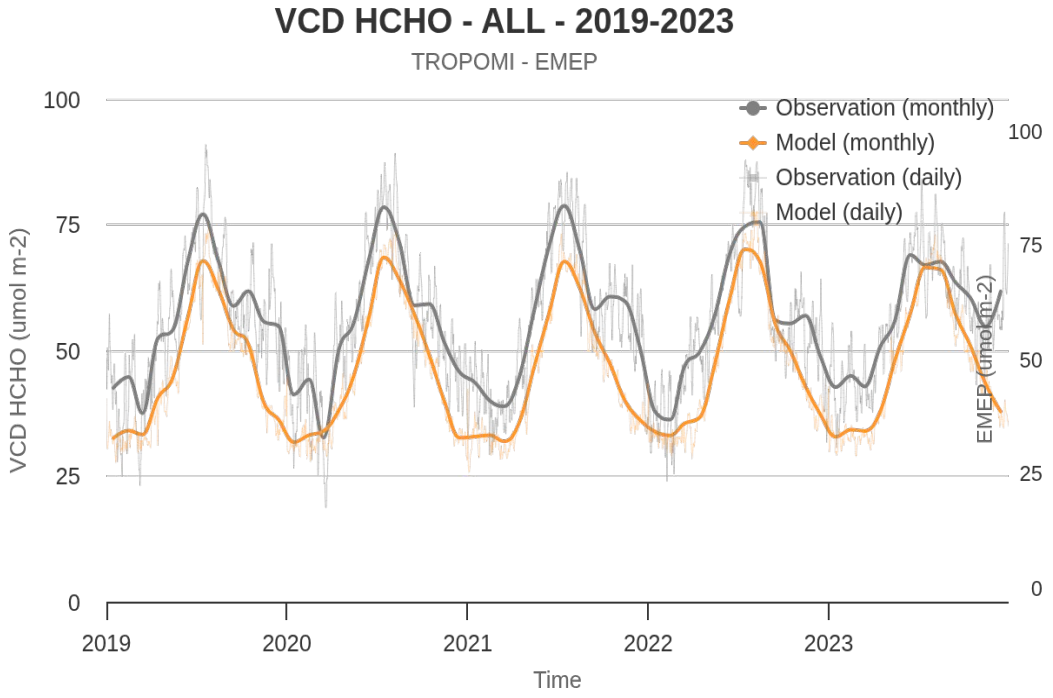


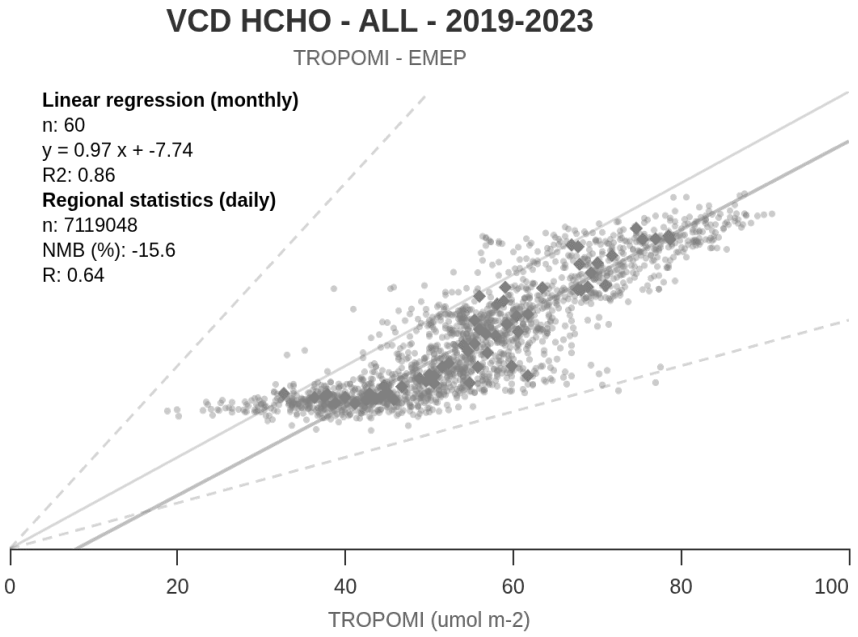
Surface data is easier to interpret (no inversion assumptions), but:

- Very few data
- Issues with short-lifetime of isoprene
- Issues with link HCHO-Isoprene

(Figs from Ge et al, ACP, 2024)

EMEP vs TROPOMI (VIIRS) HCHO - European domain





No major issues with HCHO. Not sure of implications for C5H8, but massive increase in BVOC emissions would mess this up.

Where were we last time (Feb 2026)?

- First, Dave needs to wrap up land-cover and BVOC EPs
- Then, follow CAMS2-61 procedures
  - Met Norway will prepare monthly maps of BVOC emission potentials
  - + LAI
  - Likely MEGANv2 style
  - Larger area than previous - east of Urals to include Eurasian boreal forests at least.
  - Send to Katerina Sindelarova (or straight to Vincent first?)
  - (Future should aim at MEGANv3)
- Discuss: IFS usage of monthly data. PFT data.
- Is anything else needed for IFS?

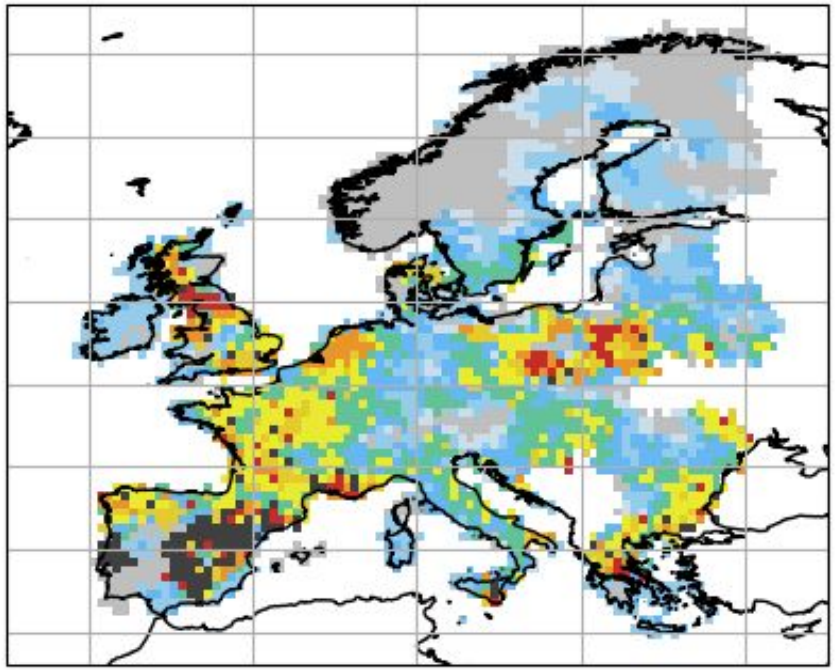
Merging with MEGAN and maybe more

1. EMEP BVOC uses JRC distribution maps of 115 species of forest tree, each assigned EFs and biomass density.
2. These EFs were merged with MEGAN for CAMS-GLOB-BIO v3 (Sindelarova et al., 2022).
3. Alternative maps of 39 forest trees were produced by Skjöth et al. (2008). Can also be used with EFs from (1).

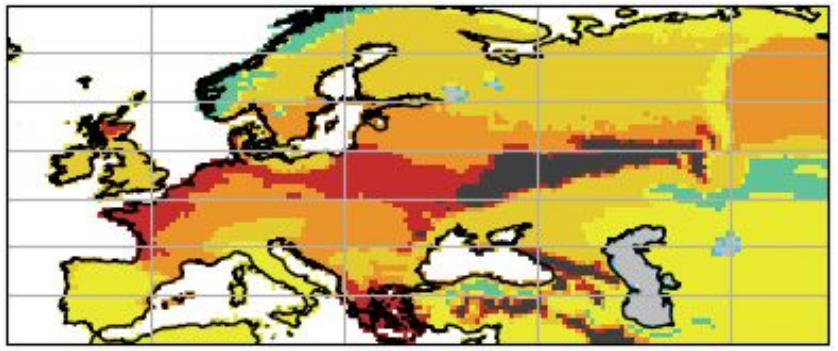
4. CAMAERA aim: produce new European EF maps, for merge with MEGAN.

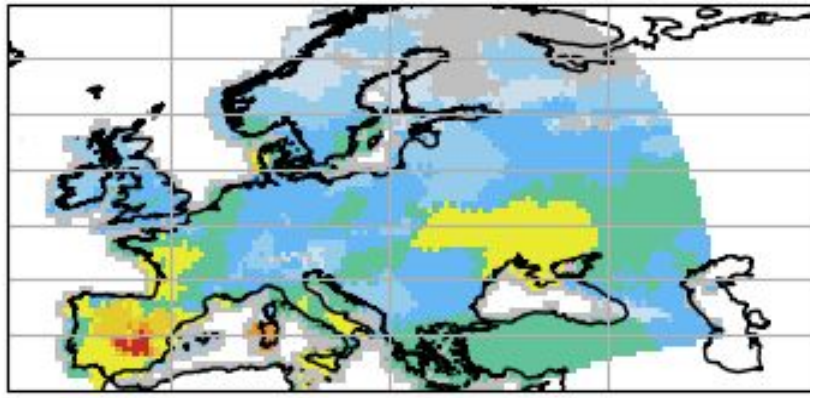
Merging with MEGAN …. (Isoprene EFs, deciduous broadleaf)

EMEP/JRC



MEGANv2

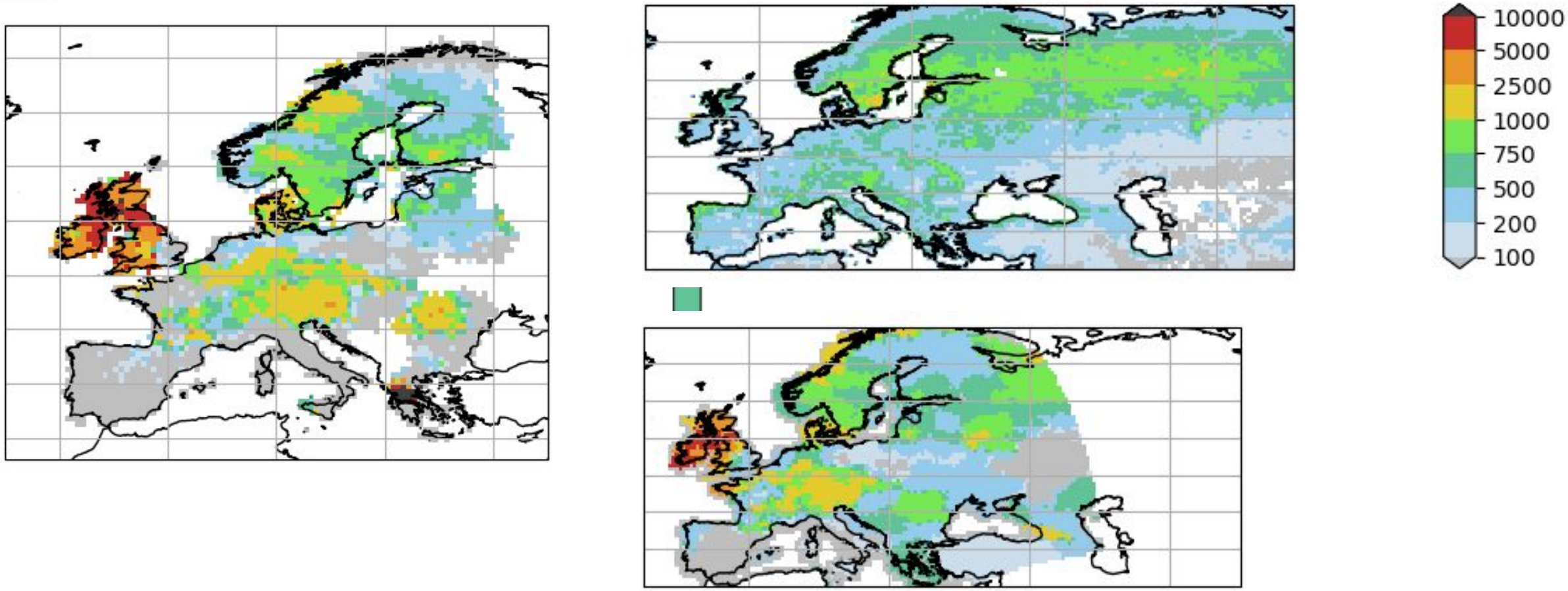




EMEP/Skjöth

MEGAN has higher EFs for isoprene everywhere - hard to reconcile with European observations or forest species. Will replace MEGAN EFs over Russia with factors derived from EMEP.

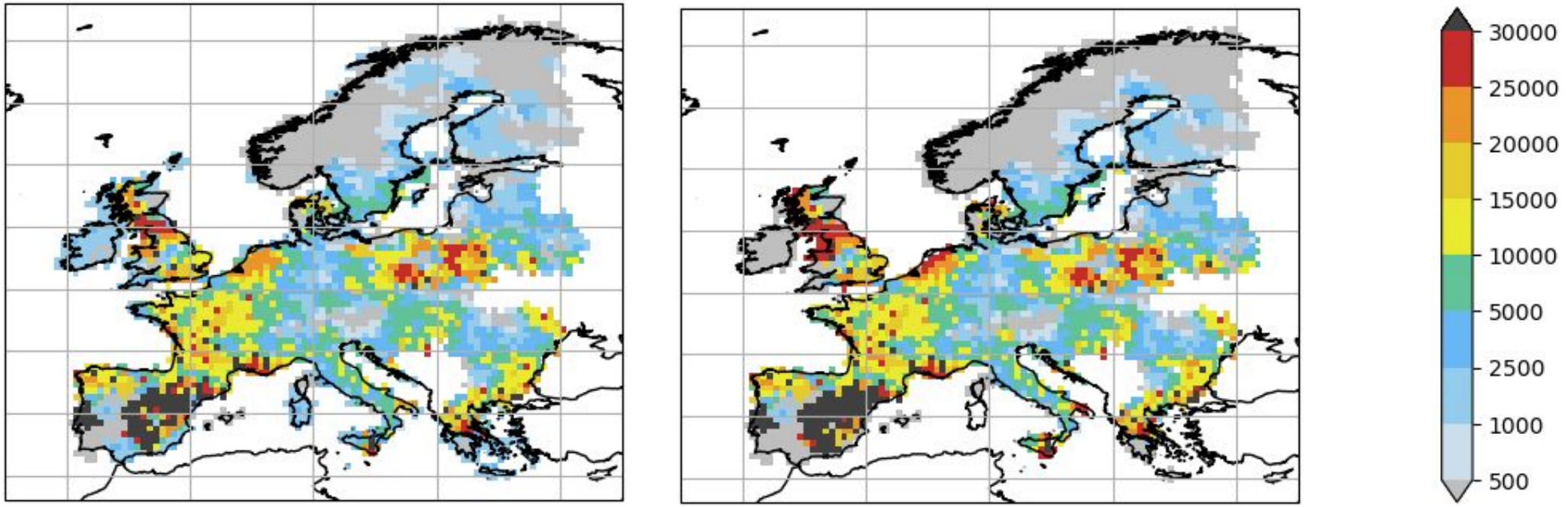
Merging with MEGAN … (Monoterpene EFs, evergreen needleleaf)



EMEP has higher EFs for monoterpenes than MEGAN in NW Europe.

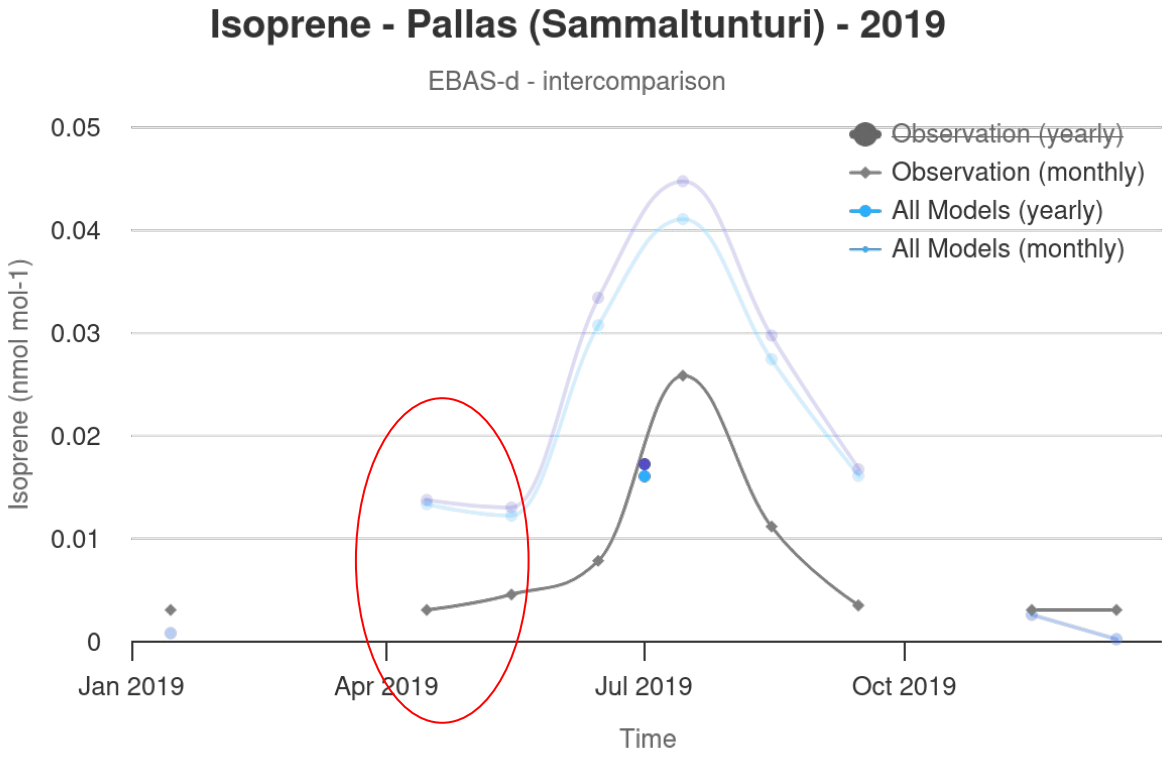
Example of complications

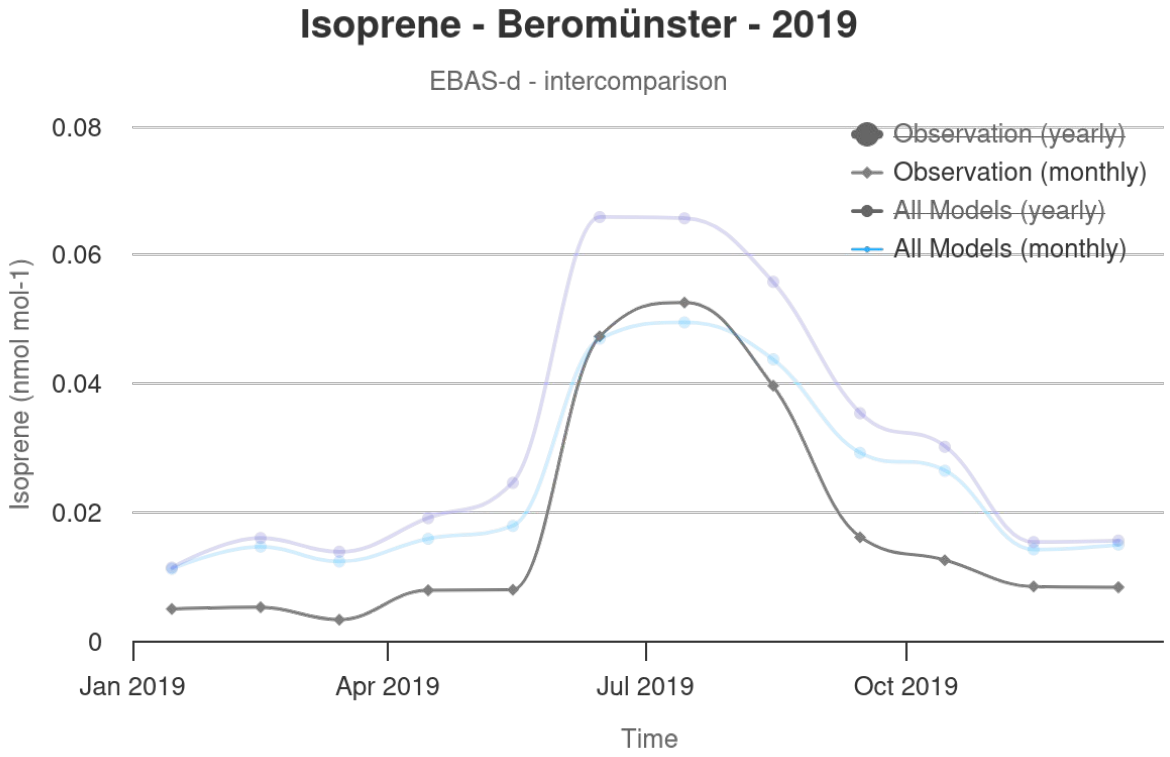
Even simple choices have visible impacts. EMEP uses > 100 forest species, but one category is simply “not classified which had a default EF.



Isoprene EFs from 1st update show pockets of emissions from “not class.” forest. Setting EF-mixed to zero has substantial impact. Not rocket-science to solve, but takes time.

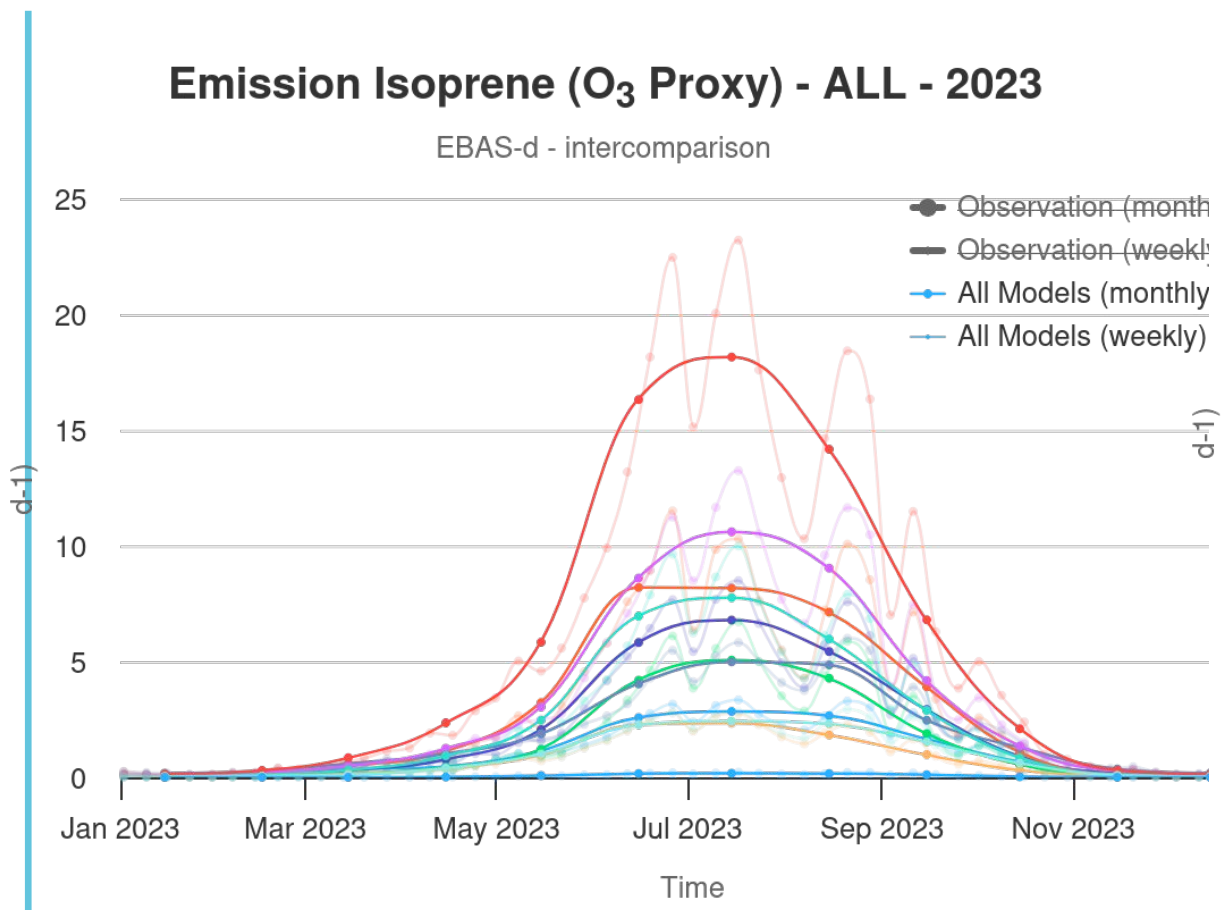
Seasonal variations?

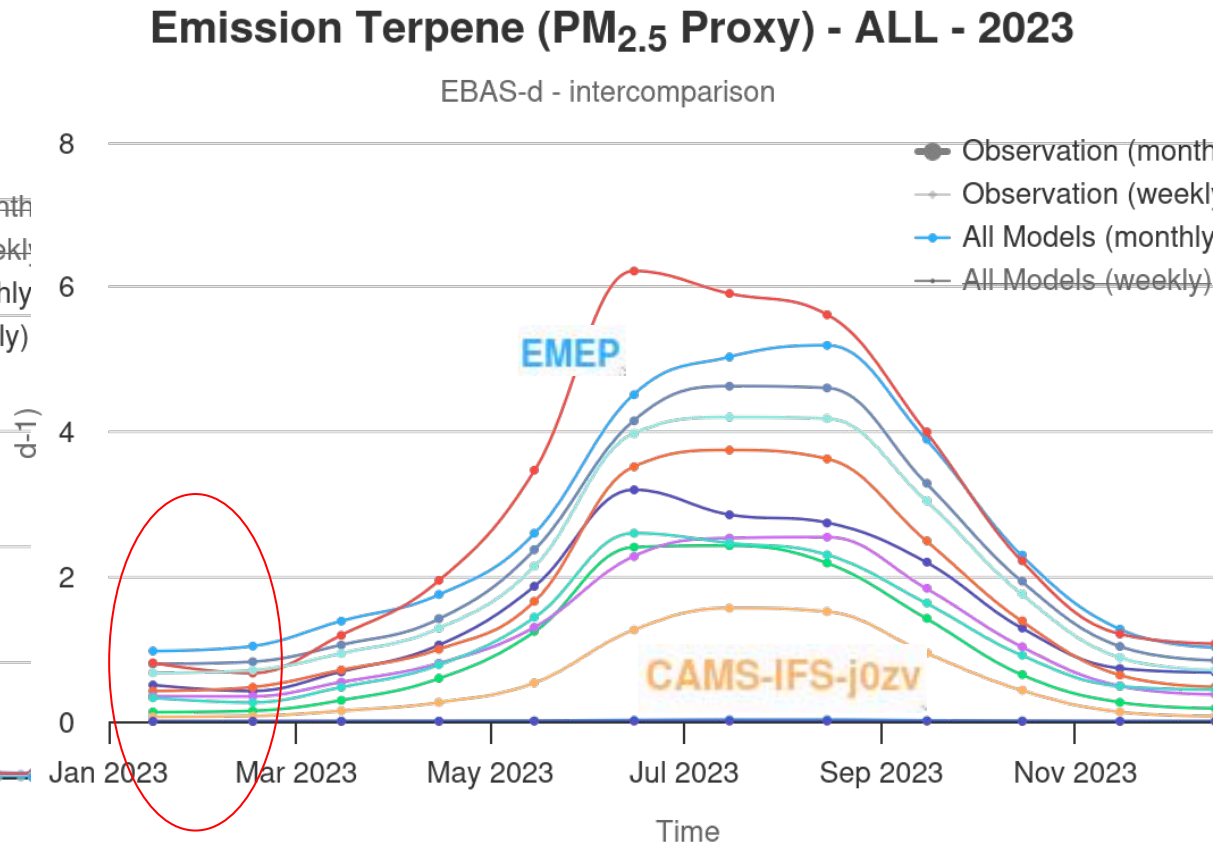




EMEP EFs too high in winter, across Europe?

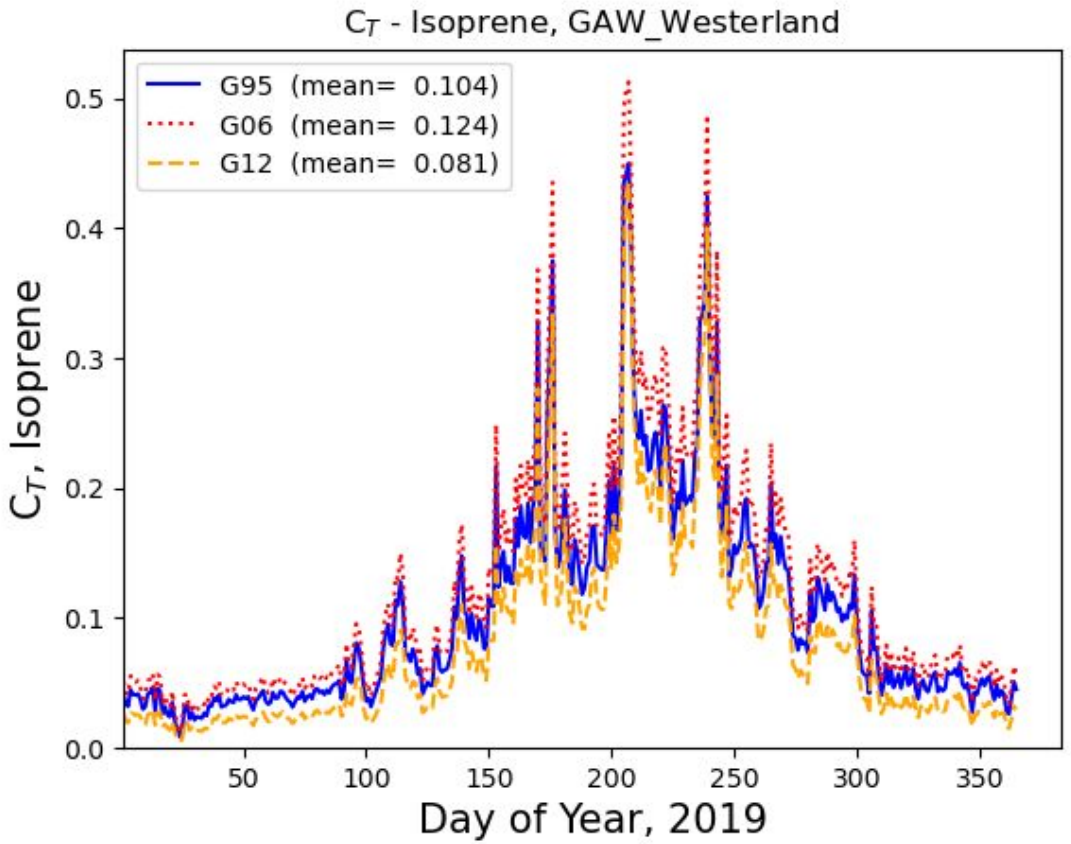
c.f. CAMS2-40 (Results from Daniel, Hilde, Jesse)

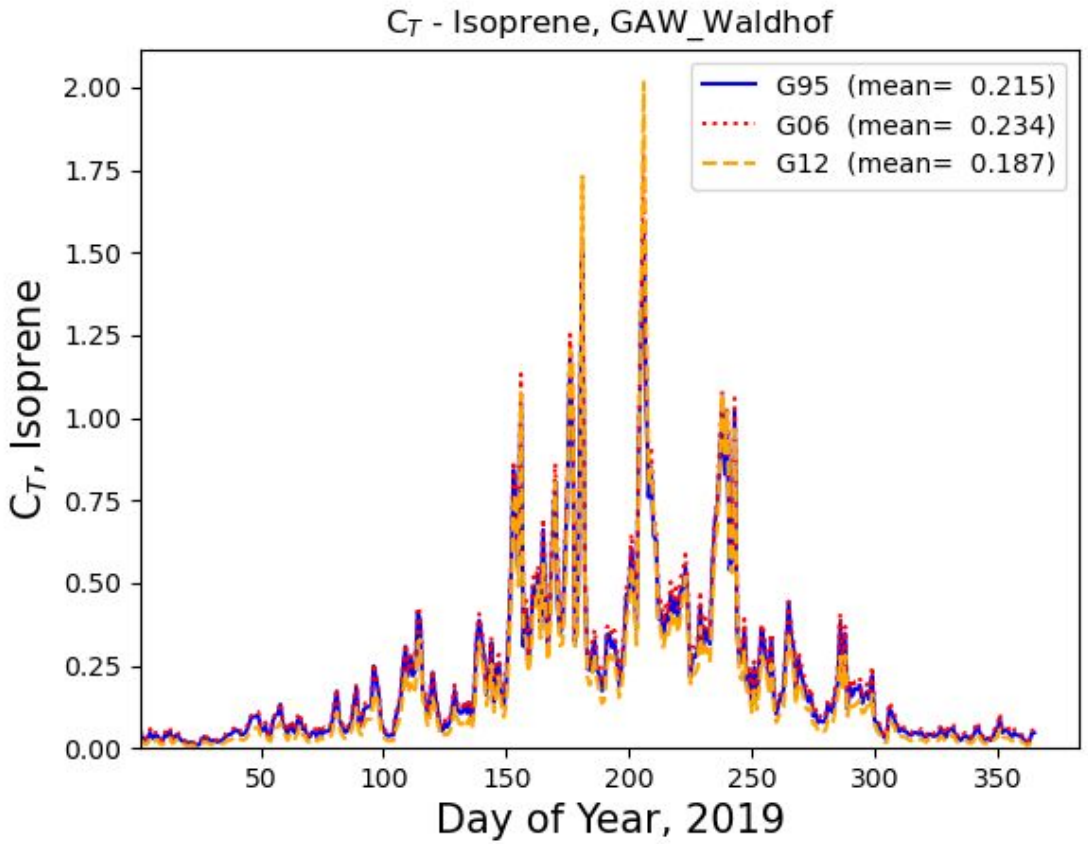




Results from 12 CAMS models, Europe, 2023, for O3 sites (isoprene, left) and PM sites (terpenes, right)

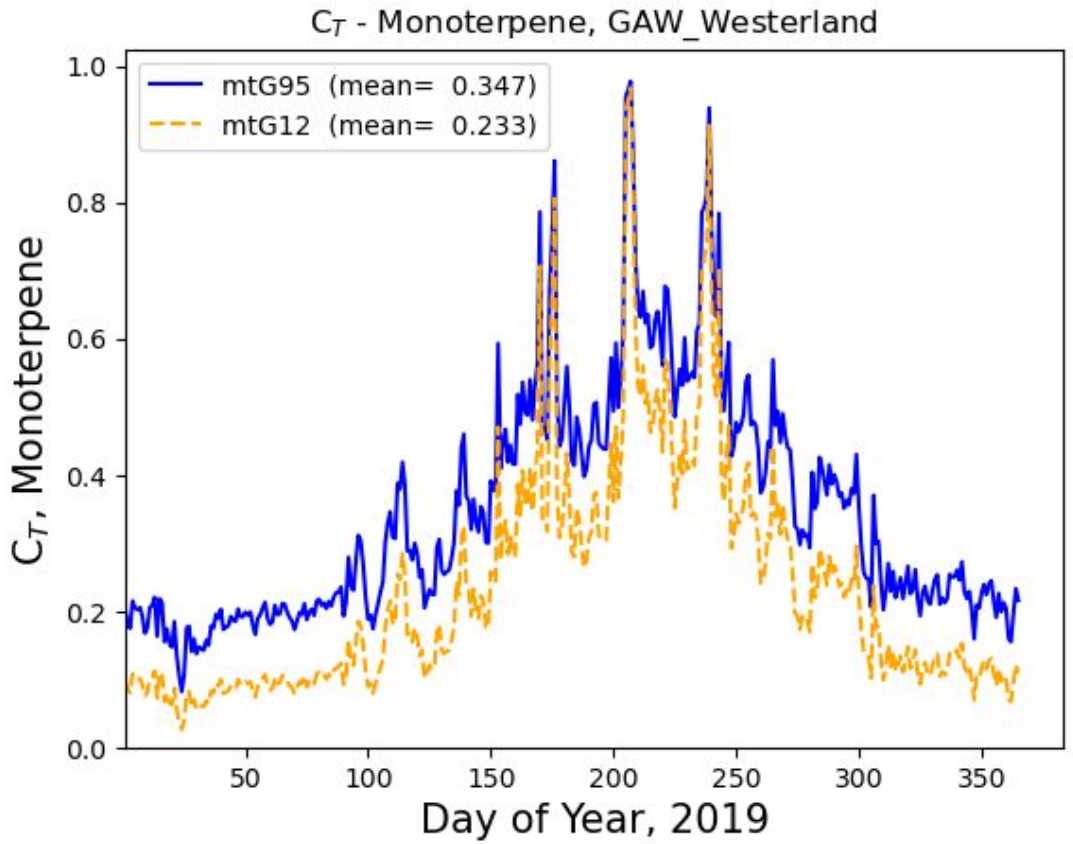
Improving the seasonal variations? More MEGAN?

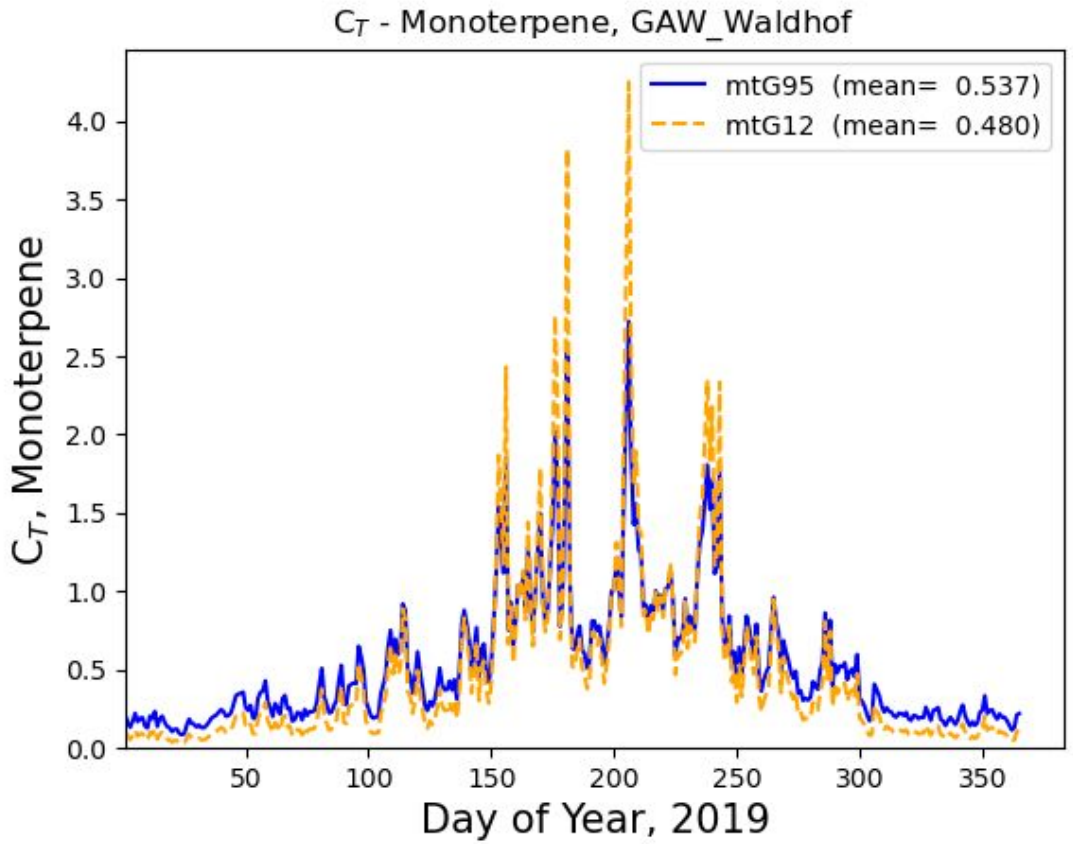




Comparison of isoprene temperature functions for Guenther et al 1995 (used in EMEP), 2006 and 2012 (MEGANv2). Two German sites, 2019

Improving the seasonal variations? More MEGAN?



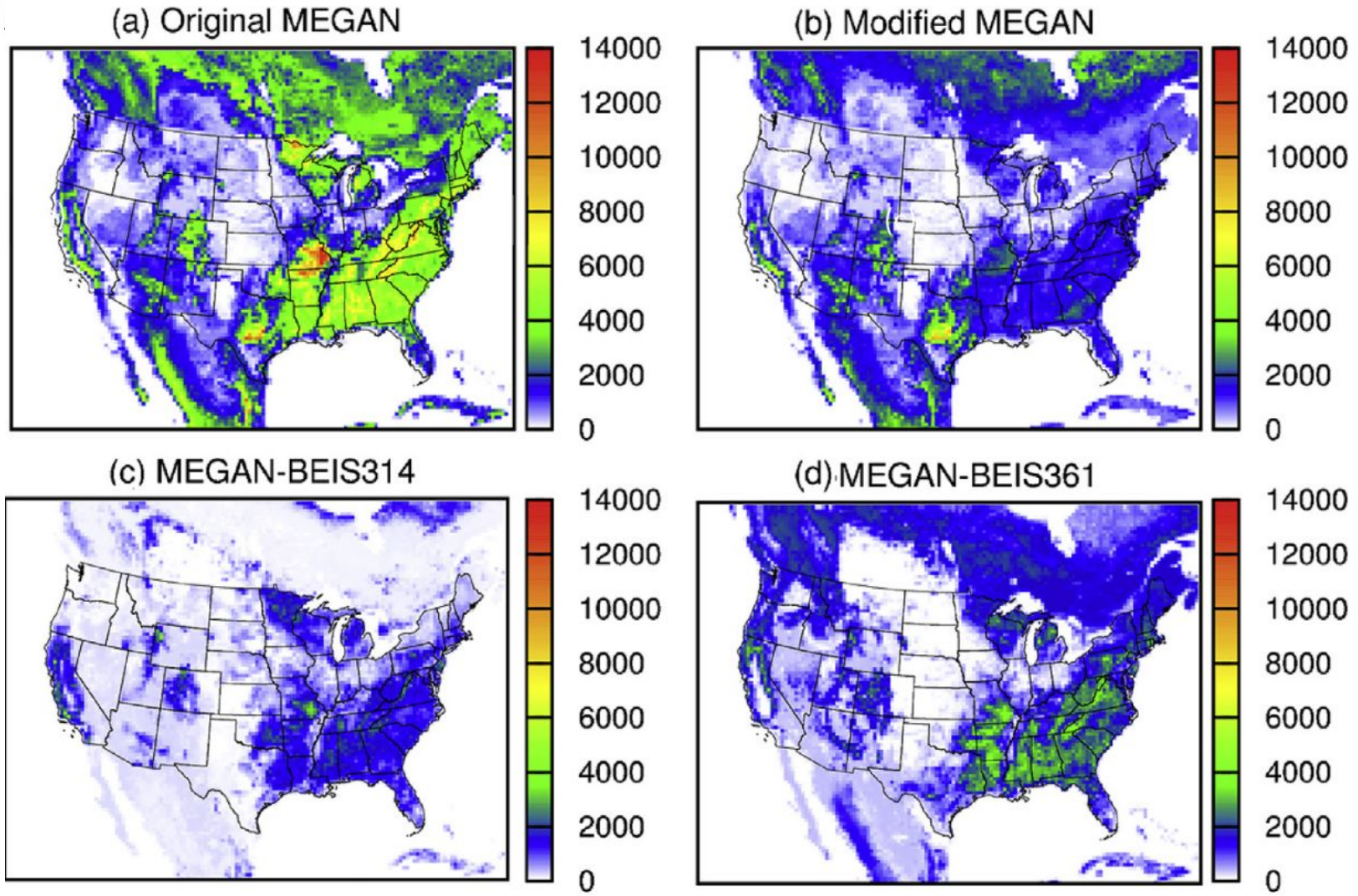


Comparison of monoterpene temperature functions for Guenther et al 1995 (used in EMEP), 2006 and 2012 (MEGANv2). Two German sites, 2019

Conclusions from CT

- The MEGAN equations have other “history” effects
  - Aslo radiation + leaf-age
  - Entails spin-up needed for 7-10 days?
- give some possibility to reduce BVOC in winter, but other options would be simpler -
  - eg no emissions before some accumulated temperature threshold (linked to global LAI analysis).
  - seasonal EF, but this is difficult on global scale
- …

An aside: back to the USA….



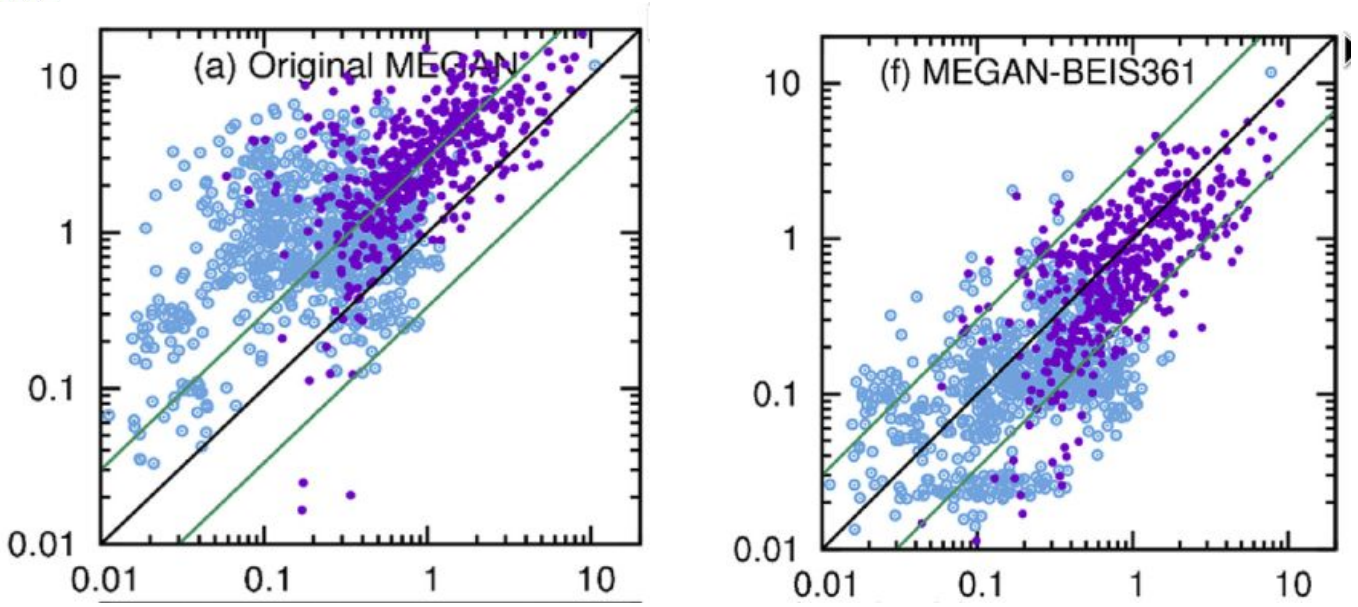
Emission factors from MEGAN/BEIS systems (Wang et al., 2017)

The US has two very well established inventories:

- MEGAN (Guenther et al. 2006..2012)
- BEIS (Pierce & Waldruff, 1991 … Bash et al, 2016)

They still differ substantially!

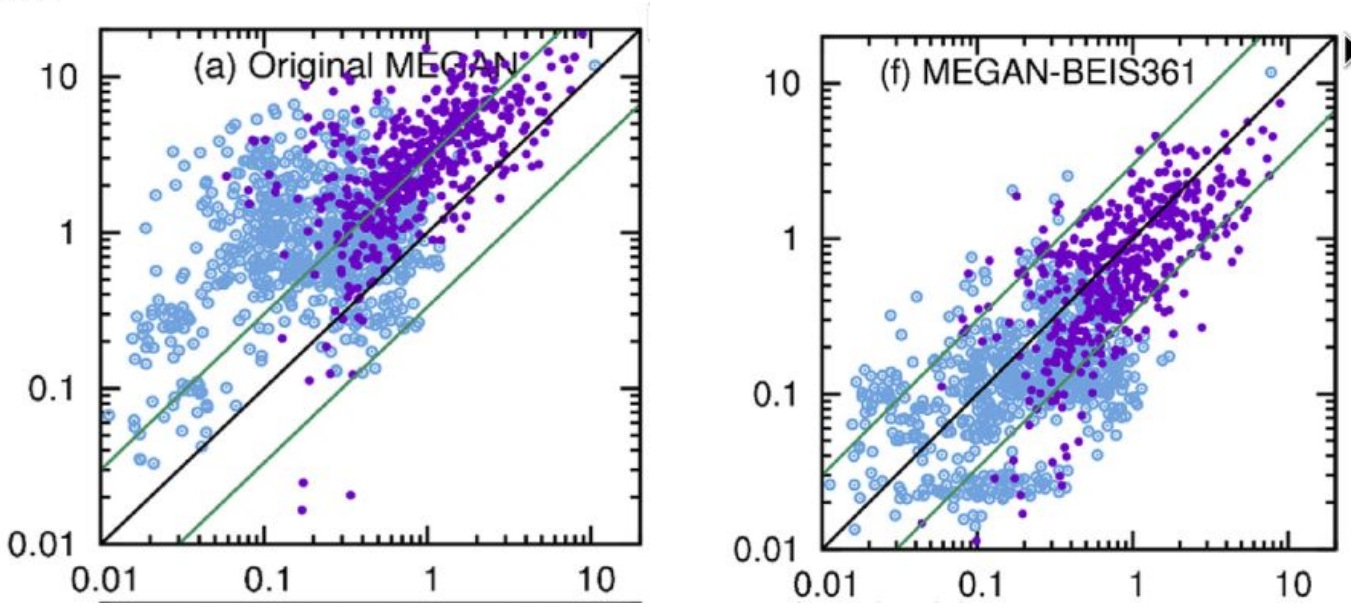
Further afield….



Modelled versus observed isoprene (July 2011, ppb, light blue = Texas). (Wang et al., 2017)

The use of BEIS EFs in MEGAN produced the best results (Wang et al., 2017).

Further afield….



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The use of BEIS EFs in MEGAN produced the best results (Wang et al., 2017).

Something for EMEP, IFS (CAMBAS?)

Finally: from EMEP to IFS - COMPO

- First, Dave (still) needs to wrap up land-cover and BVOC EPs. **URGENT!!**

- Prepare monthly maps of BVOC emission potentials
  - accounting for LAI variations
  - Larger area than previous - east of Urals to include Eurasian boreal forests at least.
  - Send to Vincent, and later (for CAMS2-61) Katerina Sindelarova

- If time allows, tackle EPs in N.America?
  - Overlaps with CAMS2-61, CAMBAS…
- T_{leaf} module (from Jesse) available for IFS-COMPO
- Will continue evaluation with EMEP (also for $PM_{2.5}$, BVOCs)