Biogenic Fluxes: Module Update

Garry Hayman and James Weber

Covers the exchange of trace gases between the land surface and atmosphere

- Emission (or release) to the atmosphere from the land surface
- Deposition (or uptake) to the land surface from the atmosphere

Specific topics

- **Emissions of biogenic VOCs (isoprene, terpenes, acetone, methanol)**
- **Atmospheric deposition**

- *Vegetation O_3 damage (with vegetation module)*
- *Emissions of CH_4 from wetlands (also hydrology and soil biogeochemistry modules)*
- *Emissions of trace atmospheric species from biomass burning (with fire module)*

Continued evaluation of isoprene columns in UKESM

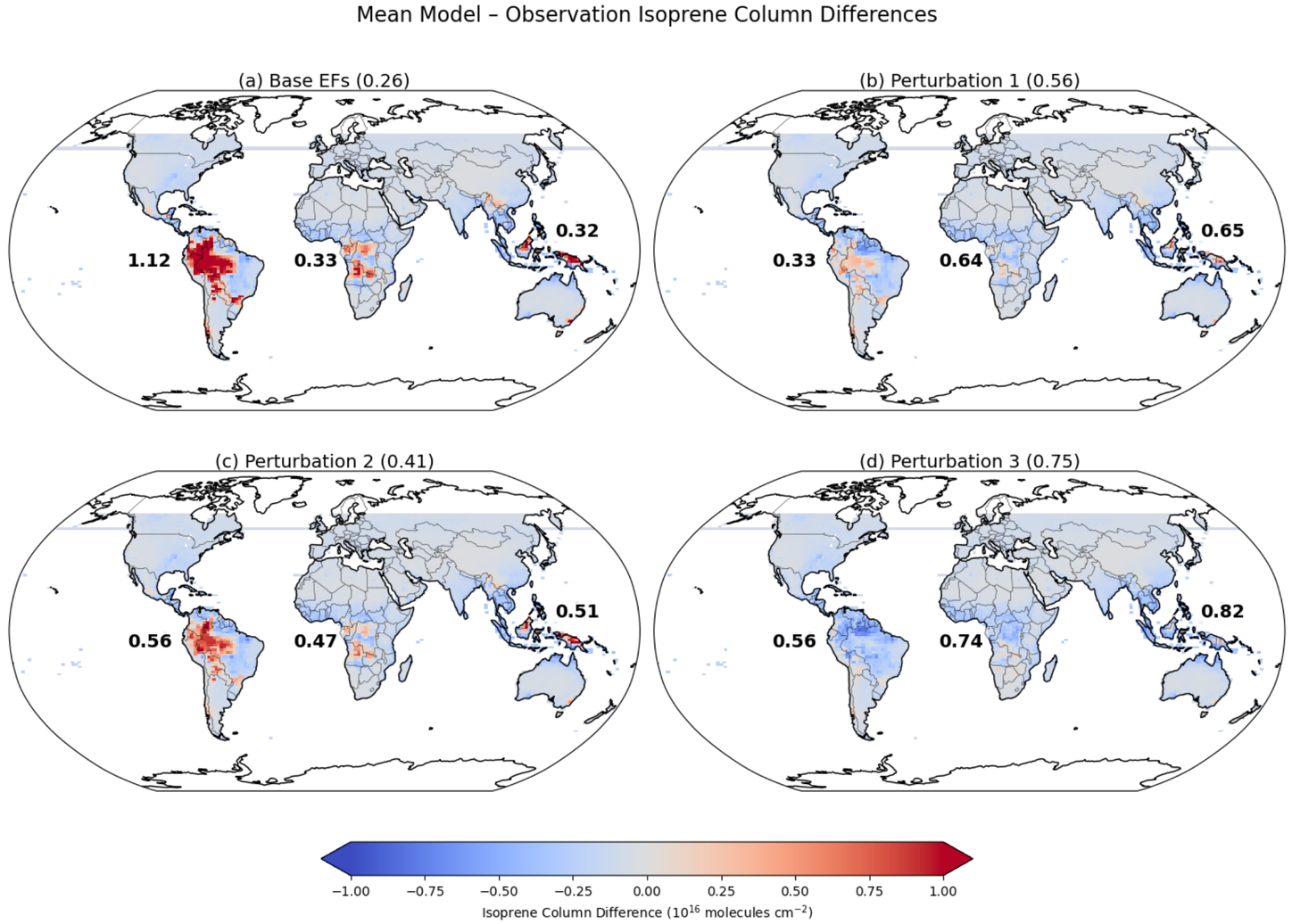
- Sophie Weller, Reading MSc student

UKESM remains high biased over most major biogenic emission regions.

Sophie has been exploring how changing the isoprene emission factors (EF_{PFT}) for different plant functional types in the iBVOC parameterisation affects model performance.

$$E = \boldsymbol{EF_{PFT}} \times f(temp) \times f(CO_2) \times f(photo)$$

Varying EF_{PFT} in reasonable value range can lead to better model performance.



Numbers are RMSE. Title - global, on plot – regional

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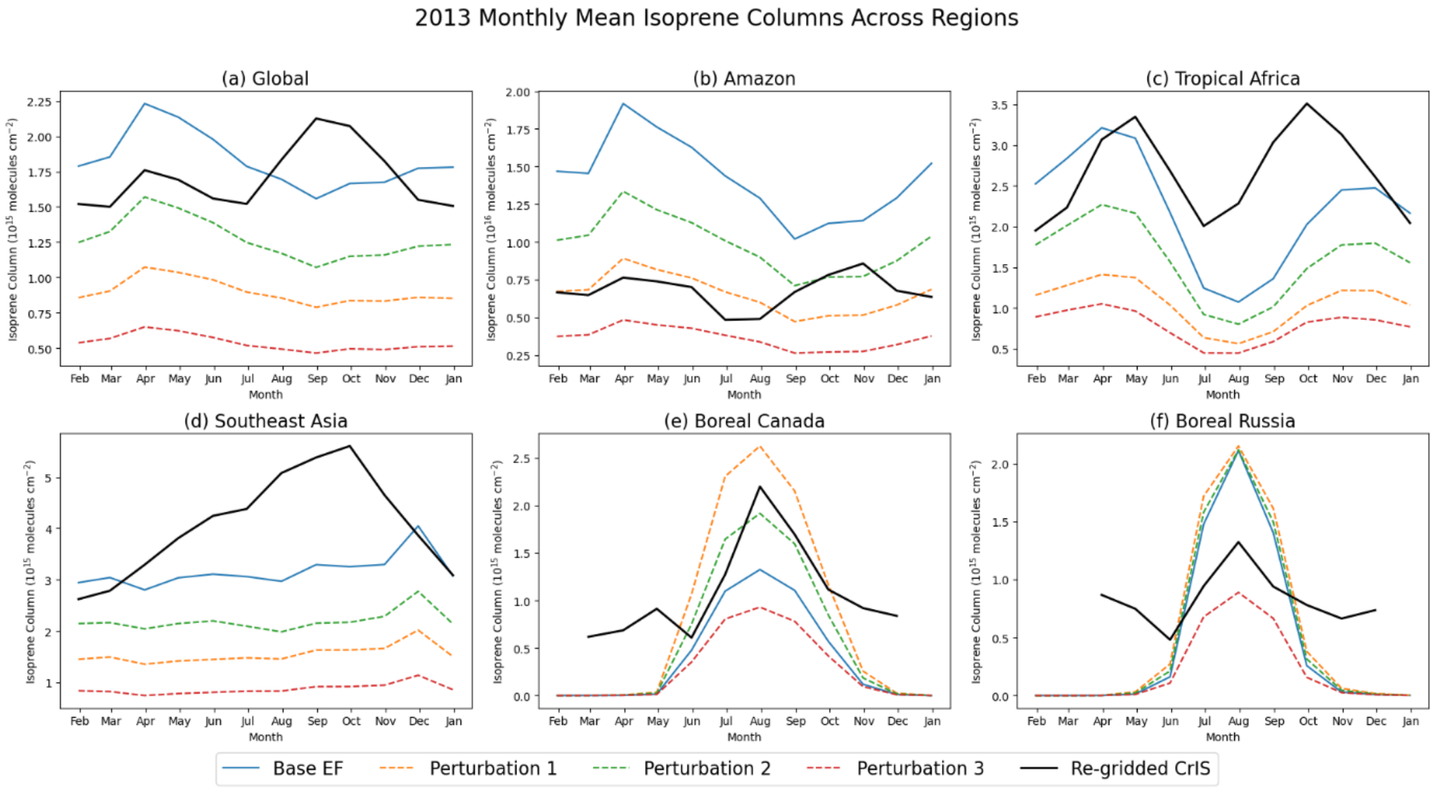
However, even though annual mean bias may be reduced, model still struggles to capture seasonality.

→ Other aspects of the iBVOC parameterisation may need addressing?

(Simulations were nudged so meteorology should be ~ reasonable)



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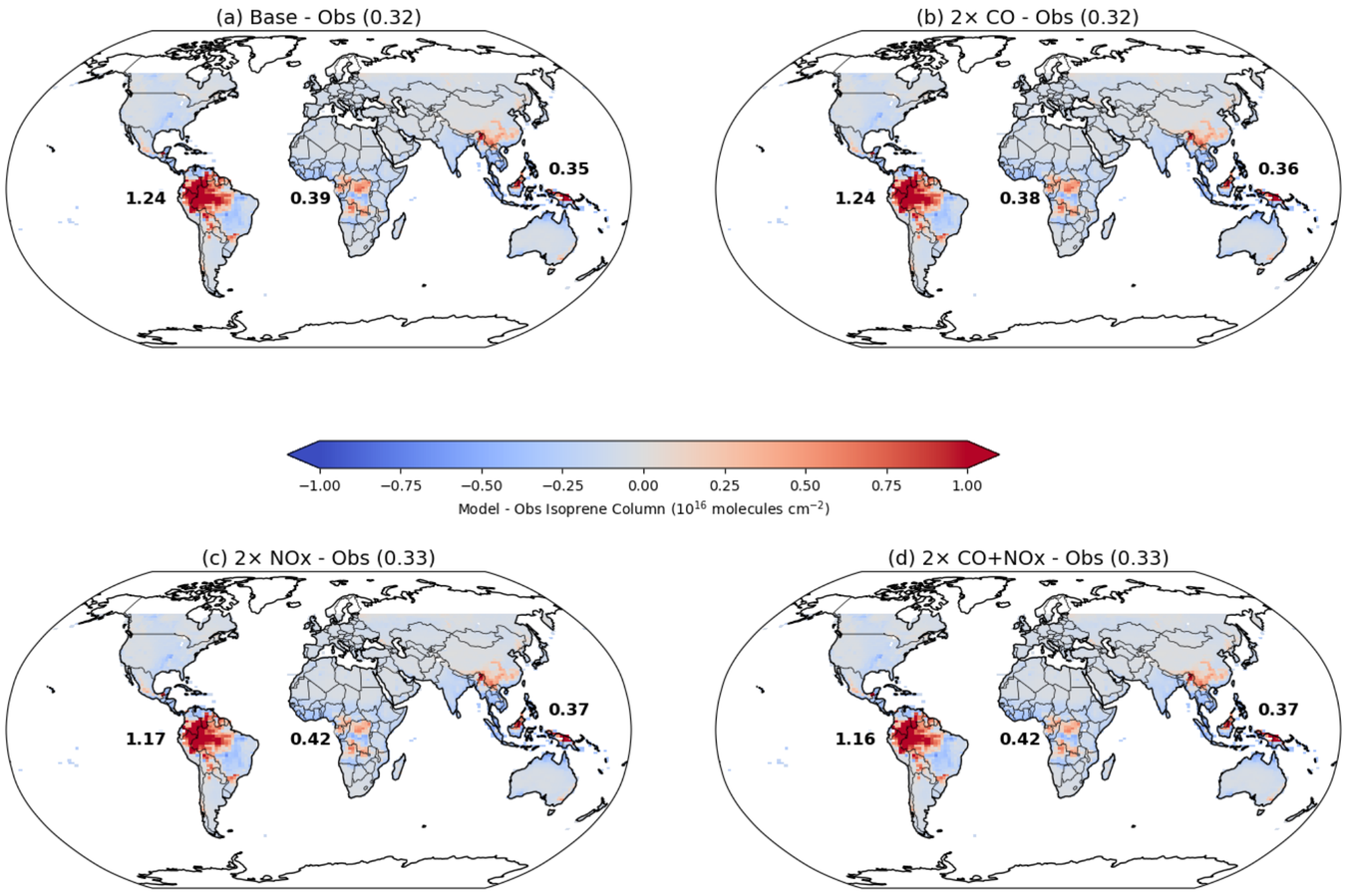
Influence of uncertainty in BB emissions on isoprene columns assessed by analysing simulations with 2xNO, 2xCO and 2x(NO+CO) emissions.

Increasing NO emissions reduces isoprene column while increasing CO increases isoprene column.

But difference is much smaller than impact of changing isoprene emission factors.



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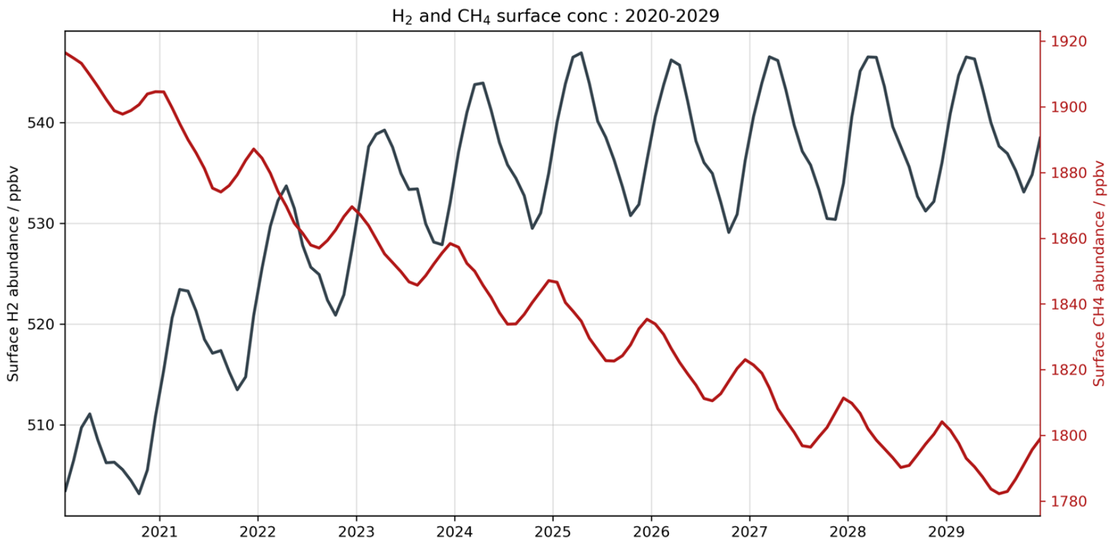
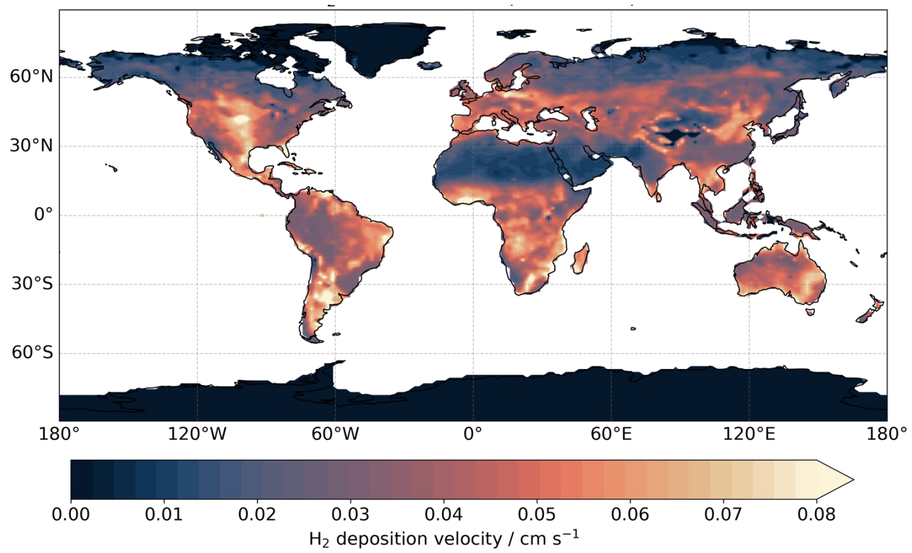
Uptake of hydrogen

- Megan Brown, Alex Archibald (U. Cambridge), Garry Hayman (UKCEH)

New two-layer scheme for H_2 uptake by soils

- Tested offline in UKCA branch with multiple CMIP6 models
- Tuned to UKCA and works interactively in model, produces surface H_2 concentration of ~510 ppbv





- Implemented into JULES, part of vn7.9 release
- Uses soil properties from JULES
- Currently only available for offline JULES

Soil:
Total porosity
Soil moisture
Soil Carbon Content
Soil type
Temperature

Atmosphere:
Pressure

Snow depth

Other
- Garry Hayman (UKCEH)

JULES with Atmospheric Deposition

- Presented at UKCA meeting at U. Reading on 17th July
- Presented at UK Atmospheric Chemistry Conference, held in York, 9th-10th September

Warming-induced Emission Model Intercomparison Project (WIE-MIP)

- Presented on Biogenic VOCs at WIE-MIP workshop, 22nd-23rd July
- *Also presentation here on Wednesday*