Biogenic Emissions in the 21st Century (?)

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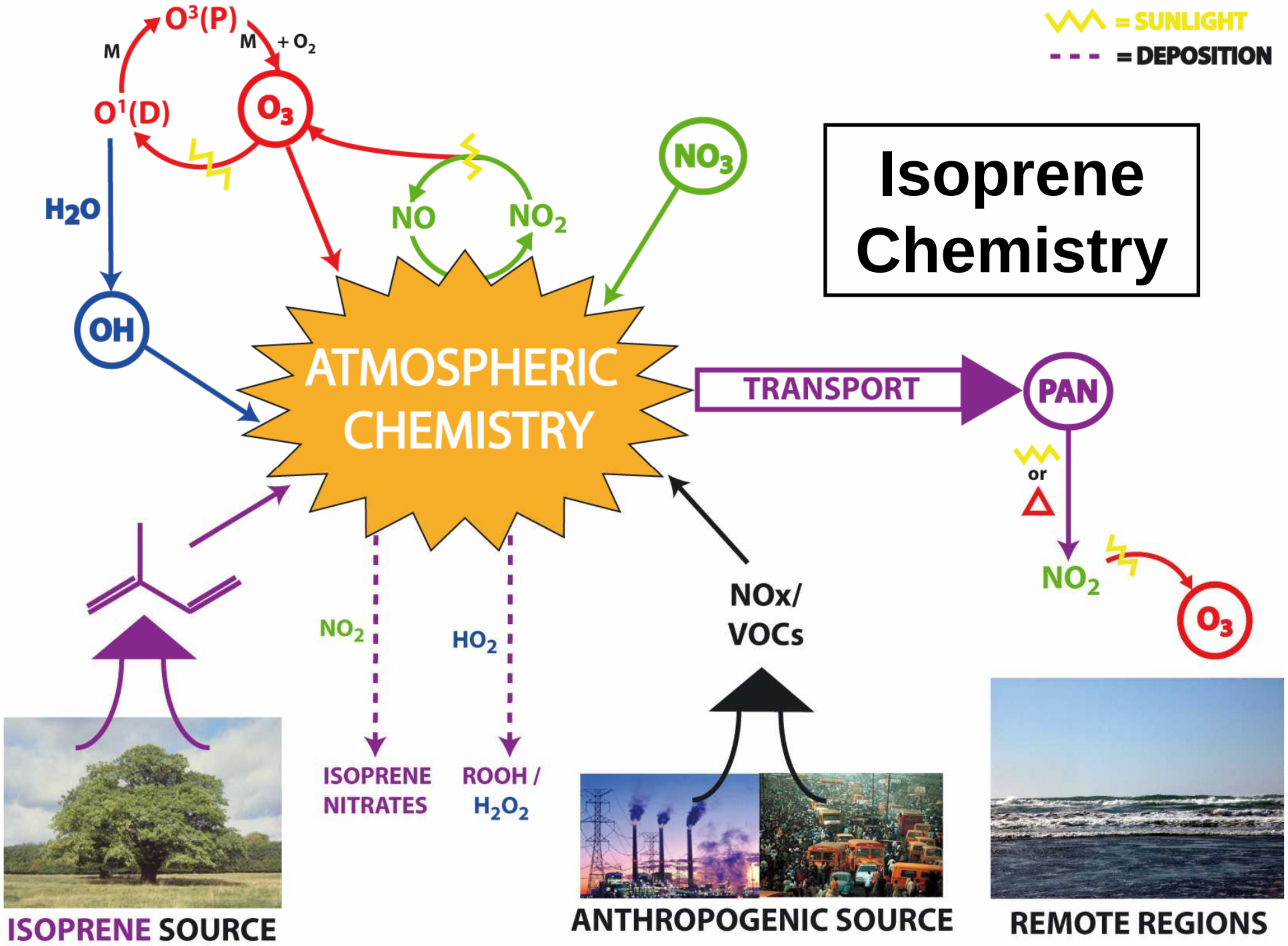
What emissions?

Isoprene
Pinenes and larger sesquiterpenes
OVOC

Why are they important?

Reactive
Potential to generate SOA
Magnitude of emissions is significant

Isoprene Chemistry



Drivers of emission

Primary productivity
Temperature
CO2
Land use (woody biofuels)
Ozone (?)
Other (nutrients, water etc)

Estimate emissions using parameterizations
- mainly driven by T and primary productivity

‘Standard’ algorithms - Guether et al. 1995, MEGAN
‘Non-standard’ algorithms - LPJ-GUESS process-based approach

Estimating future isoprene emission

Emission is function of amount of plants (D), type of plants (ε), and light and temperature (γ).

→ expect future emission to change – ↑ T and land-use change

'Activity adjustment'

$$\text{Flux} = D\,\varepsilon\,\gamma$$

$$\gamma = C_T\,C_L$$

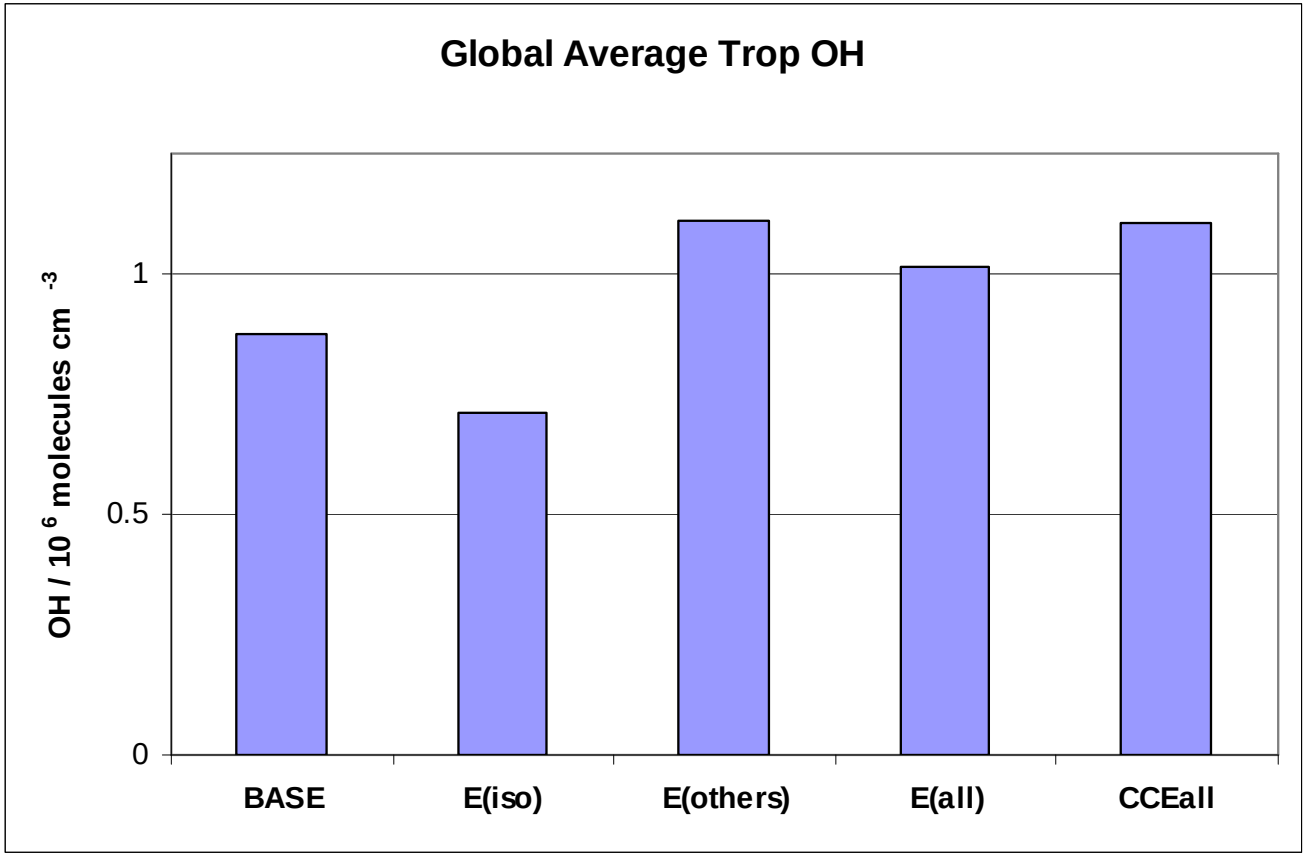
Temp dependence

$$\text{Flux}_{2090} = \frac{CT_{2090}}{CT_{2000}} \times \text{Flux}_{2000}$$

Using Guenther *et al.* emissions* and surface temperature output from Hadley Centre model (HadCM3)

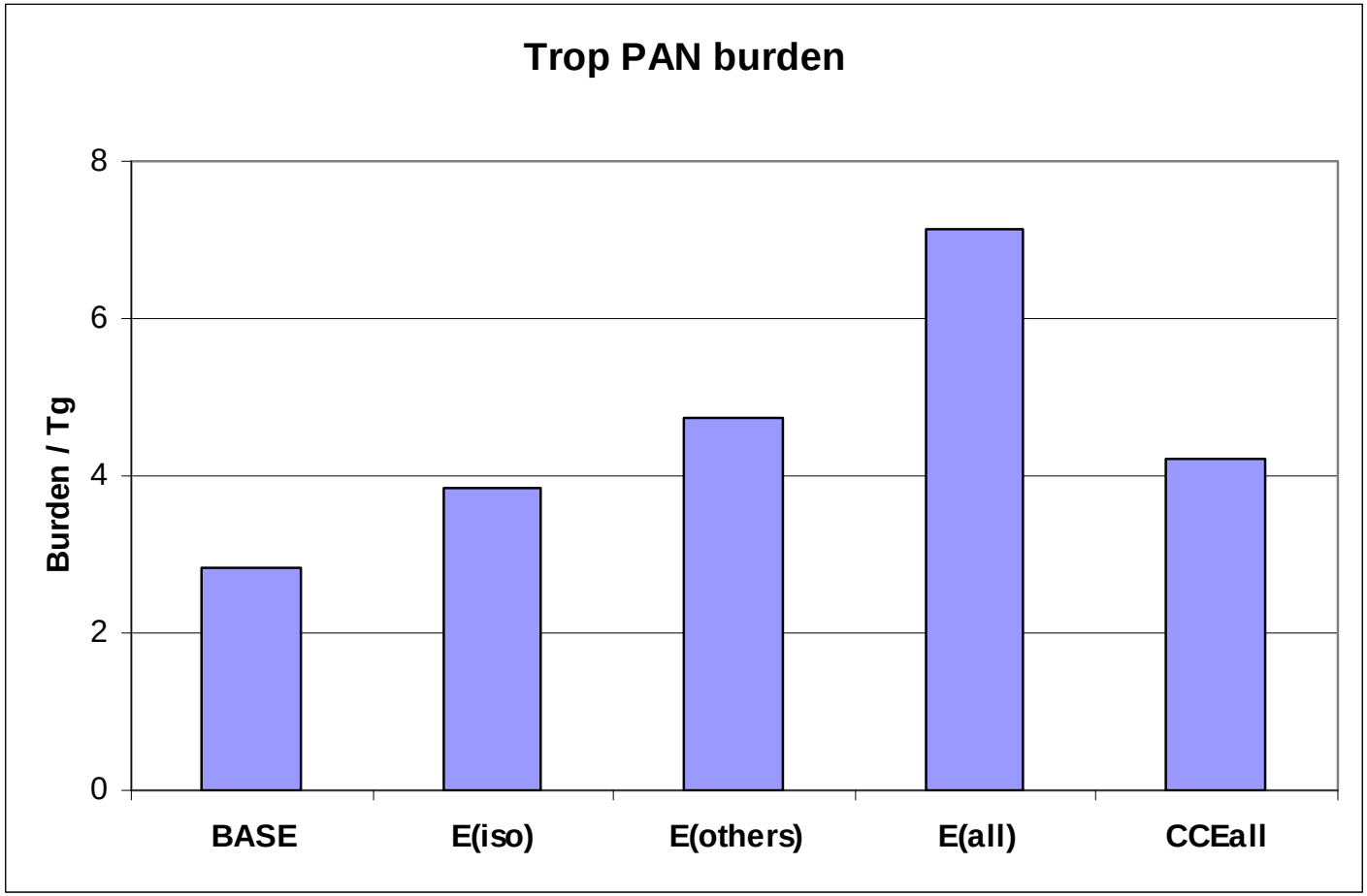
OH Burden

Tropospheric Year Average (after Lawrence *et al.* [2001]

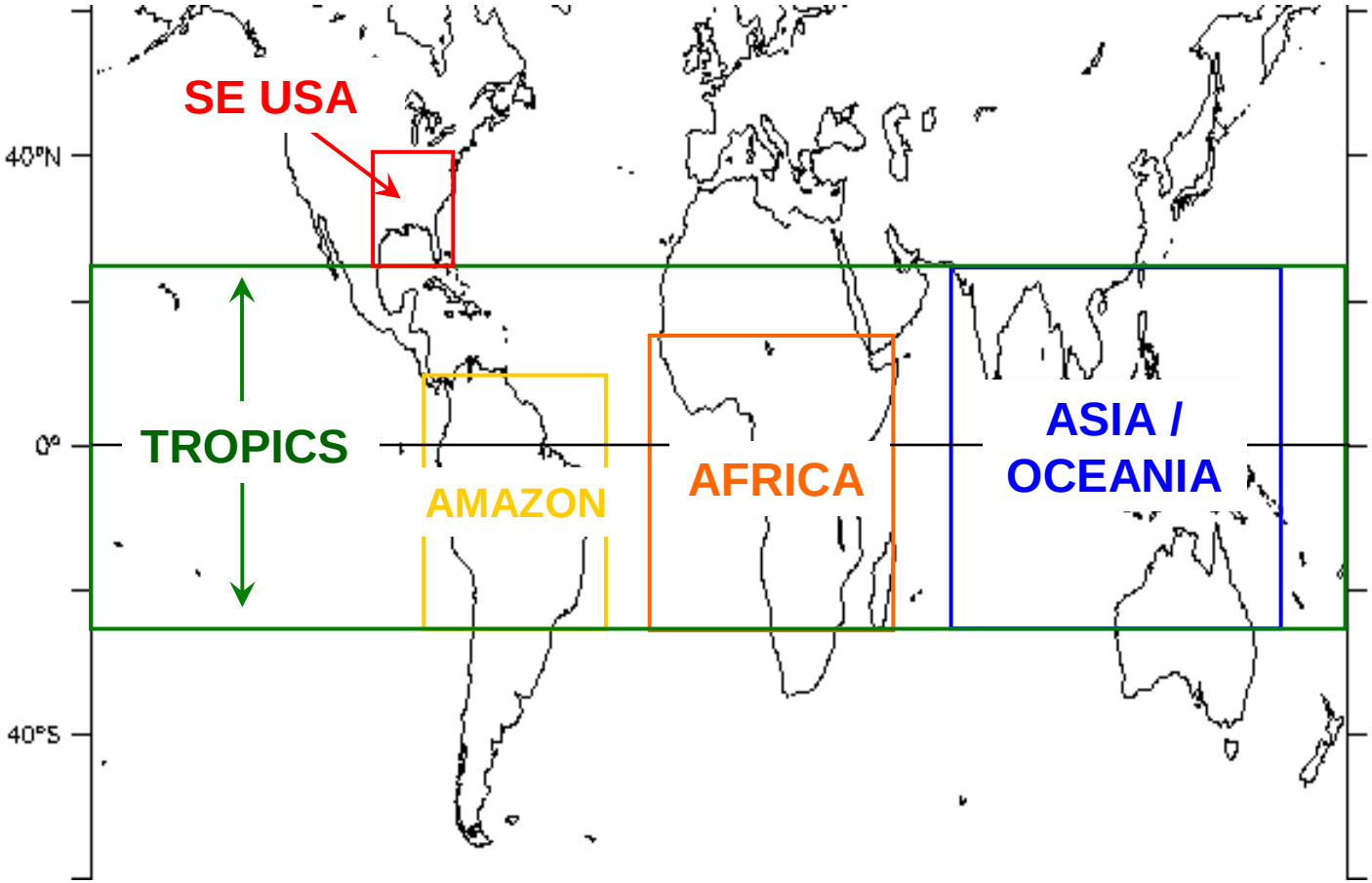


PAN Burden

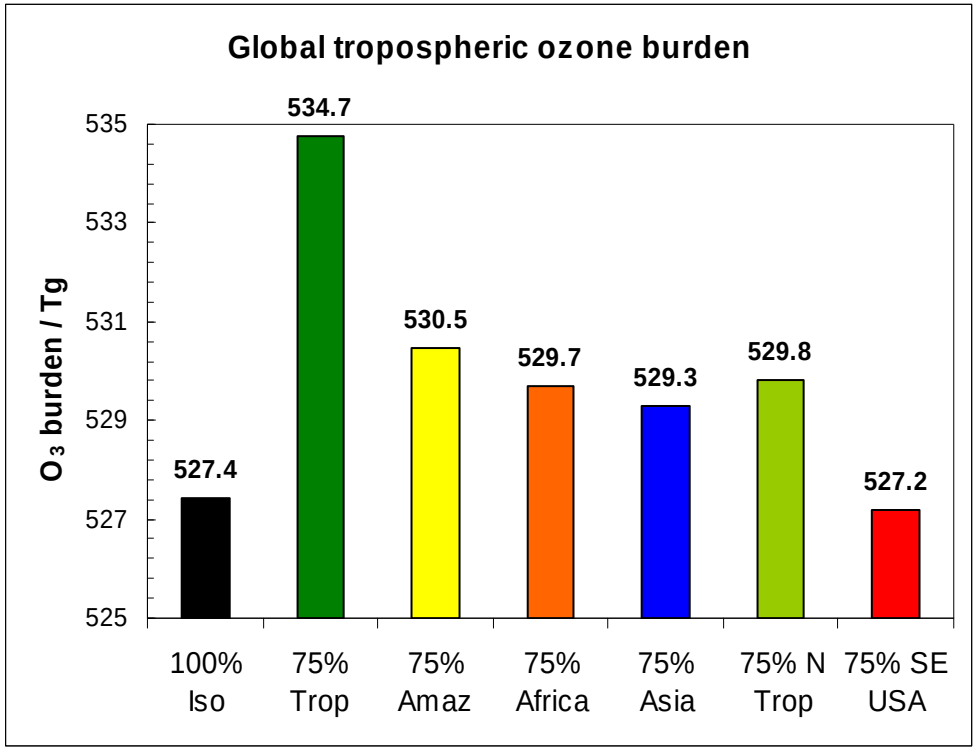
Tropospheric Year Average



Regions where emission is altered



2090 Emissions (Tg C yr^{-1})

TOTAL	770.8	Amazon	218.5	Asia/Oc	151.9
Tropics	622.9	Africa	222.0	SE USA	26.2

Impact on ozone burden