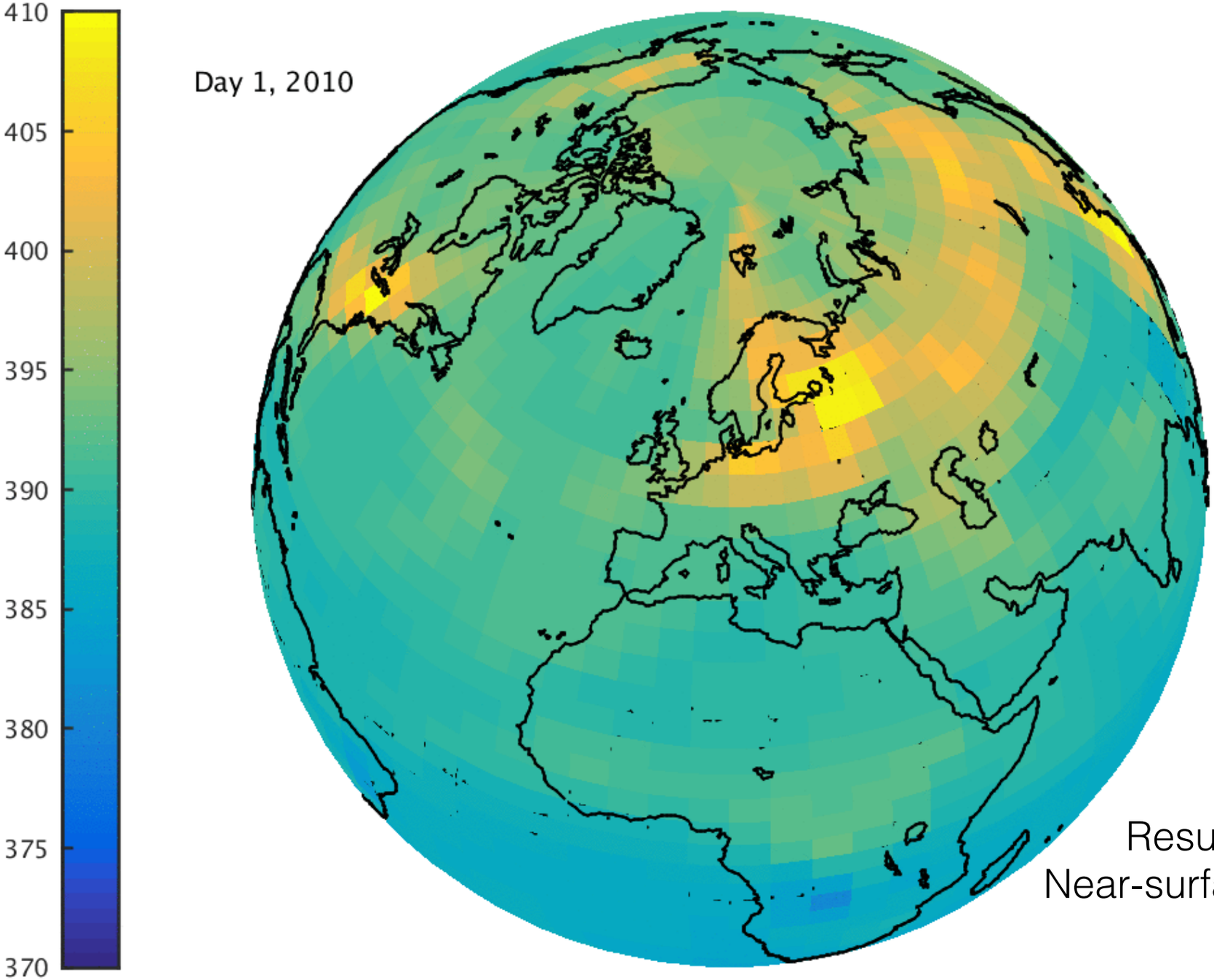
Watching the Earth Breathe

Julia Marshall



Results from Jena Inversion
Near-surface CO_2 concentration
in parts per million

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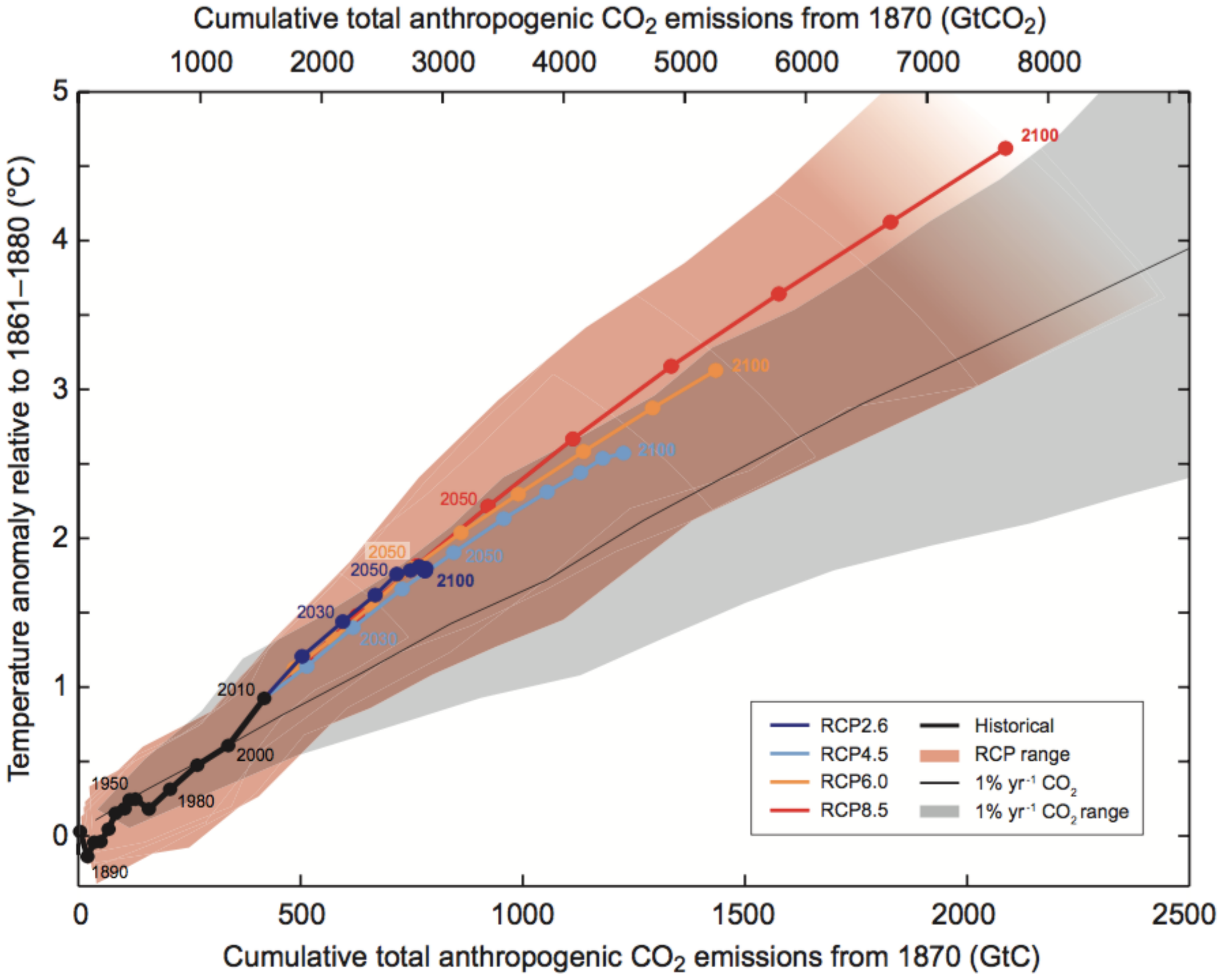
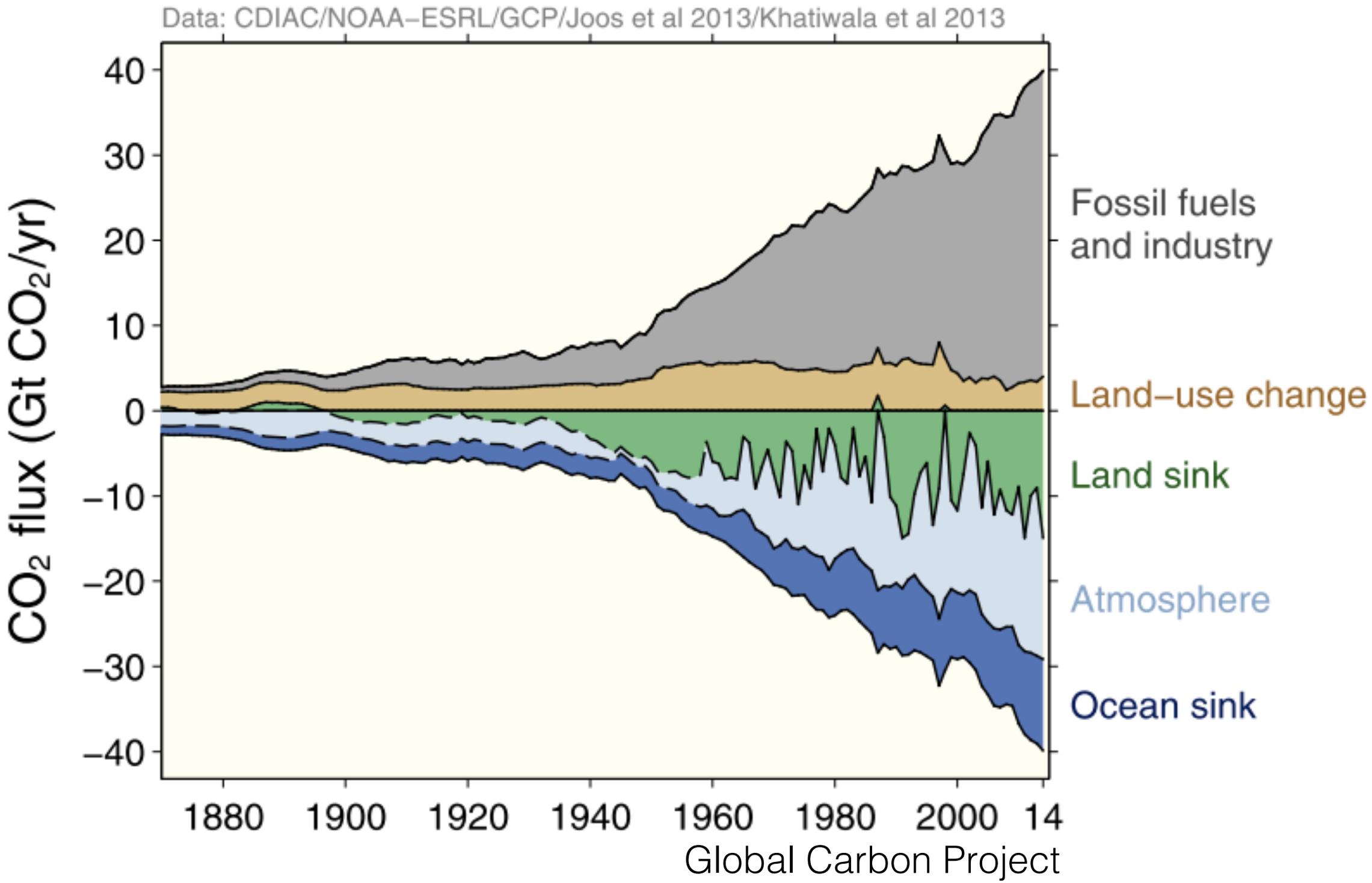
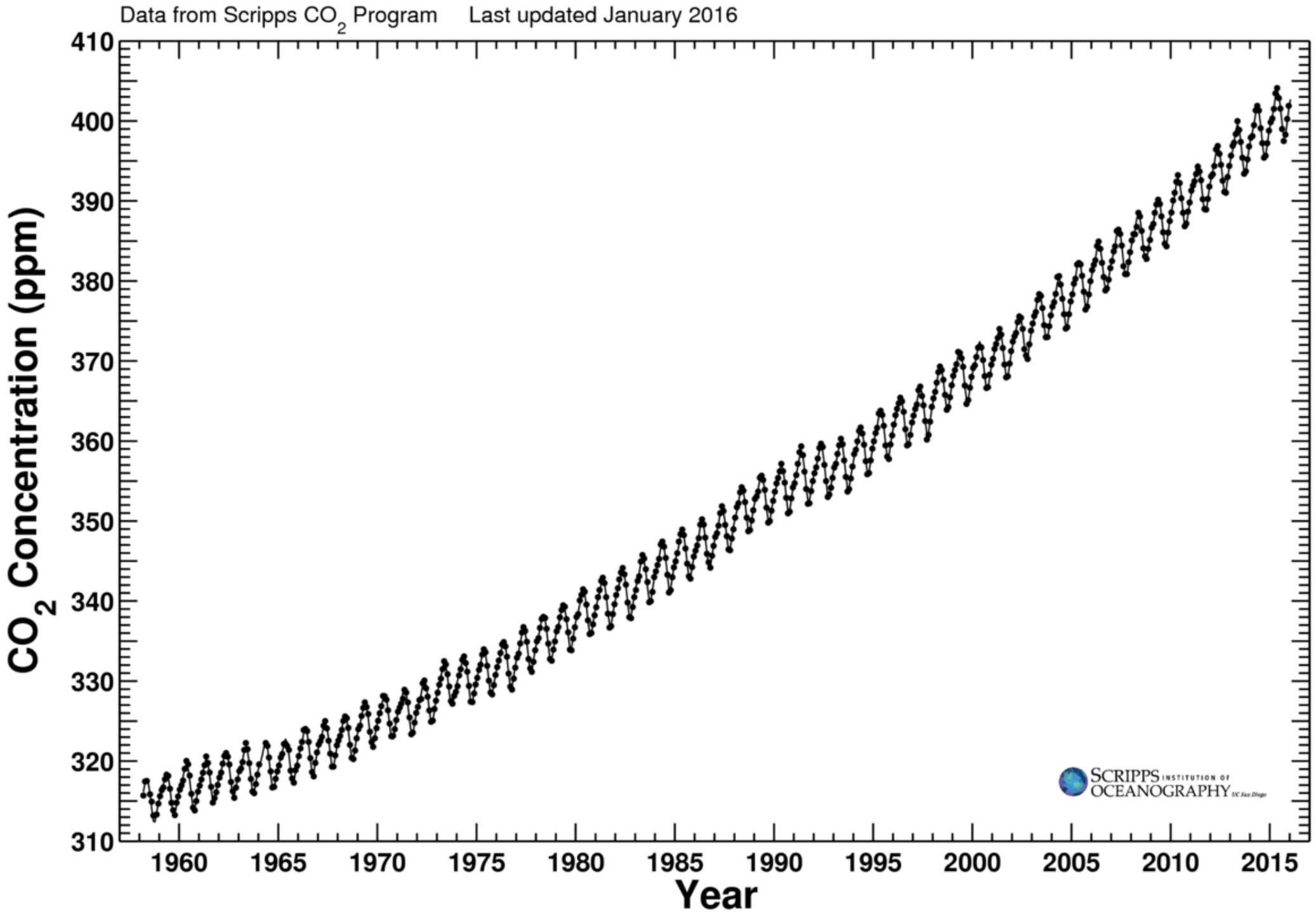


IPCC AR5, 2013


Data: CDIAC/NOAA–ESRL/GCP/Joos et al 2013/Khatiwala et al 2013
CO2 flux (GtCO2/yr)
40
30
20
10
0
−10
−20
−30
−40
1880
1900
1920
1940
1960
1980
2000
14
Fossil fuels and industry
Land–use change
Land sink
Atmosphere
Ocean sink
Global Carbon Project

The view from Mauna Loa



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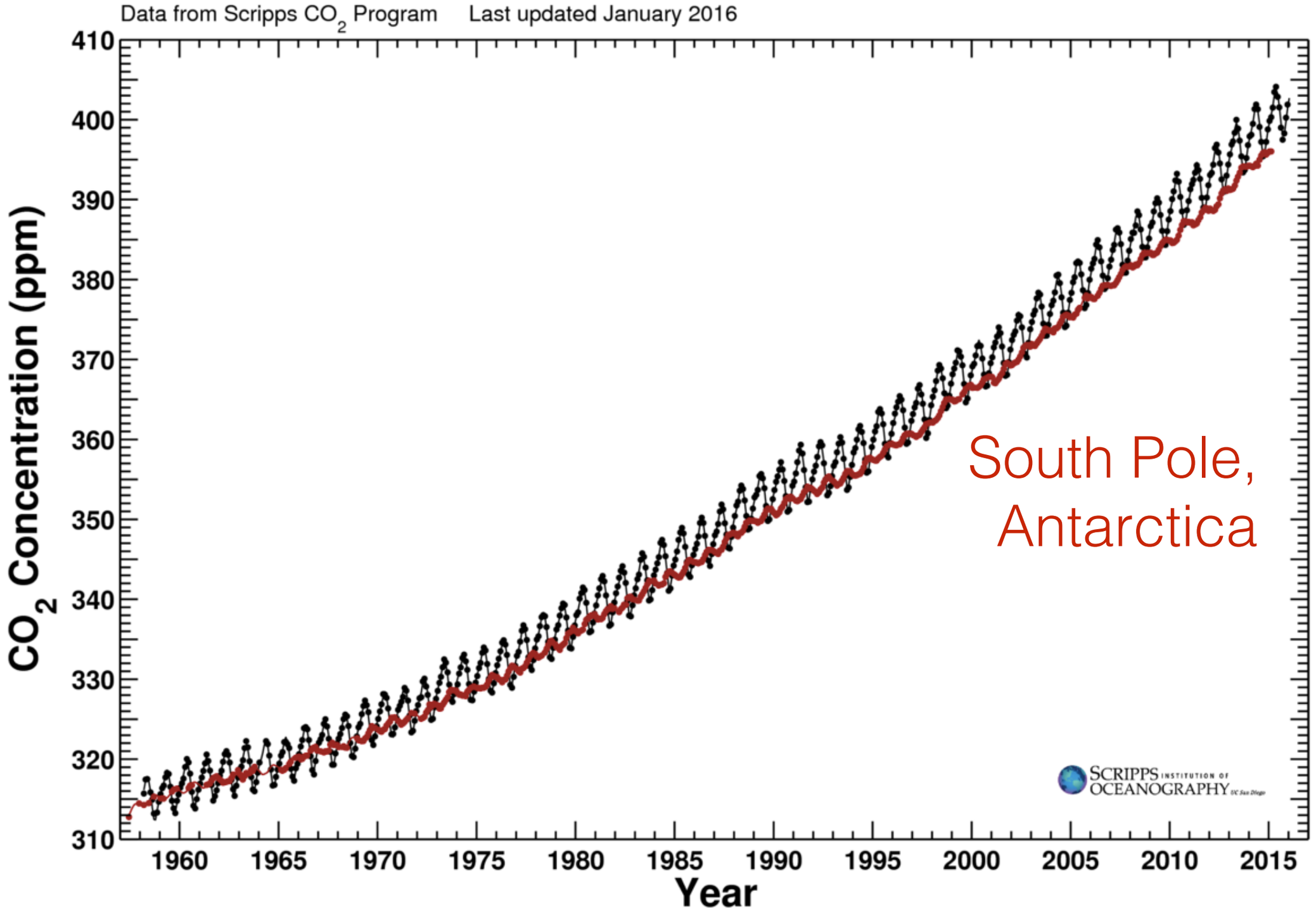
The view from Mauna Loa



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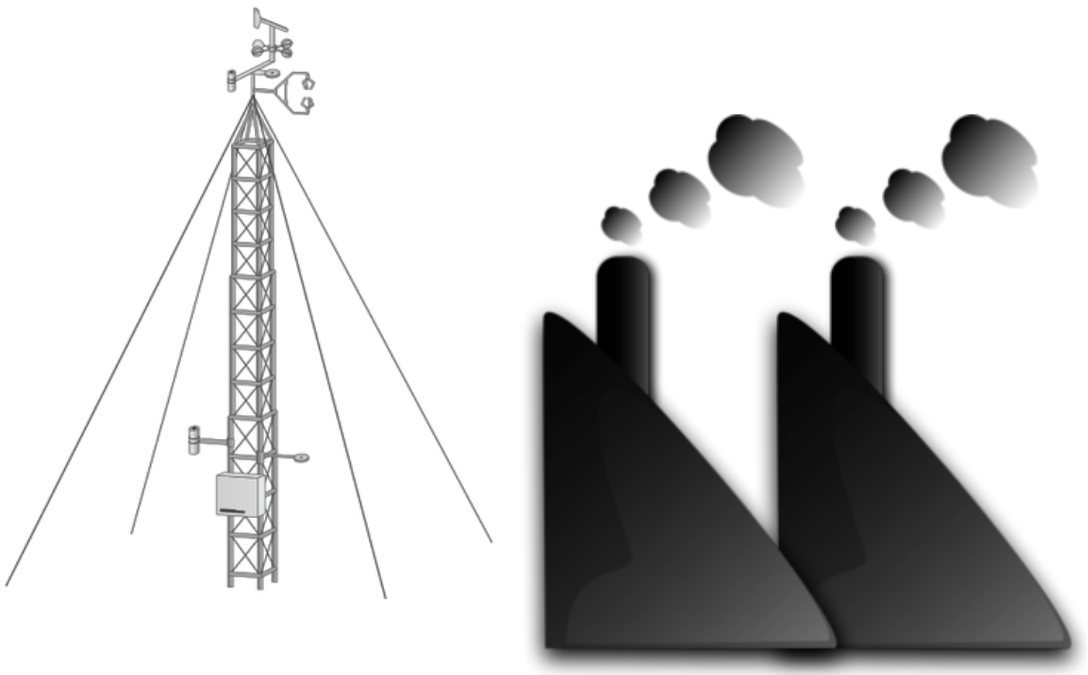
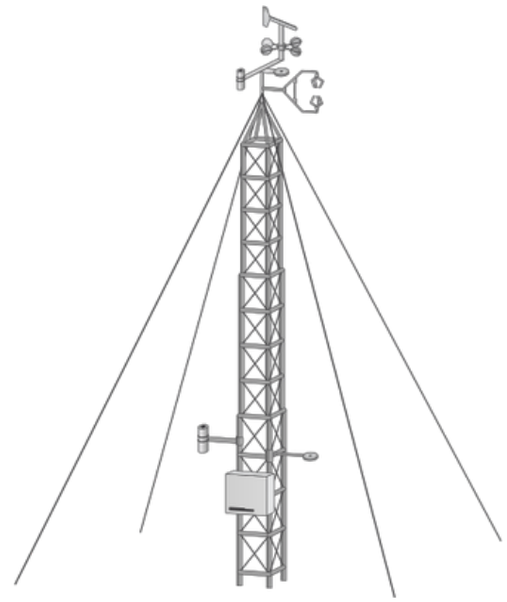
Inverse, or top-down modelling

Wind

400 ppm



410 ppm



Knowing the wind speed (plus a bit more), we can estimate the emissions.

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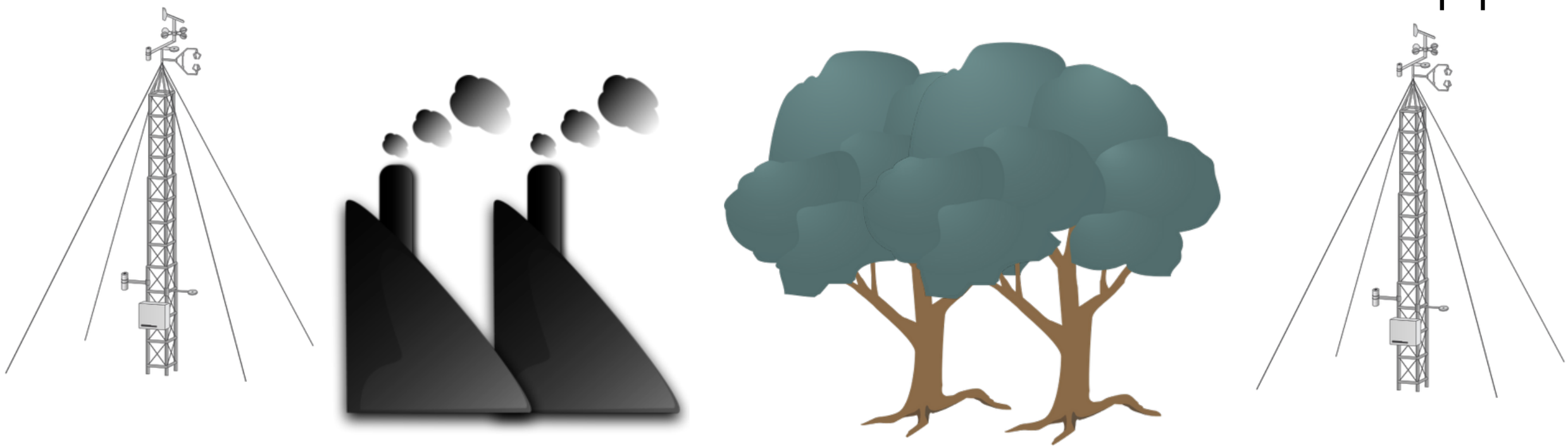
Inverse, or top-down modelling

400 ppm

400 ppm



Now it helps to know that there's a factory there, and a forest.

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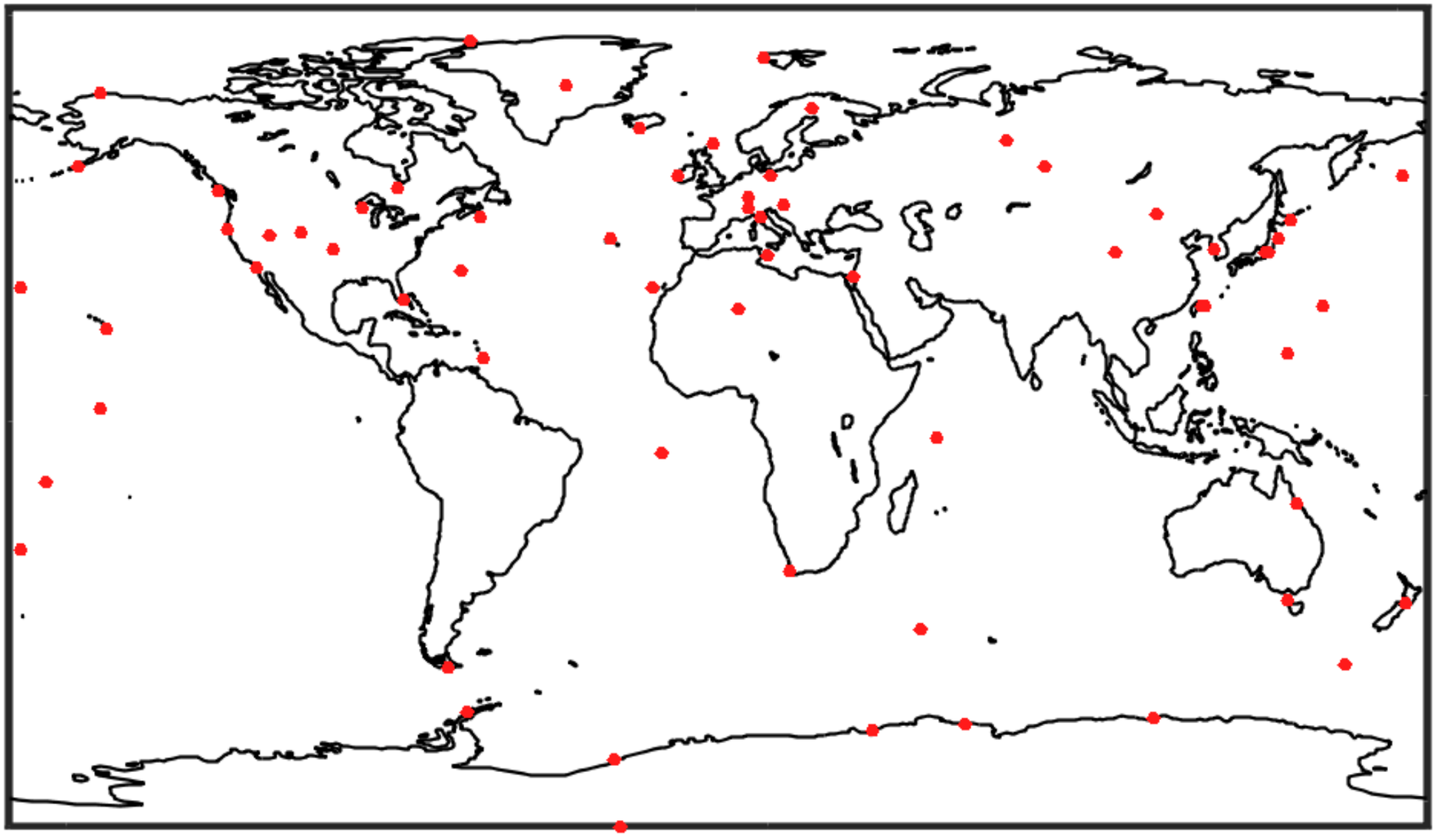
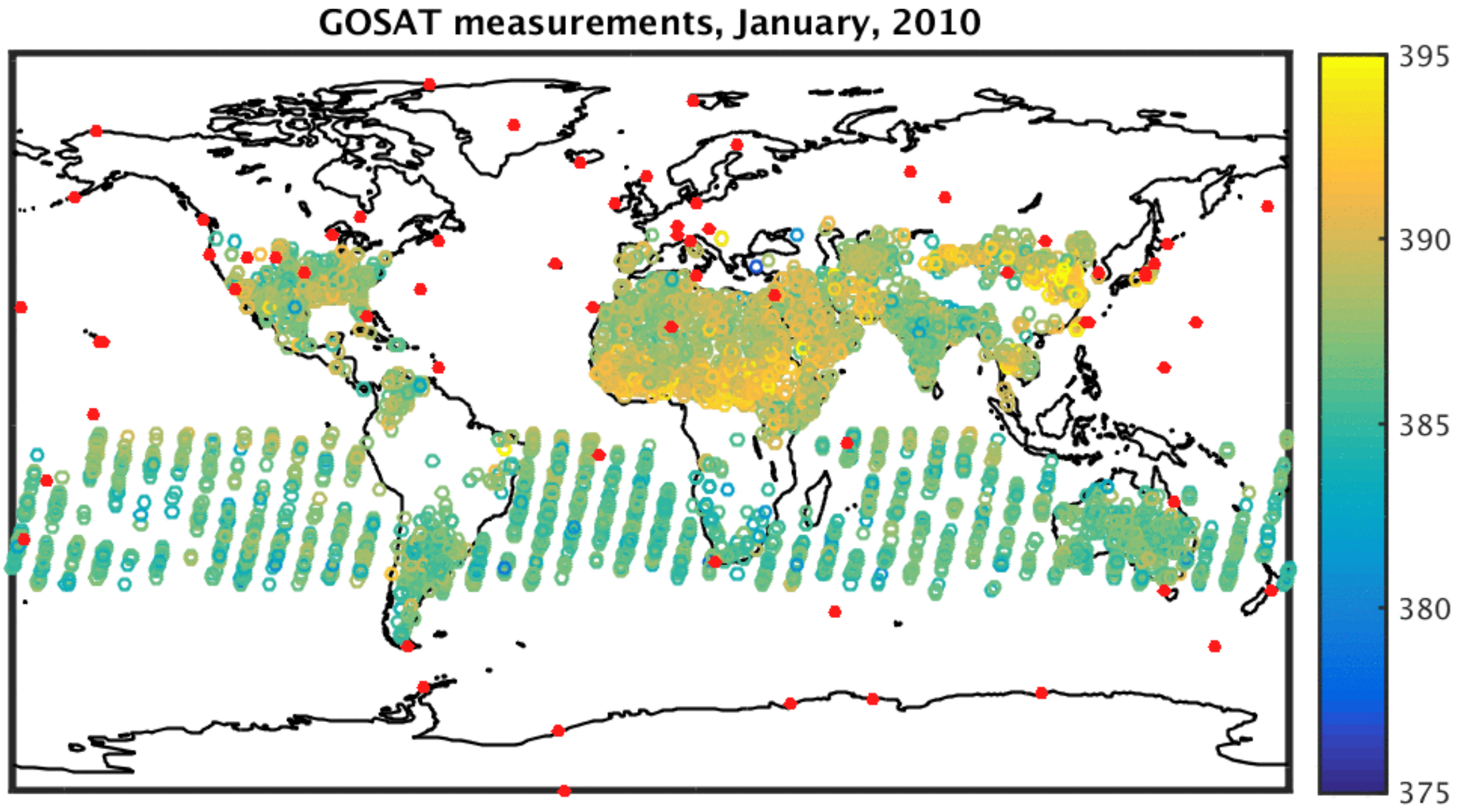
Observational constraints:

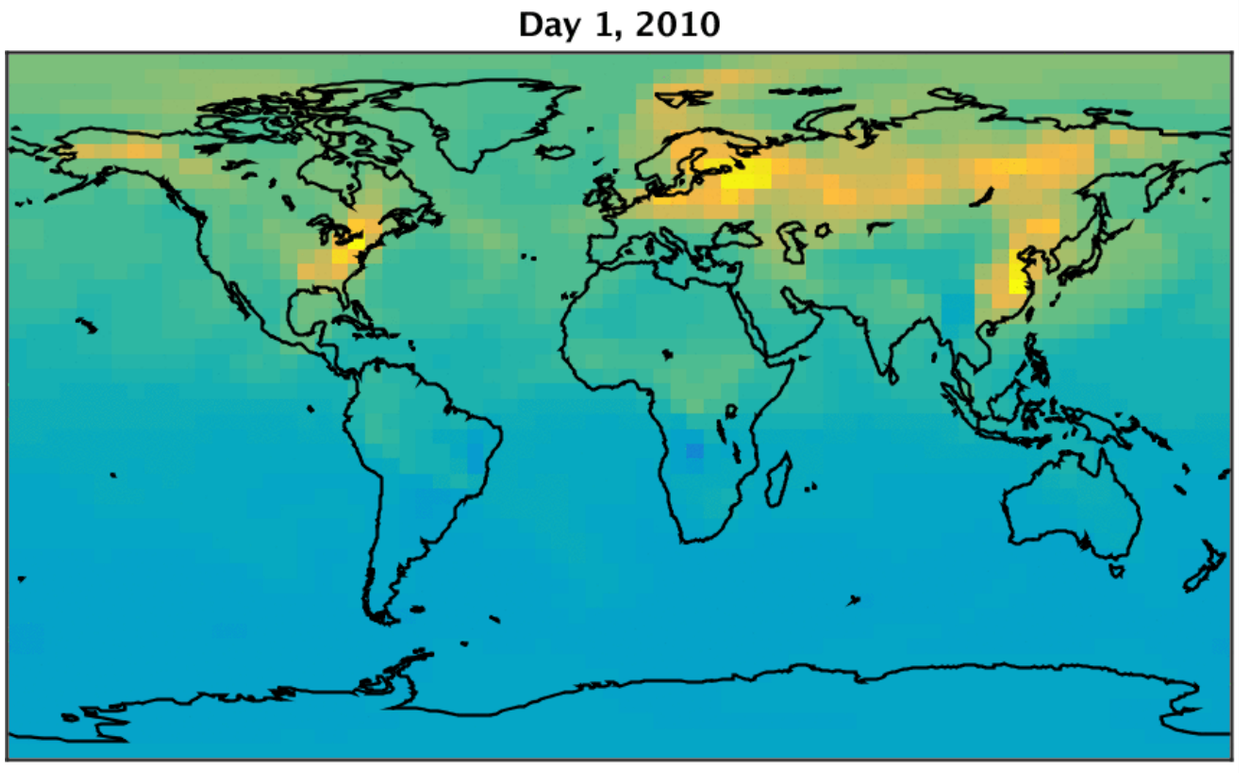


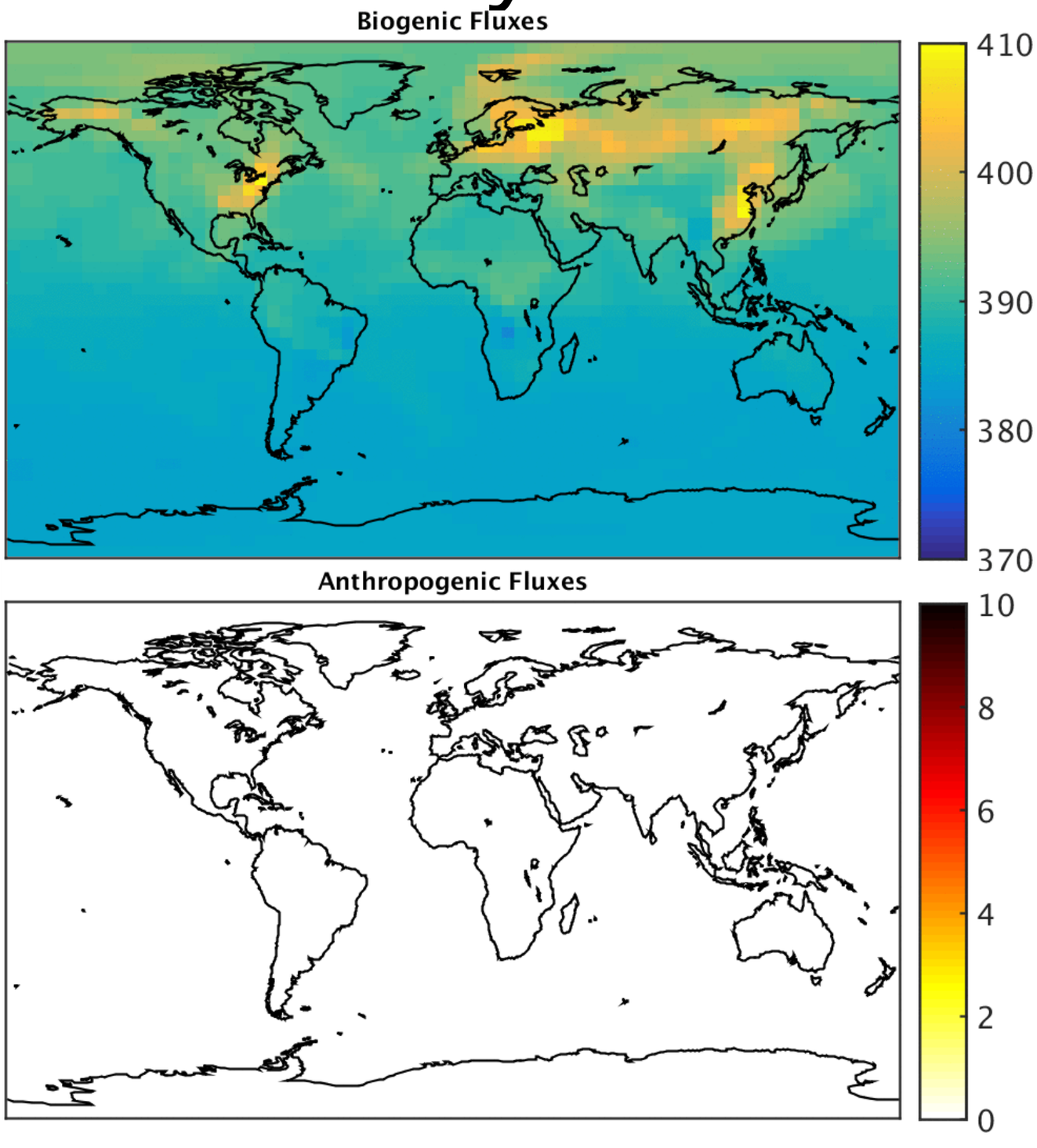
Observational constraints:



Total column CO_2 concentration (ppm)

The results, as seen by the atmosphere





Results from Jena Inversion
Near-surface CO2 concentration
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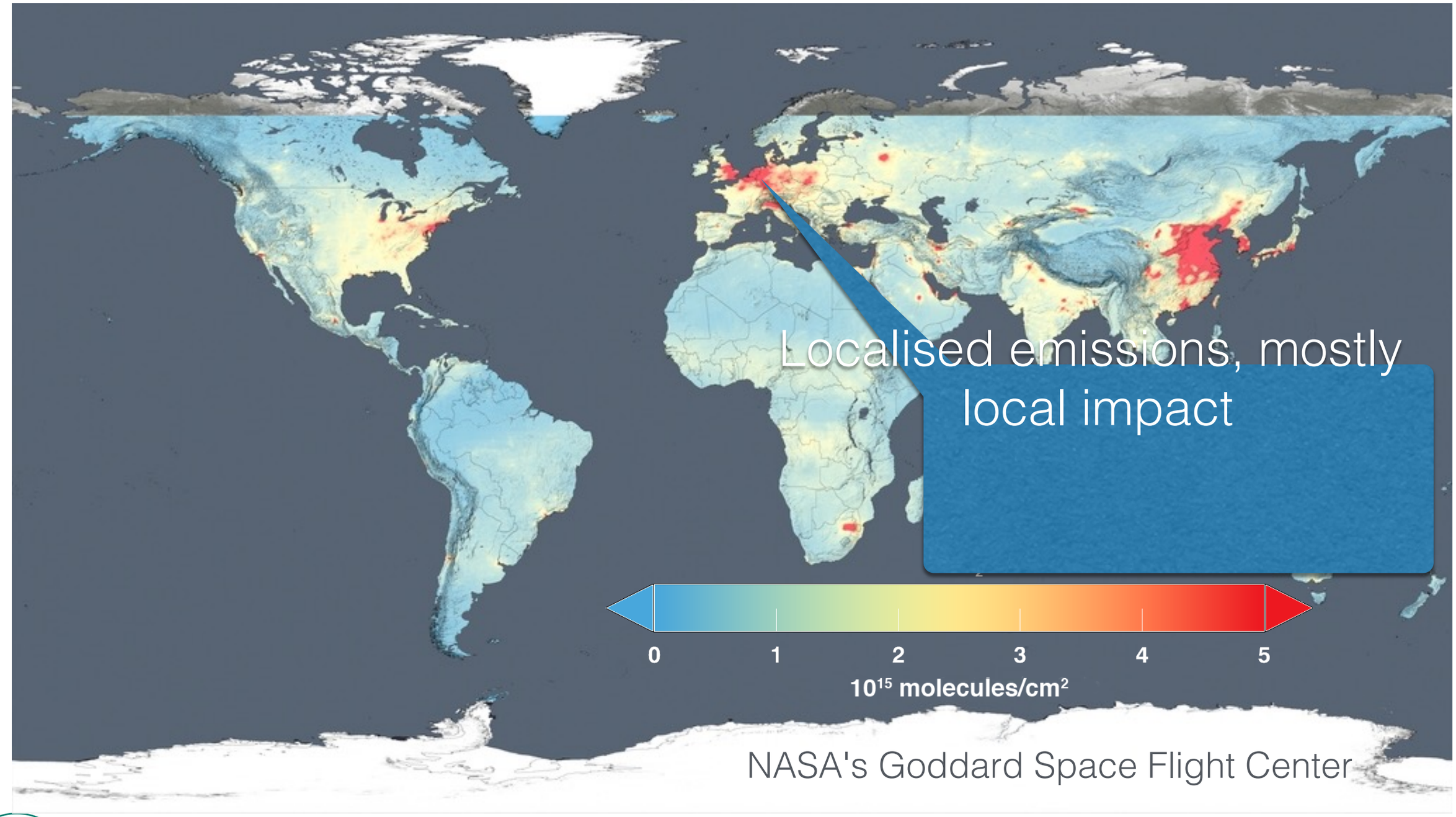
Compare to air pollution, such as nitrogen dioxide



For carbon dioxide it's different:

- *Very long lifetime* means that the emissions are distributed around the world

- *Localised emissions* have a *global impact*

- We all live with the net effect of everyone's greenhouse gas emissions

- Global cooperation is the only solution