



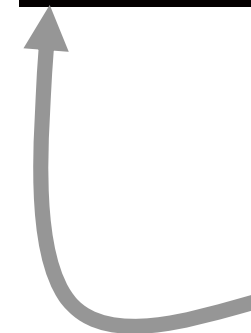
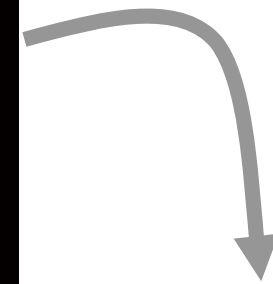
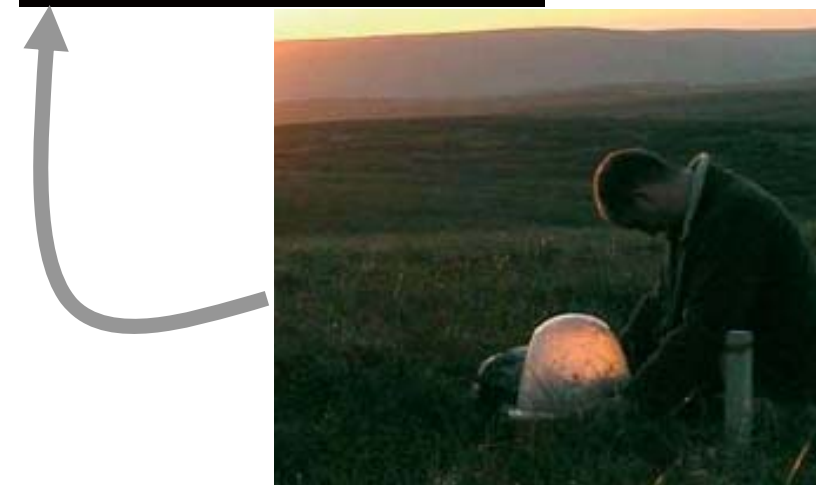


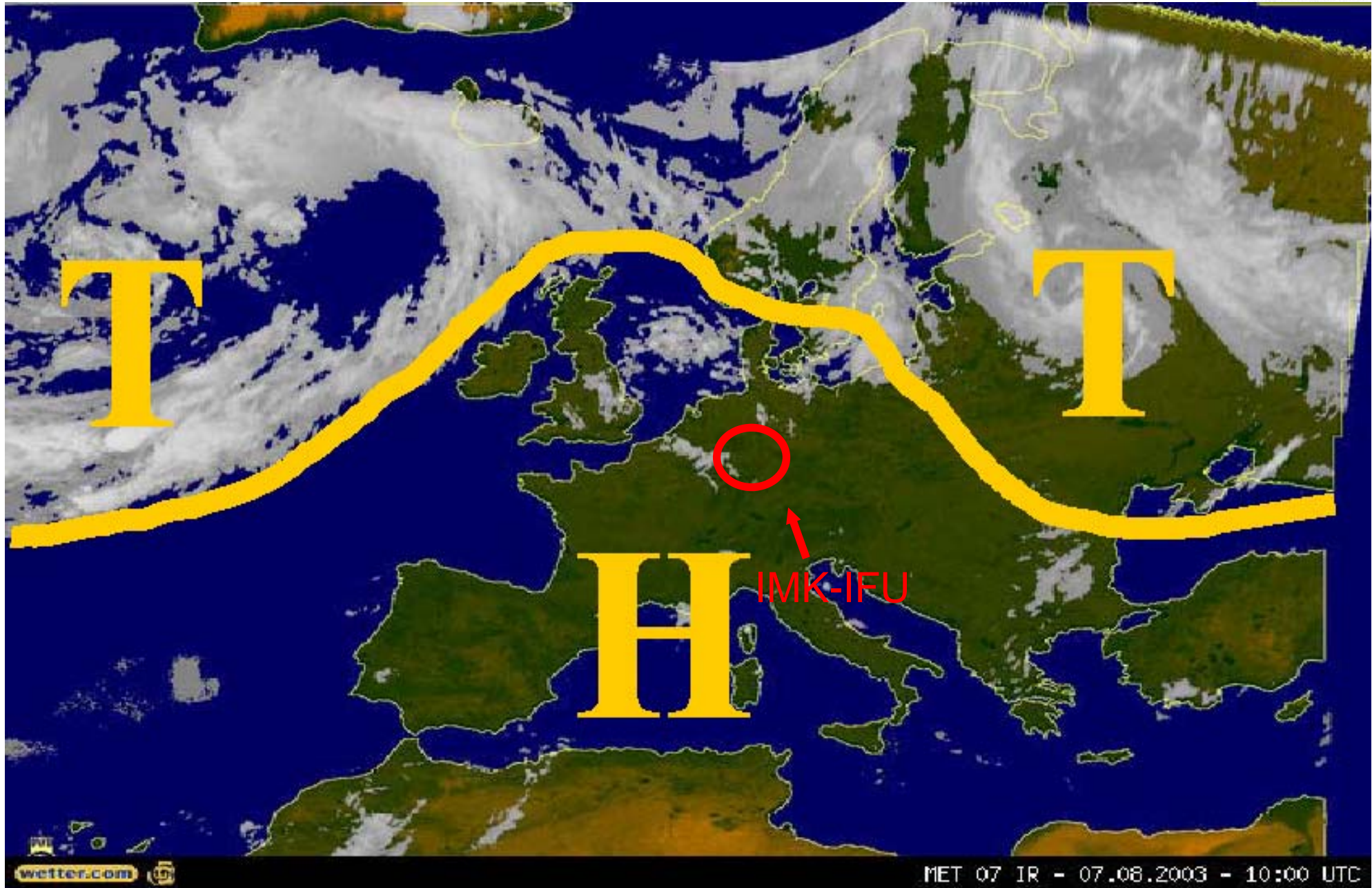
Biogenic Compounds and the Atmosphere: An European Perspective

Rainer Steinbrecher

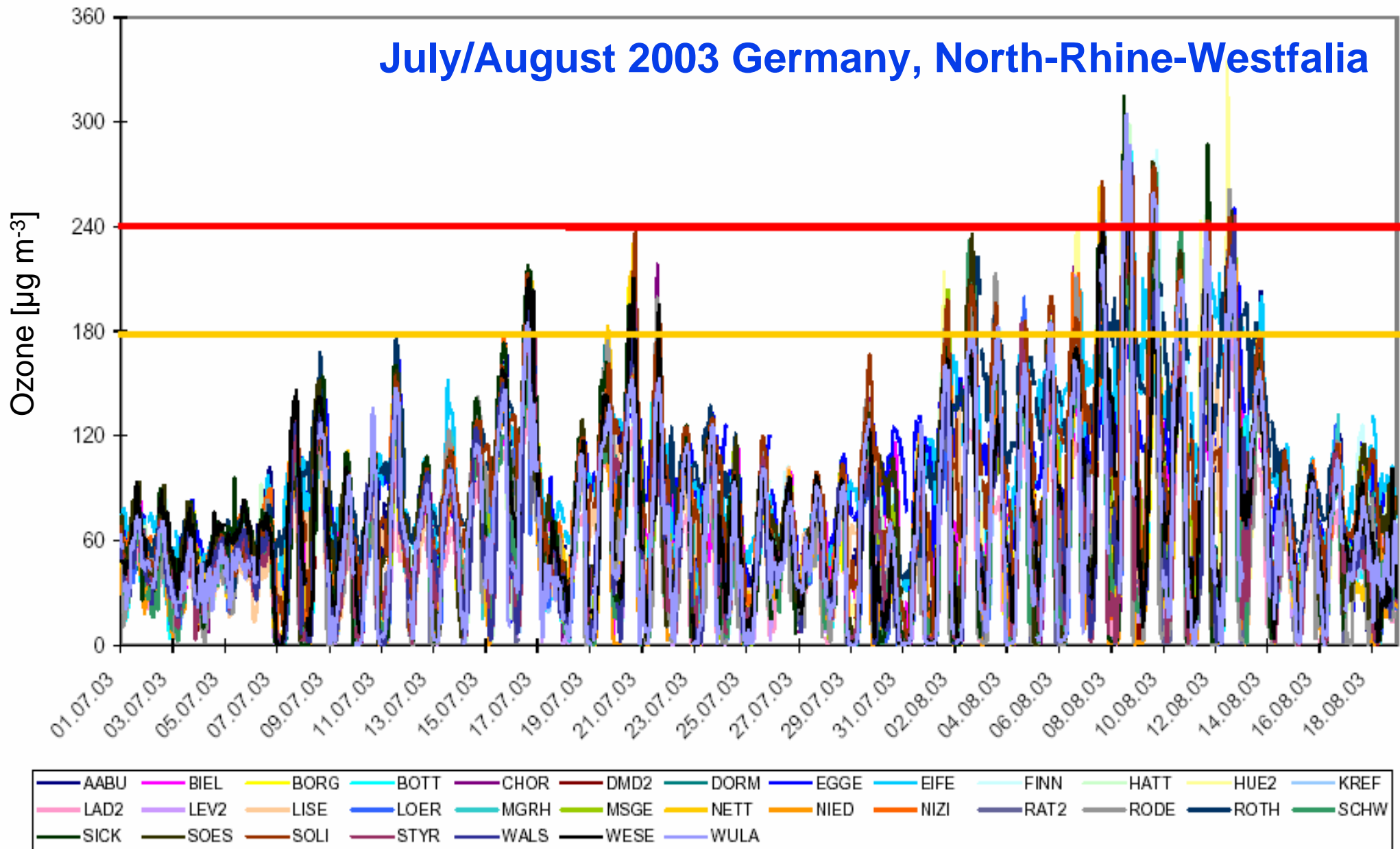
-  **Air Quality in Europe**
-  **From Regional to Local Scales**
-  **Forest Air Chemistry**
-  **Outlook: Climate and BVOC**



Air Quality in Europe

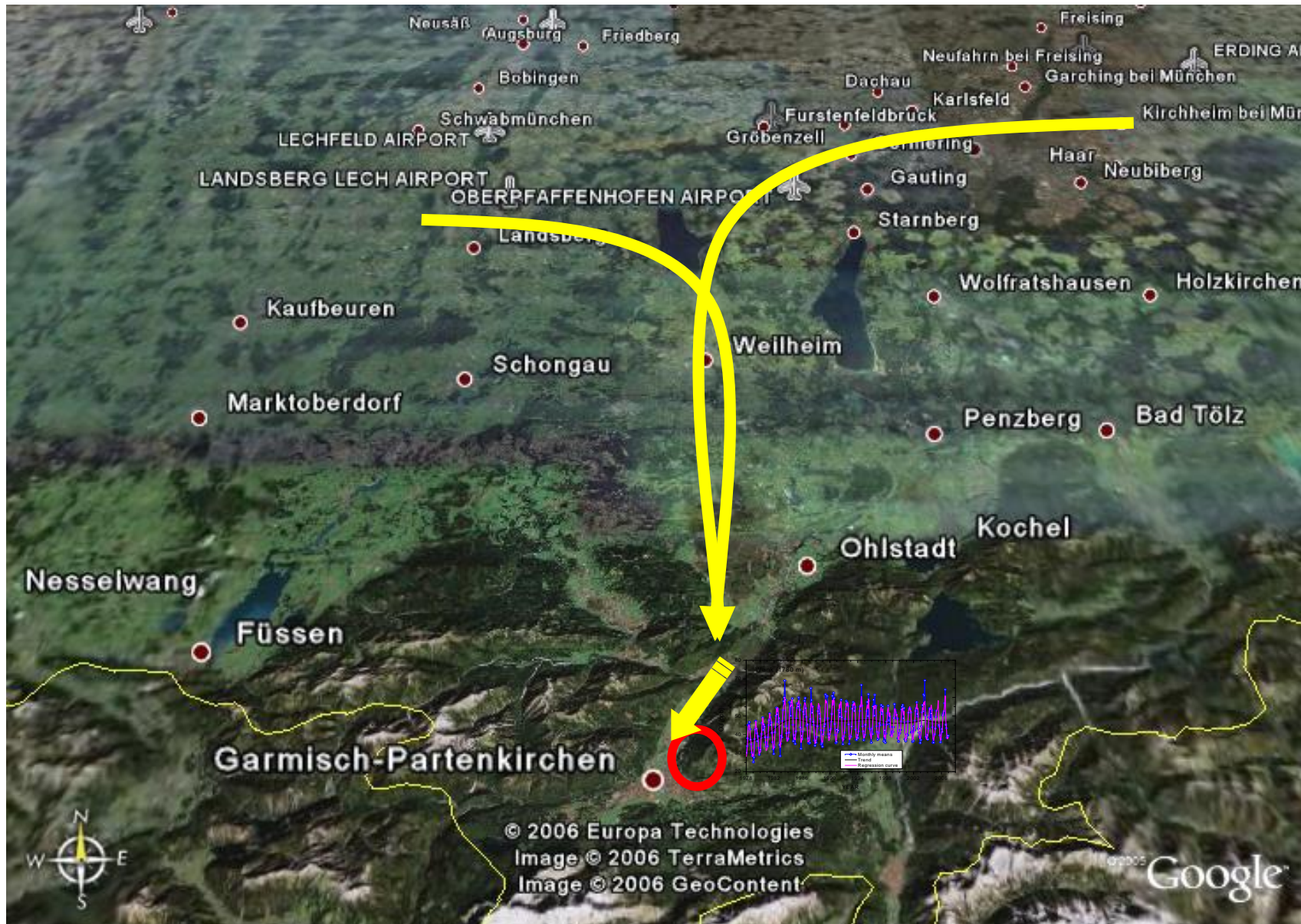


Air Quality in Europe



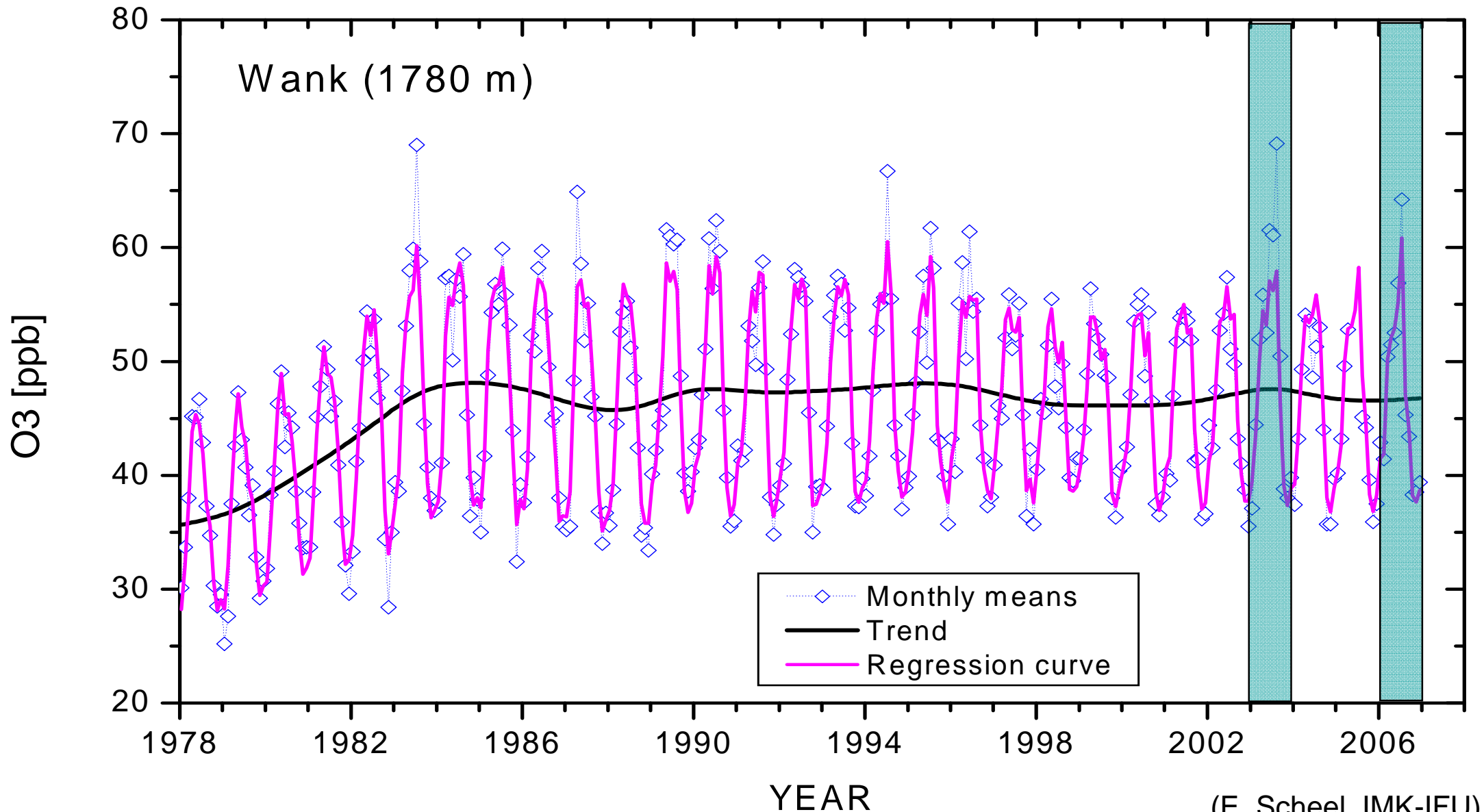
Air Quality in Europe

Ozone Wank (1780 m asl.), Garmisch-Partenkirchen



Air Quality in Europe

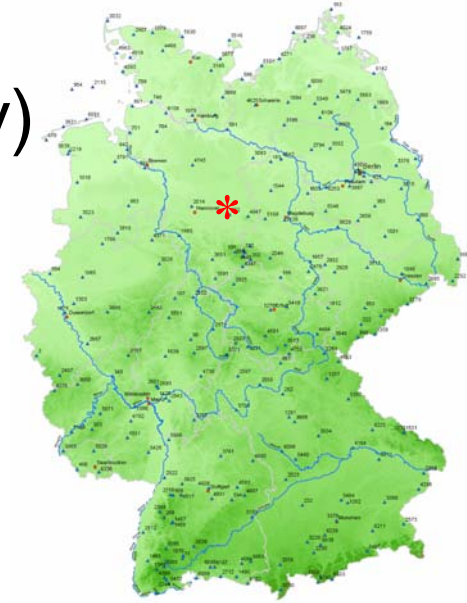
Ozone Wank (1780 m asl.), Garmisch-Partenkirchen



Air Quality in Europe

Surface Ozone: Source Analysis

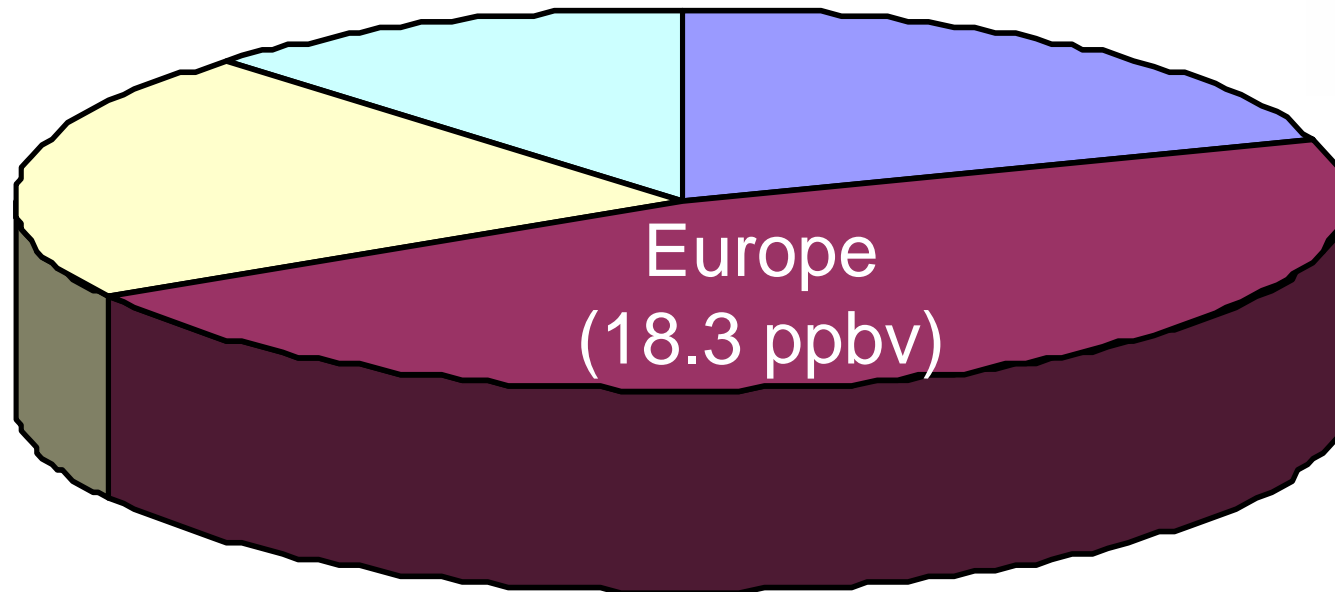
Waldhof, Germany (O_3 background 1998: 39.2 ppbv)



Asia
(4.7 ppbv)

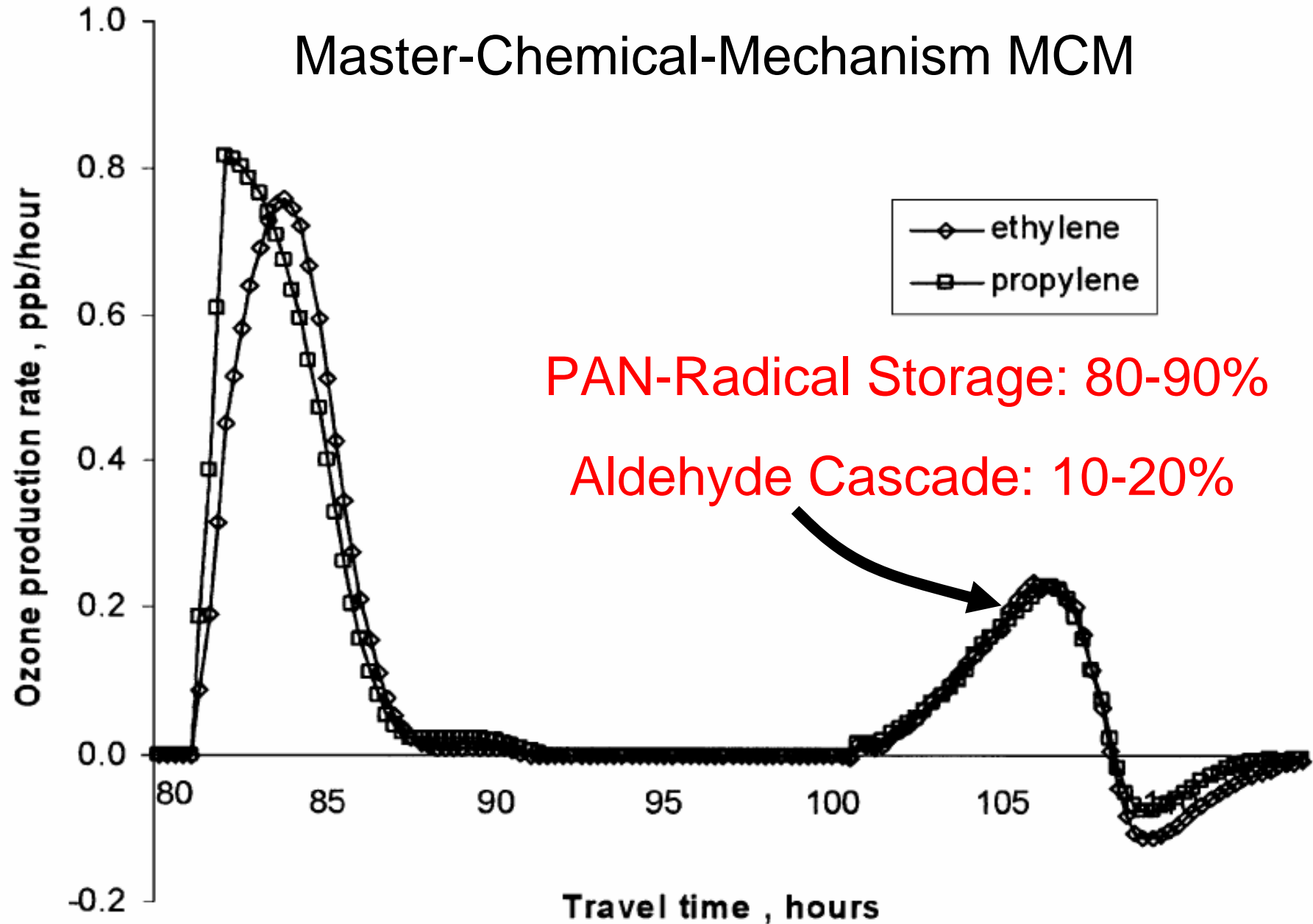
Stratosphere
(7.7 ppbv)

North America
(8.5 ppbv)



Transport *versus* Production?

(Derwent et al., 2004)

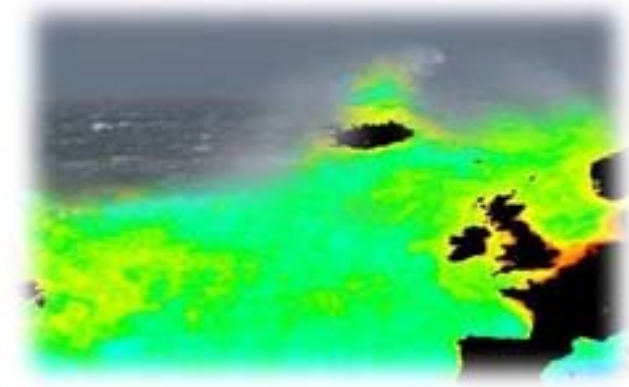


(Derwent et al., 2005)

Air Quality in Europe

Surface Ozone: Trends

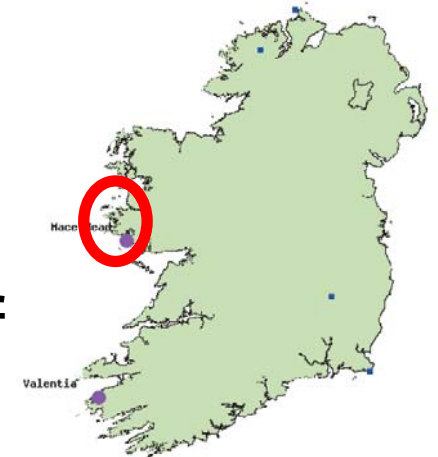
- Mace Head, Irland (background ozone)
- 12-months running mean
- 1990 to 2003



- Increase

+ 0.48 ppbv per year

- Will continue at a similar rate, despite of stringent emission control measures in the past!



What are the Reasons for that?

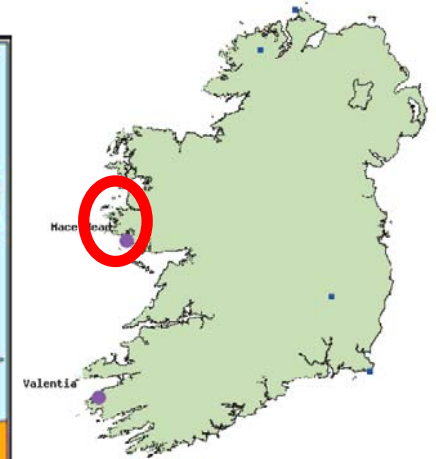
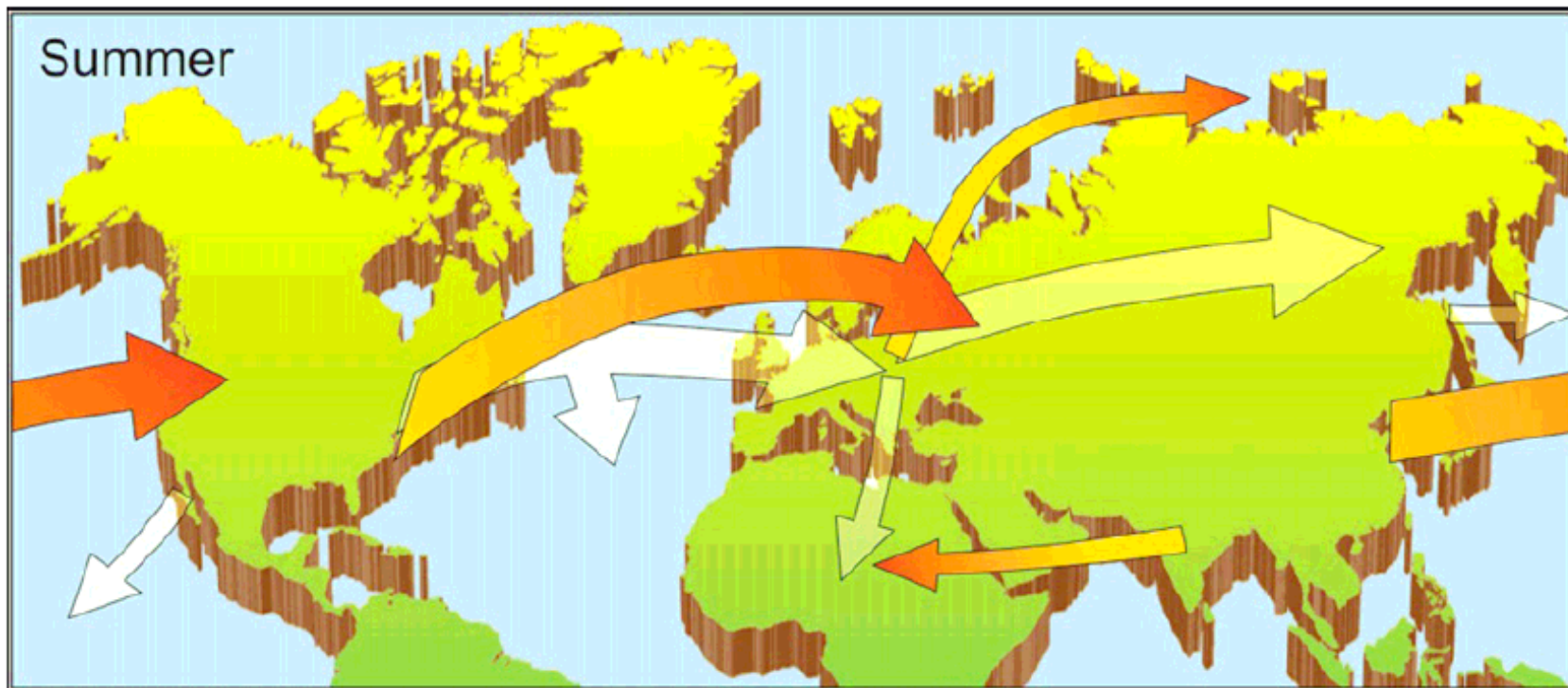
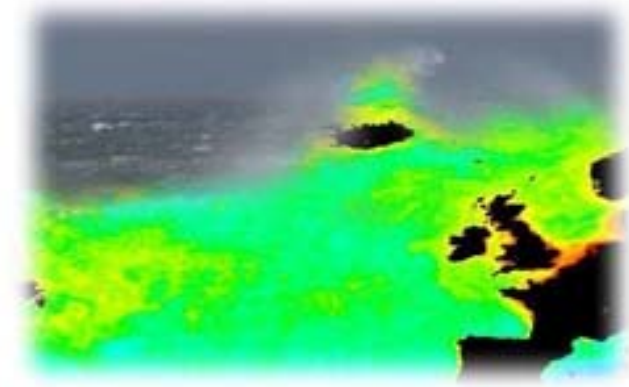
(Derwent et al., 2006)

Air Quality in Europe

Surface Ozone: Trends

- Mace Head, Irland (background ozone)
- + 0.48 ppbv per year
- Trend 1990 to 2003

What are the Reasons for that?



(Derwent et al., 2006)

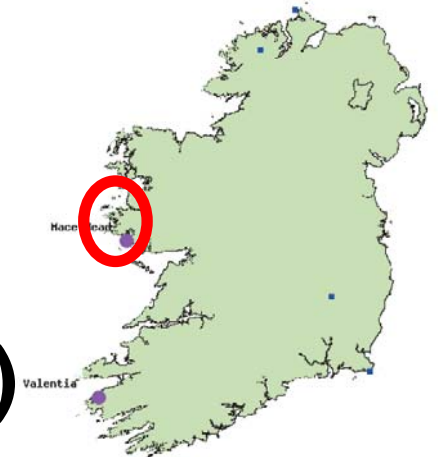
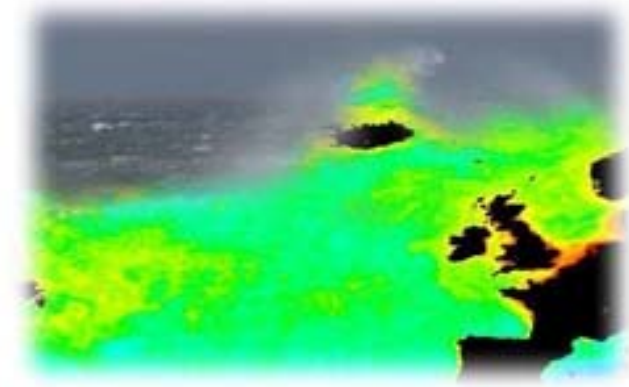
Air Quality in Europe

Surface Ozone: Trends

- Mace Head, Irland (background ozone)
- + 0.48 ppbv per year
- Trend 1990 to 2003

What shall we do?

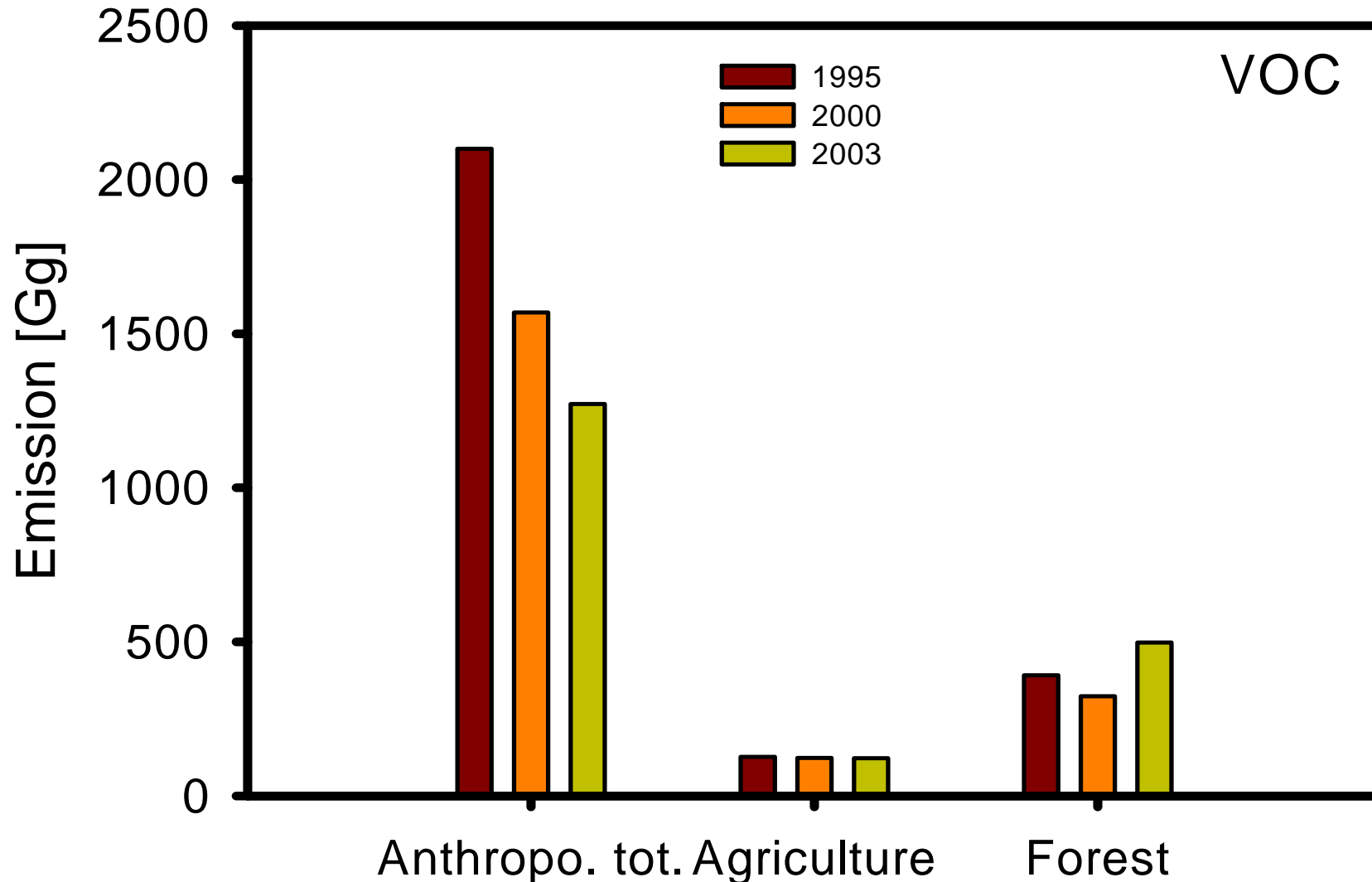
- **World wide** emission control of ozone precursors have to be set in force
- Only then we will achieve a reduction in surface ozone in Europe (MFR-Scenario)
- Decrease rate of - 0.14 ppbv per year or
- 4 ppbv in 2030



(Derwent et al., 2006)

From Regional to Local Scales

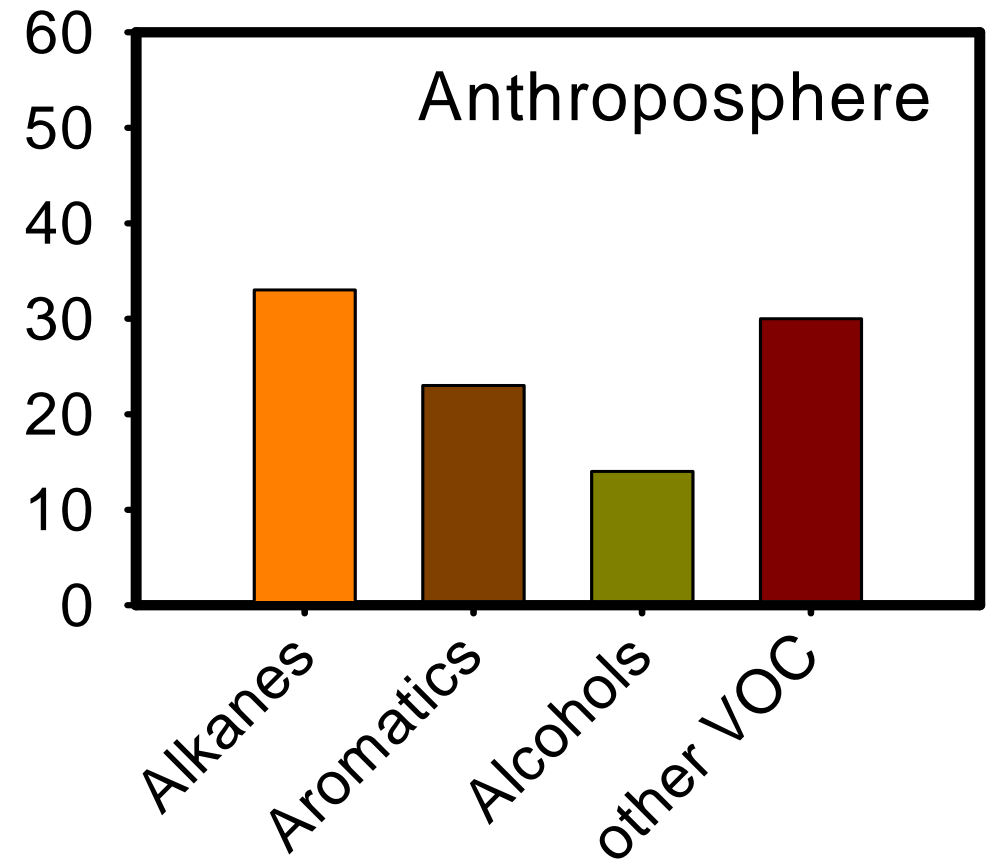
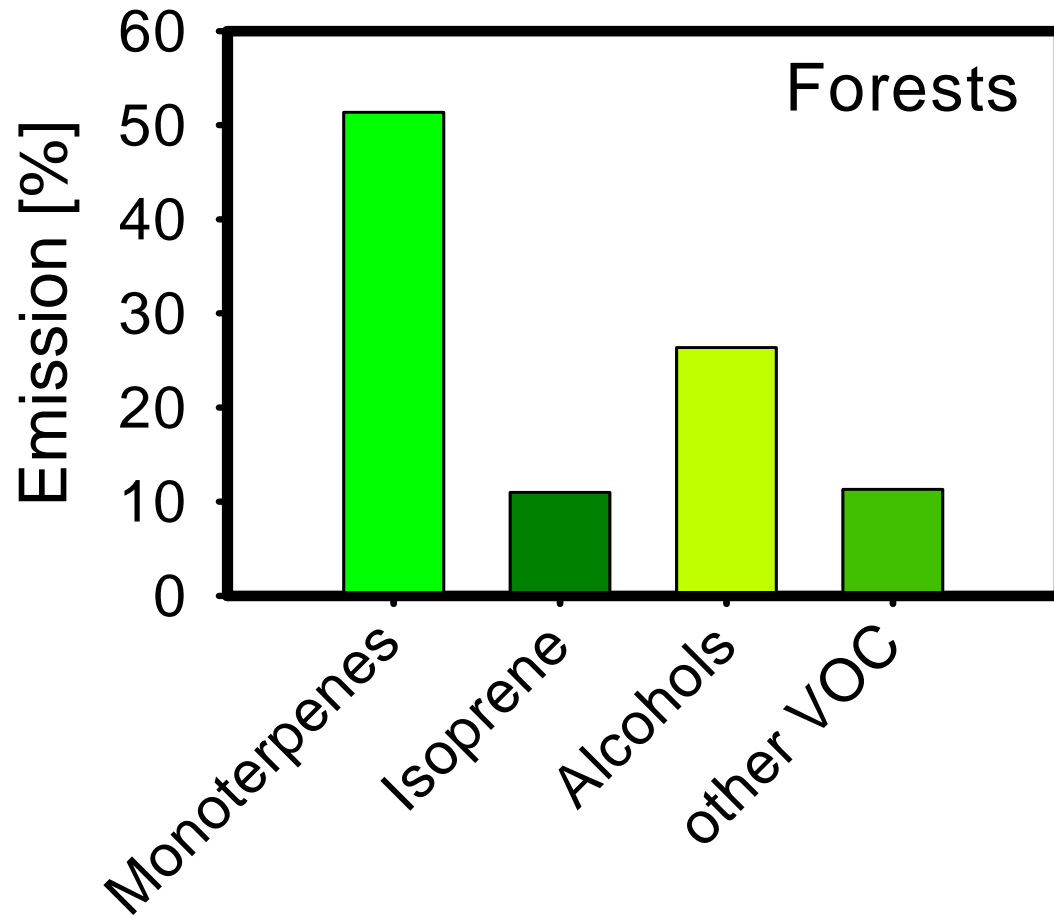
Emissions in Germany: Sources and Trends



(EMEP 2006; Smiatek, Steinbrecher 2006)

From Regional to Local Scales

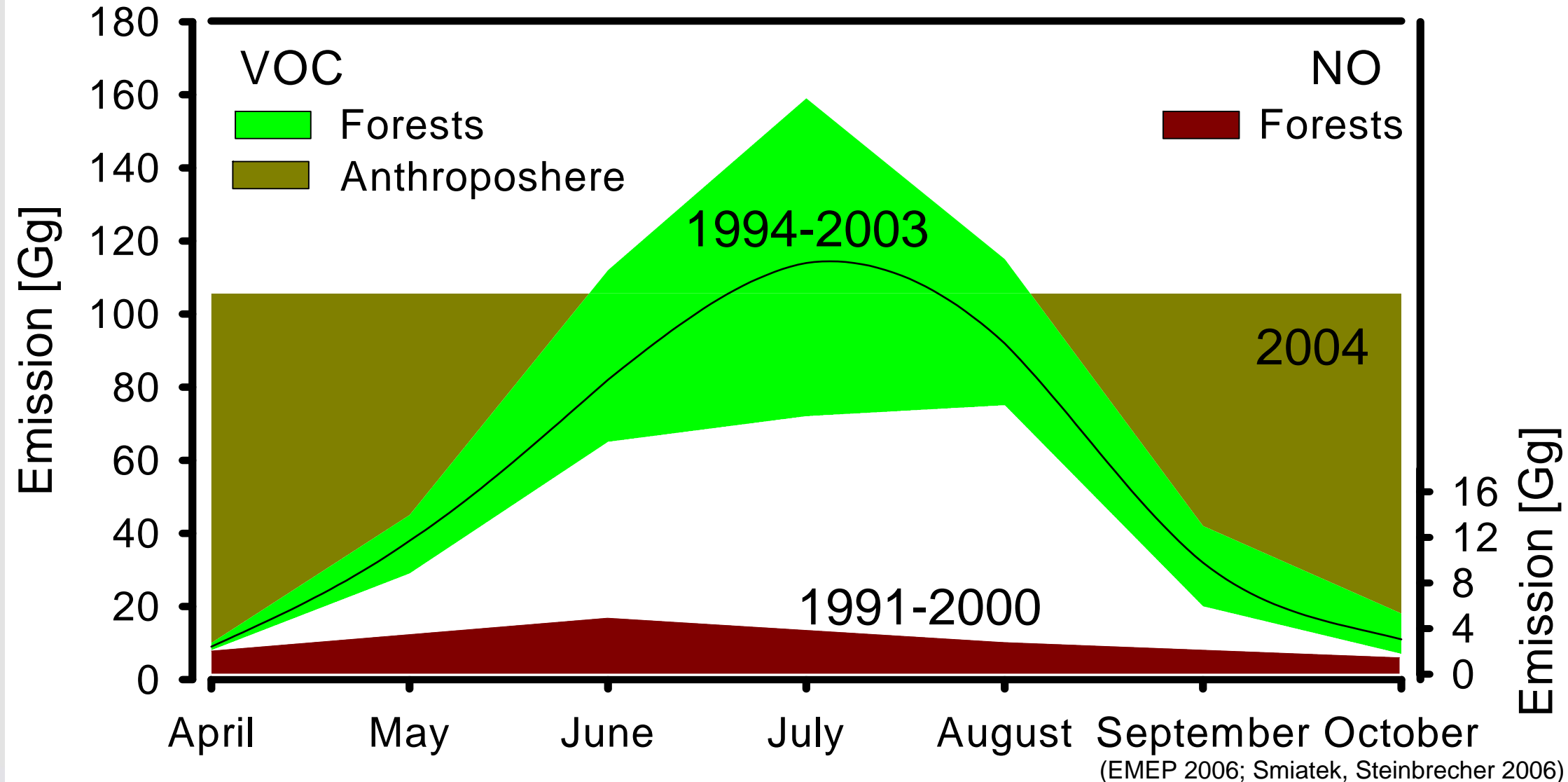
Emissions in Germany: Source Split



(Smiatek, Steinbrecher 2006; Theloke, Friedrich 2007)

From Regional to Local Scales

Emissions in Germany: Monthly and Annual Variability



(EMEP 2006; Smiatek, Steinbrecher 2006)

From Regional to Local Scales

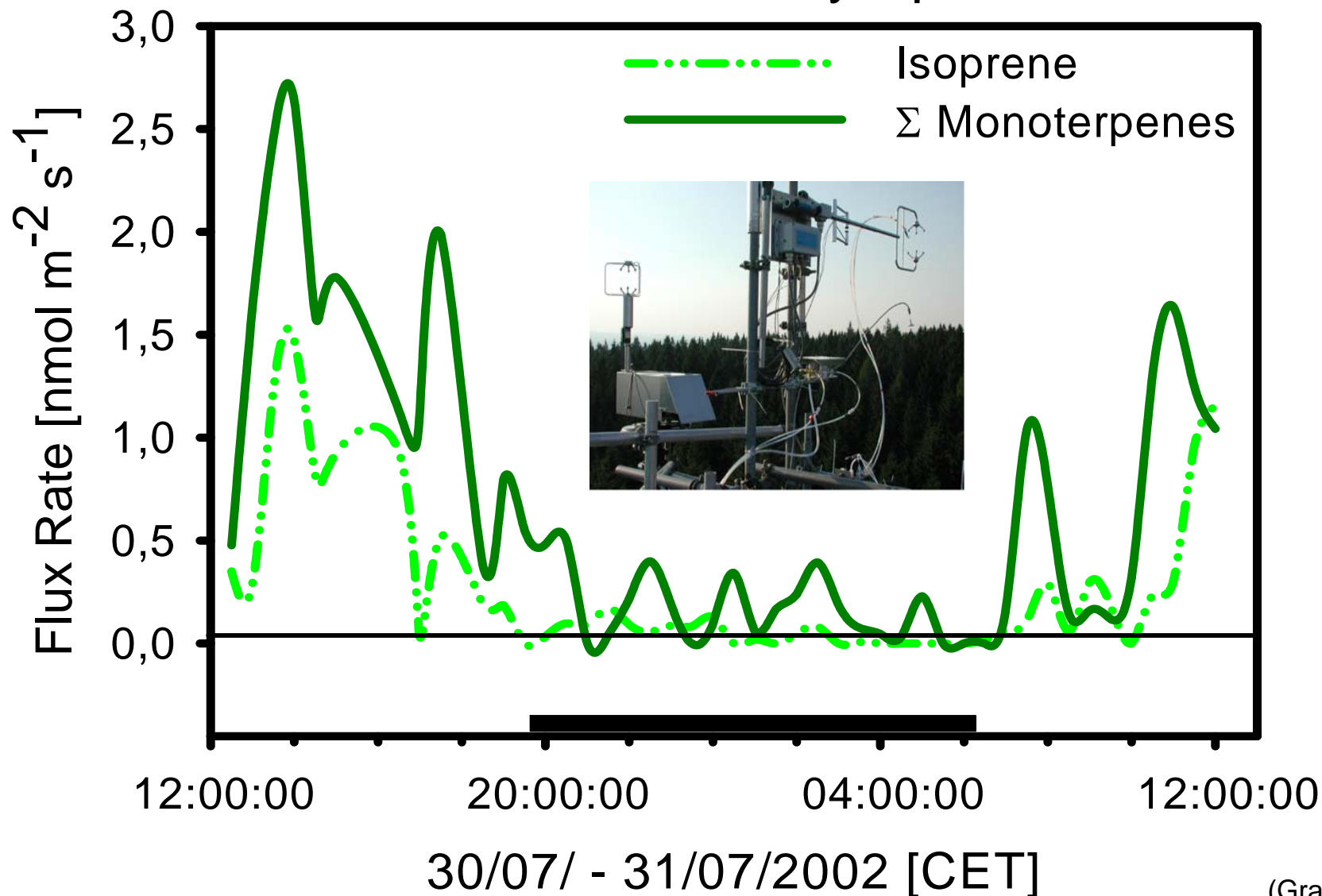
Emissions in Germany: Hourly Variability



From Regional to Local Scales

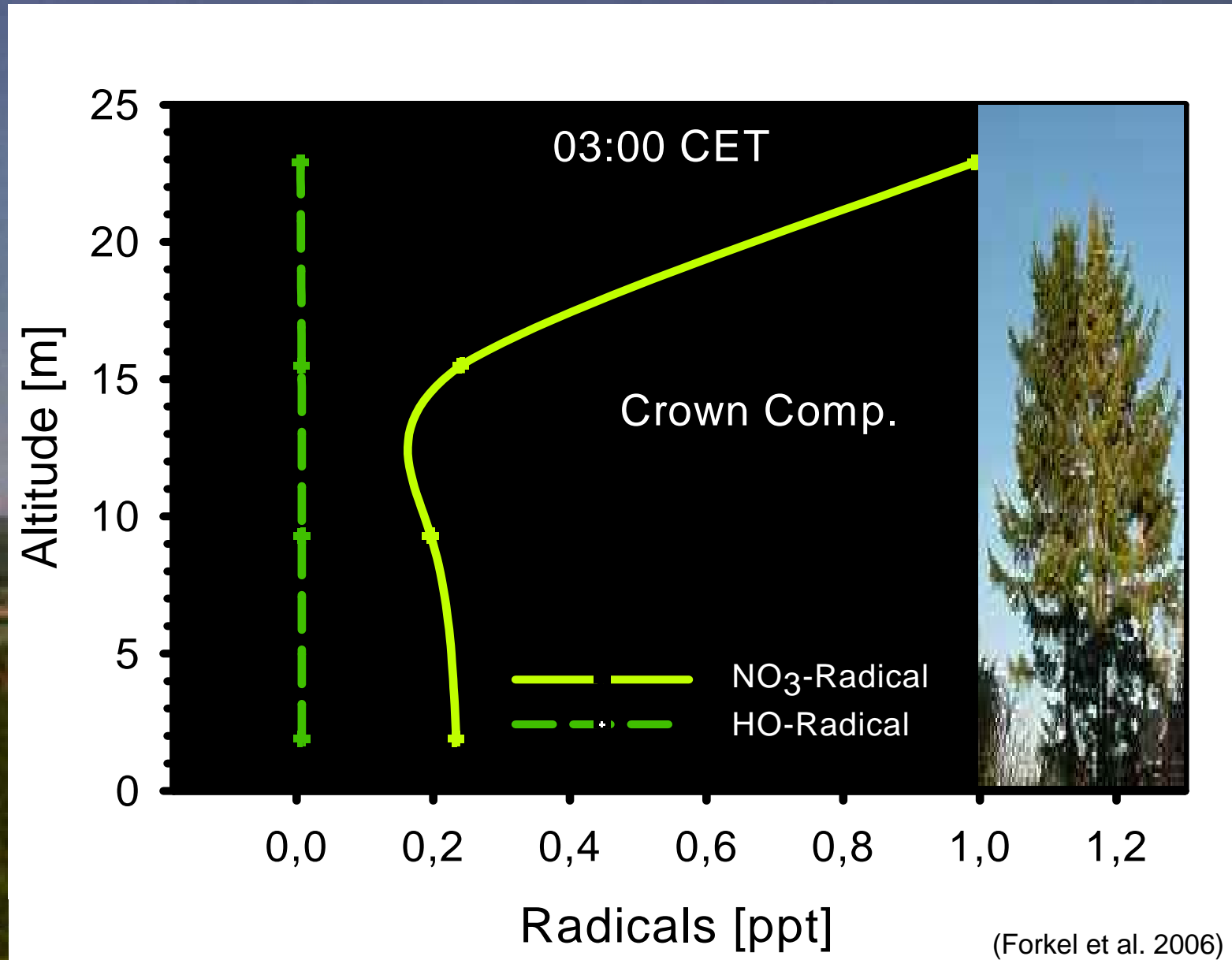
Emissions in Germany: Hourly Variability

Norway Spruce Forest



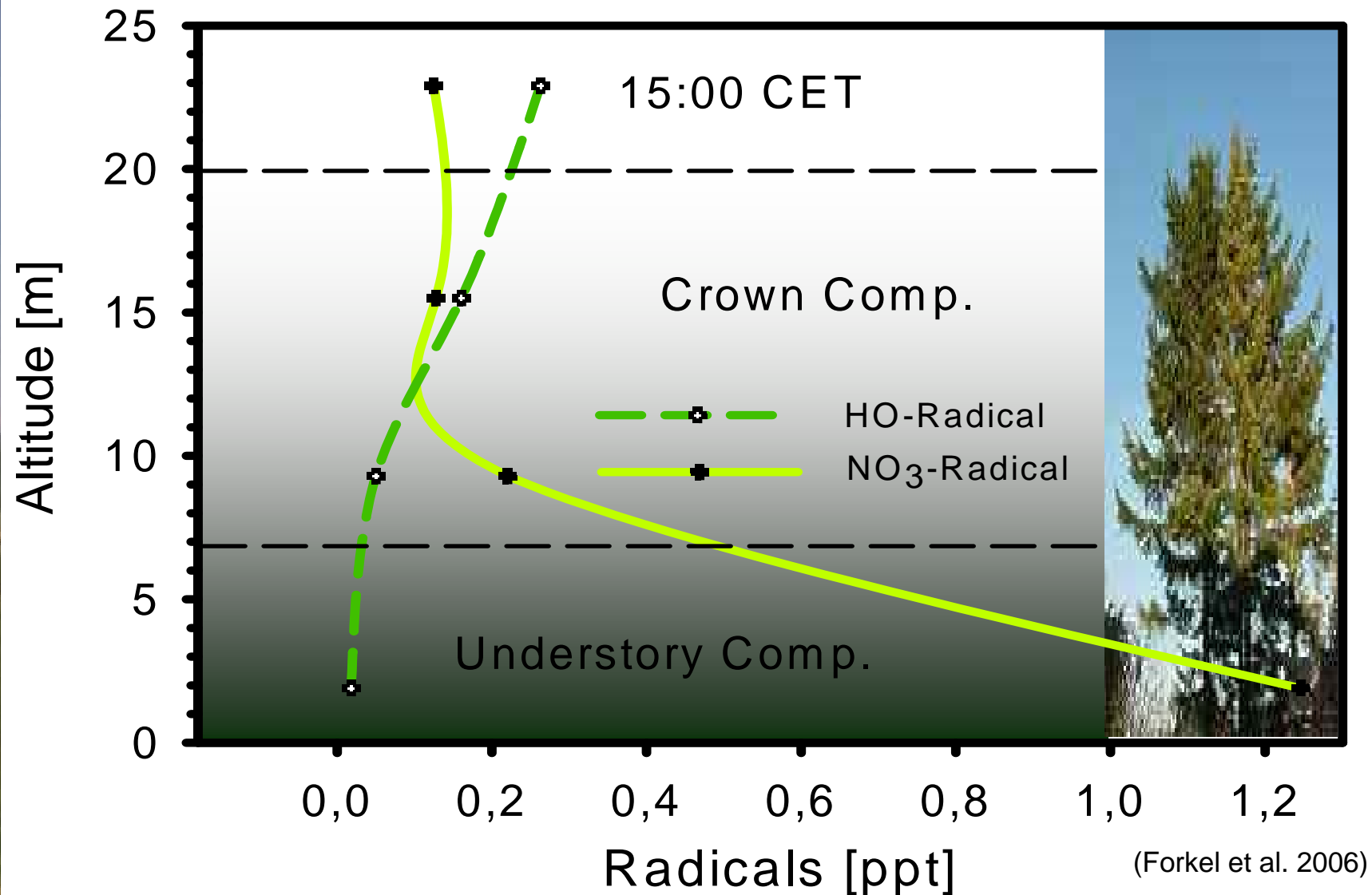
(Graus et al. 2006)

Norway Spruce Forest: Night Time

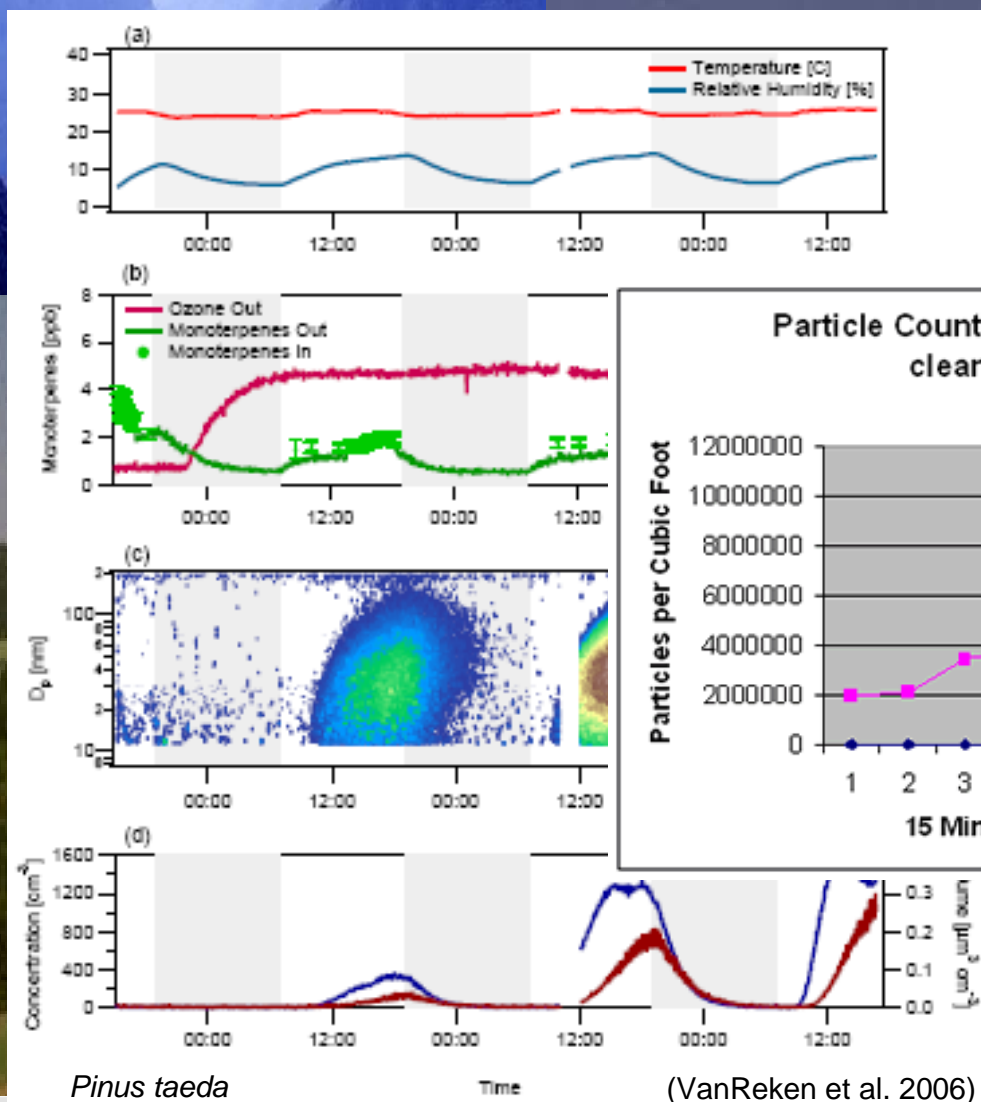
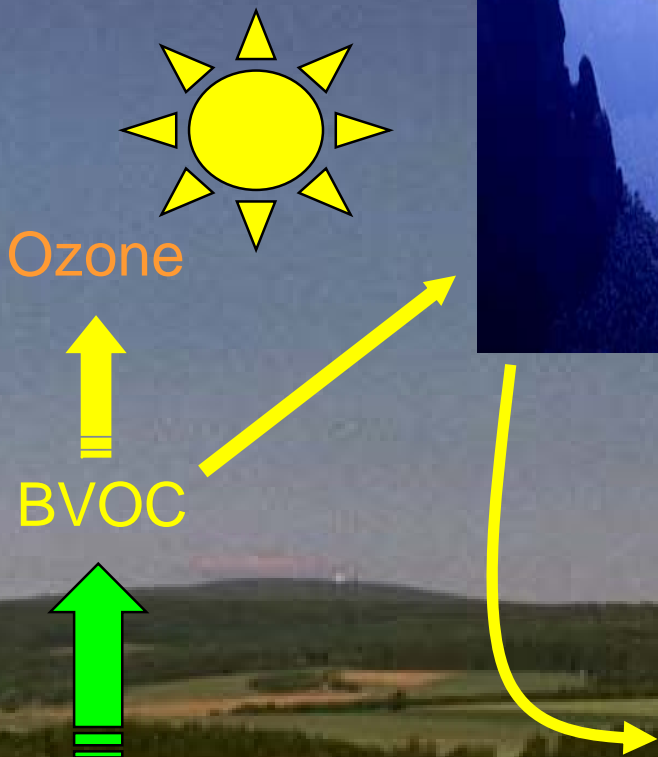
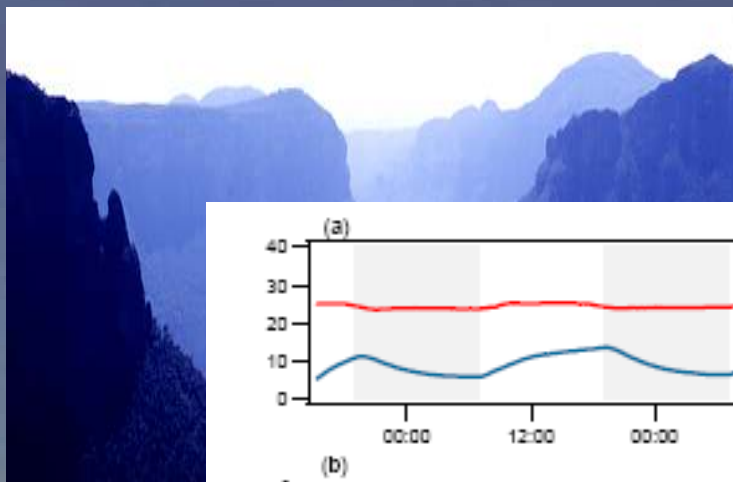


(Forkel et al. 2006)

Norway Spruce Forest: Day Time

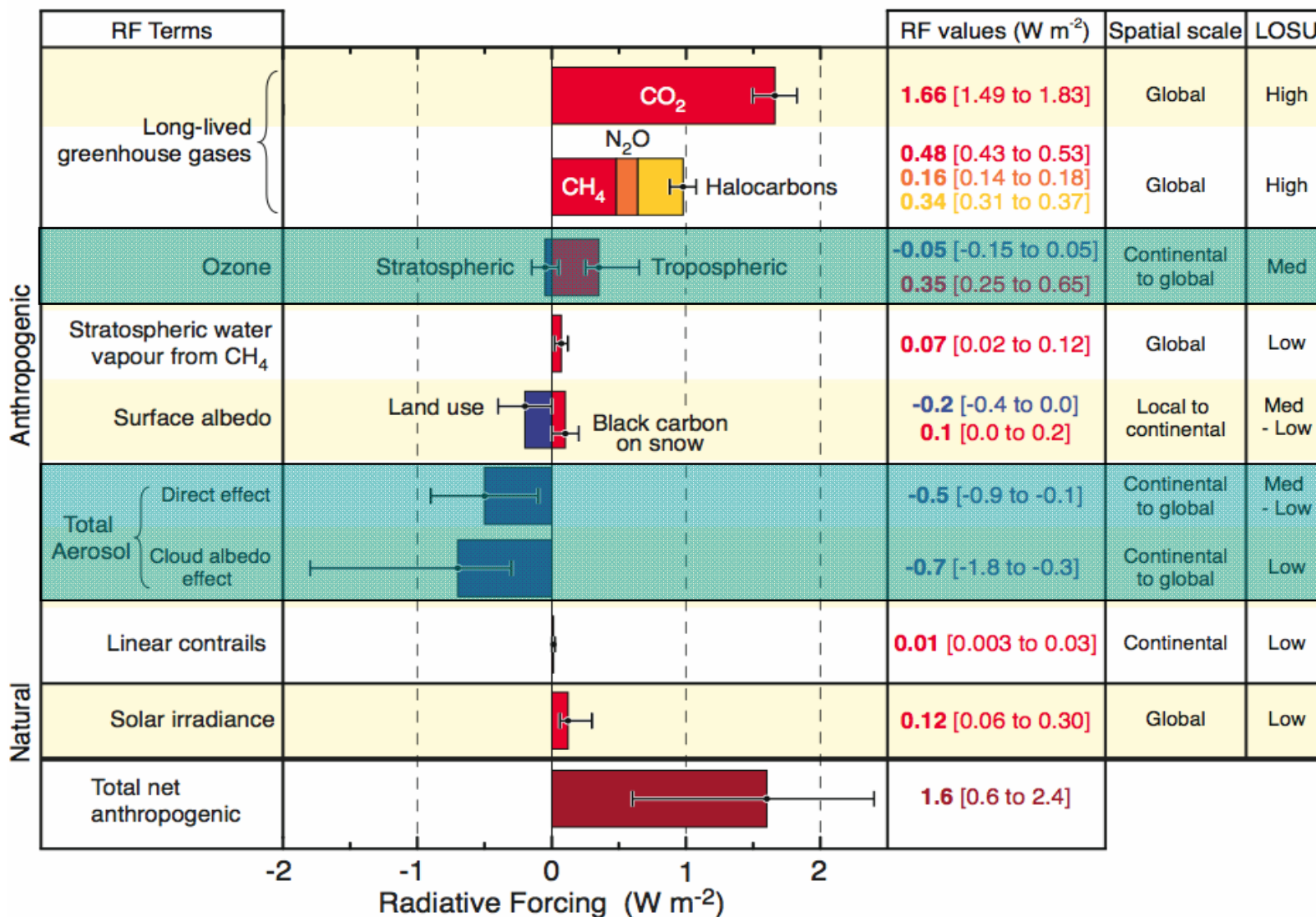


Forest Air Chemistry



VOC Oxidation in the Atmosphere

Radiative Forcing Components



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