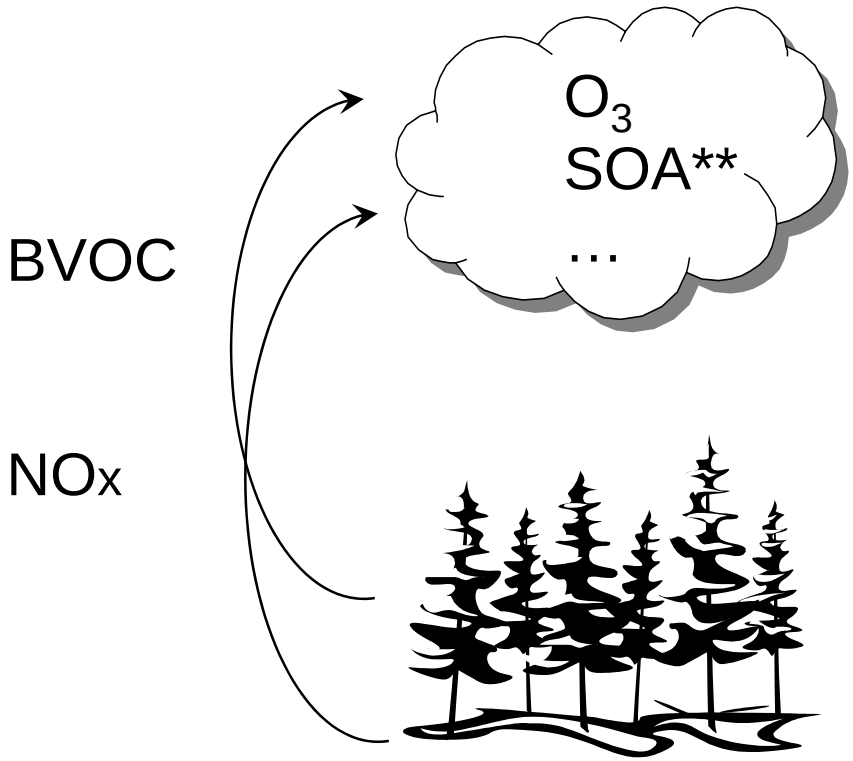
A general system to calculate air chemistry processes within biosphere canopies

18.04.2008

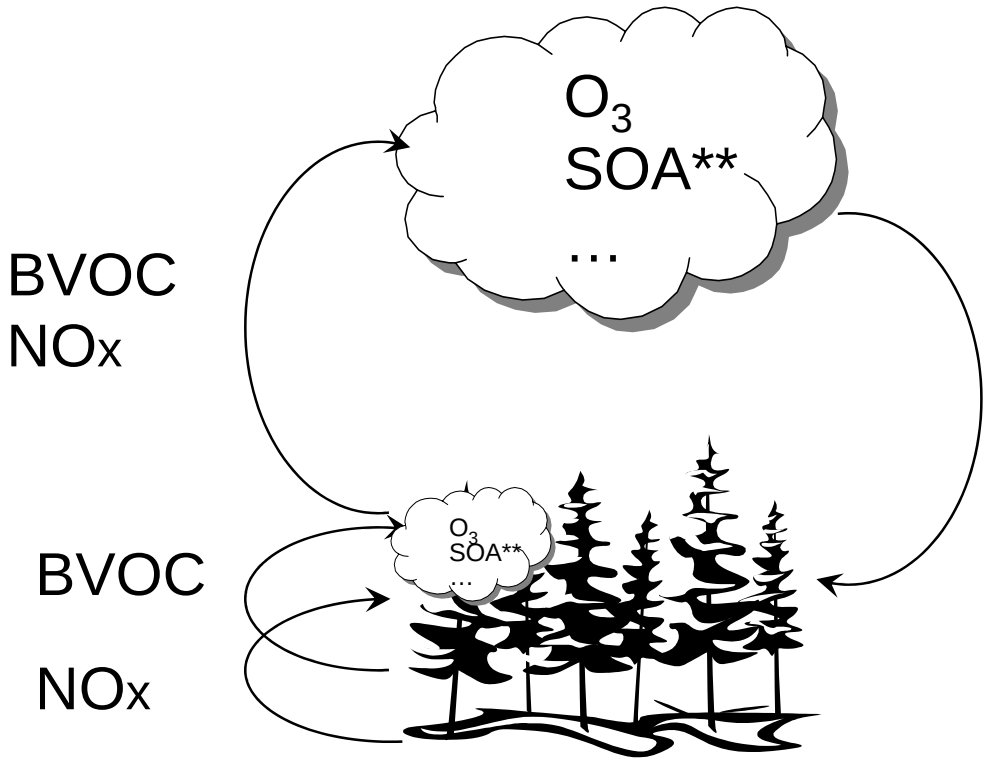
Edwin Haas – Rüdiger Grote – Renate Forkel – Rainer Gasche

Regional air chemistry modeling requires estimates of BVOC* and reactive N emission from the Biosphere…



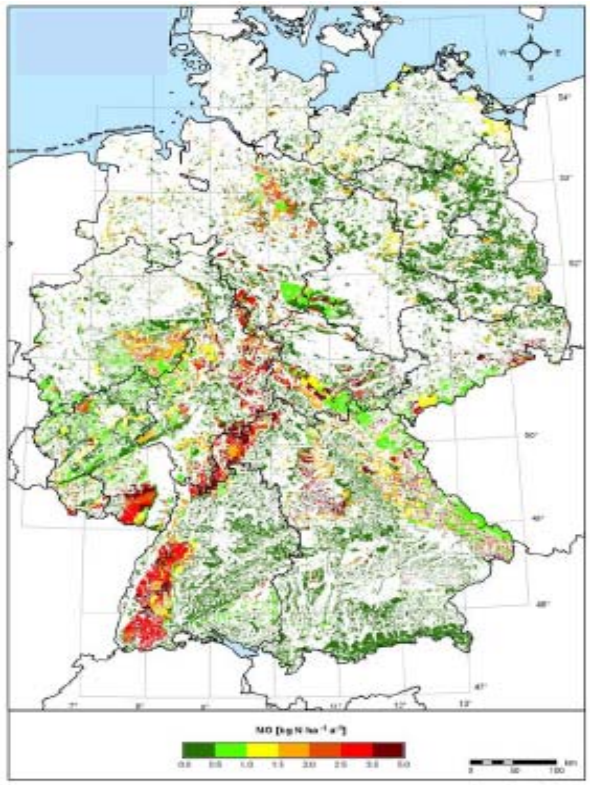
* Biogenic volatile organic carbon (e.g. isoprene)
** Secondary organic aerosols

…but current approaches usually neglect chemical reactions within the canopy!

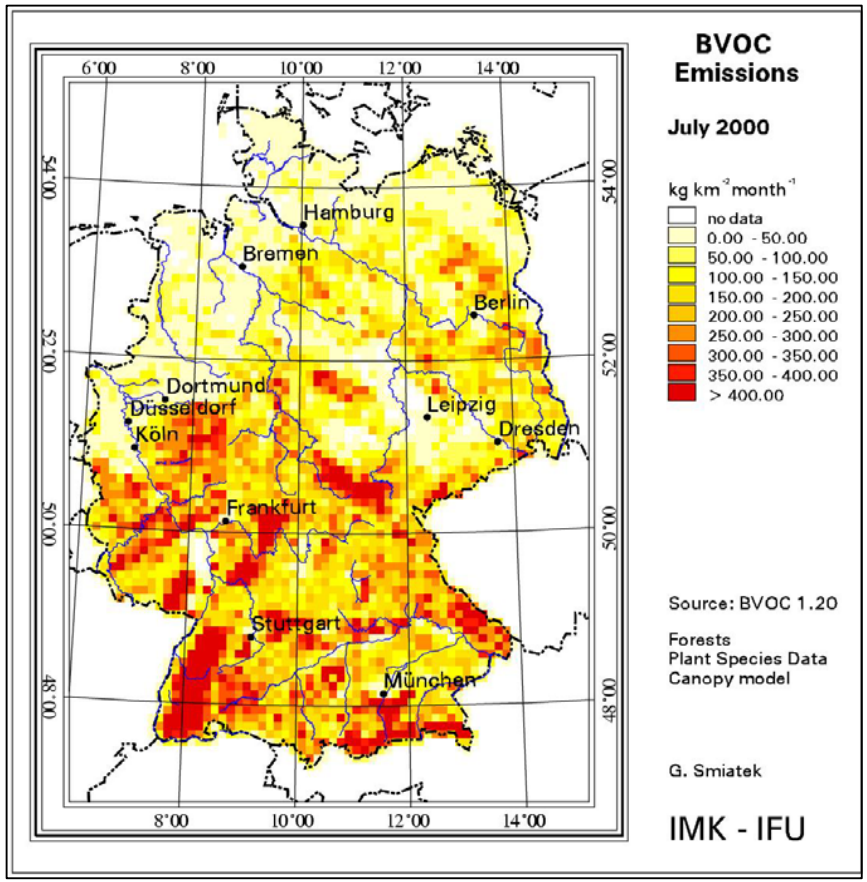


* Biogenic volatile organic carbon (e.g. isoprene)
** Secondary organic aerosols

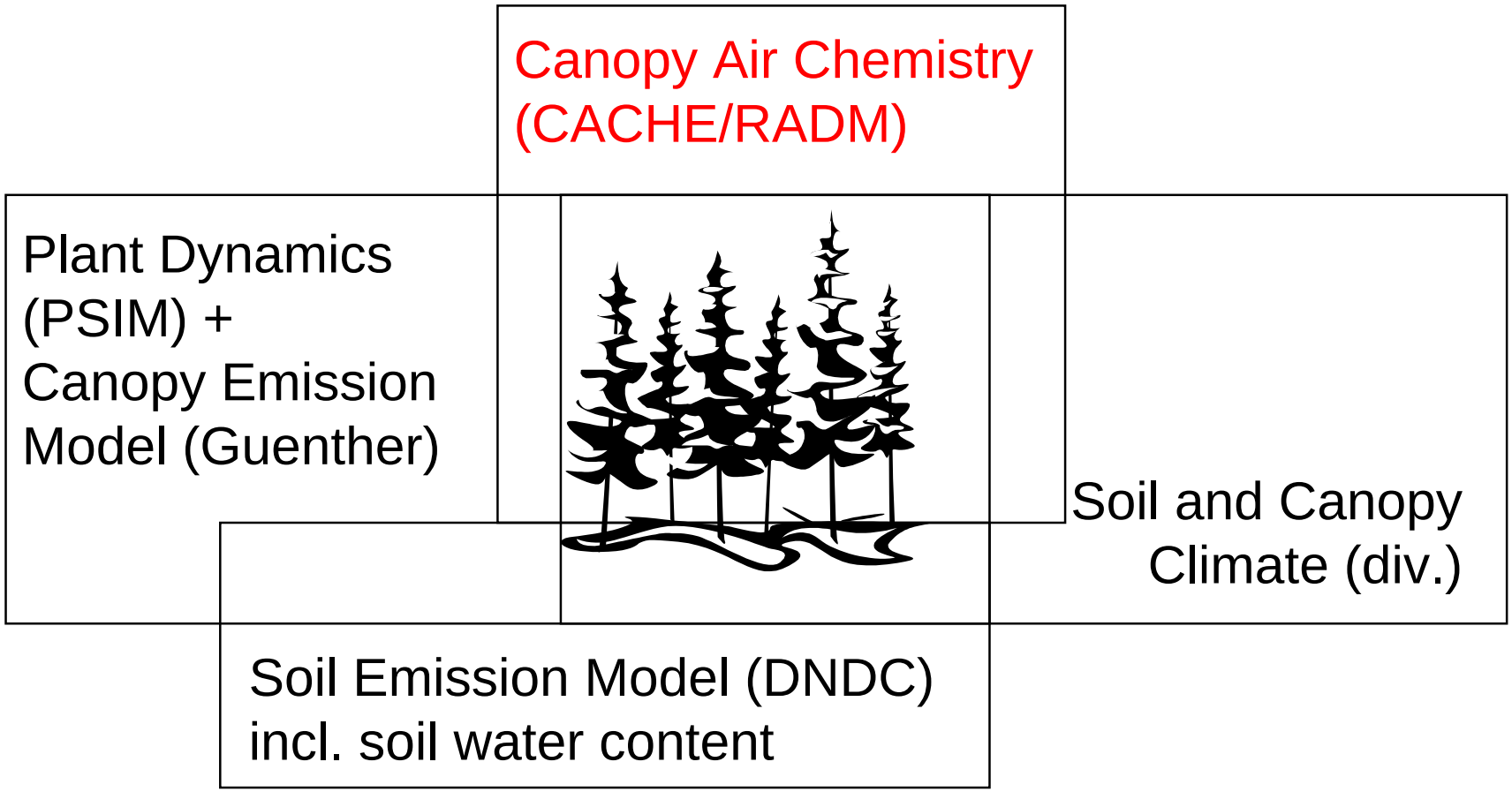
So what do emission maps really mean?



NO-N emission [kg ha-1 a-1]



Model Selection



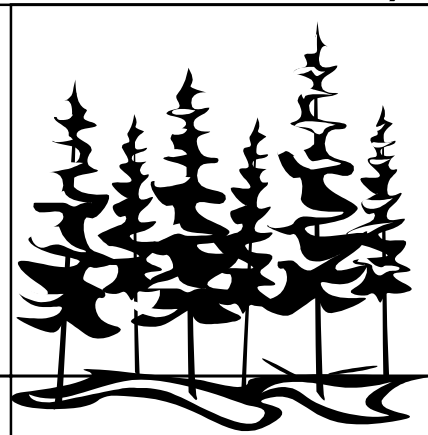
Forkel et al. 2006 (Atm.Env.)
Stockwell et al. 1990 (JGR)

Grote 2007 (New Phyt.)
Grote et al. 2009 (GCB)
Grote et al. 2010 (ACE)

Simulation Setup

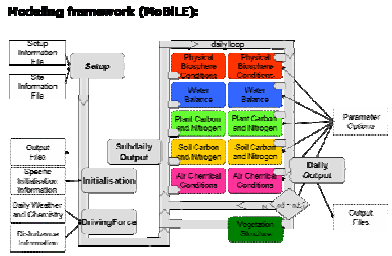
Flexible input (climate/chemistry measurements)

Flexible number of canopy layers (40)



Flexible time steps (hourly to daily)

Flexible number and height of soil layers (18/23)



Evaluation Sites

Waldstein
Spruce (27m)
2002
• climate, BVOC

Höglwald
Spruce (41m)
1995
• NO, O_3

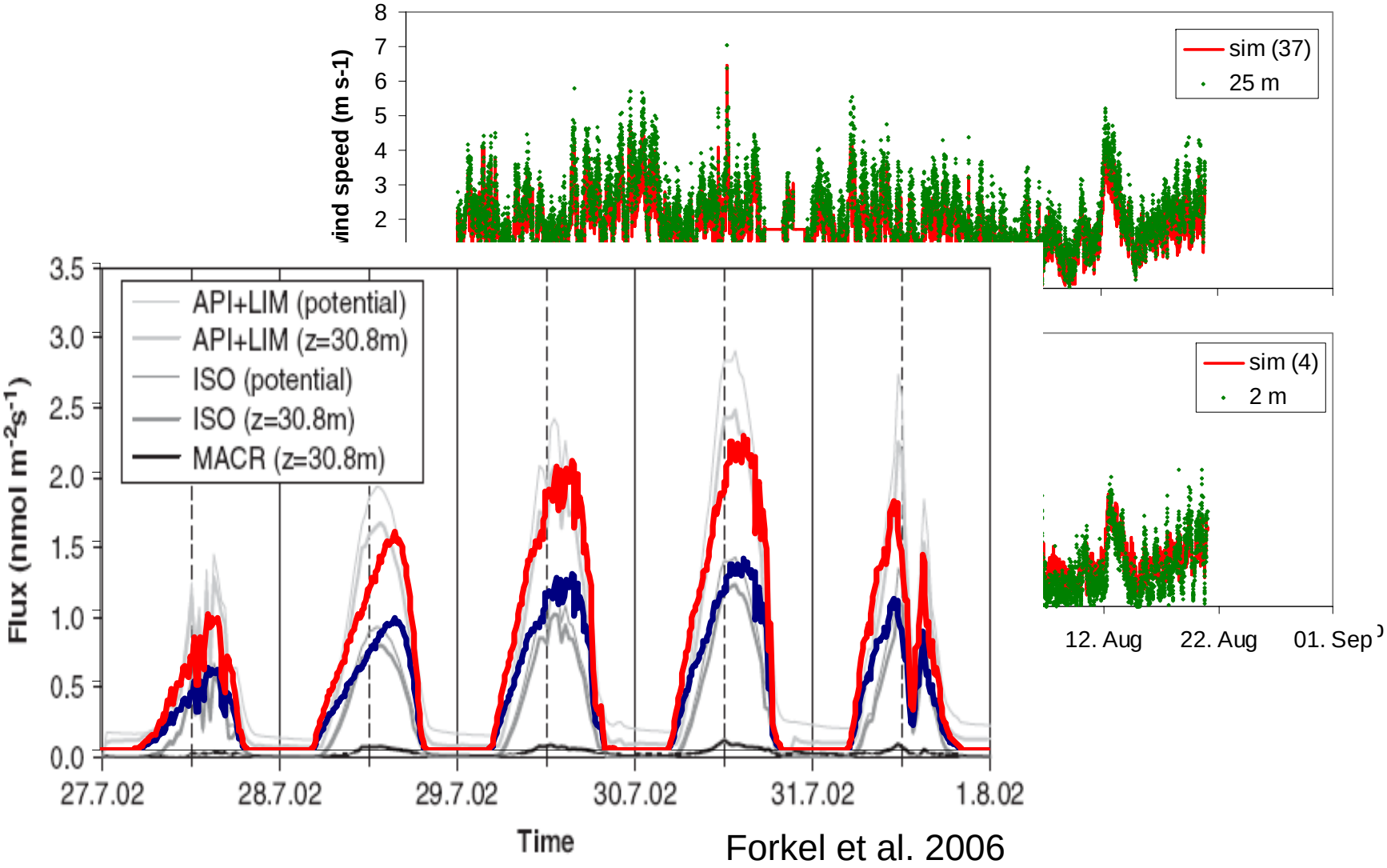
3. Evaluation

Waldstein

Boundary Conditions:

3 months

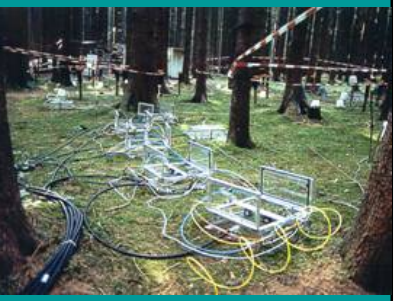
- **air temperature**
- **wind speed**
- **BVOC emission**



Forkel et al. 2006

3. Evaluation

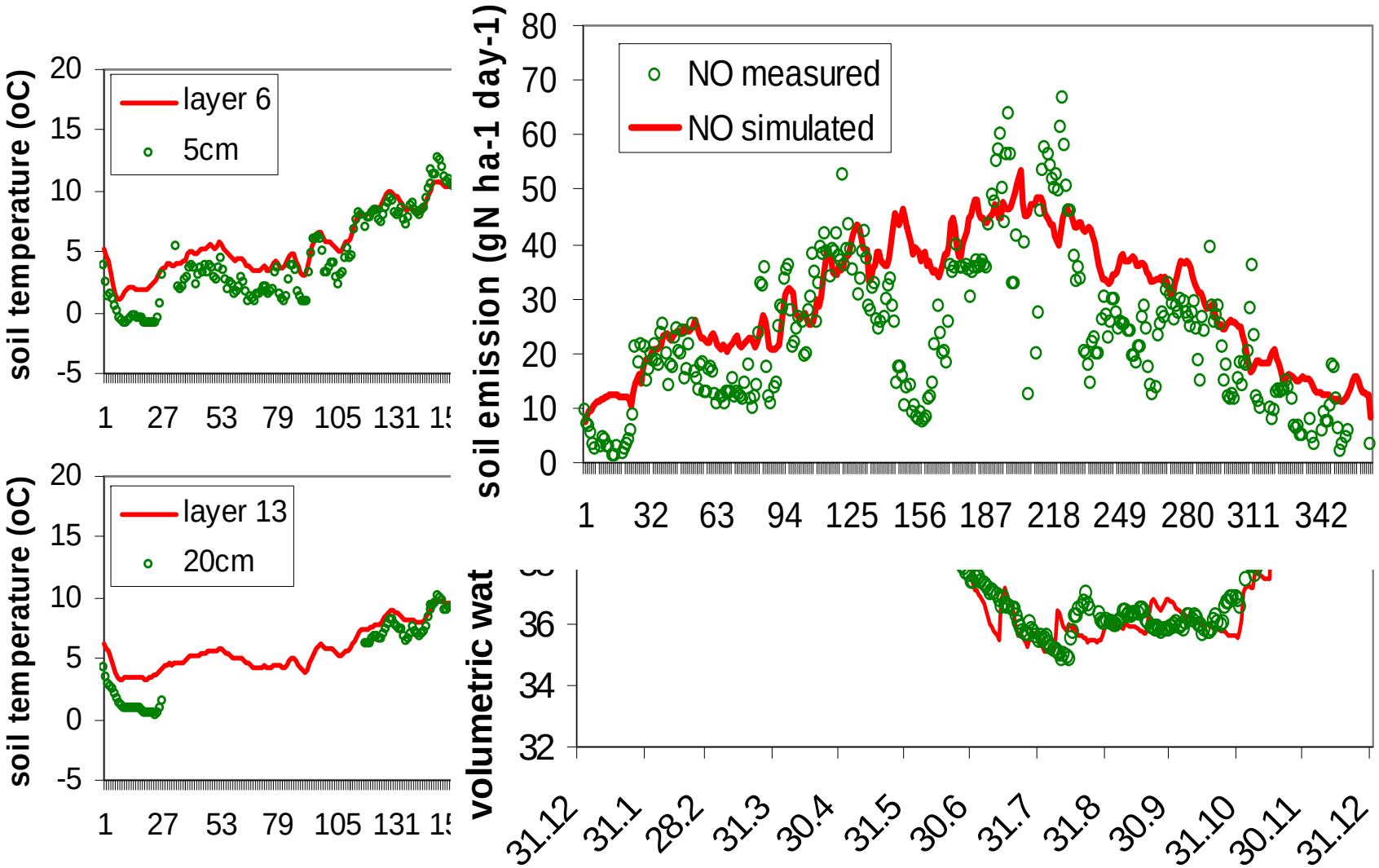
Höglwald



Boundary Conditions:

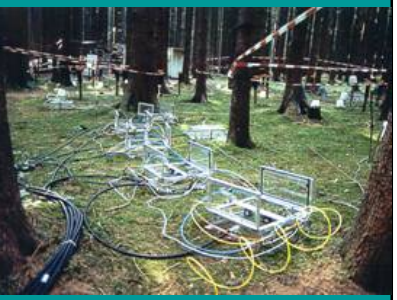
>1year

- **soil temperature**
- **soil water**
- **NO emission**



4. Simulation results

Höglwald

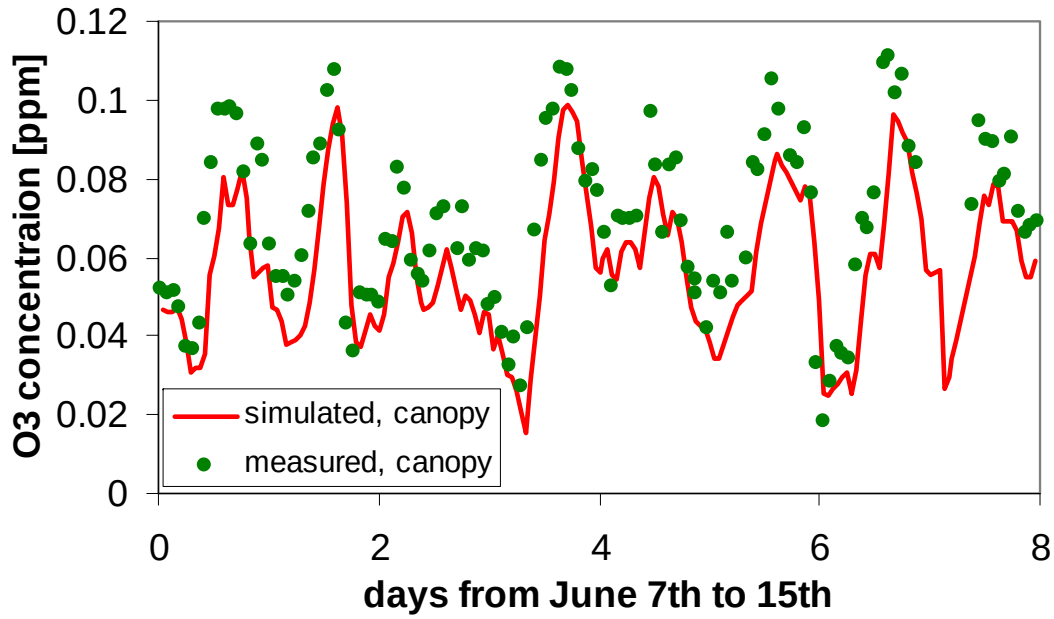


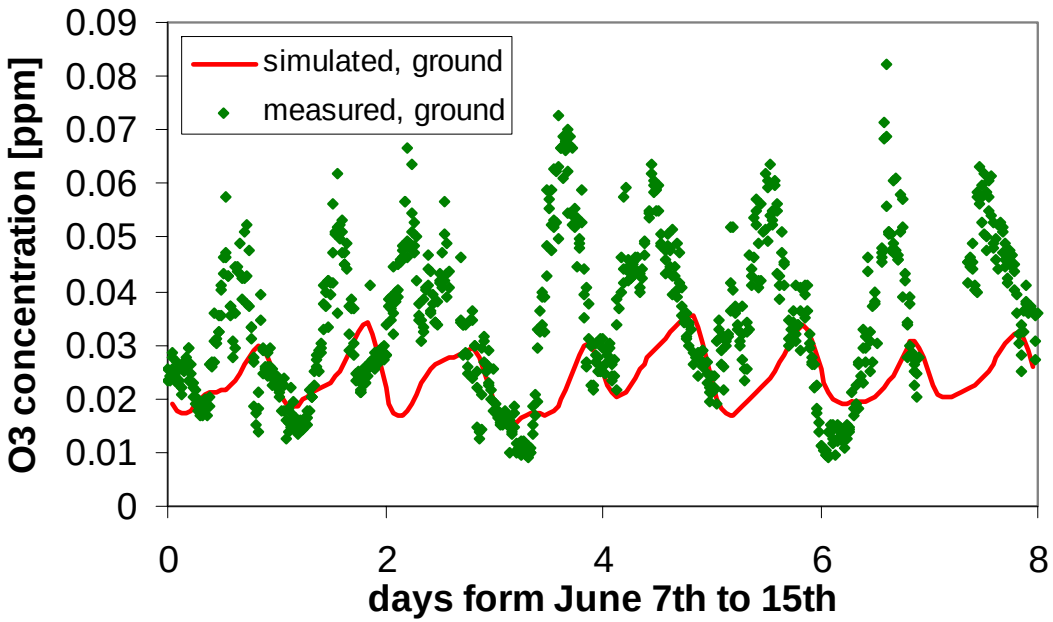
Air Chemistry:

Total: 1 month

Selected: 8 days

- O_3
- (NOx)





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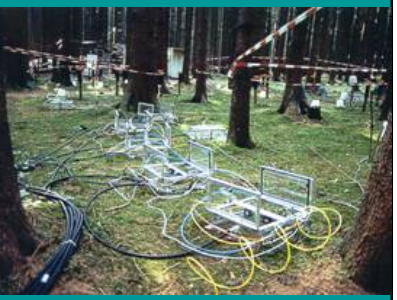

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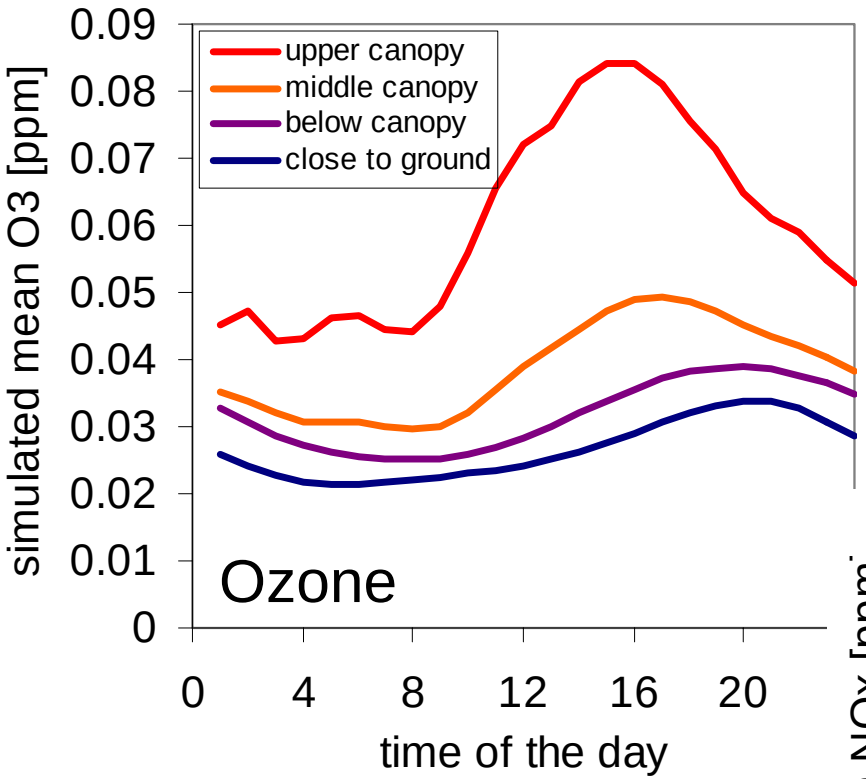

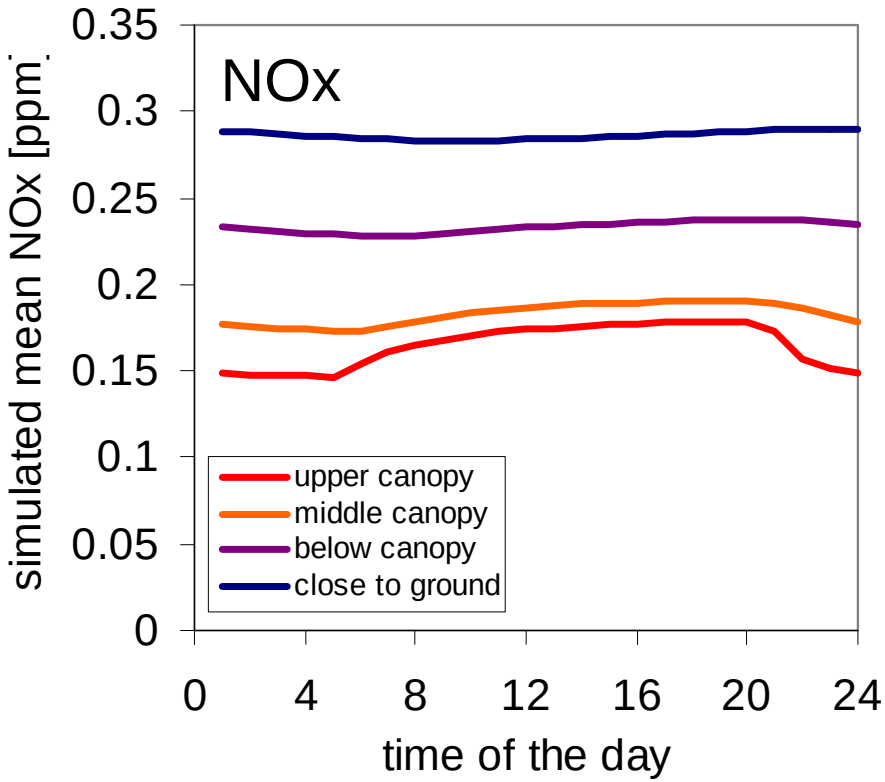

5. Outlook

Further Evaluation

Effect on net-emission

Improved emission mapping

Coupling to regional models.

Thank you for your attention!