



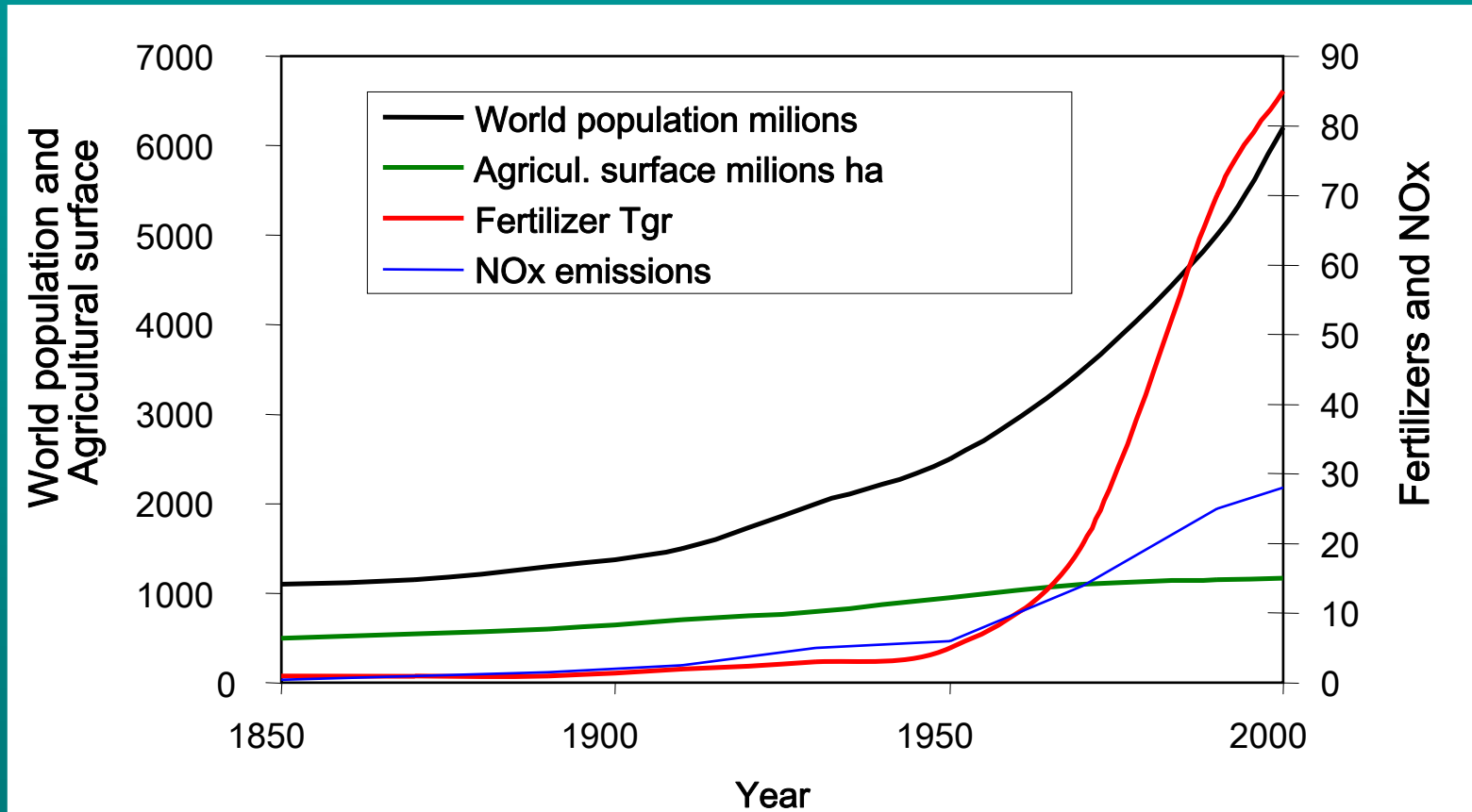
# NitroEurope IP

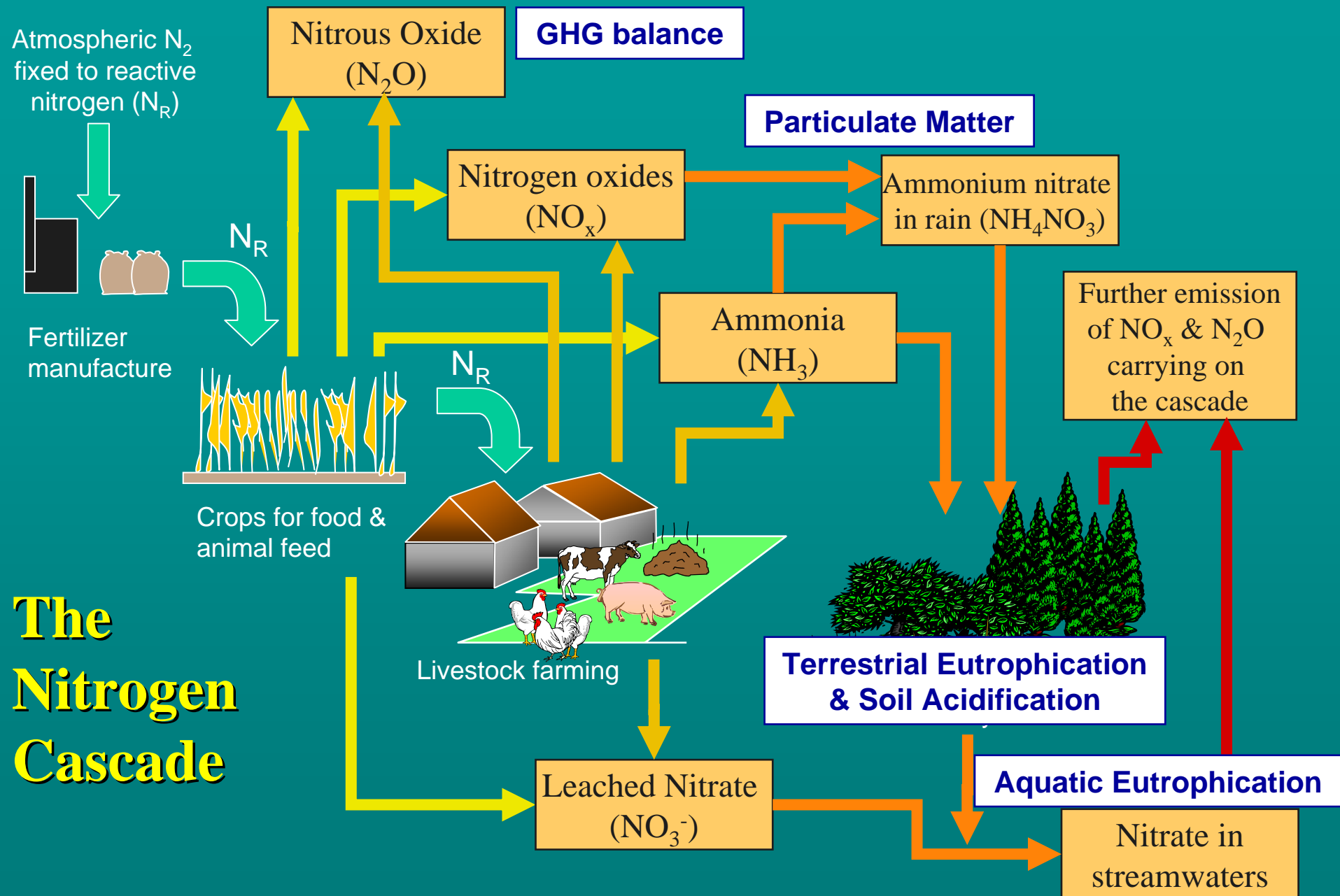
## Nitrogen and the European GHG balance

Sutton, Mark A., Jan Willem Erisman, Klaus Butterbach-Bahl, Claus Beier, Wim de Vries, Pierre Cellier, Francesca Cotrufo, Eiko Nemitz, Ute Skiba, Mark Theobald, Ulrike Dragosits, Claire Campbell, Marcel van Oijen, Bridget Emmett, Lucy Sheppard, David Fowler, Albert Bleeker, Alex Vermeulen, Nicolas Bruggeman, Kim Pilegaard, Oene Oenema, Hans Kros, Jean-François Soussana, Günther Seufert, Adrian Leip, Peter Bergamaschi, Albrecht Neftel, Juerg Fuhrer, Jan K. Schjoerring, Per Gundersen, Annette Freibauer, Vincenzo Magliulo, Sophie Zechmeister-Boltenstern, Timo Vesala, Jørgen E. Olesen, Bob Rees, Pete Smith, Jo Smith, Michael Obersteiner, Andre van Amstel, Bogdan Chojnicki, Tuomas Laurila, László Horváth, Lars R. Hole, Jan Duyzer, John Moncrieff, Keith Smith, Riccardo Valentini, Volodymyr Medinets, Leif Klemetsson, Franco Miglietta, Zoltán Tuba, Oswald Van Cleemput, Michael Sommer, Per-Erik Jansson, Lech Ryszkowski, Lutz Breuer, Alistair Manning, Ulrich Dämmgen, Josep Peñuelas, Peringe Grennfelt, Filip Moldan, Albert Tietema, Torben R. Christensen, Antonio Vallejo, Patrick Schlegli, Eva Boegh, Jari Liski and Zoltán Bozóki

**and quite a few others....**

# Why care about nitrogen?





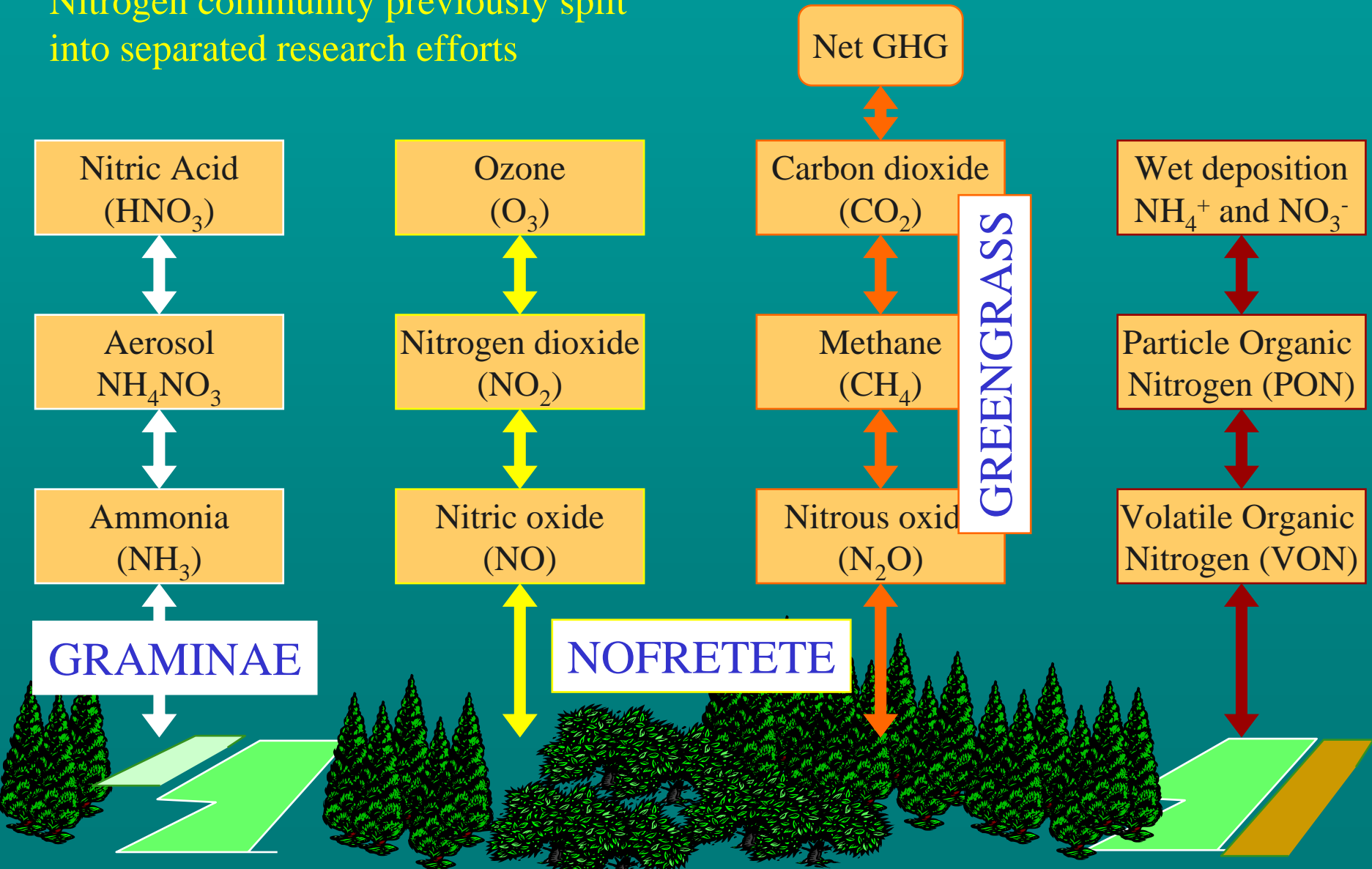
# The Nitrogen Challenge

- **Multi-source**  
agriculture, fossil fuel, natural
- **Multi-pollutant**  
 $\text{N}_2\text{O}$ ,  $\text{NO}_x$ ,  $\text{NH}_3$ , aquatic  $\text{NO}_3^-$ , aerosol etc
- **Multi-problem**  
GHG balance, biodiversity, water quality, human health
- **Multi-receptor**  
Forests & other terrest. ecosystems, agriculture, rivers, stratosphere, urban, coastal & marine, humans

Can the scientific community handle it?

# Land-atmosphere exchange of nitrogen

Nitrogen community previously split into separated research efforts



# NitroEurope IP



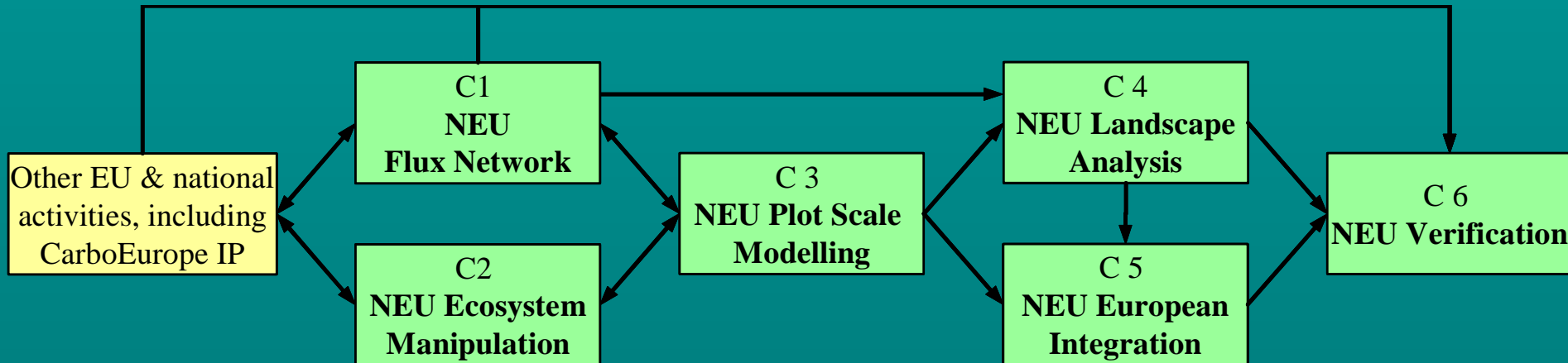
*What is the effect of reactive nitrogen supply on the direction and magnitude of net greenhouse gas budgets for Europe?*

## Effect of N on the GHG balance:

<b>↑ GHG</b>	<b>?</b>	<b>↓ GHG</b>
<b>N<sub>2</sub>O</b> (+2' from NH <sub>3</sub> , NO <sub>3</sub> <sup>-</sup> )	<b>Cattle CH<sub>4</sub></b>	<b>C uptake by plants</b>
<b>CH<sub>4</sub> from wetlands</b>	<b>SOM decomposition</b>	<b>Nitrogen aerosol</b>
<b>NO<sub>x</sub> → O<sub>3</sub> → less primary production</b>		

# NitroEurope

## Overall Science Structure



Plus four supporting components:

C7. Standards and Data Management

C8. NEU Management

C9: NEU Training

C10: NEU Dissemination



# Linking Tasks and Delivery in NEU



## C1 Flux Networks

- Methods development
- Integrated air, plant and soil data
- Process understanding

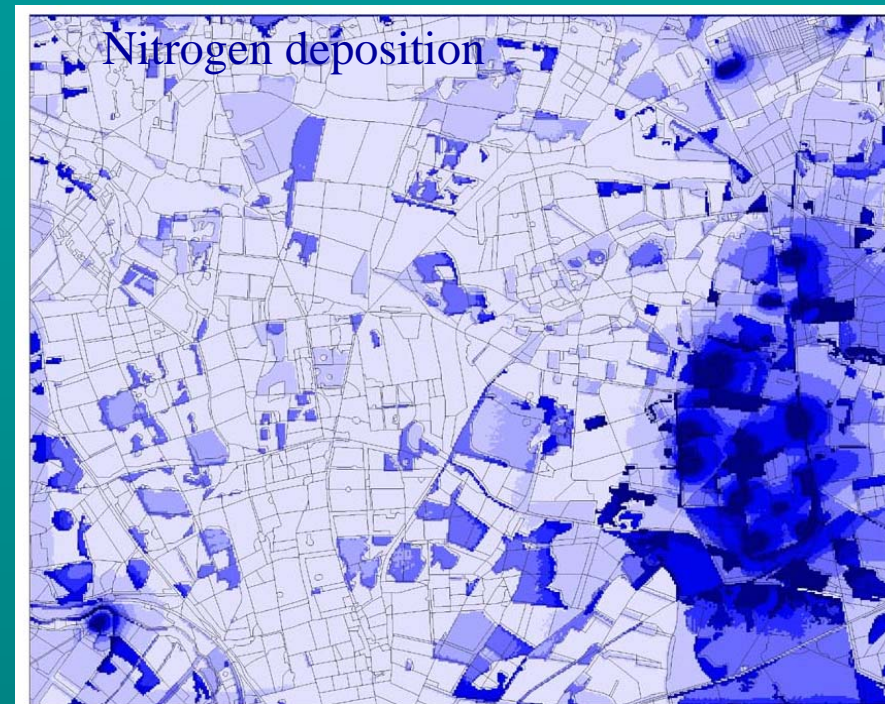
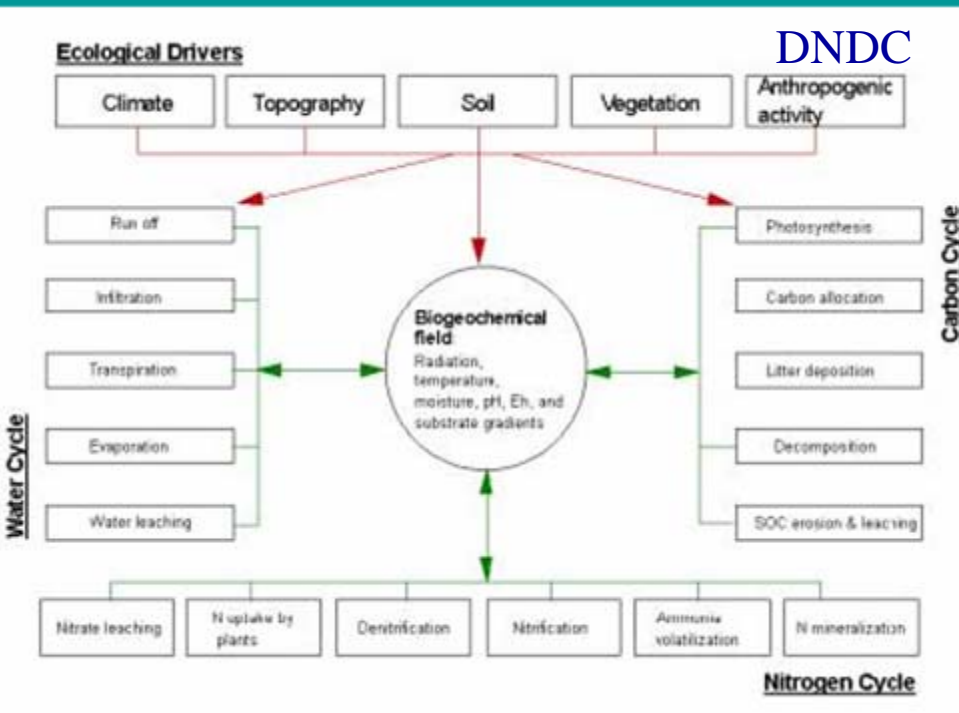


## C2 Manipulation

- Process testing
- System responses to perturbation
- Interactions between drivers



# Linking Tasks and Delivery in NEU



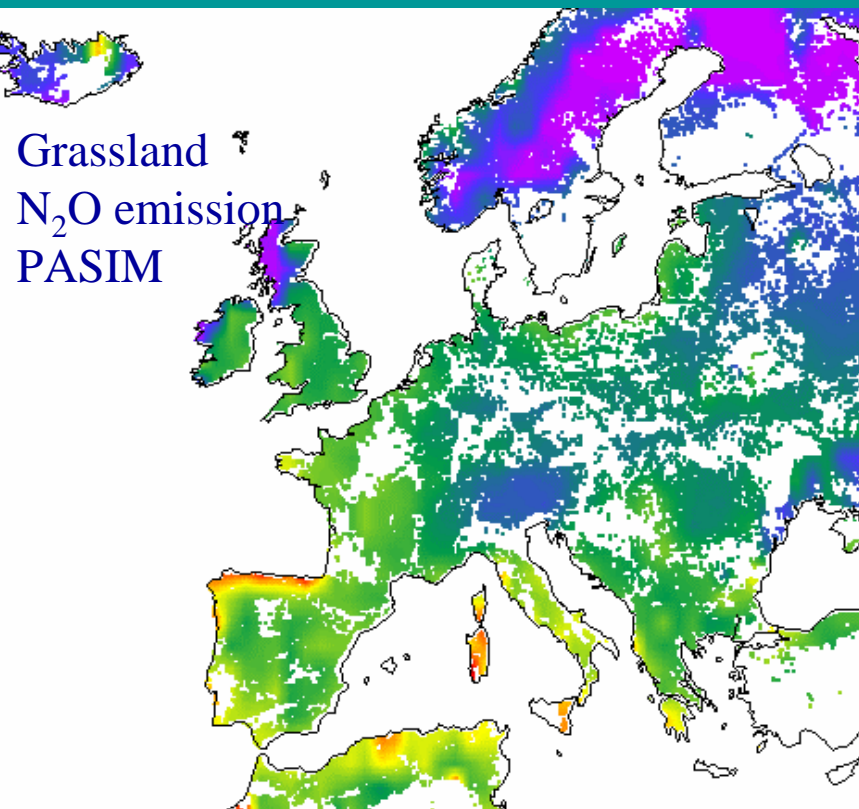
## C3 Plot-scale modelling

- Reconstruction of observations
- Explanation of interactions
- Prediction of future responses

## C4 Landscape analysis

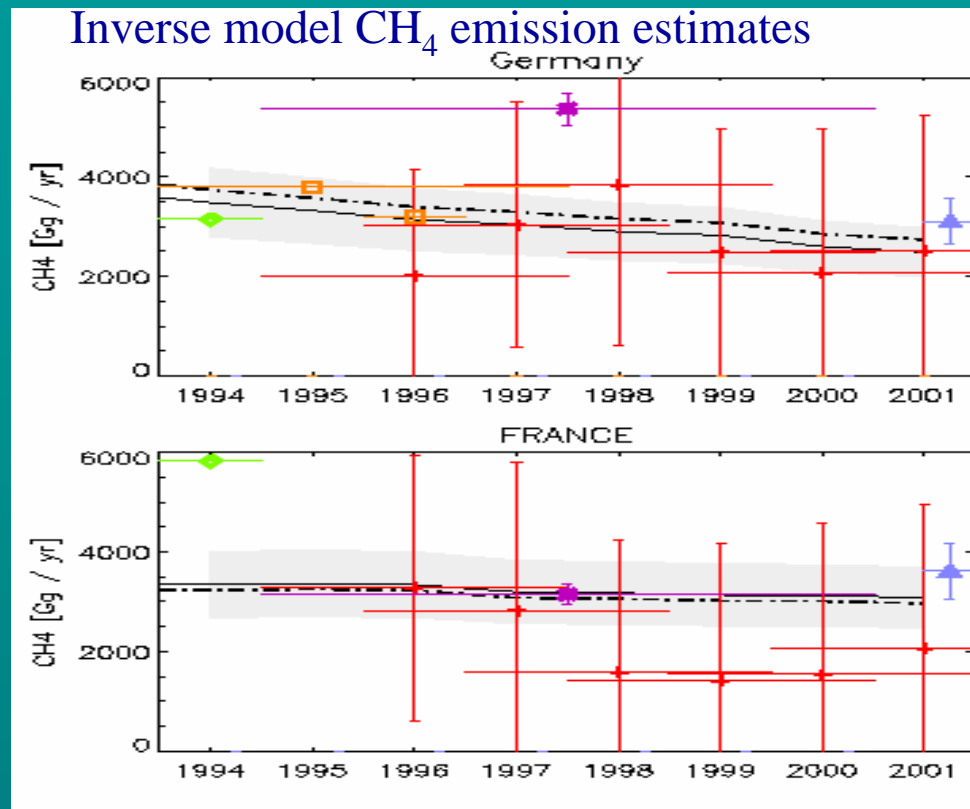
- Spatial interactions
- Complexity
- Management interactions
- Abatement strategies

# Linking Tasks and Delivery in NEU



## C5 European Integration

- Upscaling
- Improving input datasets
- Ecosystem vs multi-sector models
- Past changes and future scenarios

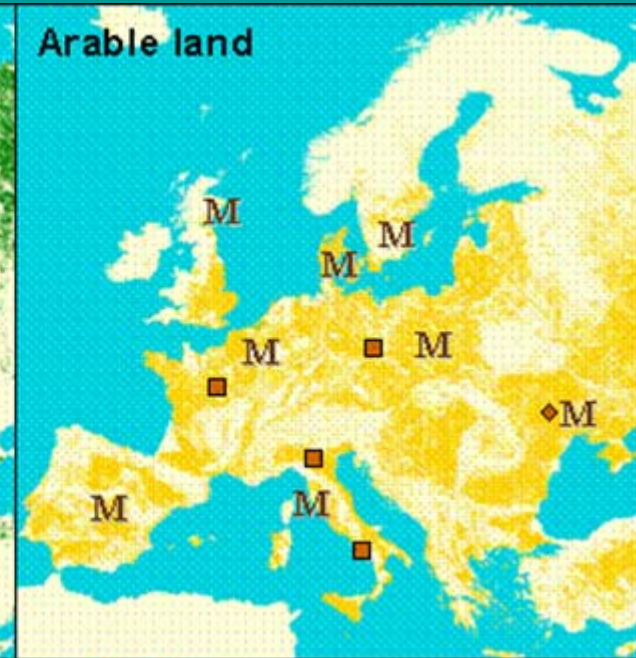


## C6: Verification

- Independent data check
- Uncertainty assessment
- Protocol compliance
- Revision of IPPC/UNECE values



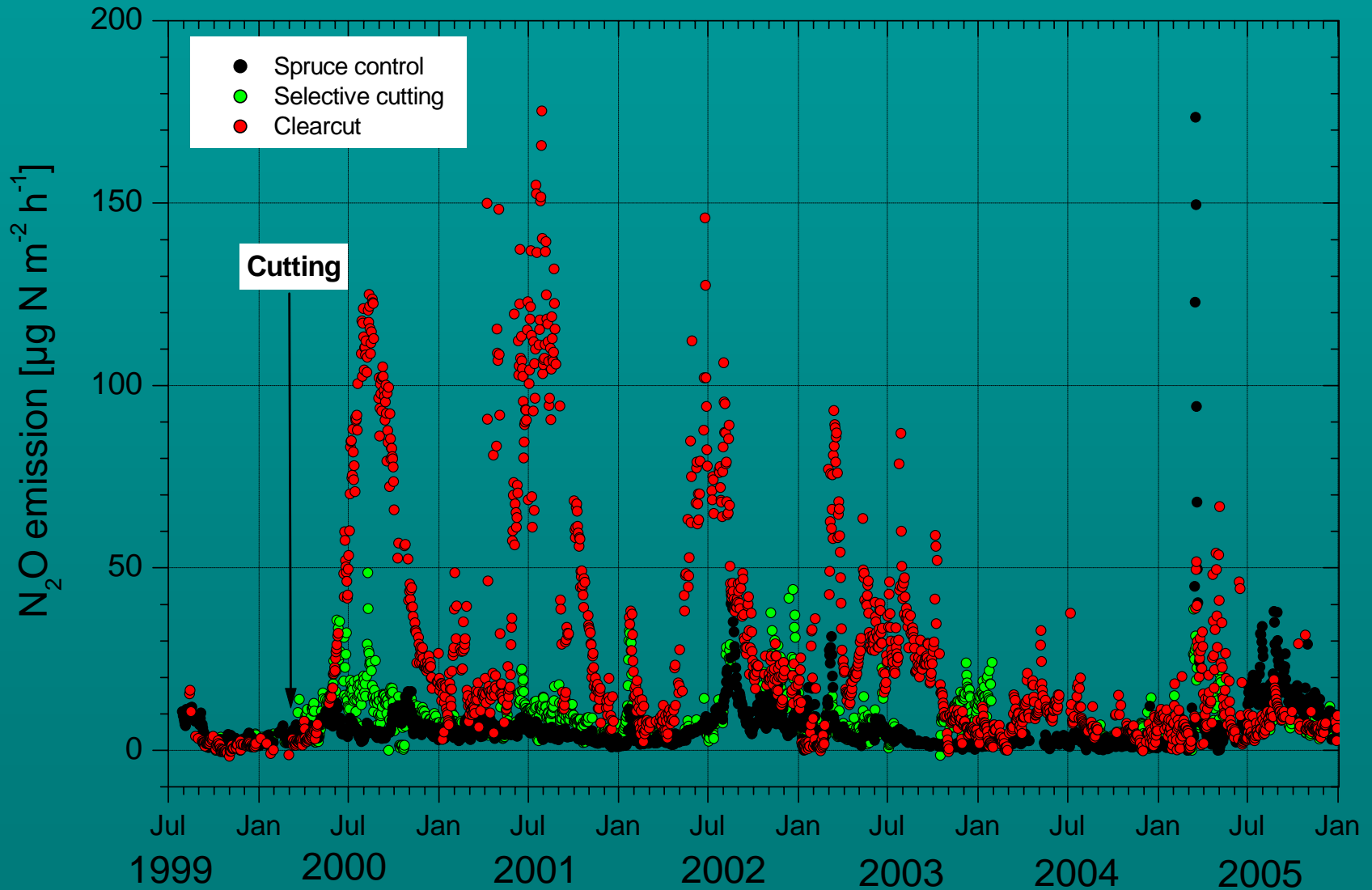
# NitroEurope: Flux network (C1) & Manipulation network (C2)



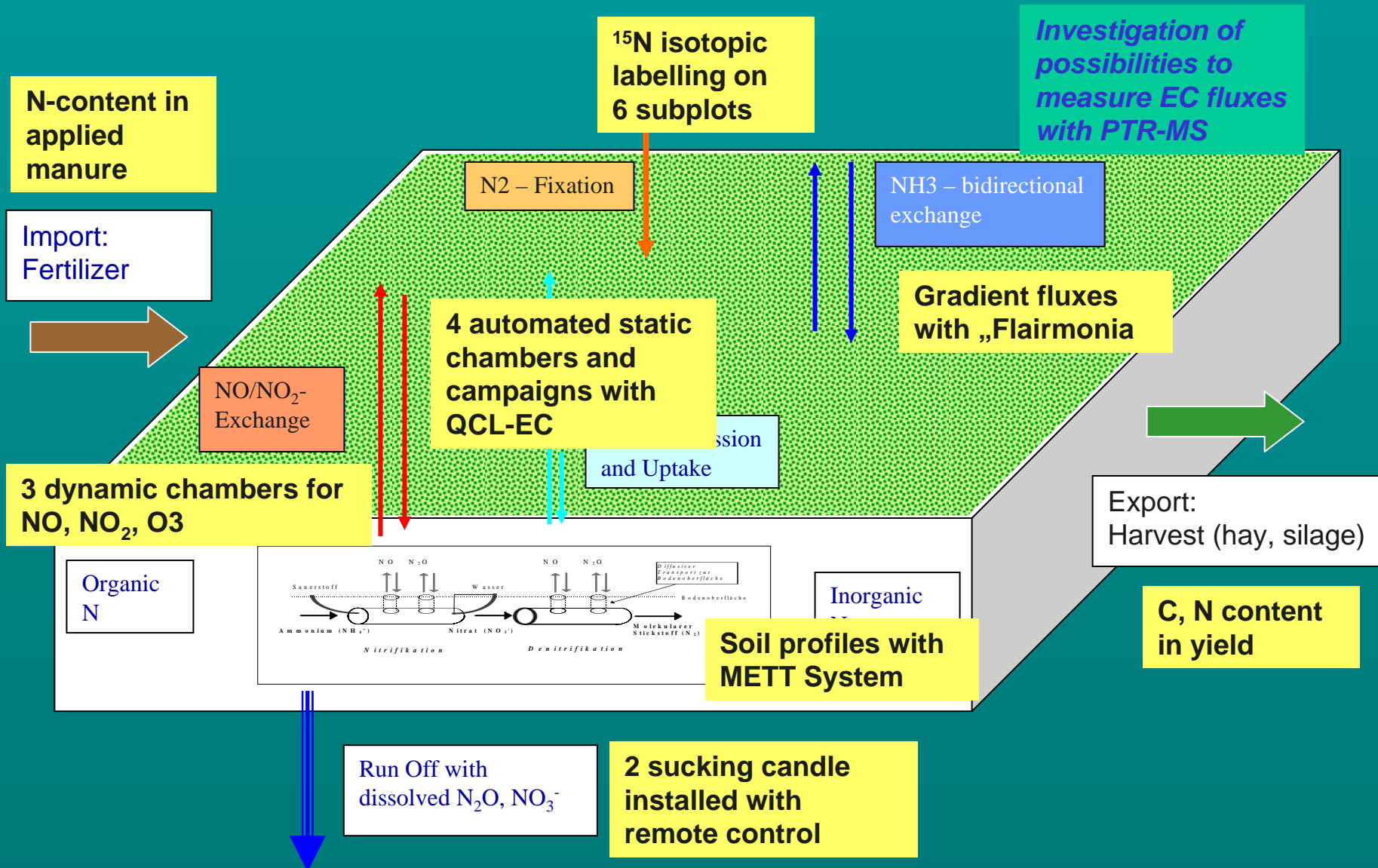
13 Super Sites  
9 Regional Sites  
50 Inferential Sites

22 Core Manipulation Sites  
14 Assoc. Manipulation Sites

# N<sub>2</sub>O Hoeglwald NEU Level 3 site



# NEU Level 3 site Oensingen





# The NEU L1 DELTA Network



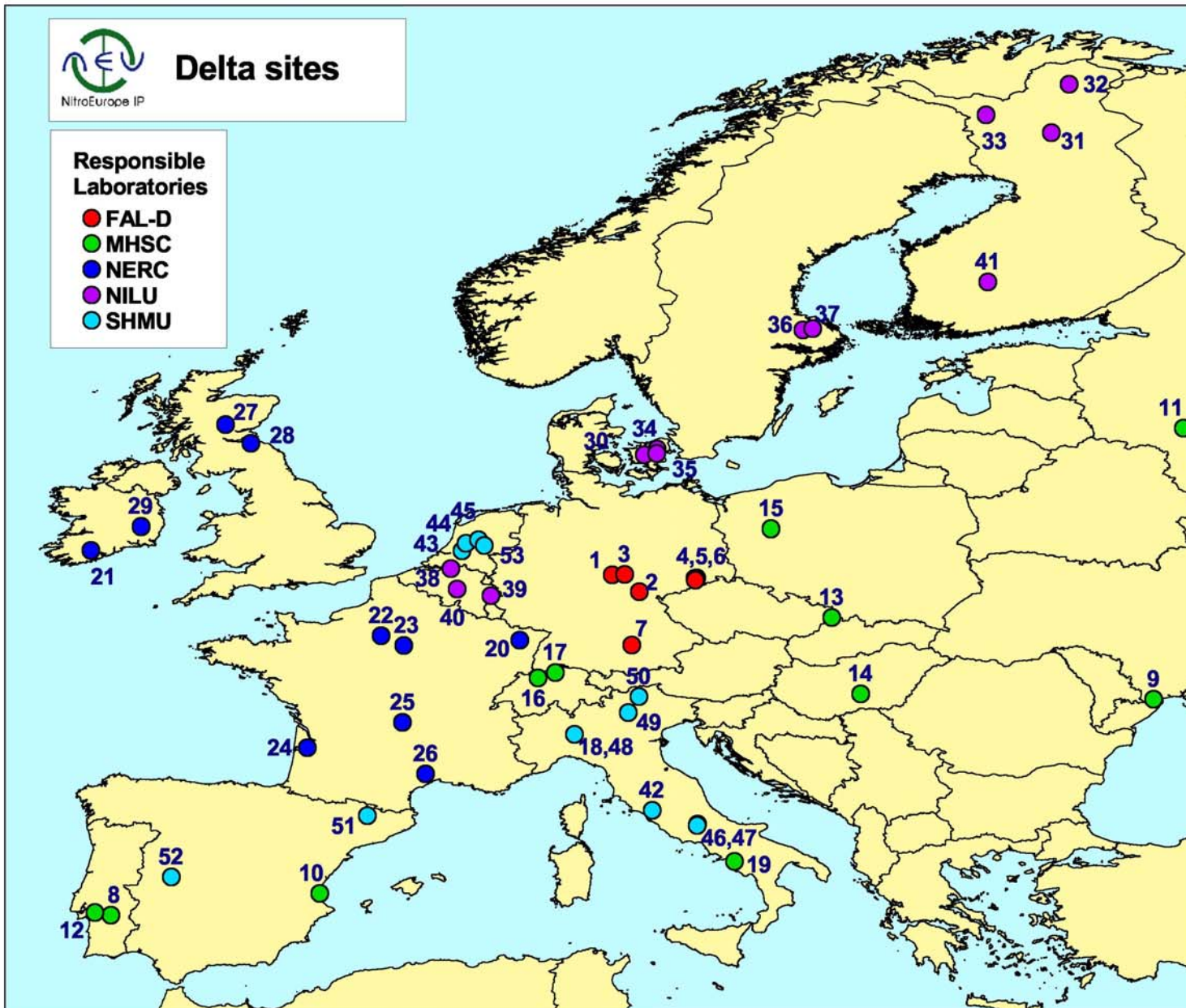
## Delta sites

### Responsible Laboratories

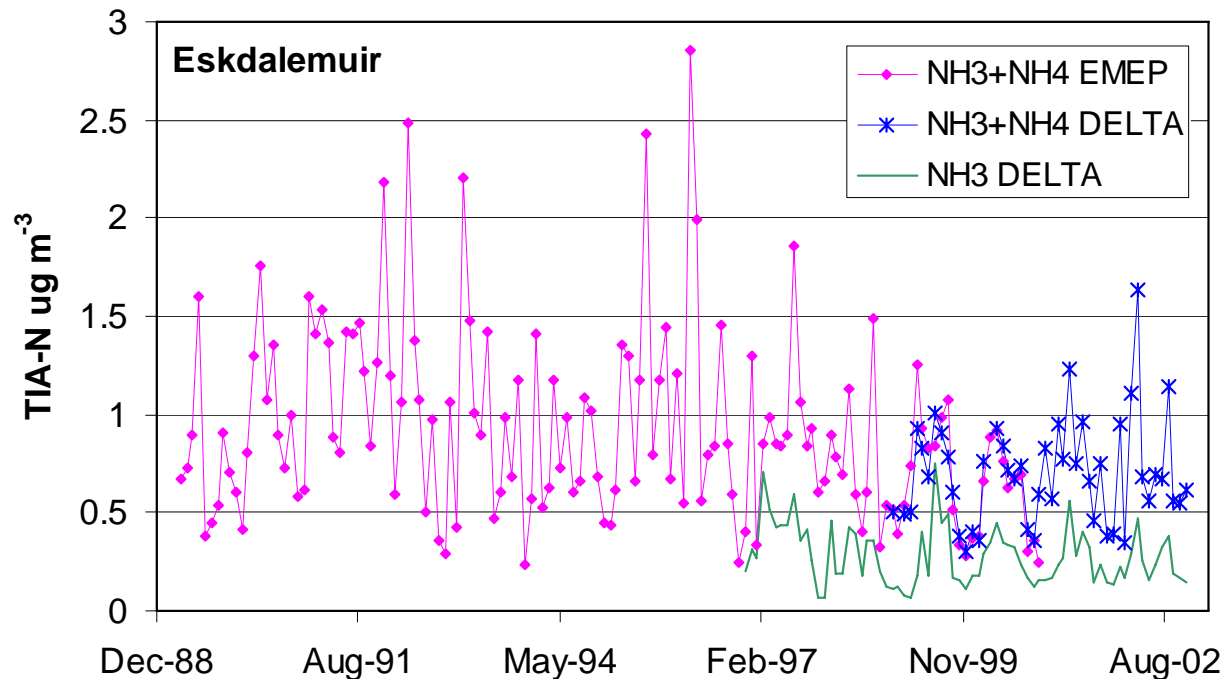
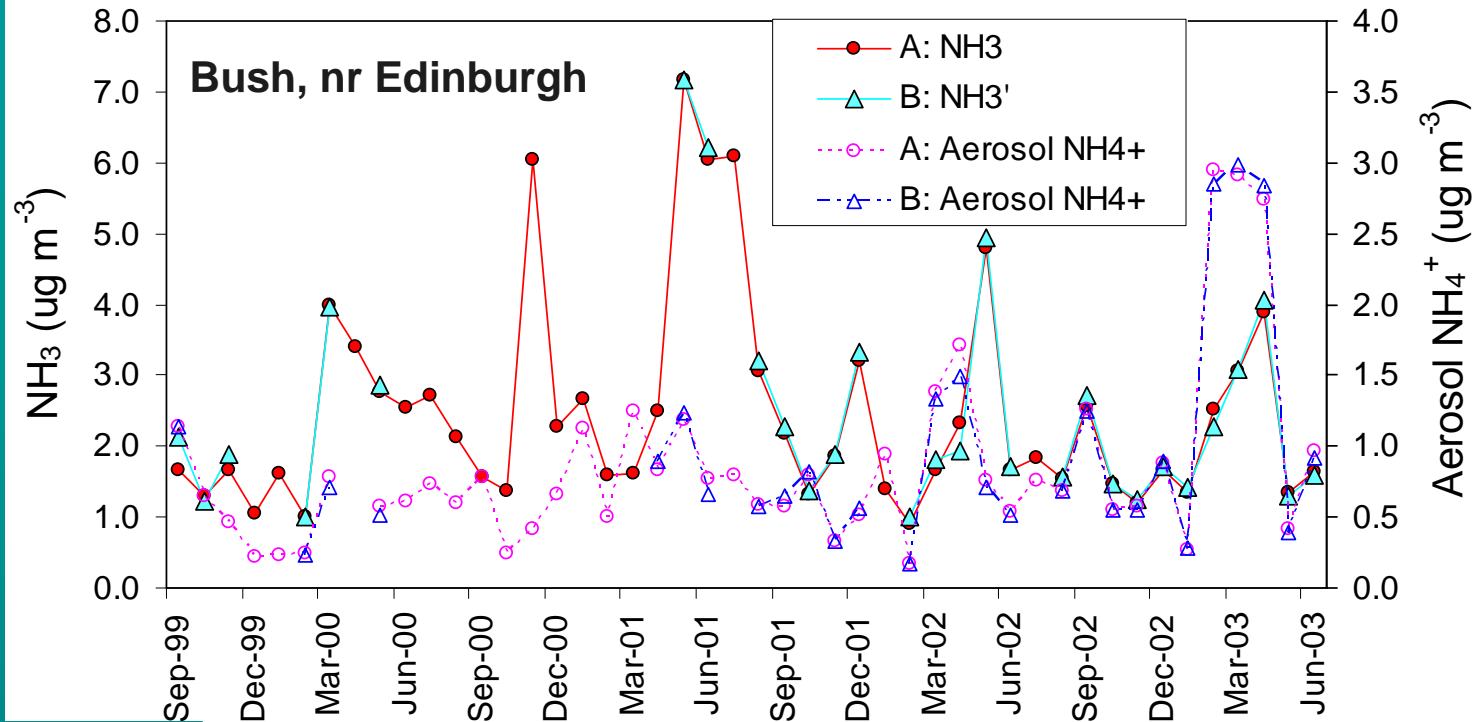
- FAL-D
- MHSC
- NERC
- NILU
- SHMU

### Site names

- 1 Hainich
- 2 Wetzstein
- 3 Gebesee
- 4 Tharandt
- 5 Grillenburg
- 6 Klingenberg
- 7 Hoglwald
- 8 Mitra II
- 9 Petrodolinskoye
- 10 El Saler
- 11 Fyodorovskoe bog
- 12 Espirra
- 13 BKFORES
- 14 Bugac
- 15 POLWET
- 16 Oensingen
- 17 Laegern
- 18 Po Valley Pavia
- 19 Piana del Sele
- 20 Hesse
- 21 Dripsey
- 22 Grignon
- 23 Fontainbleu
- 24 Le Bray
- 25 Laqueuille
- 26 Puechabon
- 27 Griffin
- 28 East Saltoun
- 29 Carlow
- 30 Soroe
- 31 Sodankylä
- 32 Kaamanen
- 33 Lompolojänkkä
- 34 Rimi
- 35 Risbyholm
- 36 Norunda
- 37 Skyttorp
- 38 Braschaat
- 39 Vielsalm
- 40 Lonzee
- 41 Hyytiälä
- 42 Roccarespampani
- 43 Cabauw
- 44 Horstermeer
- 45 Speulder
- 46 Amplero
- 47 Collelongo
- 48 Parco Ticino
- 49 Monte Bondone
- 50 Renon
- 51 Vall de Aliñá
- 52 Las Majadas del Tietar
- 53 Loobos

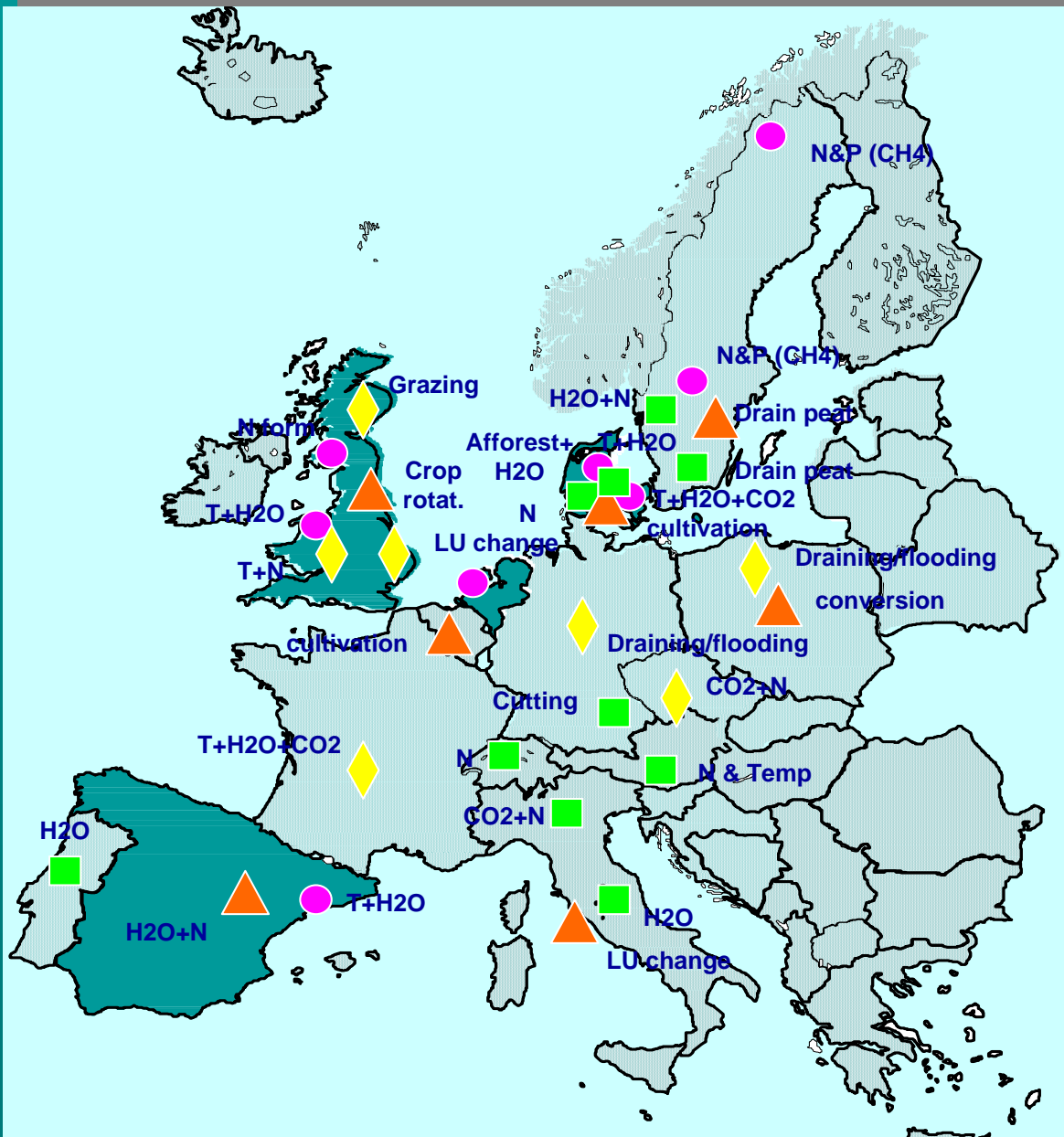


# Examples of DELTA $\text{NH}_x$ data from the UK





# NitroEurope Manipulation Network (NEU C2)

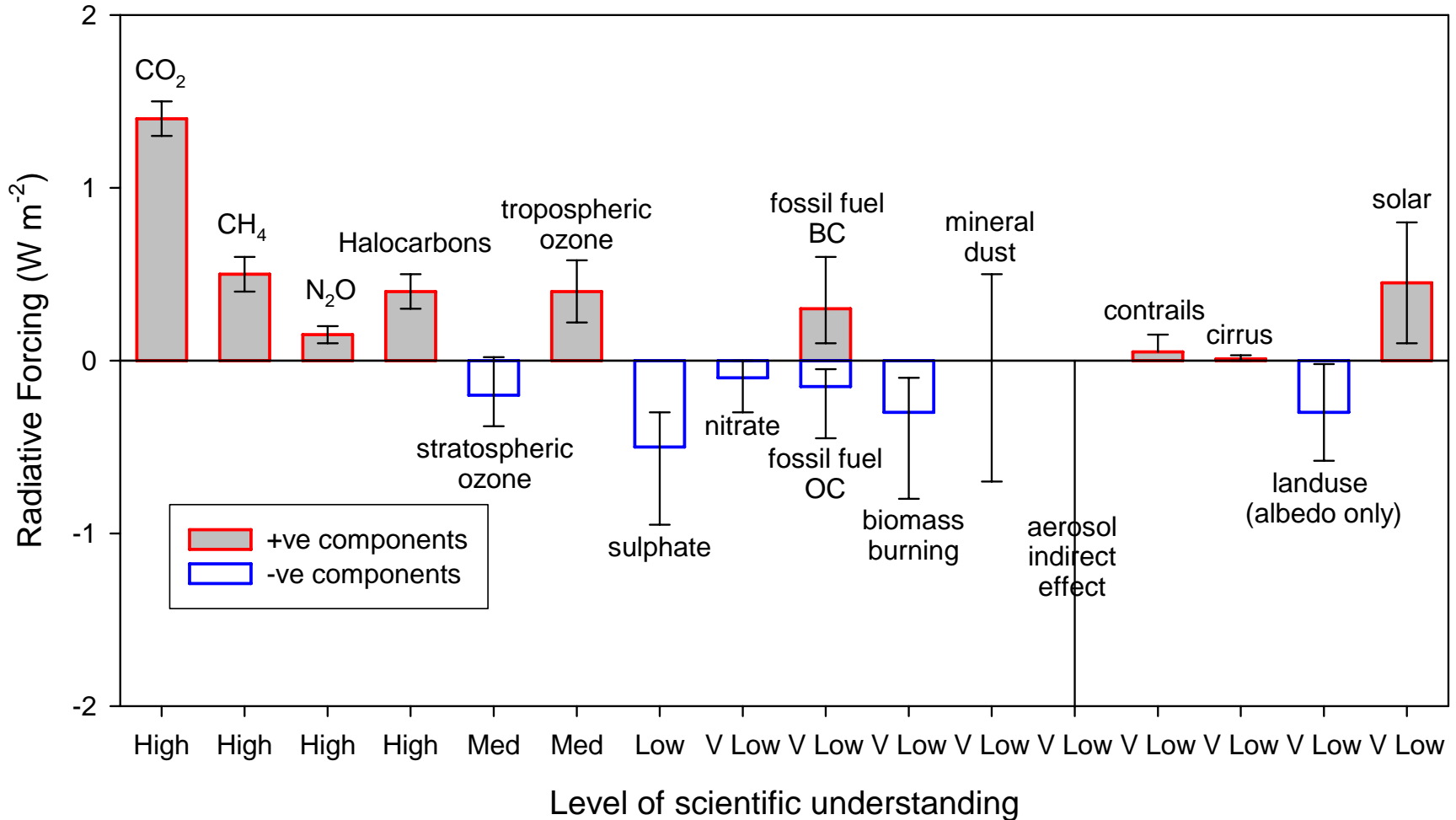


### Sites and experiments

- ▲ Arable
- Forest
- Shrub/wet
- ◆ Grass

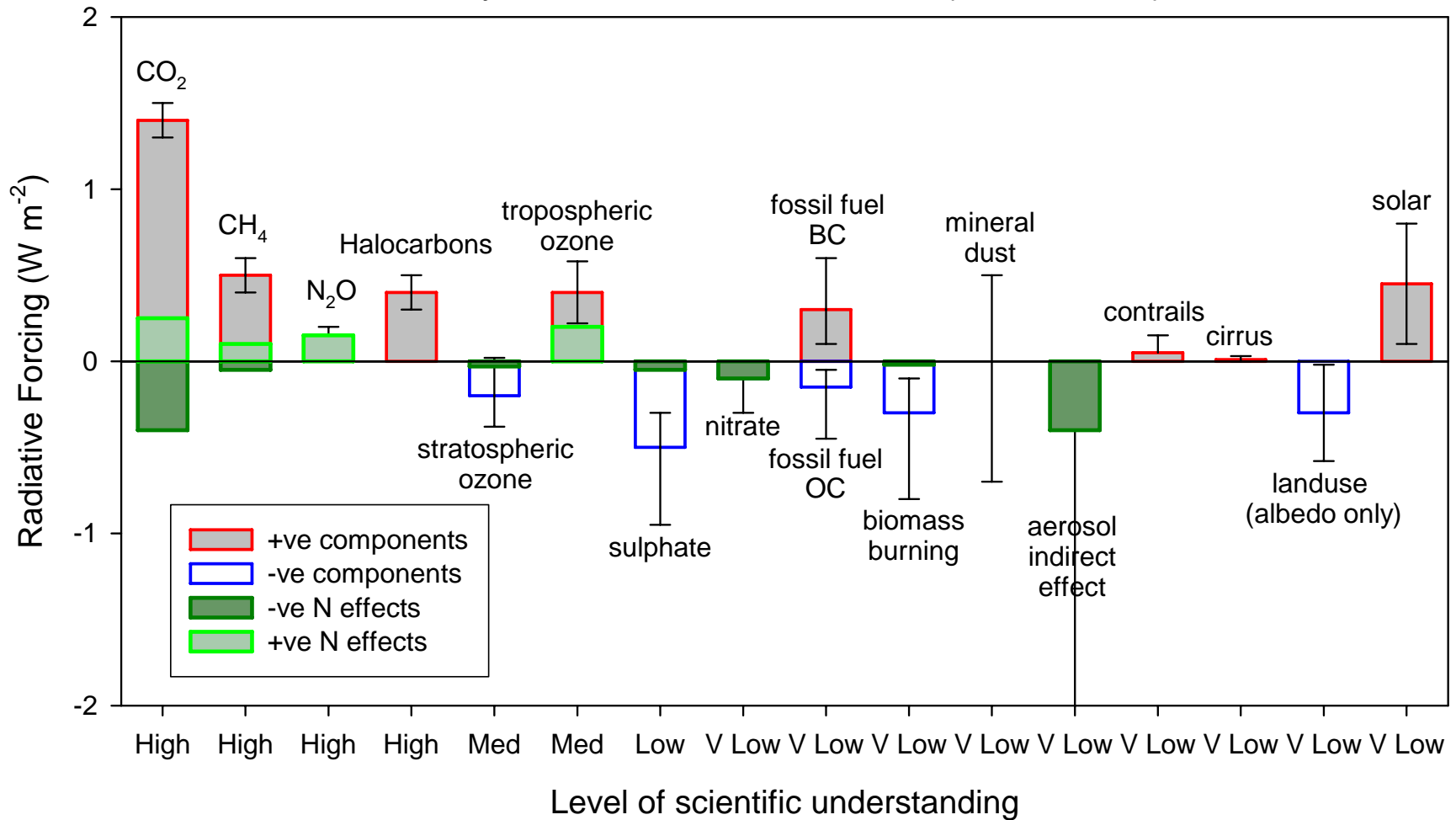
# The effect of N on the GHG balance ...

The mean global radiative forcing of the climate system for the year 2000, relative to 1750 (IPCC, 2001)



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The mean global radiative forcing of the climate system for the year 2000, relative to 1750 (IPCC, 2001)



# Further information

- See [www.nitroeuropa.eu](http://www.nitroeuropa.eu)
- 2<sup>nd</sup> General Assembly Paestum, Italy (5-9 Feb 2006)
- Project Office
  - Stefan Reis, Joyce Luk
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