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Assimilating EO Data into Terrestrial Carbon Cycle Models

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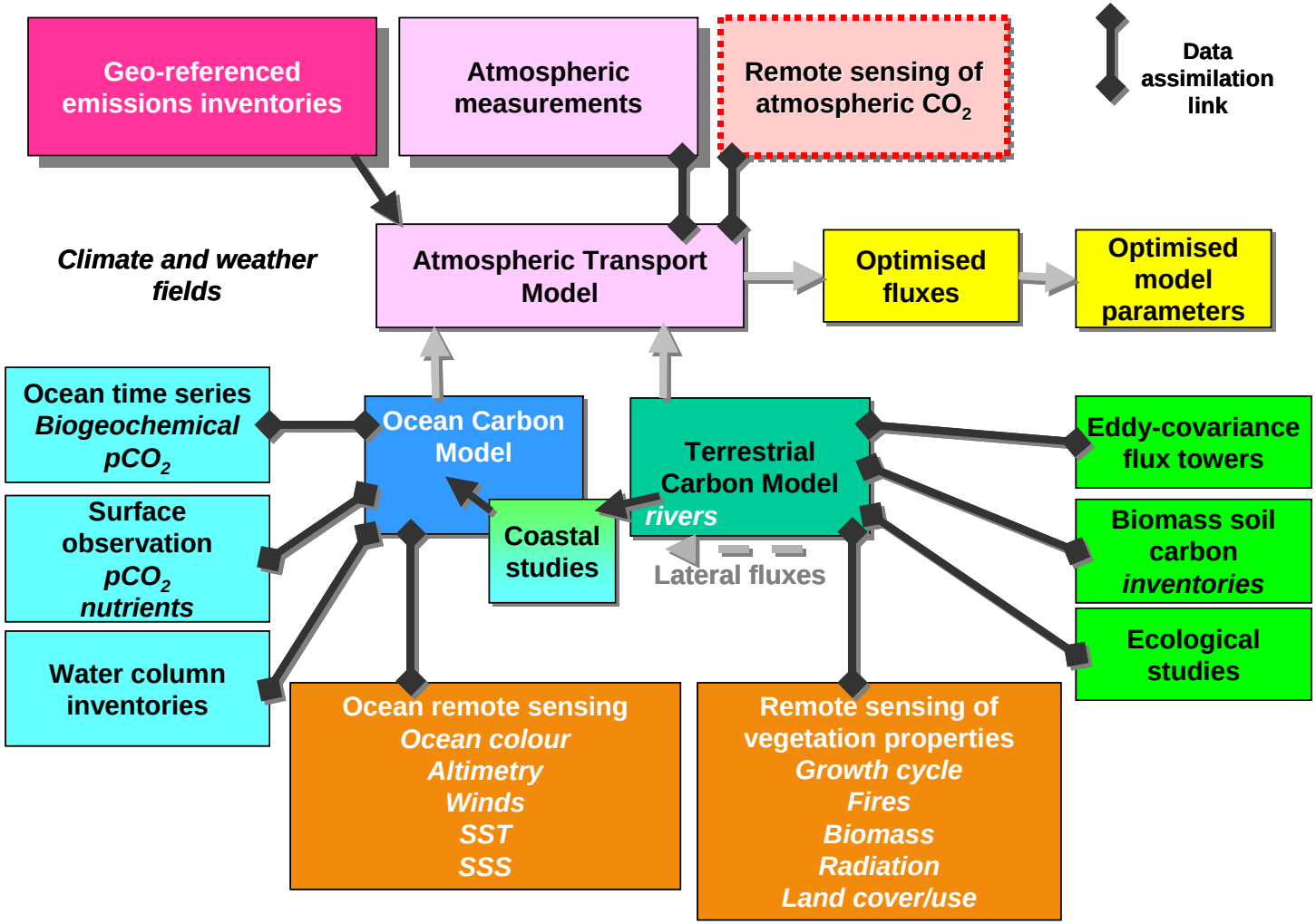
University of Sheffield

THE UNIVERSITY OF EDINBURGH

UCL

THE UNIVERSITY of York

Global Carbon Data Assimilation System



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Source: Ciais et al. 2003 IGOS-P Integrated Global Carbon Observing Strategy

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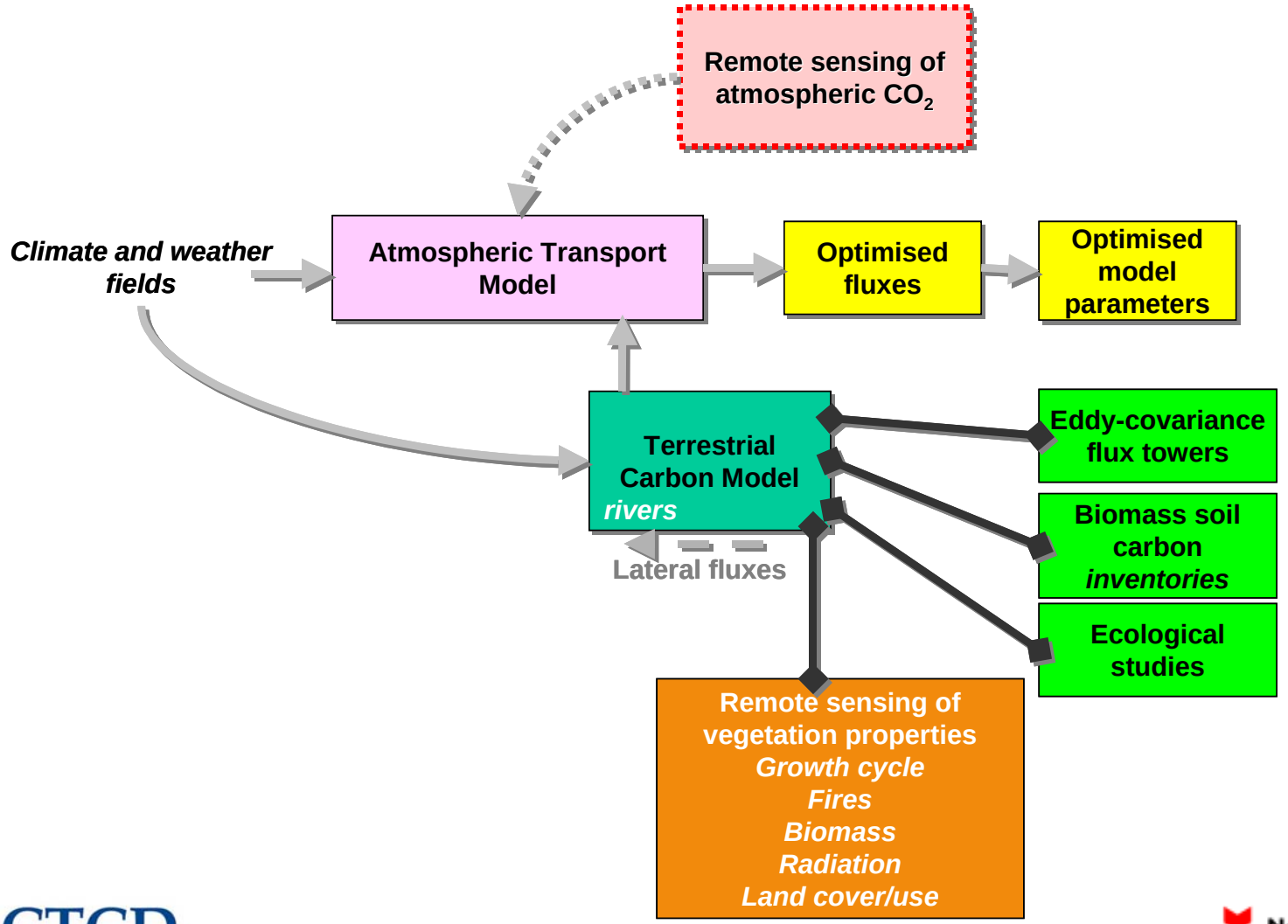
Terrestrial component



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Regional scale C budgets

Age structure determines future carbon flux:

$$NPP = \sum_{i=age} A_i \, NPP_i$$

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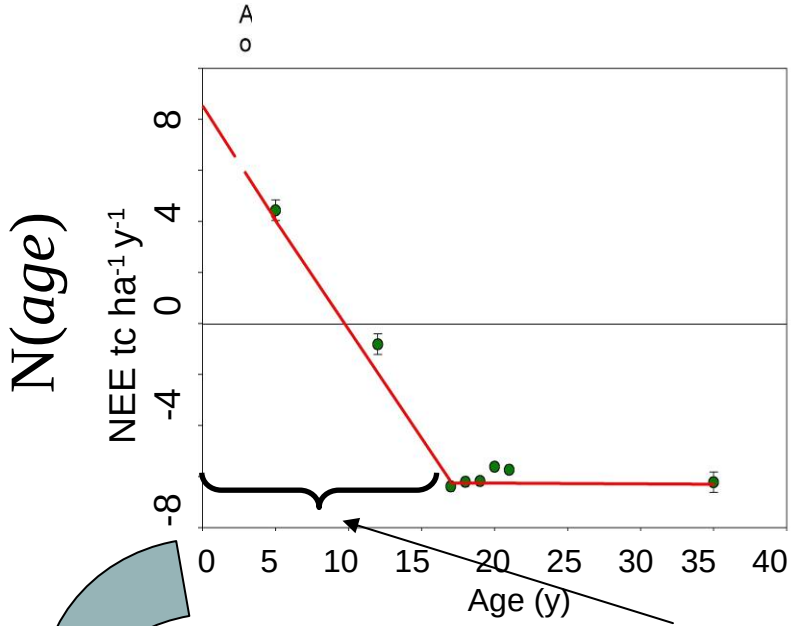
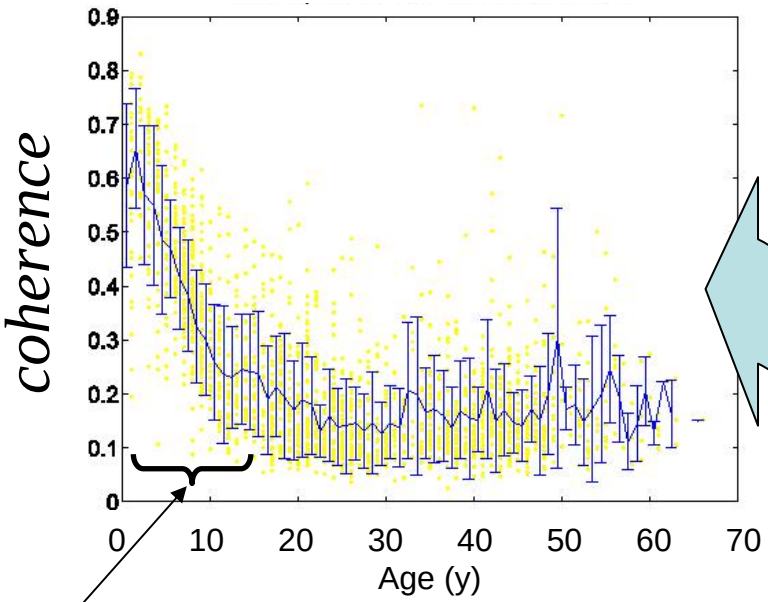
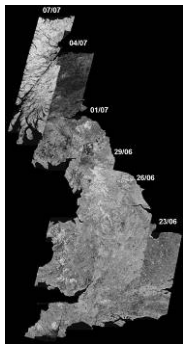
Key result 2: Estimating NEE with SAR





Sensitivity range



X

$$NEE = \int_X N(A(x))\, dx$$

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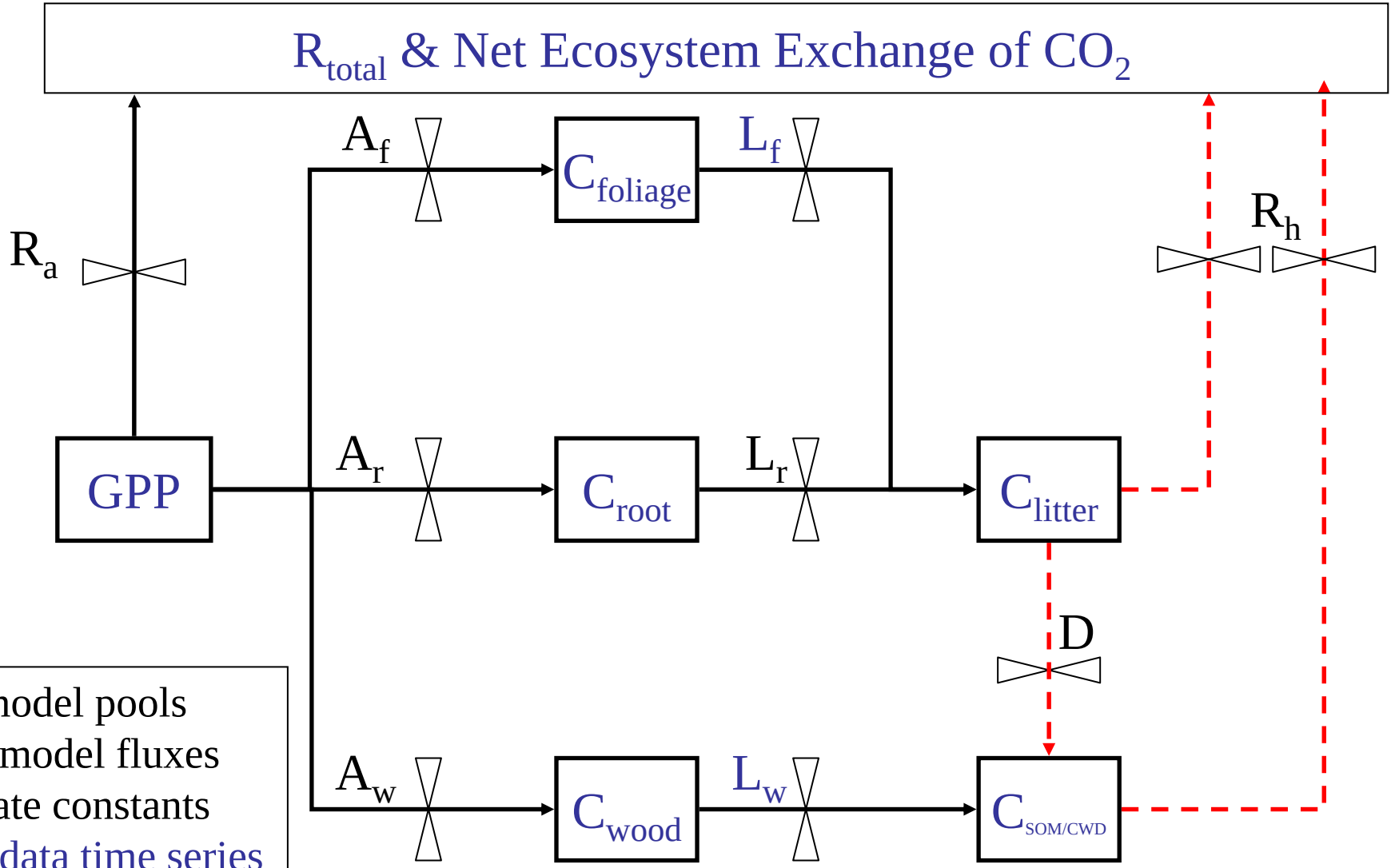

6 model pools
10 model fluxes
9 rate constants
10 data time series

C = carbon pools
A = allocation
L = litter fall
R = respiration (auto- & heterotrophic)

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Land cover and the C balance

- The tropical C balance
  - Improved knowledge on deforestation
- The boreal C balance
  - Improved knowledge on VCF and firescars

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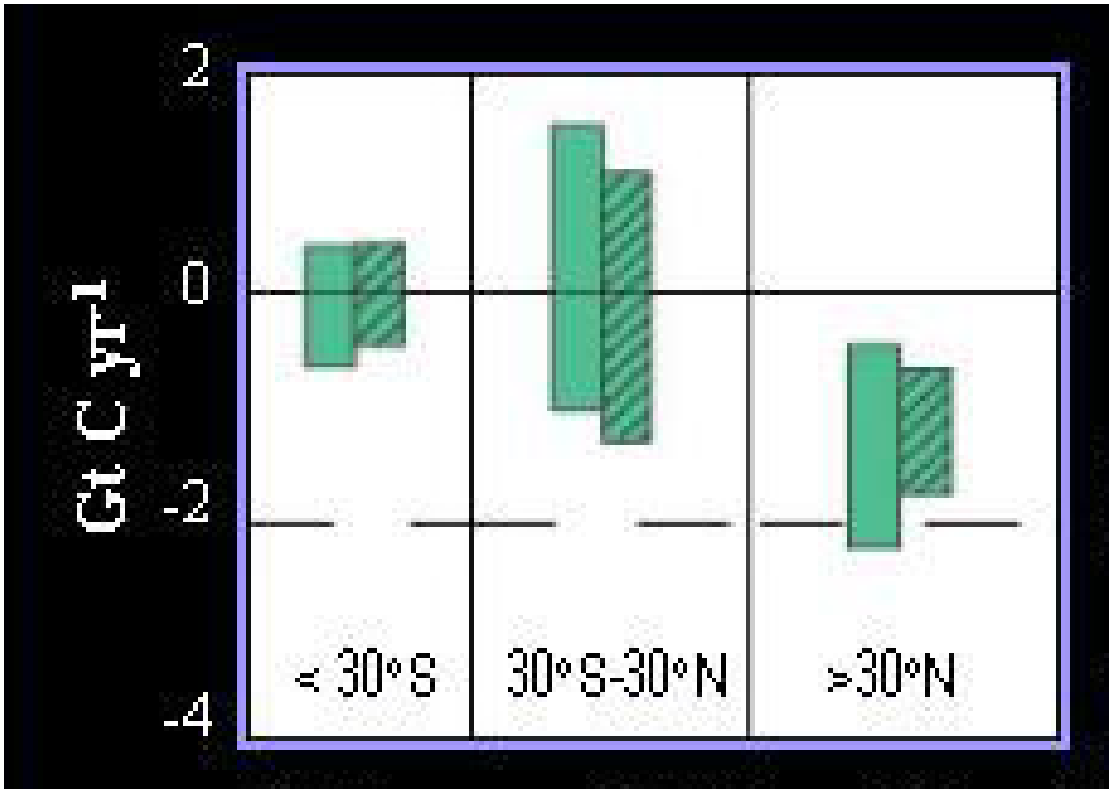
Current knowledge on carbon sources and sinks (from atmospheric inversions)



Land carbon sinks (<0) and sources (>0) for the 1980s (plain bars) and for 1990-1996 (hatched bars) (Heimann et al., 2001)

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1-2 Gigatons sequestered on land North of 30°; elsewhere, sources match sinks

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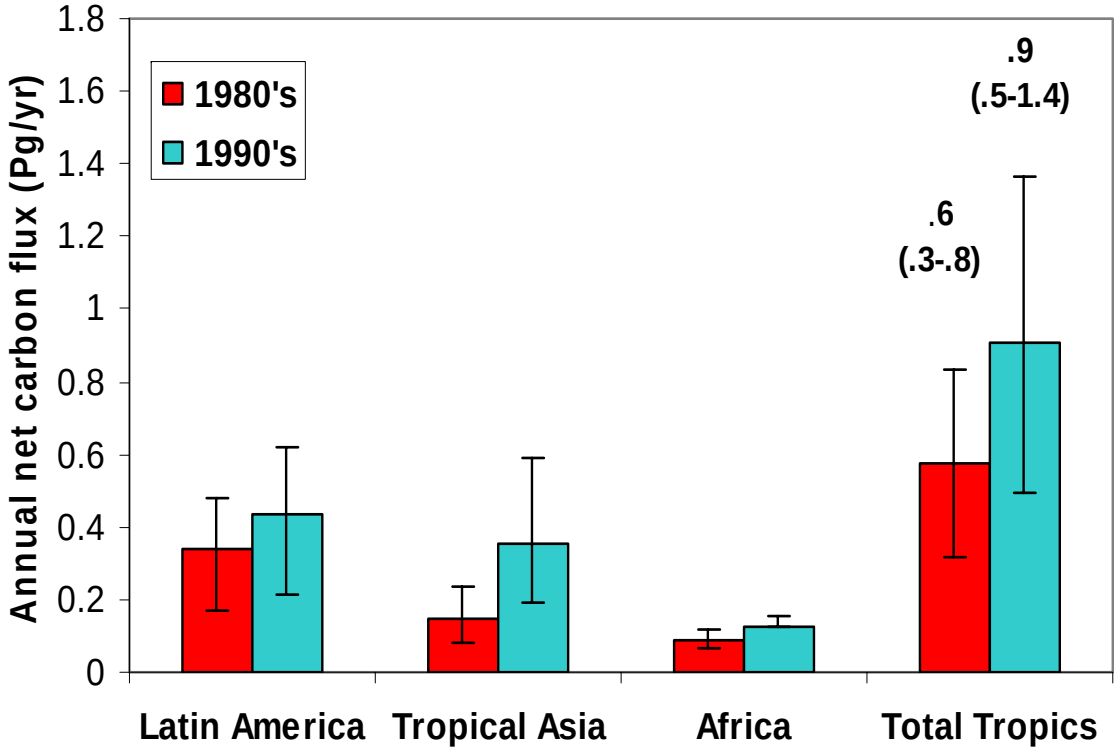
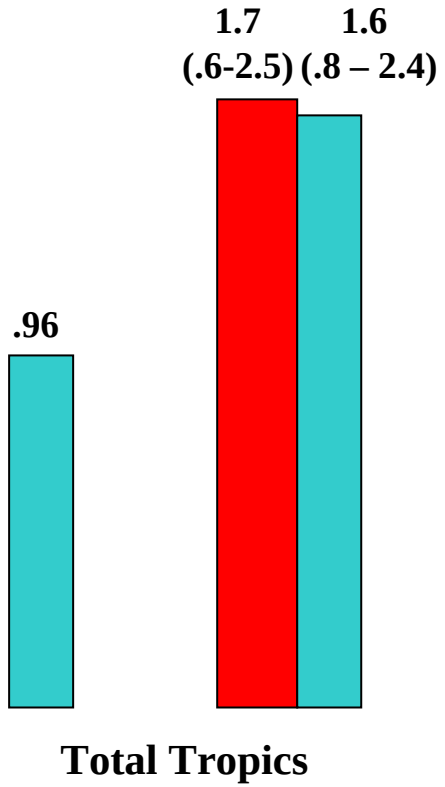
Estimated Carbon Flux from Tropical Deforestation and Regrowth for 1980s and 90s



(DeFries, et al., 2002)



(Achard et al., 2002)

IPCC estimates based on FAO stats

"Bottom up" estimates based on satellite observations indicate substantially lower fluxes than estimates based on national statistics

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Combining data sources

The aim is to combine all available data sources,

atmospheric (SCIAMACHY, GOSAT, OCO)

surface (multiple data sources) with models to estimate and assign

- CO2 fluxes
- CH4 fluxes

at regional and global scale

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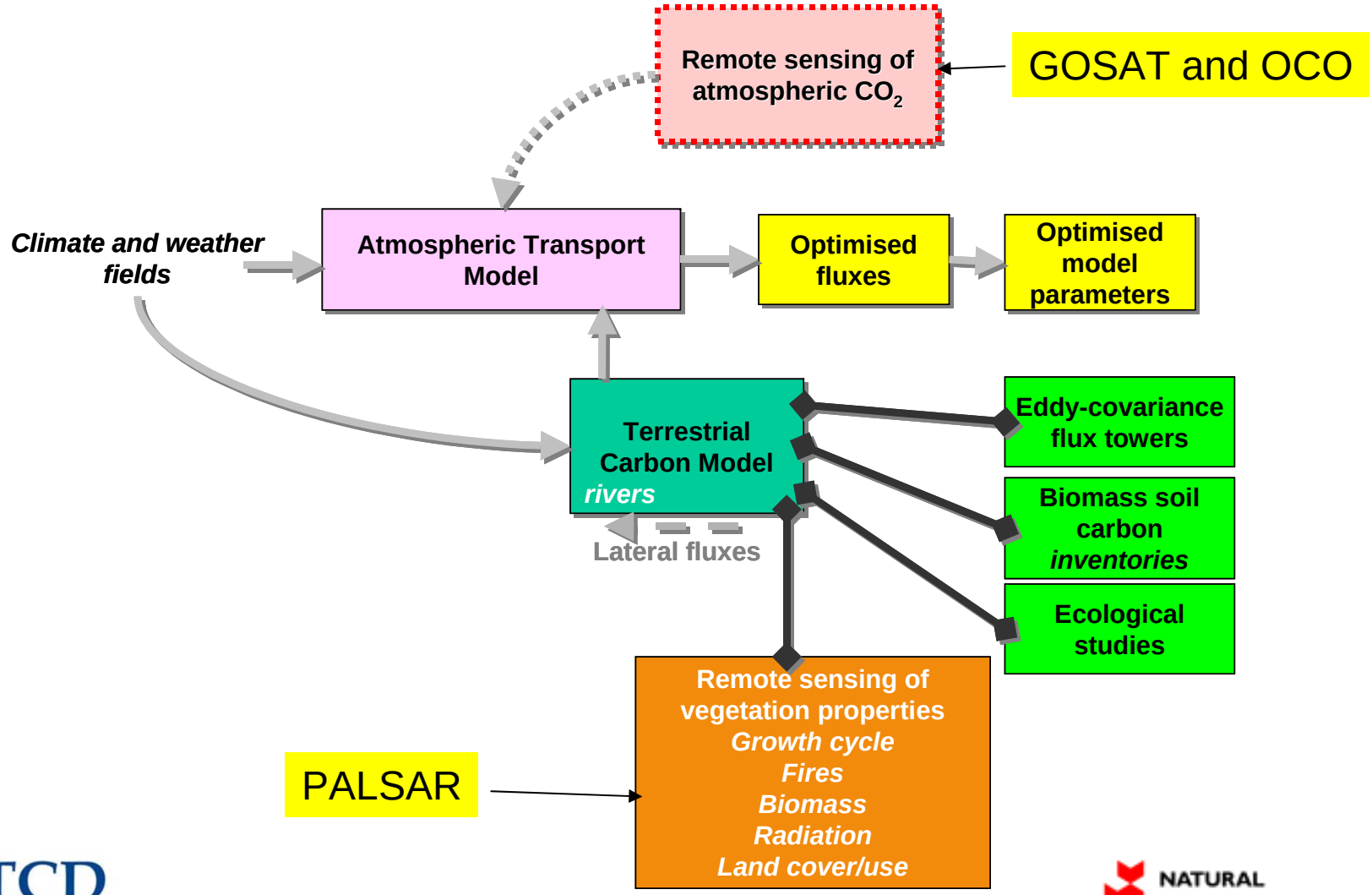
Atmospheric and surface data



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Practicalities

- RA dedicated to using ALOS for model initialisation and testing (forest/non-forest; age vs backscatter in plantation forests; linking backscatter to biomass; VCF)
- LC and LCC in Malaysia (new PhD)
- UK National Centre for EO

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