

Going beyond the stationary flux towers to assess the interactions of land use and climate

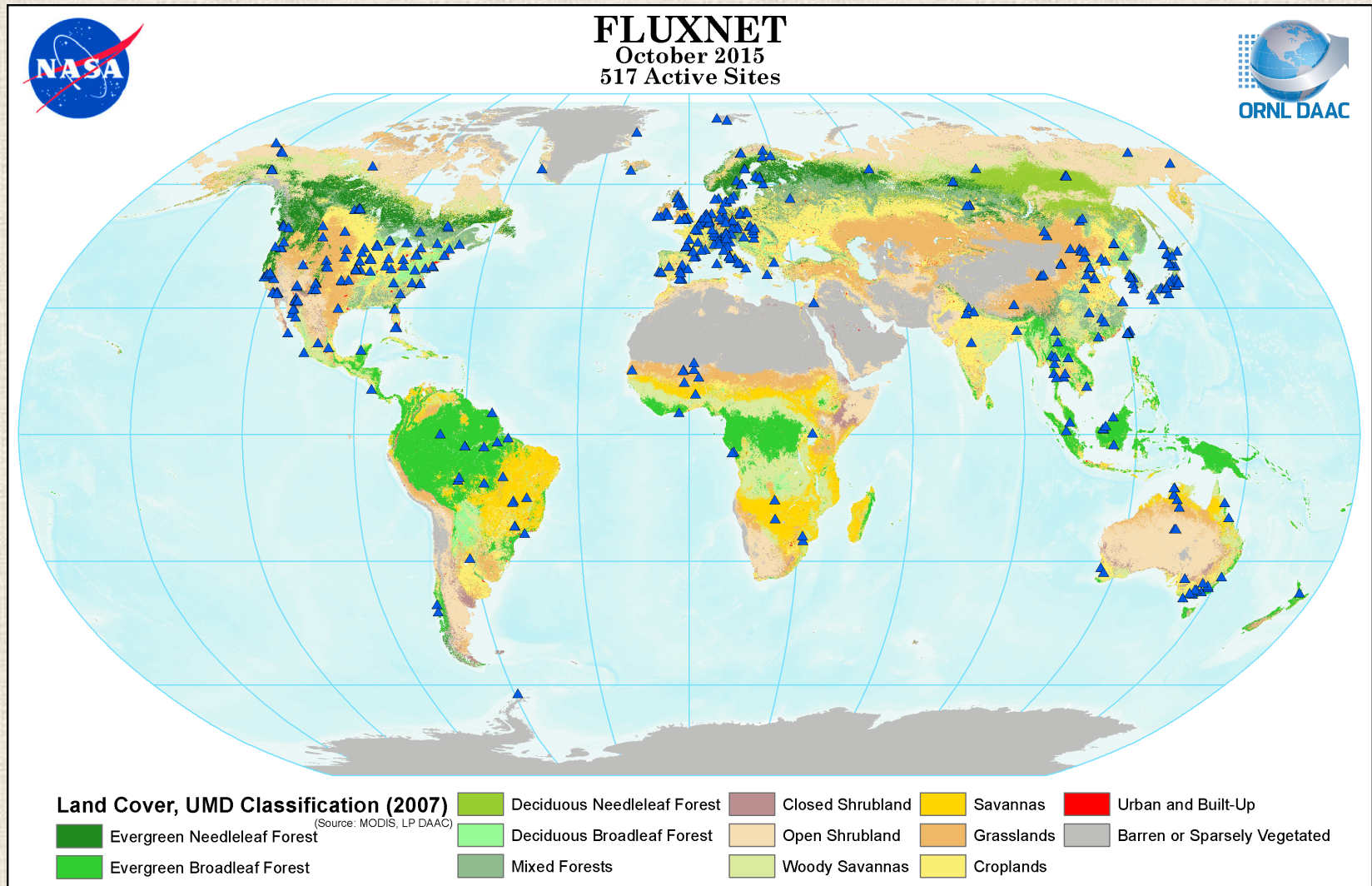
Dan Yakir, Shani Rohatyn, Efrat Ramati, Feyodor Tatarinov, Eyal
Rotenberg, Rafael Stern, Madi Amer

Earth & Planetary Sciences



Support: KKL, Lewis & Wills, ISF, Minerva, Water Authority; WIS

Fluxnet site distribution: Leaving much to be desired...



PERSPECTIVES



Slow in, Rapid out--Carbon Flux Studies and Kyoto Targets

Christian Körner

Science **300**, 1242 (2003);

DOI: 10.1126/science.1084460

However, such measurements have limited potential to contribute to a quantification of a region's, a nation's, or a subcontinent's carbon budget. These limitations deserve wider acknowledgment, given the hopes tied to such studies for carbon accounting within the Kyoto protocol.



Limited flexibility of the permanent Fluxnet sites:

- **Species**
- **Age**
- **Soil type**
- **Slope/aspect**
- **Disturbance**
- **Water availability**
- **Local climate**



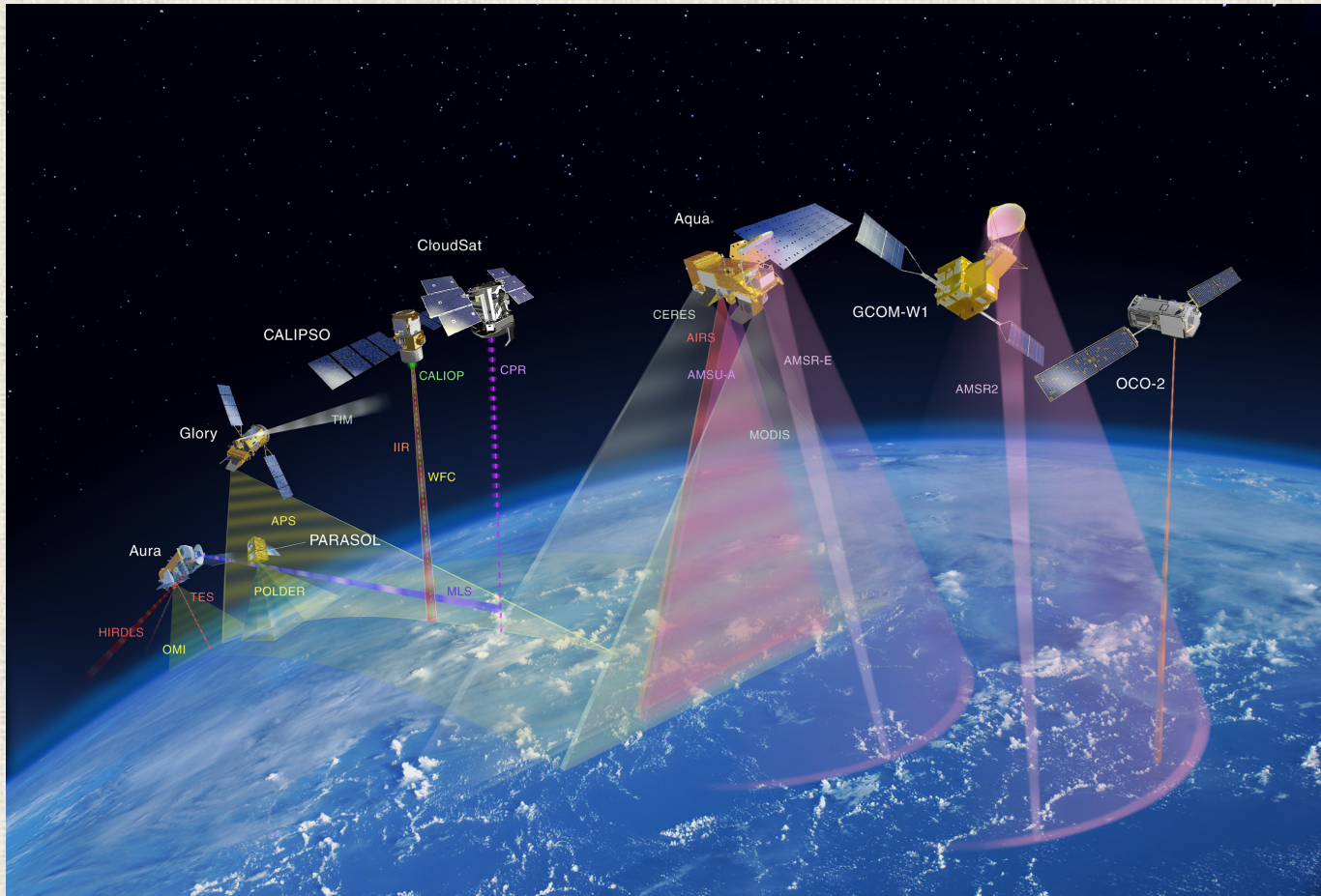
Some potential remedies:

1) Going higher...

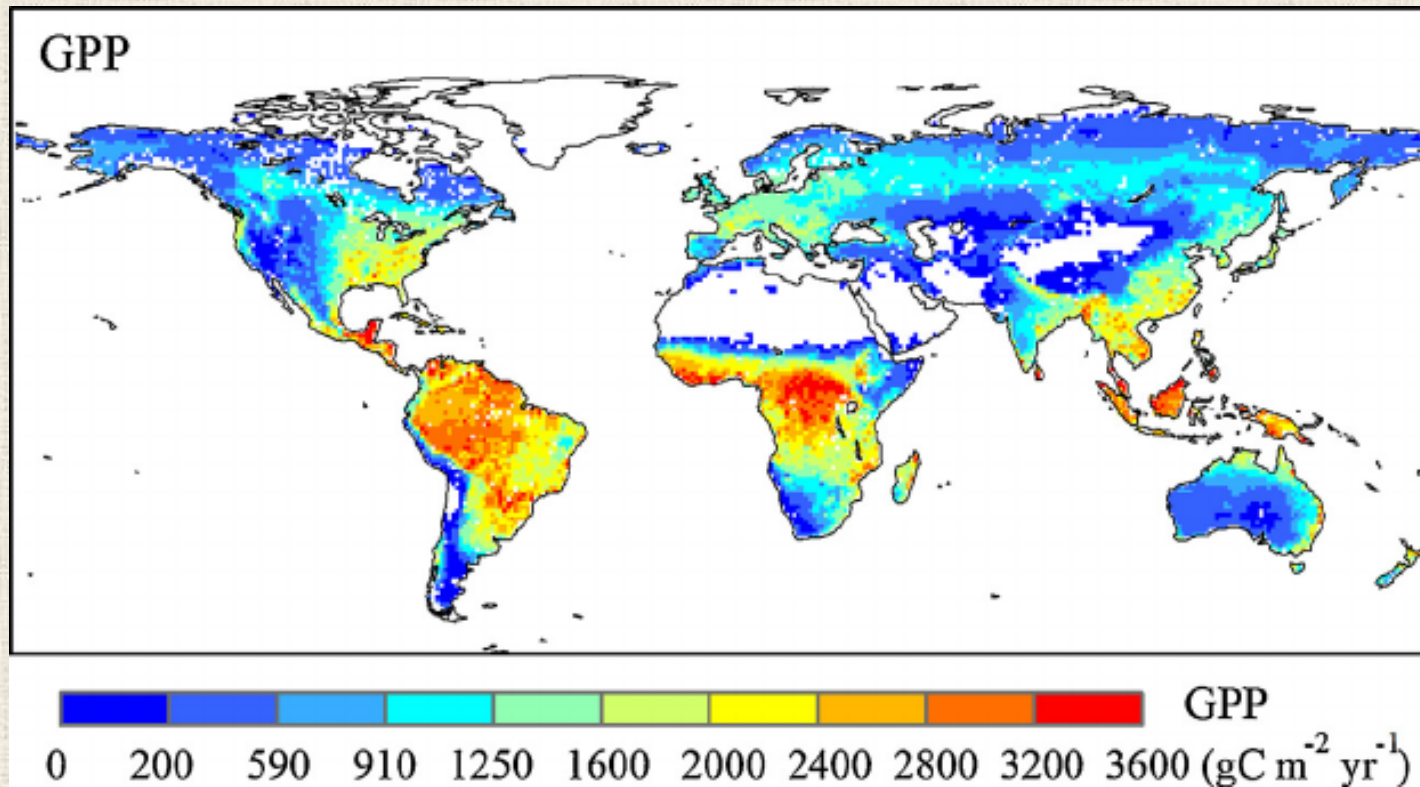


2) Remote sensing...

...the A-train



3) Modeling perspective....



Ecological Modelling 297 (2015) 42–59

Our approach: Extending the range of permanent flux flux Mobile flux towers with mobile labs



The challenge: Estimating annual budgets..

1

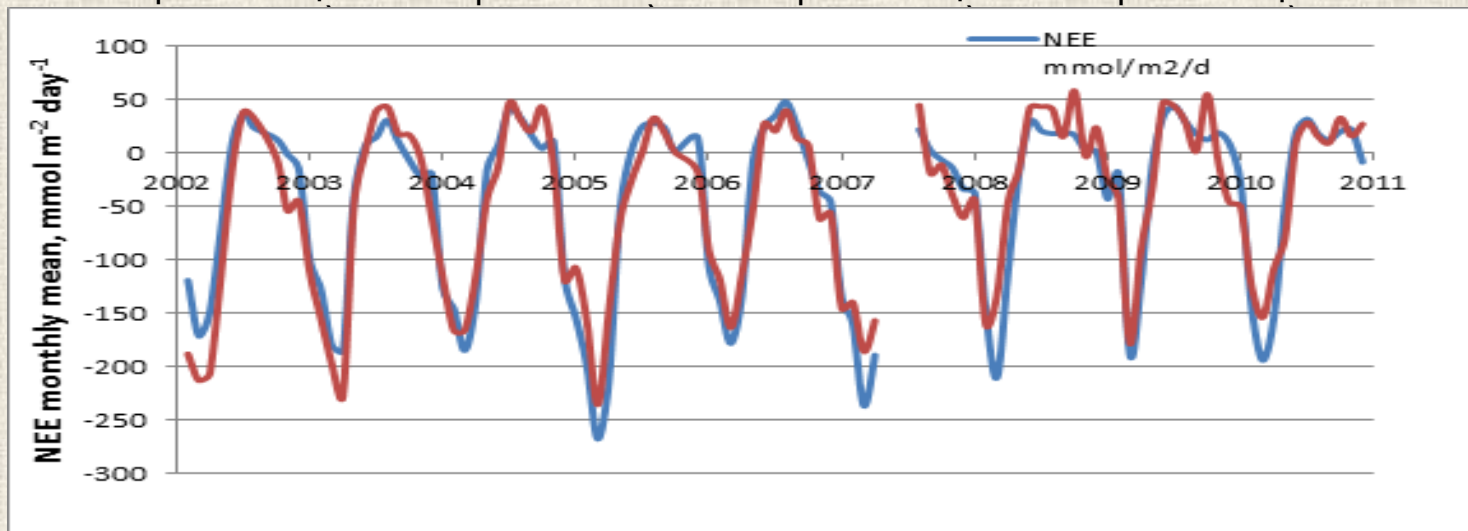
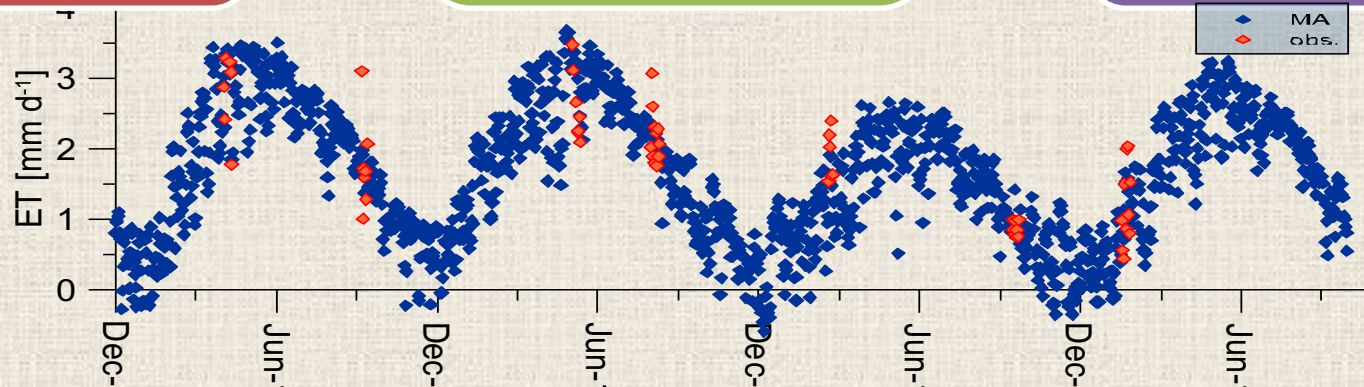
Multiple regression of ET
over met. parameters
(R_g , T, RH, P-PETnorm.)

2

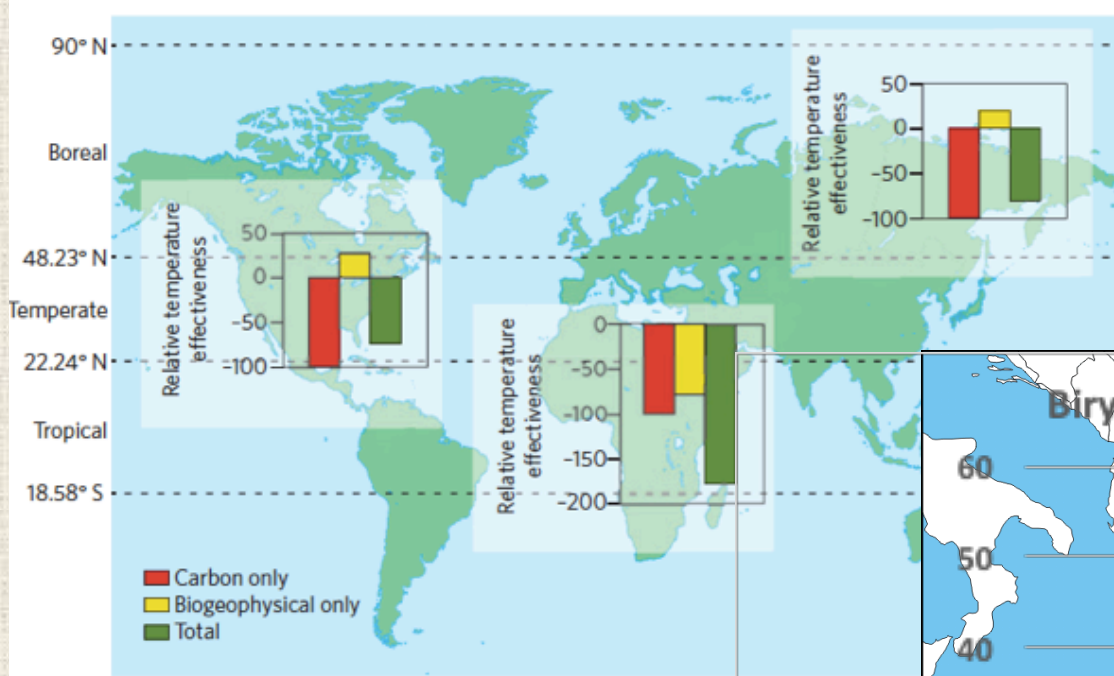
Applying the algorithm
on a continues met.
data sets from nearby
met. stations

3

Estimation of
continuously annual
fluxes (water, carbon,
and energy fluxes)



Forest mitigation potential greatly vary over short scale



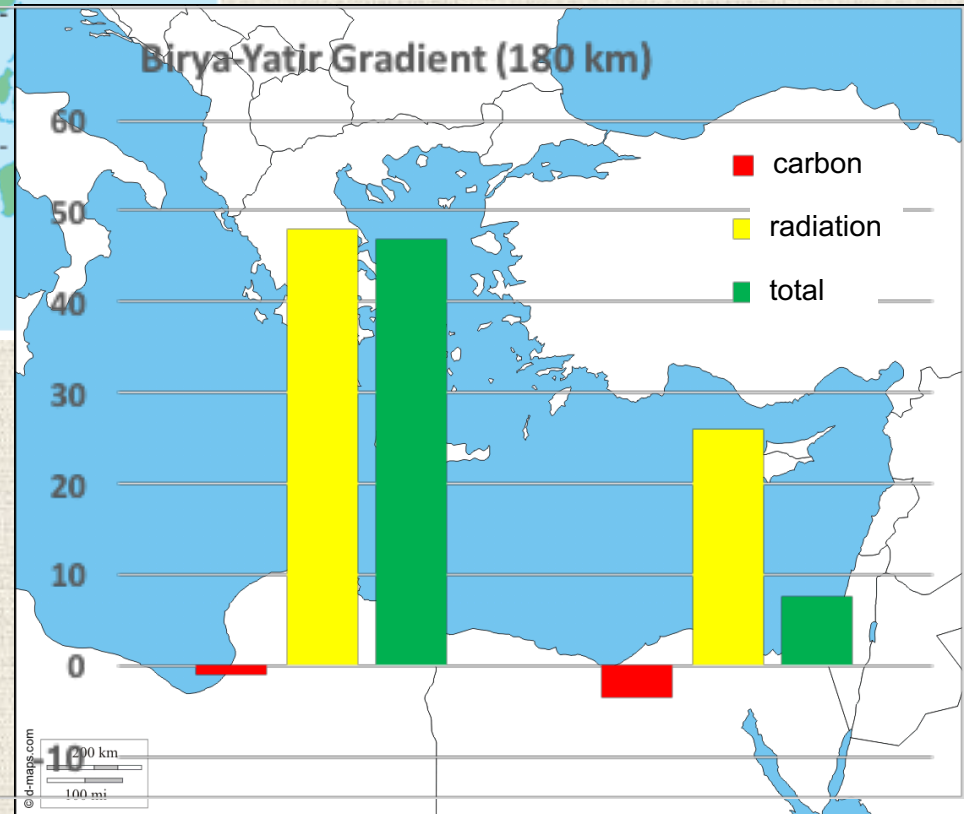
Time to balance BGP & BGC effects: From 50 to 7 years across 180 km, 400 mm MAP
 “From flux tower to Mobile site”

CLIMATE SCIENCE

Afforestation cools more or less

Forests affect climate not only by taking up carbon, but also by absorbing solar radiation and enhancing evaporation. In the tropics, the climate benefit of afforestation may be nearly double that expected from carbon budgets alone.

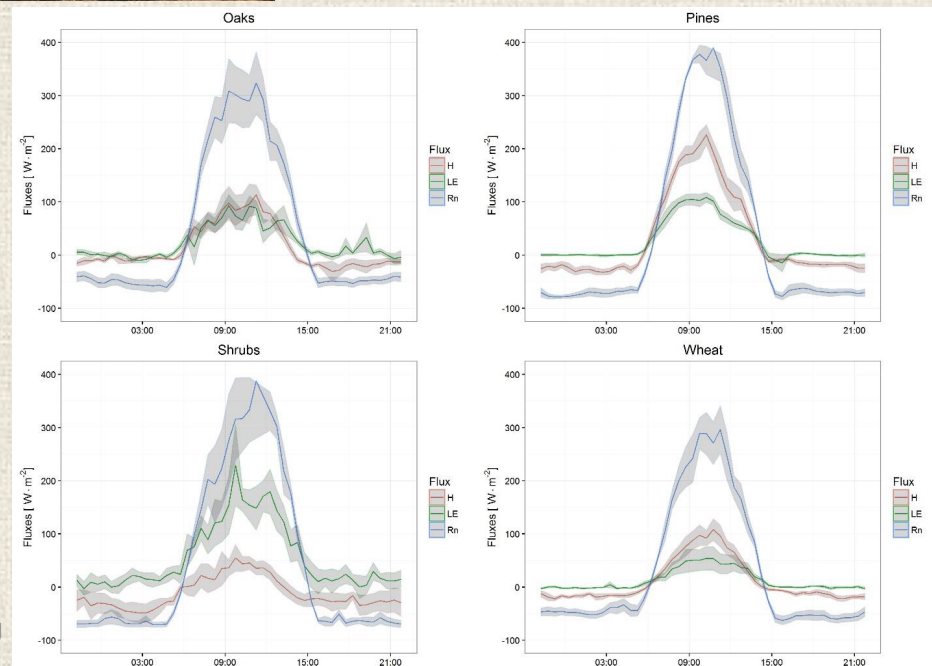
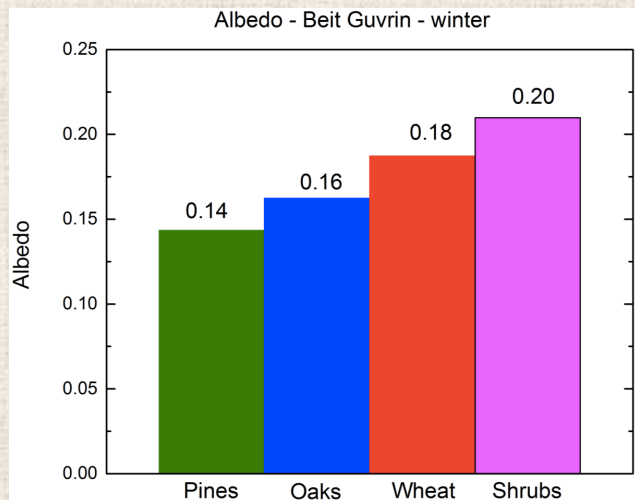
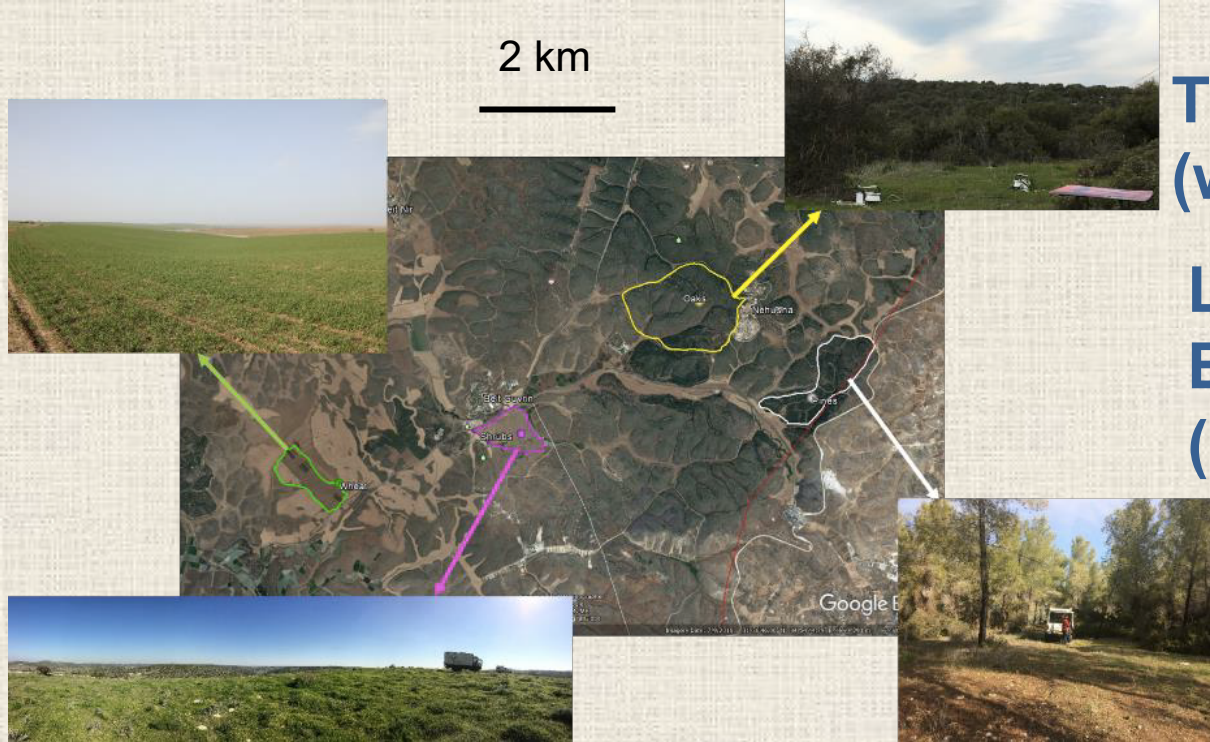
Richard A. Betts



2 km

The Ecosystem Mosaic (within ~5 km diameter):

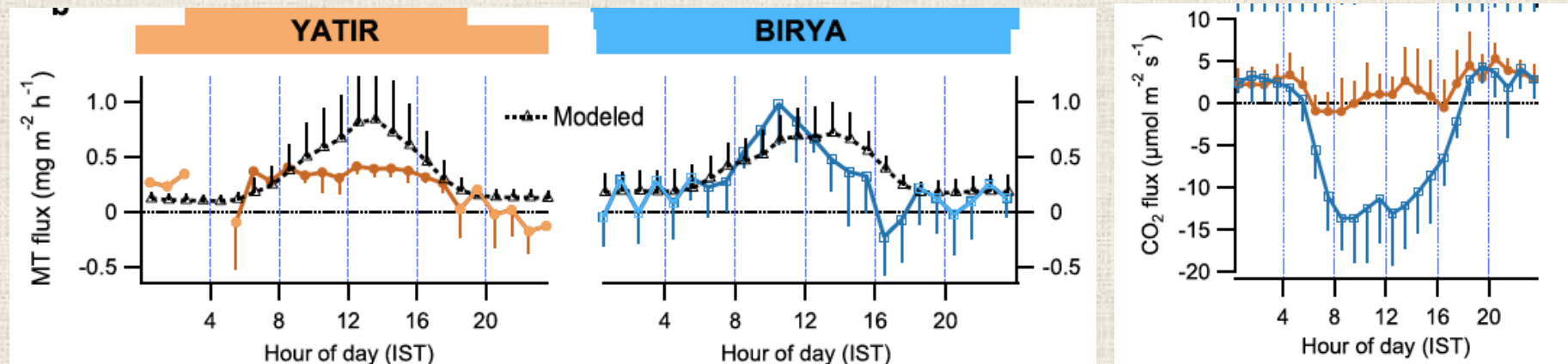
Large variations in
Bowen ratio and albedo
(preliminary results)



Springtime ecosystem-scale monoterpene fluxes from Mediterranean pine forests across a precipitation gradient

Roger Seco^{a,*}, Thomas Karl^b, Andrew Turnipseed^c, Jim Greenberg^d, Alex Guenther^a, Joan Llusia^{e,f}, Josep Peñuelas^{e,f}, Uri Dicken^g, Eyal Rotenberg^g, Saewung Kim^a, Dan Yakir^g

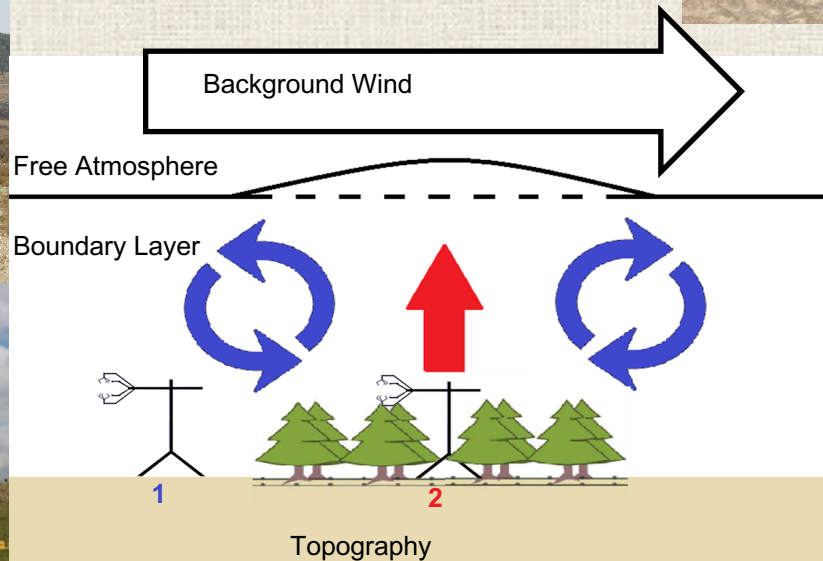
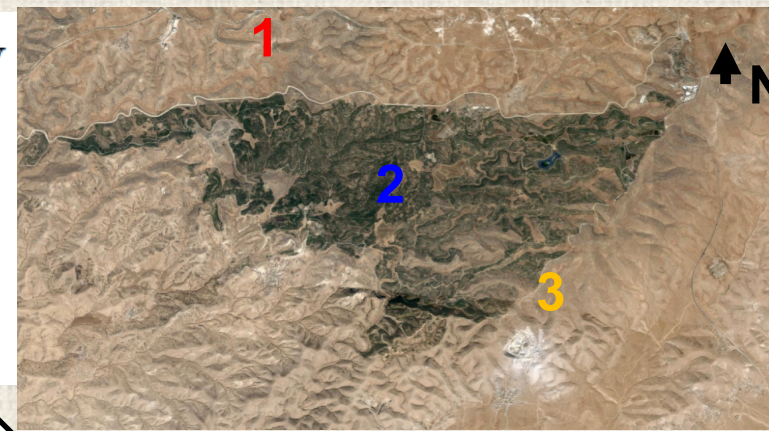
Agricultural and Forest Meteorology 237 (2017) 150–159



- Large change in CO₂ uptake across climatic gradient
- But similar VOC emission rates
- Model over-estimate VOC due to temperature effects

Effect of surface heterogeneity on the boundary layer height: a case study at a semi-arid forest

Peter Brugger · Tirtha Banerjee ·
Frederik De Roo · Konstantin Kröniger ·
Eyal Rotenberg · Dan Yakir · Matthias
Mauder



Secondary circulations at a solitary forest surrounded by semi-arid shrubland and their impact on eddy-covariance measurements

Fabian Eder^{a,b,*}, Frederik De Roo^a, Eyal Rotenberg^c, Dan Yakir^c, Hans Peter Schmid^a, Matthias Mauder^{a,b}

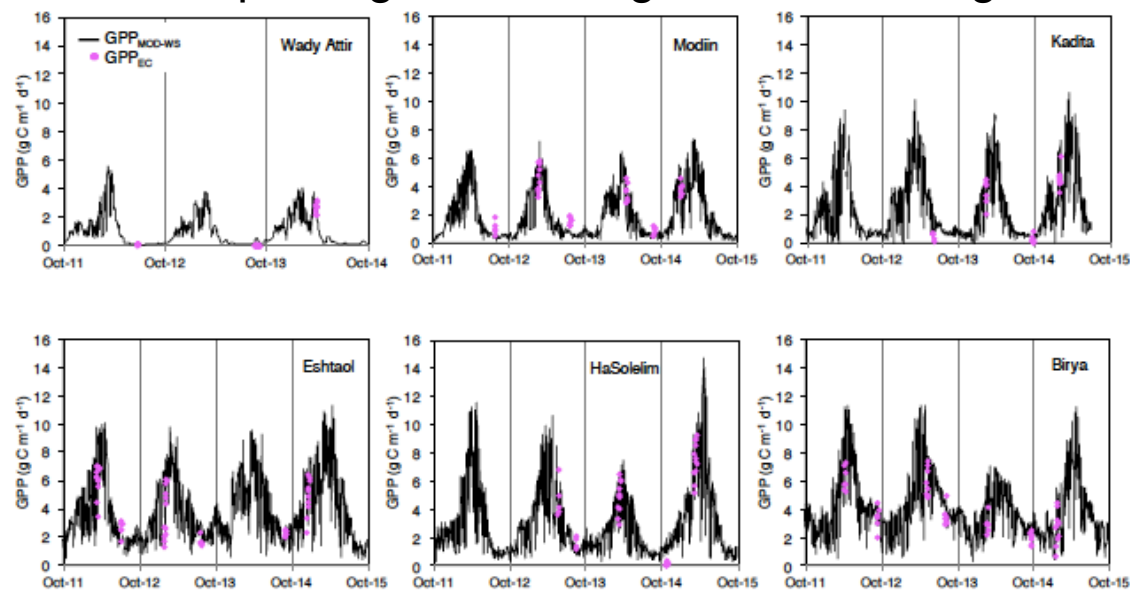
EGU2017:
Oral AS2.1, 8:45
Poster AS2.1, X5.294,

Agricultural and Forest Meteorology 211 (2015) 115–127

Daily estimations of evapotranspiration and CO₂ uptake in water-limited ecosystems using vegetation index and meteorological data are improved by accounting for seasonal water stress

David Helman¹, Itamar M Lensky¹, Yagil Osem², Shani Rohatyn³, Eyal Rotenberg³ and Dan Yakir³

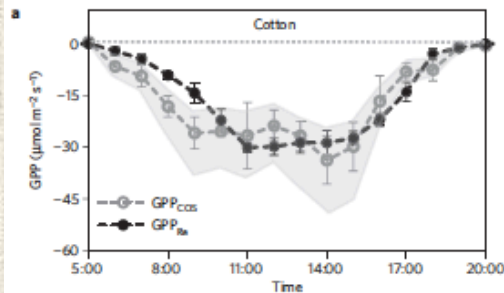
Improving & validating remote sensing



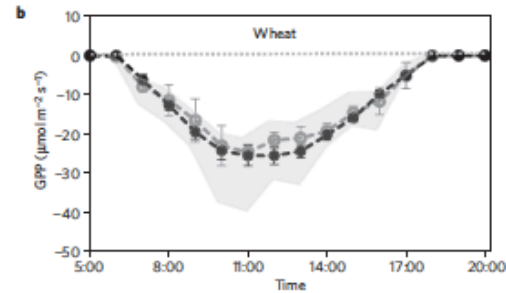
Ecosystem photosynthesis inferred from measurements of carbonyl sulphide flux

David Asaf¹, Eyal Rotenberg¹, Fyodor Tatarinov¹, Uri Dicken¹, Stephen A. Montzka² and Dan Yakir^{1*}

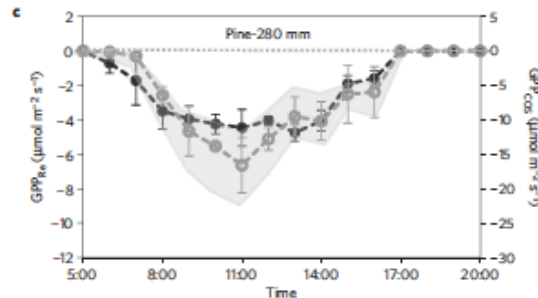
cotton



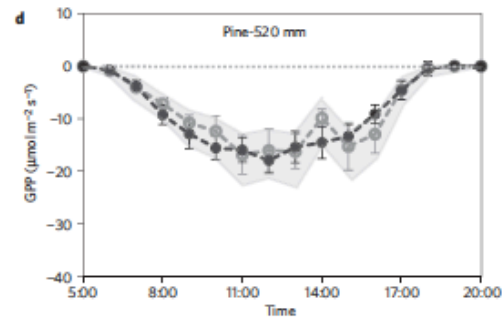
wheat



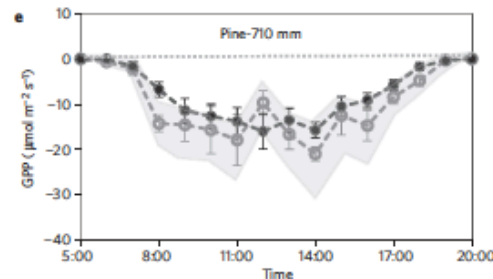
Pine 289 mm



pine 520 mm



Pine 710 mm



Summary:

- Full scale mobile flux tower systems should become an important extension of the traditional permanent Fluxnet sites
- The operation of such such system has been demonstrated on campaign and annual time scales and for wide range of research applications

Thank you
on behalf of the Mobile Lab team

