A combined radiative transfer and micrometeorological model application to EAGLE data

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Objective

Combine hyperspectral, multi-directional remote sensing data in a consistent way to calculate:

(1) Net photosynthesis
(2) Energy fluxes
   - Absorbed radiation
   - Sensible heat flux
   - Latent heat flux
   - Soil heat flux
Model structure

Fluxes of energy, H2O, CO2

Meteorological forcing

RTM (SAIL) opt

RTM thermal

RTM fluor

E_{in} opt

E_{out} opt

E_{in} thermal

E_{out} thermal

F

aE

aPAR

aE_i

T_c

Micro-meteorological model
Experimental setup
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- EC, Scintillometer
- Temperature and humidity
- Wind speed and direction
- Radiation
- Temperature and humidity
- Temperature and humidity
- Contact Temperatures
- Soil moisture, temperature, contact temperatures, heat flux
Radiative transfer using MODTRAN4 input

Optical

Thermal
Canopy + soil fluxes
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Flux (W m\(^{-2}\))
Net CO2 uptake
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Friction velocity
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Outgoing thermal radiation

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Possibilities...

• Fluorescence
• (Thermal) hot spot effect
• Data assimilation
• Reflectance spectrum soil and leaf in thermal range
• Correlations between biochemistry and leaf reflectance
Acknowledgement

NWO SRON
RIVM
Differences with CUPID

- Use of SAIL for the visible part
  - Partly analytical
  - Not just spherical leaf angle distribution
- 1D model: RTM only used for distribution of light
- Fewer parameters
- Fluorescence is included
- Written in MATLAB
Modelled canopy and soil fluxes

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