New Methods to Measure Photosynthesis from Space
August 26 – 31, Pasadena, CA

Introductions, rules of the game and potential questions

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Outline

• Introductions

• Objectives of the workshop and study program

• Scope

• Structure of workshop and suggestions for productive interaction

• Potential questions!
Introductions

– Ian Baker - Colorado State University
– Joseph Berry - Carnegie Institution for Science
– Kevin Bowman - JPL
– Saulo Castro-Contreras - University of Alberta
– Maria Pilar Cendrero-Mateo - University of Arizona
– Alexander Damm - University of Zurich
– Darren Drewry - JPL
– Bethany Ehlmann - Caltech
– Joshua Fisher - JPL
– Jaume Flexas - Universitat de les Illes Balears
– Christian Frankenberg - JPL
– John Gamon - University of Alberta
– Bernard Genty - CNRS CEA Cadarache
– Luis Guanter - University of Oxford
– Thomas Hilker - Oregon State University
– Joanna Joiner - NASA Goddard Space Flight Center
– Martin Jung - Max Planck Institute for Biogeochemistry
– Jung-Eun Lee - JPL
– Junjie Liu - JPL
– Anna Michalak - Carnegie/Stanford
– Charles Miller - JPL
– Christopher O'Dell - Colorado State University
– Nicholas Parazoo - JPL
– Albert Porcar-Castell - University of Helsinki
– Sassan Saatchi - Caltech/JPL
– Christopher Schwalm - Northern Arizona University
– Christian Van der Tol - ITC-University of Twente
– Paul Wennberg - Caltech
– Debra Wunch - Caltech
Objectives

• We want to investigate/discuss...
  – …how the fluorescence signal is related to gross primary production.
  – …how the new global (though coarse in space and time) measurements can be used in global carbon cycle research.
  – …how the signal can be best exploited in conjunction with atmospheric CO₂ measurements.
  – Missed something?

• Our goals are to...
  – …identify pitfalls in current interpretations
  – …identify new avenues in global carbon cycle research (e.g. separating respiration and GPP)
  – …discuss the “optimal” measurement from space
  – …convince the wider research community of the usefulness of fluorescence (lots of skepticism out there).
Objectives - continued

• A successful outcome at the end of the workshop:
  – we will have a solid understanding of fluorescence principles
  – we will have built a small research community interested in fluorescence
  – we will have a good understanding of what can be done and what OCO-2 will achieve
  – we will have extended the more local focus of the FLEX community to the global carbon cycle (distinguishes this workshop from the FLEX concept, avoiding “bad blood” and focusing on what can done now and with OCO-2)
‘global’ vs. ‘local’

- FLEX main goal as we understand it:
  - Focus on small-scale features, guiding, e.g. agriculture
  - Global carbon cycle community not heavily involved

- Our goal here:
  - Focus on the global carbon cycle (a necessity as we neither have mapping nor fine spatial resolution BUT high noise)
  - Use the synergy with atmospheric CO$_2$ measurements (and the fact that the carbon cycle community is already heavily involved through GOSAT/OCO-2)

- Identify ways to separate net fluxes into GPP and respiration.
Structure of workshop

• Discussion sessions are structured to have a lead-in talk, followed by a moderated discussion session
  – we plan to begin by formulating relevant questions then proceeding to discuss them in detail

• We need volunteers (thank you!) to take notes in each discussion session

• We have some room to make adjustments in our agenda, expand or change discussion topics
Guidelines/suggestions

• Productive discussion is key to our success

• Please share what you know (and don’t fear to speak up if you don’t know something)

• Help formulate the relevant questions and discussion topics

• Do not be dismissive; if we are discussing a moot point, help us understand it too (then help us form the right question)

• Postdocs/students: you are part of our core group. Ask questions, participate in discussions
Potential questions

• Fluorescence from space
  – Can we ever “validate” it and do we need to (at GOSAT spatial scales)?
  
  – How well are fluorescence principles known and what is needed to consolidate the models?
  
  – How direct a proxy for GPP is it (under what conditions does it break down)?
  
  – What is the impact of canopy structure (canopy RT)?
  
  – How well (and linear) does it indicate stress (e.g. moisture vs. light vs. ozone vs. other)?
Potential questions

- Fluorescence from space (continued)
  - Can net CO$_2$ fluxes be separated into GPP and respiration using fluorescence and XCO$_2$?
  
  - Fluorescence through (thin) clouds: what could this enable?

  - Satellite: Sun-synch or not? Advantages of fixed vs. variable local time (e.g. for OCO-3 on the ISS). What could a geostationary satellite do?

  - Others?