Science and Application of Chlorophyll Fluorescence

(Airborne fluorescence workshop)

26 - 29 September 2017, University of Nebraska - Lincoln

Meeting Schedule:

- Open Meeting - Tuesday, Sept 26 (open to the public)
- Airborne Workshop – Wednesday and Thursday, Sept 27-28 (by invitation only)
- Field trip - Friday, Sept 29 (preregistration required)

*detailed schedule below*

Objectives, Day 1 (public session):

- Overview of science questions, instrumentation & sampling platforms
- Explore the link between fluorescence, reflectance, pigment activity, and photosynthesis/GPP, using both proximal and airborne data, and explore synergies between these approaches.
  - Clarify the roles of plant structure vs. physiology on the SIF signals.
  - Clarify the links between SIF and pigment-based retrievals (e.g. spectral reflectance)
- Consider applications (carbon cycle studies, vegetation stress detection, phenotyping, etc.)

Objectives, Days 2-3 (airborne workshop):

- Start a discussion between the groups operating airborne and field fluorescence sensors.
- Discuss strategies to ensure inter-comparability between the data from the different sensors
- Discuss options and ways to benefit from each other’s experiences, and to exchange code, data, and retrieval methods with the aim of preparing a common understanding in preparation of the FLEX satellite mission
- Initiate the planning for future joint activities, such as joint or complementary campaigns, inter-calibration activities or joint workshops.
- Propose ways and procedures to develop Level 2 products that can be used for the FLEX satellite mission

Topics to consider:

- How can we best facilitate exchange of protocols, software, and data
- Do we need standardized methods or tools for inter-comparison across sites and groups?
What joint activities should we consider as a group. What publications or proposals should we consider together? Should we hold future workshops, field campaigns or research projects?

**Venue and logistics:**

- The open meeting (Sept 26) will be held at the Cottonwood Room (East Campus Union), and workshop (Sept 27-28) will be held at 901 Hardin Hall, East Campus, University of Nebraska – Lincoln. The local host is John Gamon, CALMIT, School of Natural Resources, University of Nebraska.
- The workshop is initiated by ESA and the FLEX Advisory Group to support future joint trans-Atlantic activities for remote sensing of fluorescence in the preparation of the FLEX satellite mission.
- Attendance for the core workshop is by invitation only and will focus on (i) research groups from the USA and Europe, who (ii) are operating an airborne fluorescence sensor and conducting supporting ground measurements.
- The meeting will include a 1-day open forum and optional field trip so newcomers can participate. Field trip attendance requires pre-registration.

*Airborne SIF workshop Sept 27-28 limited to approx. 20 people due to venue constraints

**Poster Session:**

Posters will be encouraged and in public view in the second floor lobby of Hardin Hall on days 1-3, with informal poster sessions held during the meeting breaks.
**Schedule:**

**Day 1: Tuesday 26. September 2017 – Open Plenary Meeting, Cottonwood Room, East Campus Union**

8:00  Van pickup from hotel. Meeting Registration (Cottonwood Room, East Campus Union). Early arrivals can set up posters in 2nd floor lobby of Hardin Hall.

8:45  John Carroll (SNR Director), Brian Wardlow (CALMIT Director) – Welcoming remarks

9:00  John Gamon – Introduction: Workshop goals, key questions & hypotheses

9:30  Dirk Schuettemeyer - The FLEX satellite mission, scientific objectives, and technical implementation, including the importance of airborne fluorescence, calibration/validation scheme

10:00 Coffee break (set up posters)

10:30 Kaiyu Guan - Progress in using Solar Induced Fluorescence for monitoring crop productivity in the US Corn Belt

11:00 Betsy Middleton - The GSFC automated in-situ field measurement system for fluorescence.

11:30 Jim Kellner, Carlos Silva, Xi Yang - Bayesian inversion of SCOPE to quantify seasonal variation in NPQ at Harvard Forest.

12:00 Lunch (included for all registrants with name badges)

13:00 Uwe Rascher - The airborne sensor HyPlant – the history of the first dedicated airborne fluorescence sensor (established 2012)

13:30 Philipp Koehler - Sun-induced chlorophyll fluorescence retrievals using the Chlorophyll Fluorescence Imaging Spectrometer (CFIS)

14:00 Bruce Cook (NASA Goddard): G-LiHT v2.0 with FIREFLY – NASA’s Airborne multi-sensor system and 3D radiative transfer modeling

14:30 John Gamon & colleagues (Univ. of Nebraska-Lincoln): Airborne fluorescence and related research in Nebraska: Science objectives and first data from 2017 SIF campaign

15:00 Coffee break

15:30 Poster Mini-Talks (Poster presenters can provide 5-min poster previews)

16:30 Workshop Preview & Discussion (Uwe Rascher, Dirk Schuettenmeyer, Betsy Middleton)

17:00 Adjourn

17:00-19:00 Reception (1250 N. 37th Street, Lincoln, hosted by J. Gamon and UNL)
Day 2: Wednesday 27 September – Workshop - Technical Information on the different airborne sensors (901 Hardin Hall) - By invitation. Interested newcomers welcome up to allowable space – Contact J. Gamon

8:00 Van pickup from hotel
8:15 Introduction to today’s activities - data processing & calibration/validation issues
8:30 Uwe Rascher – HyPlant data preprocessing: 5 years of lessons learned.
9:00 Sergio Cogliatti - The spectral fitting approach to retrieve fluorescence from high resolution data
9:30 Gabriel Hmimina – SIF fitting and normalization approaches
10:00 Coffee break (Hardin Hall, 2nd floor Lobby)
10:30 Technical discussion around data processing, sensor calibration/validation – synergies and complementarities among instruments & methods.
   ➢ Which instrument parameters are crucial (signal-to-noise, spectral sampling interval, point spread function)?
   ➢ Can we identify common laboratory protocols for instrument characterization?
   ➢ What is needed for in-flight calibration & stability checks?
   ➢ What ground or other independent validation is needed?
   ➢ What reference targets are needed?
   ➢ What are the pros and cons of different processing methods?
   ➢ How do we correct for atmospheric effects?
12:00 Lunch & Poster Session (Hardin Hall, second floor lobby, Lunch included for Workshop registrants)
13:30 Continue technical discussion
14:00 Refreshment Break (Hardin Hall, 2nd floor Lobby)
14:30 Break into working groups
16:00 Reconvene working groups to review today’s progress
17:00 Van returns to hotel
19:00 Dinner – (included for Workshop registrants)
Day 3: Thursday 28. September 2017 – Continue closed workshop - *Synergies and differences of the sensors/groups* (901 Hardin Hall)

8:00  Van pickup from hotel

8:15  Plenary session – introduction to today’s activities – joint activities in the future, or continue yesterday’s discussion, as needed.

10:00 Coffee Break (Hardin Hall, 2\textsuperscript{nd} floor Lobby)

10:30 Working groups

12:00 Lunch & Poster Session (Hardin Hall, second floor lobby, Lunch included for Workshop registrants)

13:30 Working groups reconvene

15:00 Coffee Break (Hardin Hall, 2\textsuperscript{nd} floor Lobby)

15:30 Plenary session – meeting wrap-up (open meeting)

(meeting expected to end by 17:00)

17:00 Van return to hotel

18:00 – dinner (included for Workshop registrants)
**Day 4: Friday 29 September 2017 – Field trip to Lincoln Airport & ENREC (Mead, Nebraska) and Lakehouse Farm (Waverly NE) (open to all participants who have registered for the field trip)**

8:00 Van pickup from hotel for visit to Lincoln Airport

8:30 Visit to Lincoln Airport to view CHAMP (CALMIT Hyperspectral Airborne Monitoring Program), including Kestrel and IBIS sensors. Hosts include Rick Perk & John Gamon

10:00 Van return to hotel from airport

10:30 Van pickup from hotel for visit to Mead

11:30 Box lunch for registered field trip attendees; travel to Eastern Nebraska Research and Extension Center (ENREC) at Mead

12:00 Visit to ENREC/Mead to visit Carbon Sequestration Plots and field sampling instrumentation (including Eddy Covariance, D-FLOX, and U. Illinois’ Fluorometers). Hosts include Andy Suyker, Tim Arkebauer, Betty Walter-Shea, Art Zygielbaum, Kaiyu Guan, and Gabriel Hmimina.

15:00 Van leaves ENREC/Mead for Lakehouse Farm

16:00 Tour of organic farm Lakehouse Farm, 10405 Branched Oak Rd., Waverly NE 68462, 402-786-2239

16:30 Reception at Prairie Plate Restaurant (Lakehouse Farm) (Field trip registrants only)

15:30 Dinner at Prairie Plate Restaurant (Lakehouse Farm) (Field trip registrants only)

20:00 – Van return to hotel