



## First Announcement

### Reflectance-Based, Imaging Spectrometer Error Budget Training Course

To be held from 15-17 July 2016 by  
**Dr Kurtis Thome (NASA Goddard),**  
**Mr Chris MacLellan (University of Edinburgh) and Dr Cindy Ong (CSIRO)**

The goal of the training activity is to:

- teach the basic procedures and methods of the reflectance-based calibration method for use with imaging spectrometry, and,
- describe how those concepts translate into an error budget, both for understanding the repeatability, as well as the absolute uncertainty.

The duration of the course is three days, beginning with an introduction to the terminology and techniques of imaging spectroscopy calibration (both laboratory-based and in-flight) and an overview of the Reflectance-Based Method. Discussions on atmospheric and surface measurements will be provided as well as an overview of atmospheric radiative transfer. Each section includes a discussion of the tools used, their related uncertainties, and the impact on the reflectance-based results. The training will include a practical session using real world examples for the selection of vicarious calibration sites as a means to demonstrate the application of the concepts and to foster participant discussion within the course.

A course overview is given below, with each numbered unit constituting approximately 20 minutes of class time.

This course will be sponsored by the IEEE GRSS as part of the Geoscience Imaging Spectroscopy Technical Committee's Calibration And Validation Initiative. A requirement of the course is that participants have some previous experience and/or formal background in optical remote sensing. Preference will be given to early career scientists and people associated and/or are working in spaceborne imaging spectroscopy teams.

**Date and venue: 15-17 July 2016 following IGARSS 2016 at the Chinese Academy of Sciences, Olympic Park Meeting Room.**

Please register your interest in attending the course with Dr Cindy Ong ([cindy.ong@csiro.au](mailto:cindy.ong@csiro.au)) or Dr Kurt Thome ([kurtis.thome@nasa.gov](mailto:kurtis.thome@nasa.gov)). Please provide a short biography/CV of yourself and the reason that you would like to attend this course.

## Day 1 [7.5 hours]

### **Introduction to calibration (1.5 hrs)**

1. General terminology
2. Calibration concepts
3. Pre-launch characterization and calibration methodologies
4. In-flight characterization and calibration methodologies

### **Reflectance-based method overview (2 hours)**

1. Basic approach
2. Results from a selection of vicarious calibration sites
3. Site location
4. TOA Radiance/reflectance determination
5. Uncertainty sources (solar, geolocation)
6. Error budget

### **Conversion of sensor DN to spectral radiance to spectral reflectance (1 hour)**

### **Lunch (1 hour)**

### **Reflectance-based method – The atmosphere (2 hours)**

1. Concepts and approaches
2. Equipment and reference standards
3. Measurement approaches
4. Example results
5. Uncertainty sources
6. Reflectance-based error budget discussion

## Day 2 [7.5 hours]

### **Reflectance-based method – The surface (2 hours)**

1. Concepts and approaches
2. Equipment and reference standards
3. Measurement approaches
4. Example results
5. Uncertainty sources
6. Reflectance-based error budget discussion

### **Reflectance-based method – Radiative transfer (1.5 hours)**

1. Basics of radiative transfer
2. Necessary inputs
3. Example results
4. Uncertainties

### **Lunch (1 hour)**

### **Sensitivity analyses (1.5 hours)**

1. Input variability
2. Atmosphere-surface coupling
3. Site-related dependencies
4. Example results

### **Error budget (1.5 hours)**

1. Traceability
2. Repeatability versus accuracy
3. Conversion of sensitivity analysis to an error budget
4. Largest uncertainties for reflectance-base method

### **Day 3 /7.5 hours]**

#### **Site selection - (1.5 hours)**

1. Examples of current sites and how they were selected
2. Natural versus man-made
3. Key parameters
4. Accuracy, uncertainties and traceability

#### **Site selection for imaging spectroscopy sensors to be launched in the next 5 years (1.5 hours) – session 1**

1. Overview and specifications of imaging spectroscopy sensors to be launched In the next 5 years
2. Need for new sites
3. Prospective sites
4. Student practicum

#### **Site selection practical session (1 hour)**

#### **Lunch (1 hour)**

#### **Site selection for imaging spectroscopy sensors to be launched in the next 5 years (1 hour) – session 2**

1. Presentation of class site selection results from practical session
2. Discussion of student results
3. The team's current choice

#### **Conclusions and wrap up (1.5 hours)**

1. How do we improve repeatability?
2. How do we improve accuracy?
3. Role of automation
4. Role of CLARREO/TRUTHS
5. Final comments