

**National Summer School in  
Applications with High Spectral Resolution Infrared Environmental Satellite Data  
Curtin University, Perth, WA  
28 Jan – 10 Feb 2009**

With the advent of high spectral resolution infrared sensors giving global data coverage, it is important to probe the data for new information pertinent to weather and climate. Applications include but are not limited to atmospheric temperature and moisture profiling, cloud characterization, trace gas signatures, volcanic ash and dust detection, sea surface temperature estimation, and terrestrial ecosystem monitoring. This course offers some physical background to the data, introduces a visualization tool, and provides some exercises for determining atmospheric and surface changes of the Earth.

**Objectives**

Curtin Adjunct Prof. Paul Menzel will be conducting the course. It will offer an in depth explanation of methods and techniques used to extract information from environmental satellite data, with emphasis on the latest high spectral resolution infrared sensing technologies. The course will consist of lectures, laboratory sessions, group lab projects, homework and tests. The results from each of the group projects will be presented to the class by the participating students. The lecture topics include

- Radiation and the Radiative Transfer Equation
- Infrared high spectral resolution remote sensing
- Spectral signatures from Earth's surface and atmosphere
- Instrument Considerations and Cal/Val
- Evolving to the Future Global Observing System

The labs will be conducted using HYDRA (a JAVA based freeware tool) to manipulate multi-spectral data. Lab exercises include data from MODIS, AIRS, IASI, and CALIPSO.

**HYperspectral viewer for Development of Research  
Applications - HYDRA**

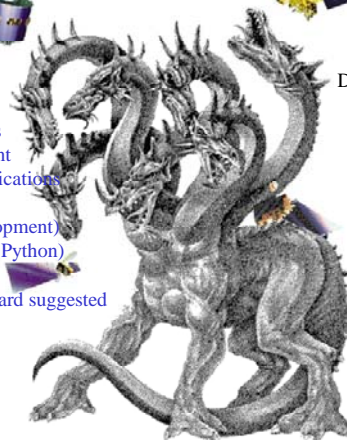
MSG,  
GOES



MODIS, AIRS  
IASI, CALIPSO



Freely available software  
For researchers and educators  
Computer platform independent  
Extendable to more sensors and applications  
Based in VisAD  
(Visualization for Algorithm Development)  
Uses Jython (Java implementation of Python)  
runs on most machines  
512MB main memory & 32MB graphics card suggested  
on-going development effort



Developed at CIMSS by  
Tom Rink  
Tom Whittaker  
Kevin Baggett

With guidance from  
Paolo Antonelli  
Liam Gumley  
Kathy Strabala  
Allen Huang  
Paul Menzel



<http://www.ssec.wisc.edu/hydra/>

**Text for Classroom and Visualization Tool for Lab**

“Applications with Meteorological Satellites” is used as a resource text; it is available for free at <ftp://ftp.ssec.wisc.edu/pub/menzel/>. HYDRA is available for free at <http://www.ssec.wisc.edu/hydra/>.

### Student Qualifications Needed

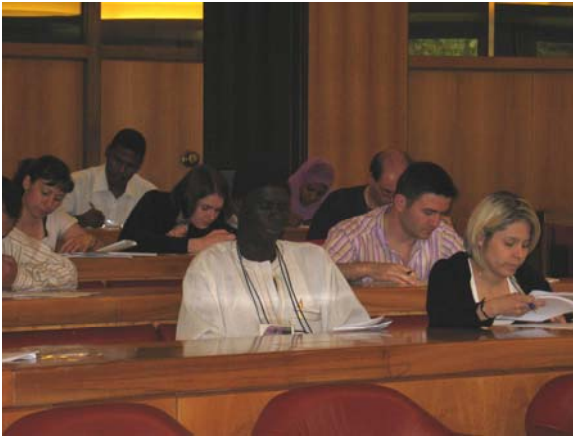
Participants must be senior undergraduates or graduates in Meteorology, Physics, Environmental Sciences or Environmental Engineering. Consultants and professionals in these same fields are also welcome. Candidates will be selected on the basis of their *curriculum vitae* and their interest in environmental remote sensing.

### Laboratory Requirements

Laboratory will provide one computer for every 2 or 3 students; the computers can be lap-tops with windows or Linux, more than 512 MB of memory (this is kind of important), and greater than 2 GB of available space on disk.

### Courses Previously Offered

Benevento 2007, Ostuni 2006, Krakow 2006, Bertinoro 2004, Maratea 2003, Roma 2002, Bologna 2001. See <http://www.ssec.wisc.edu/rss/> for some additional information about these courses.



Lecture



Lab

### Nominal Agenda 28 Jan – 10 Feb

<b>Wed</b>	<i>Welcome</i> <i>Introduction</i> <i>Lecture 1</i> <i>Homework</i>	Introduction of students and teachers Discussion of Agenda (All) Radiative Transfer in the Earth Atmosphere
<b>Thu</b>	<i>Lab 1</i>	Lab on Planck Function and Intro to Hydra
<b>Fri</b>	<i>Lecture 2</i>	High spectral resolution infrared sensing
<b>Mon</b>	<i>Quiz 1</i> <i>Lab 2</i>	Interrogating AIRS Data with Hydra
<b>Tue</b>	<i>Lecture 3</i>	Spectral signatures from Earth's surface & atmosphere
<b>Wed</b>	<i>Lab 3</i>	Looking at clouds with AIRS, MODIS, and CALIPSO
<b>Thu</b>	<i>Lecture 4</i>	Sounding with AIRS
<b>Fri</b>	<i>Lab 4</i>	Investigating low level moisture gradients with AIRS/IASI
<b>Mon</b>	<i>Quiz 2</i> <i>Lab 5</i>	Student Projects
<b>Tue</b>	<i>Lab</i> <i>Lecture 5</i>	Student Presentations of their Investigations Summary

Sessions are from 2:00 pm to 5:00 pm

### Cost and Contact Information

There is no cost for the course. More information is available from Prof. Mervyn Lynch at [M.Lynch@curtin.edu.au](mailto:M.Lynch@curtin.edu.au). Email should indicate subject as *January Remote Sensing School*.