AUS-SPECCHIO: taking spectroscopy data from the sensor to discovery

Laurie Chisholm, Andreas Hueni, Cindy Ong

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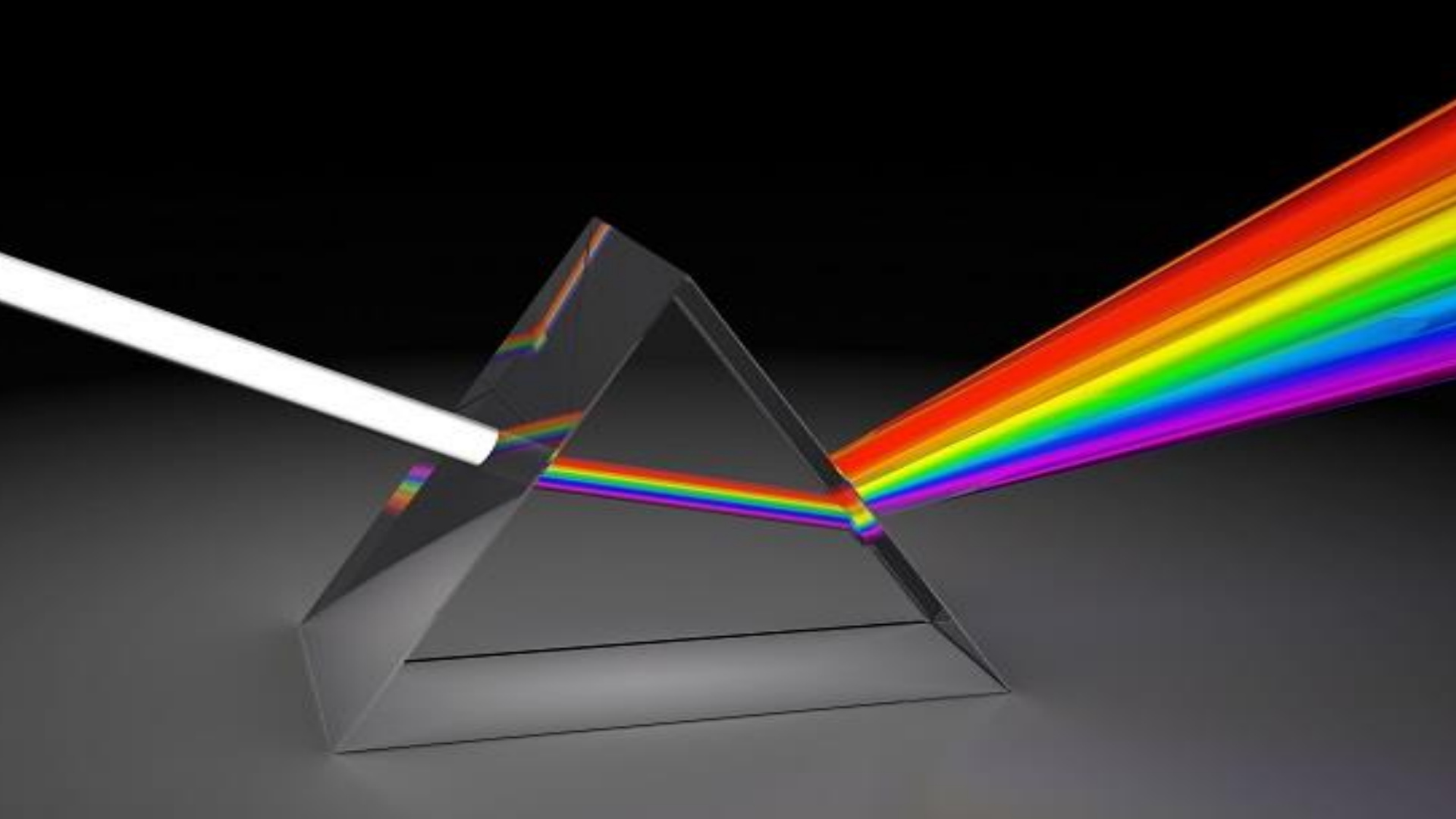
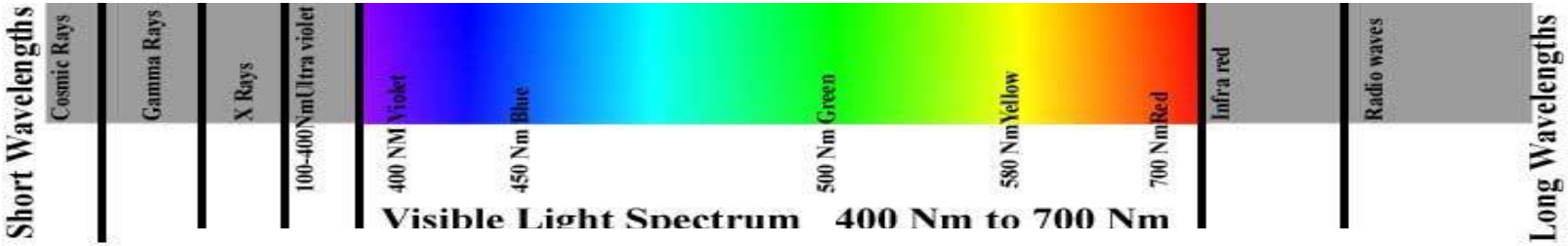
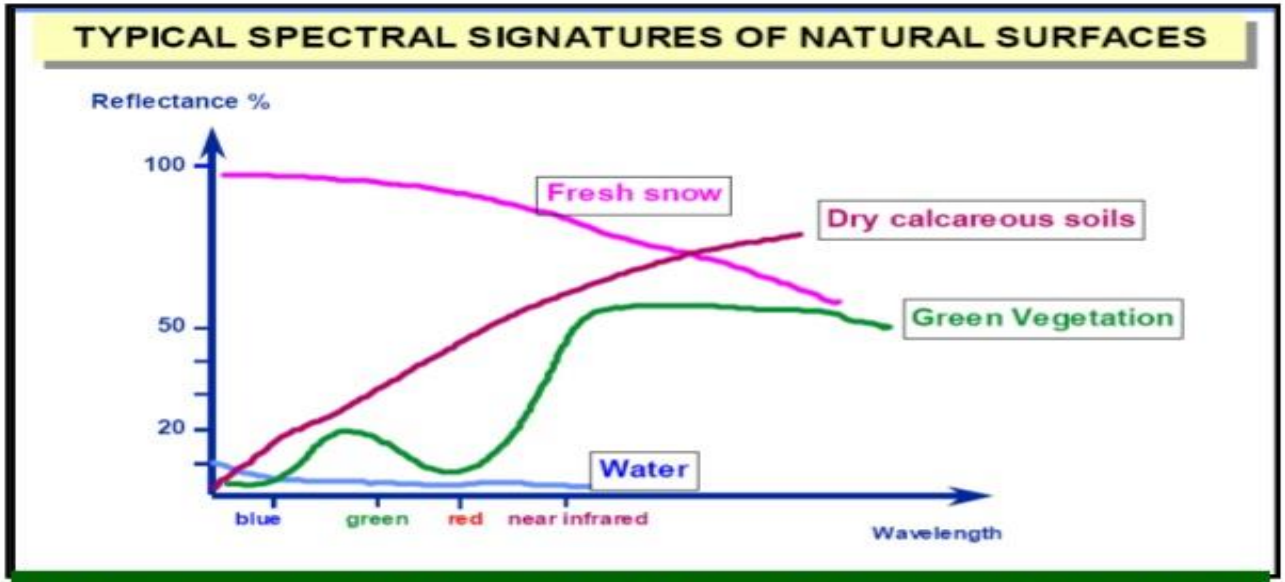
Zurich[UZH]

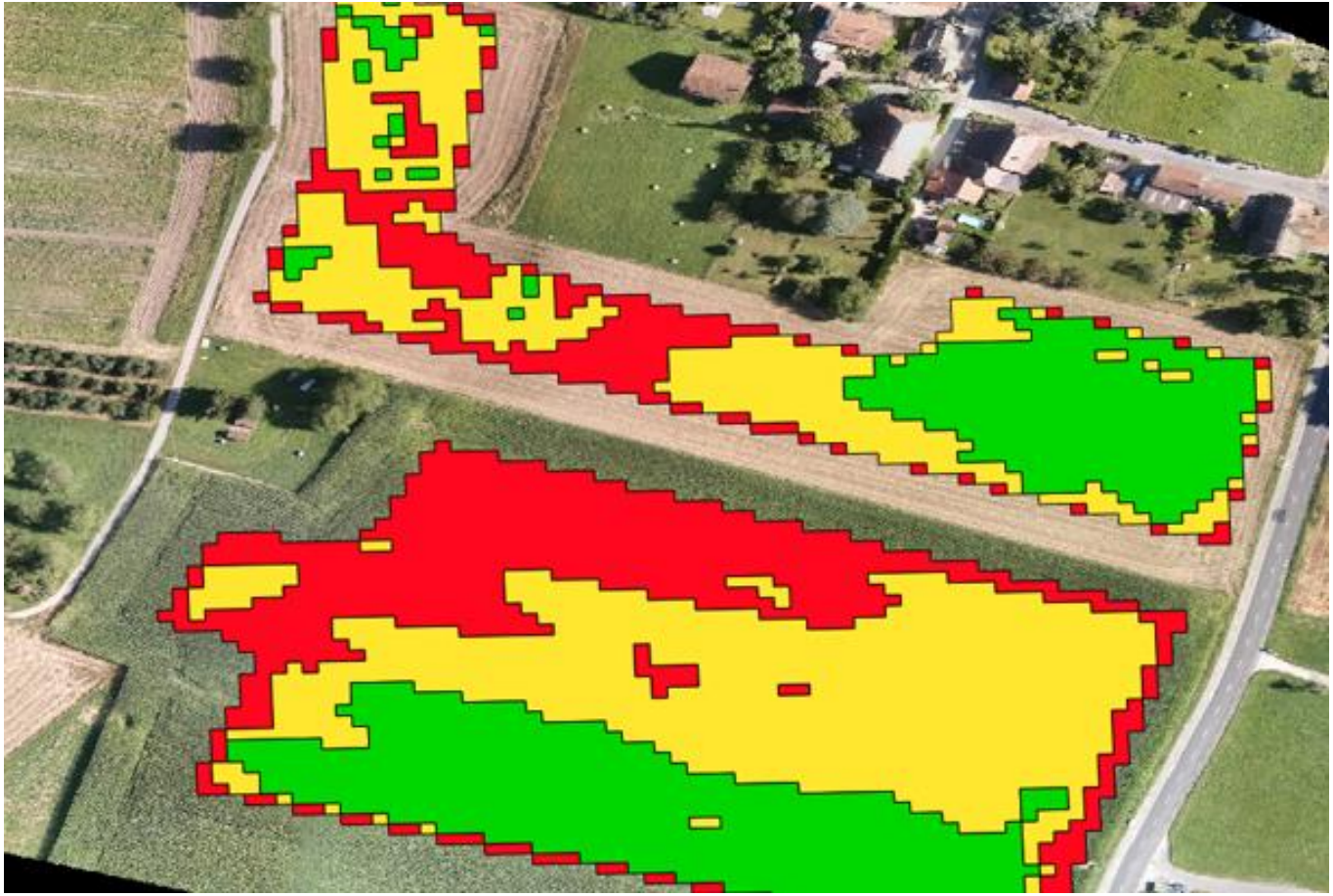


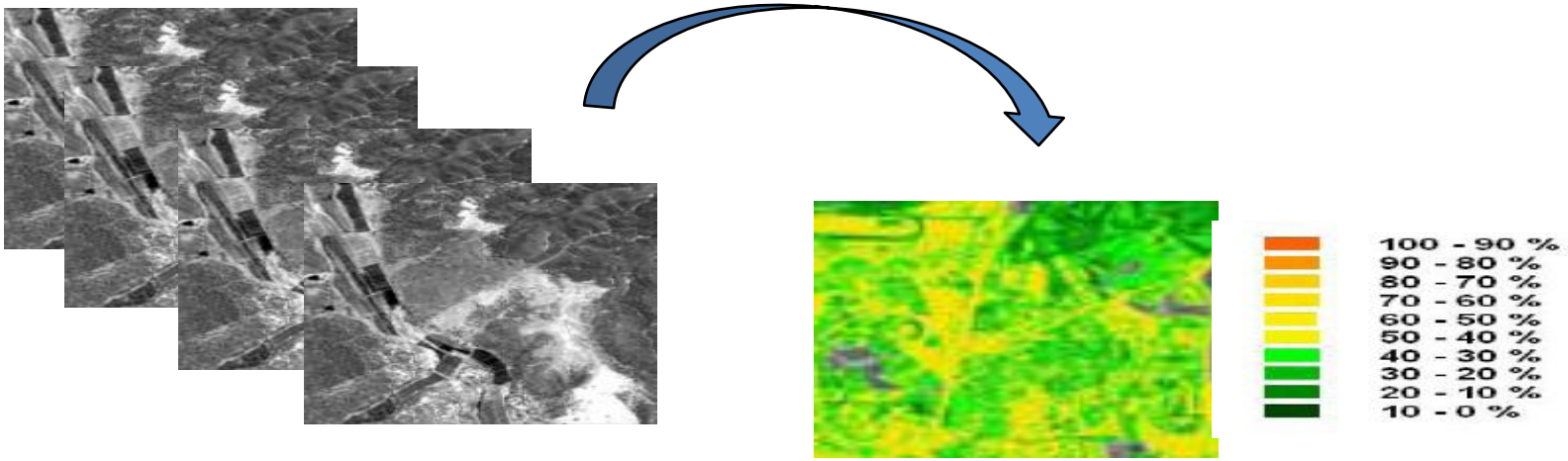


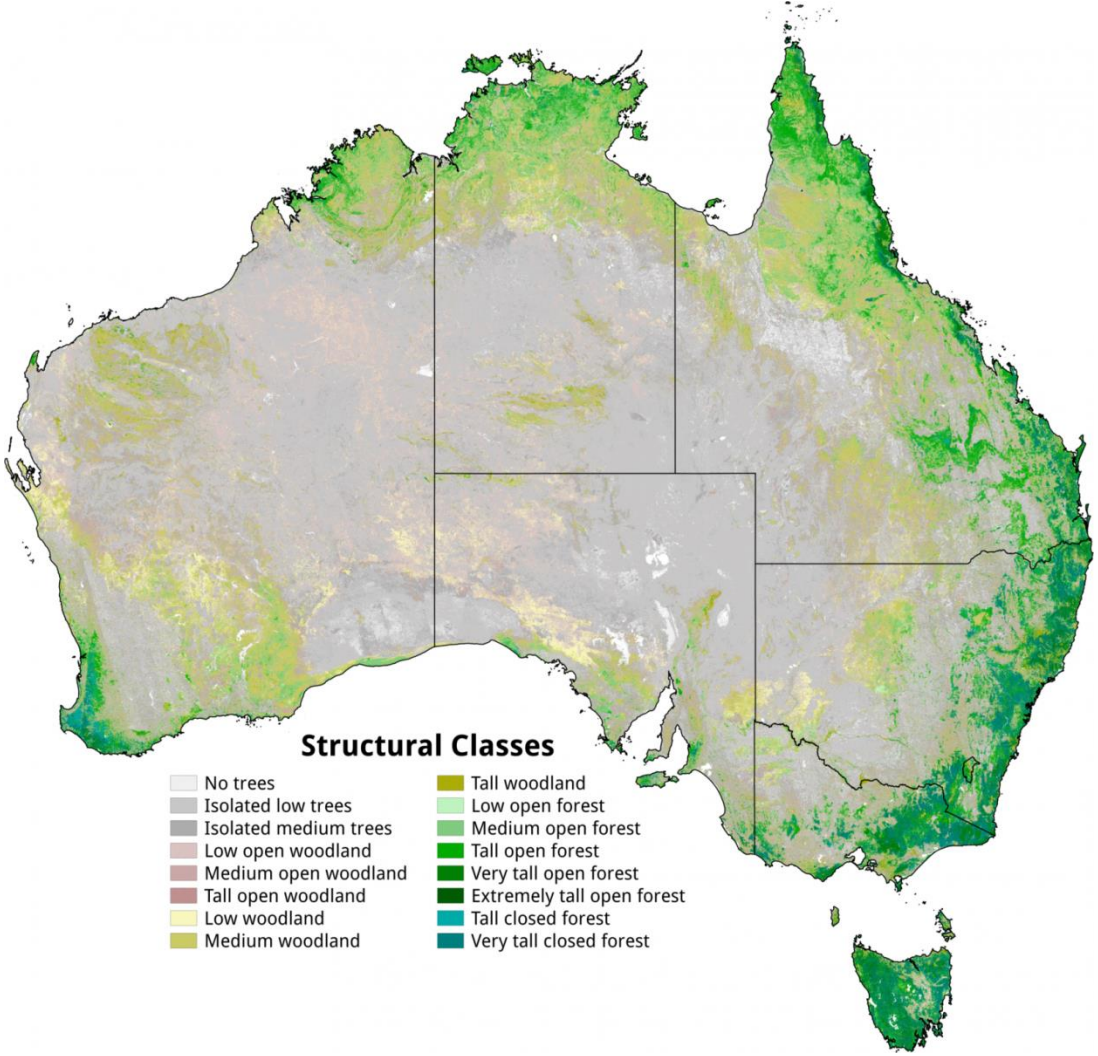


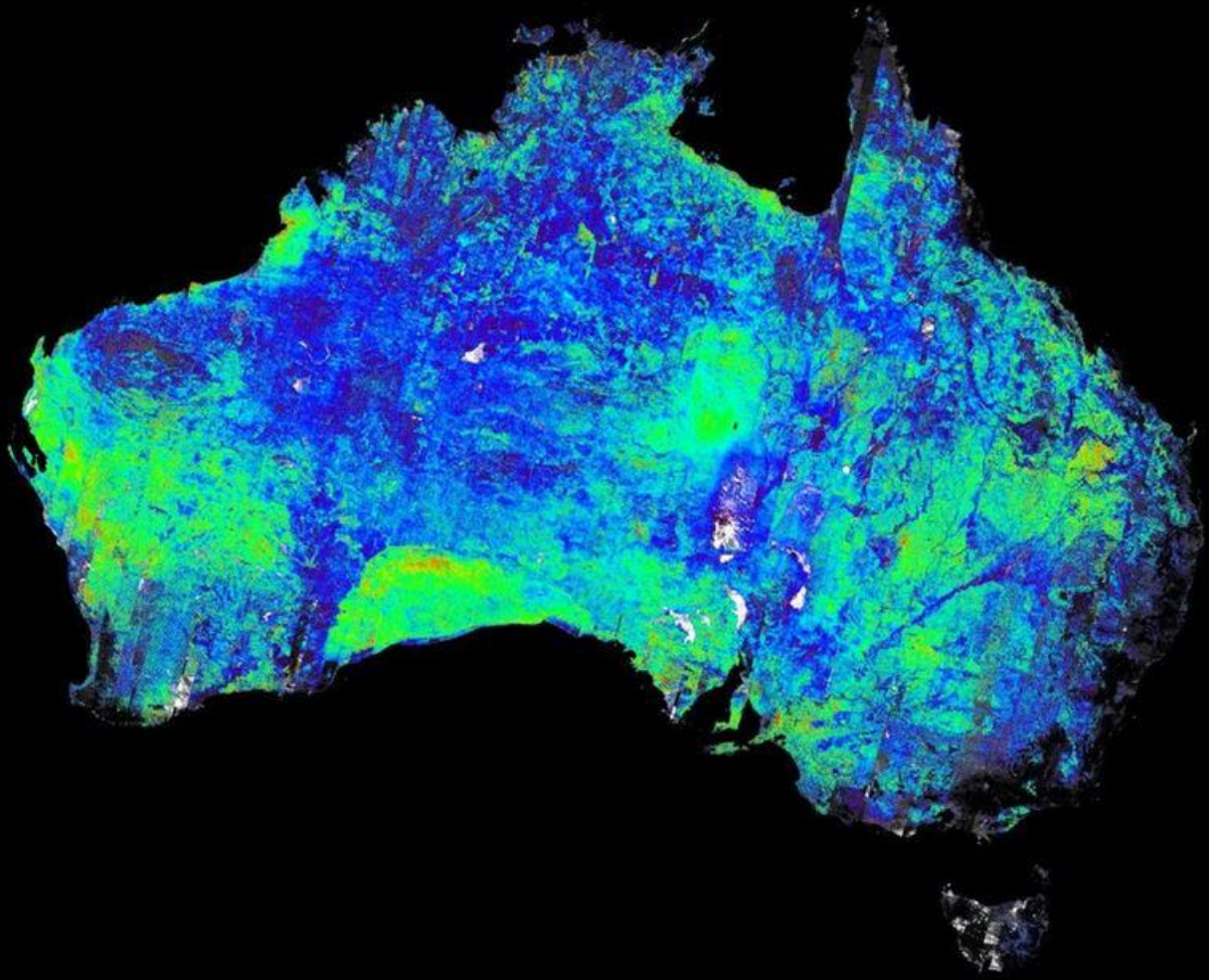
By measuring the energy that is reflected (or emitted) by targets on the Earth's surface over a variety of different wavelengths, we can build up a **spectral response** for that object.

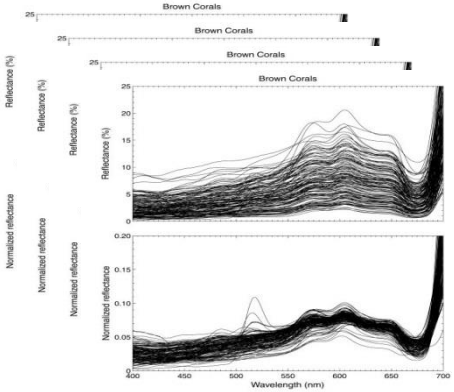
“Man must rise above Earth, to the top of the atmosphere and beyond, for only thus will he fully understand the world in which he lives”
Socrates (circa 399BC).

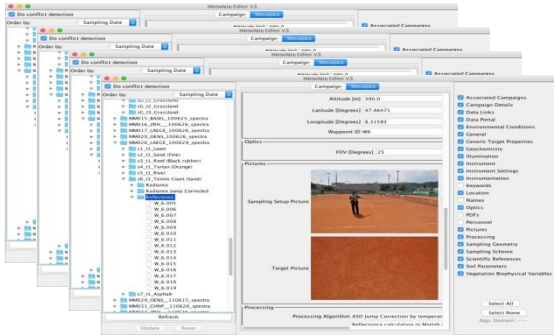



100 - 90 %
90 - 80 %
80 - 70 %
70 - 60 %
60 - 50 %
50 - 40 %
40 - 30 %
30 - 20 %
20 - 10 %
10 - 0 %


Structural Classes
No trees
Isolated low trees
Isolated medium trees
Low open woodland
Medium open woodland
Tall open woodland
Low woodland
Medium woodland
Tall woodland
Low open forest
Medium open forest
Tall open forest
Very tall open forest
Extremely tall open forest
Tall closed forest
Very tall closed forest







Coral Reefs (2004) 23: 84–95
DOI 10.1007/s00338-003-0350-1

REPORT

Eric J. Hochberg · Marlin J. Atkinson
Amy Apprill · Serge Andréfouët

Spectral reflectance of coral

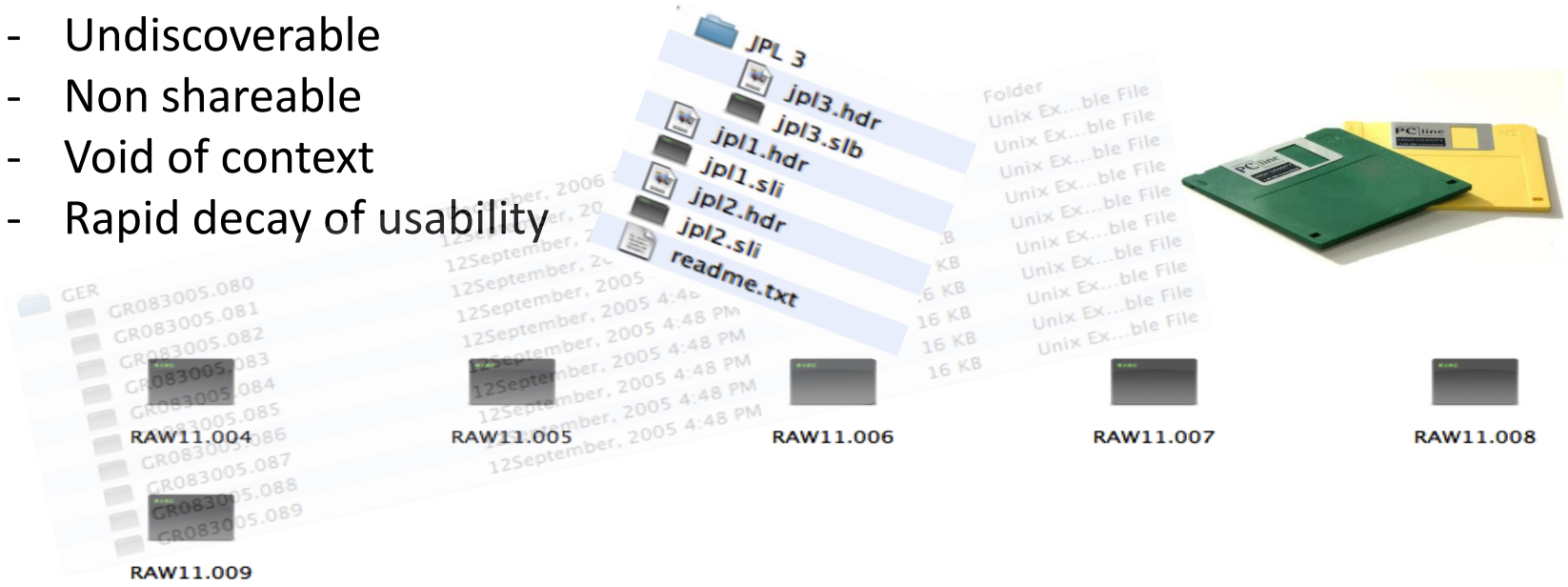
Received: 7 March 2003 / Accepted: 27 August 2003 / Published

Abstract Spectral reflectance (*R*) of corals is a funda
mental parameter to coral reef remote sensing. W
explore general trends as well as geographic an
taxonomic variabilities of coral *R* using a data set con
sisting of 5,199 *R*'s measured in situ at depths of up t
15 m for 195 coral colonies at 11 sites worldwide. Cora
R ranges in magnitude from ~0.5% at 400 nm to nea
100% at 700 nm; mean coral *R* rises from ~2.5% a
400–500 nm to ~8% between 550 and 650 nm. A
corals measured in this study exhibit one of two basi
shapes of *R*, which we label the "brown" and "blue
modes. We postulate that brown-mode *R* is determine
by pigment absorption solely by zooxanthellae, whil
blue-mode *R* arises through expression of a non-fluc
rescing coral-host pigment. Taxonomic and geographi
variabilities are approximately equal to global variabil
ity, both in magnitude and shape, indicating that coral
is independent of taxonomic or geographic differences
We reason that this is to be expected, since *R* is deter
mined by pigments that are conservative across geo
graphic and taxonomic boundaries.

Nemesis of spectral data collections

Collections of spectral data held in any random, semi-structured or static way, such as files and folders stored on personal computers or servers:

- Undiscoverable
- Non shareable
- Void of context
- Rapid decay of usability



TERN
Terrestrial Ecosystem Research Network

aceas
Australian Centre for Ecological Analysis & Synthesis

Bio-optical data: Best practice and legacy datasets workshop

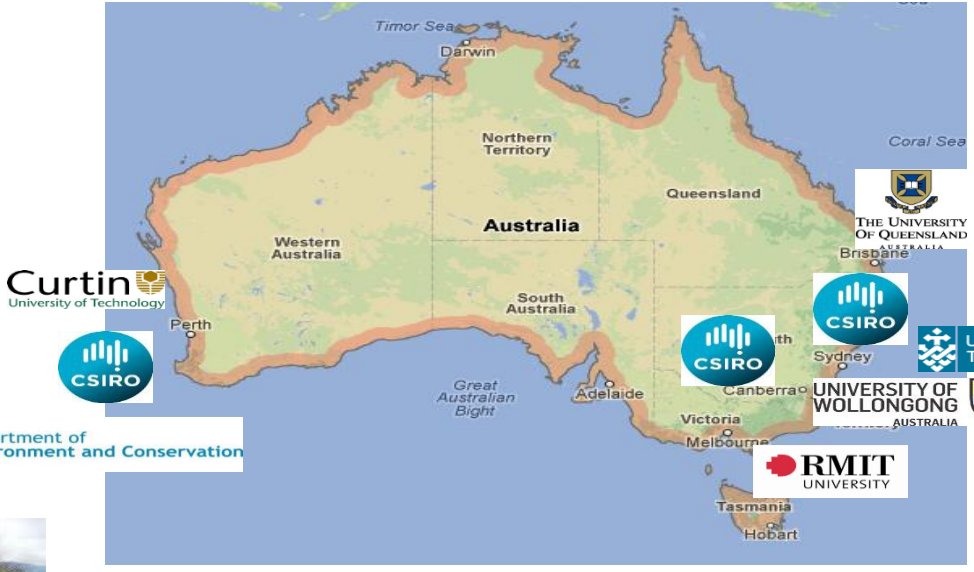
18 – 22 June 2012

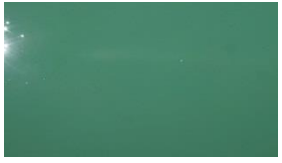
University of Queensland, Brisbane

Report: http://www.aceas.org.au

TERN is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy and the Super Science Initiative.

Spectroscopy User Info Sessions



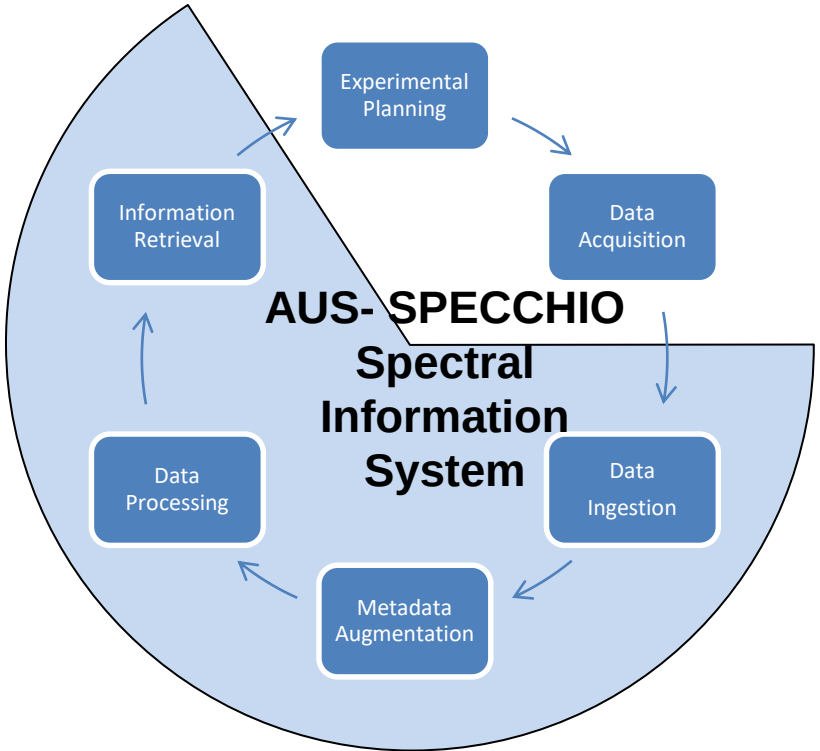


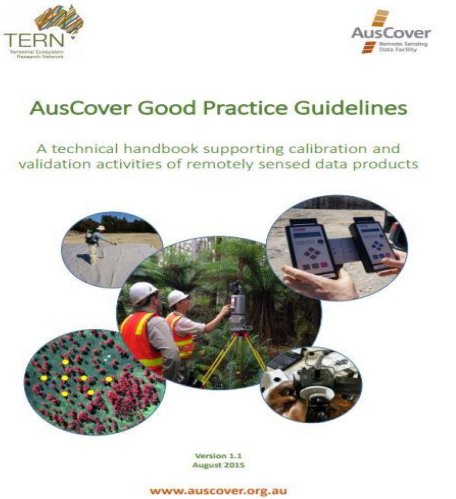
- Identified **core metadata requirements** for a number of different applications.
- Considered a variety of methods to both **exchange** and store spectral data and tools to assist in summarising the **completeness and quality** of such datasets.
- Agreed that with modifications, the SPECCHIO (Hueni et al 2009) software could meet international objectives for **spectral data exchange and to** promote **best practice protocols**.

AUS-SPECCHIO

Spectroscopy Lifecycle Support

Extensive, generic metadata – published standard





AusCover Good Practice Guidelines

A technical handbook supporting calibration and validation activities of remotely sensed data products

Version 1.1
August 2015

www.auscover.org.au

Chapter 14. **The Spectroscopy Dataset Lifecycle: Best Practice for Exchange and Dissemination**

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[2] Remote Sensing Laboratories, University of Zurich, Switzerland

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Citation:
Chisholm, L.A., Hueni, A. (2015). The Spectroscopy Dataset Lifecycle: Best Practice for Exchange and Dissemination. In A. Held, S. Phinn, M. Soto-Berelov, & S. Jones (Eds.), *AusCover Good Practice Guidelines: A technical handbook supporting calibration and validation activities of remotely sensed data product* (pp. 234-248). Version 1.1. TERN AusCover, ISBN 978-0-646-94137-0.

Metadata Editor V3

Do conflict detection

Order by: Sampling Date

- sG_t1_Grassland
- sG_t2_Grassland
- sG_t3_Grassland
- MM015_BASEL_100625_spectra
- MM016_ZRH___100626_spectra
- MM017_LAEGE_100626_spectra
- MM020_OENS_100626_spectra
- MM026_LAEGE_100629_spectra
  - s1_t1_Lawn
  - s2_t1_Sand (Fine)
  - s3_t1_Roof (Black rubber)
  - s4_t1_Tartan (Orange)
  - s5_t1_River
  - s6_t1_Tennis Court (Sand)
    - Radiance
    - Radiance Jump Corrected
    - Reflectance
      - W_6.005
      - W_6.006
      - W_6.007
      - W_6.008
      - W_6.009
      - W_6.010
      - W_6.011
      - W_6.012
      - W_6.013
      - W_6.014
      - W_6.015
      - W_6.016
      - W_6.017
      - W_6.018
      - W_6.019
  - s7_t1_Asphalt
- MM029_OENS__110615_spectra
- MM031_CHNP__110626_spectra

Refresh

Update Reset

Campaign | Metadata

Altitude [m] 390.0

Latitude [Degrees] 47.46471

Longitude [Degrees] 8.31583

Waypoint ID W6

Optics

FOV [Degrees] 25

Pictures

Sampling Setup Picture

Target Picture

Processing

Processing Algorithm ASD Jump Correction by temperat

Reflectance calculation in Matlab

- [x] Associated Campaigns
- [x] Campaign Details
- [x] Data Links
- [x] Data Portal
- [x] Environmental Conditions
- [x] General
- [x] Generic Target Properties
- [x] Geochemistry
- [x] Illumination
- [x] Instrument
- [x] Instrument Settings
- [x] Instrumentation
- [ ] Keywords
- [x] Location
- [ ] Names
- [x] Optics
- [ ] PDFs
- [ ] Personnel
- [x] Pictures
- [x] Processing
- [x] Sampling Geometry
- [x] Sampling Scheme
- [x] Scientific References
- [x] Soil Parameters
- [x] Vegetation Biophysical Variables

Select All

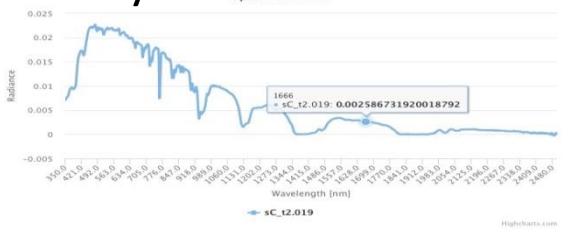
Select None

App. Domain: ---

Why enter all that metadata?

➜ Quantitative and qualitative interpretation!

➜ Spectral in situ data without metadata is utterly useless.



Generic Target Properties

Target/Reference Designator:	Target
Basic Target Type:	Roof (Black rubber)

Optics

FOV:	25

Sampling Geometry

Sensor Distance:	1.0
Illumination Azimuth:	105.00302797758435
Illumination Zenith:	45.06345046087947
Sensor Zenith:	0.0

General

File Comments:	
Spectrum Number:	19
File Name:	sC_t2.019
Acquisition Time:	2010-06-26 11:23:25
Loading Time:	2016-12-02 14:23:13

Show All

Instrumentation

Reference Panel Levelled:	true

Sampling Scheme

Spatial Sampling Scheme:	Sweep

Processing

UTC Time Computation:	UTC Acquisition Time computed by shifting 2 hours East using the SPECCHIO UTC function.

Location

Environmental Conditions

Cloud Cover:	0.0

Instrument Settings

Integration Time:	34
Number of internal Scans:	10
Gain_SWIR1:	44
Gain_SWIR2:	16
Offset_SWIR1:	2072

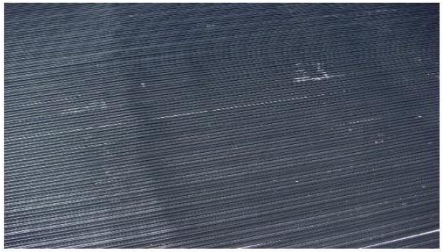
Show All

Campaign Details

Campaign Name:	APEX SGCPs

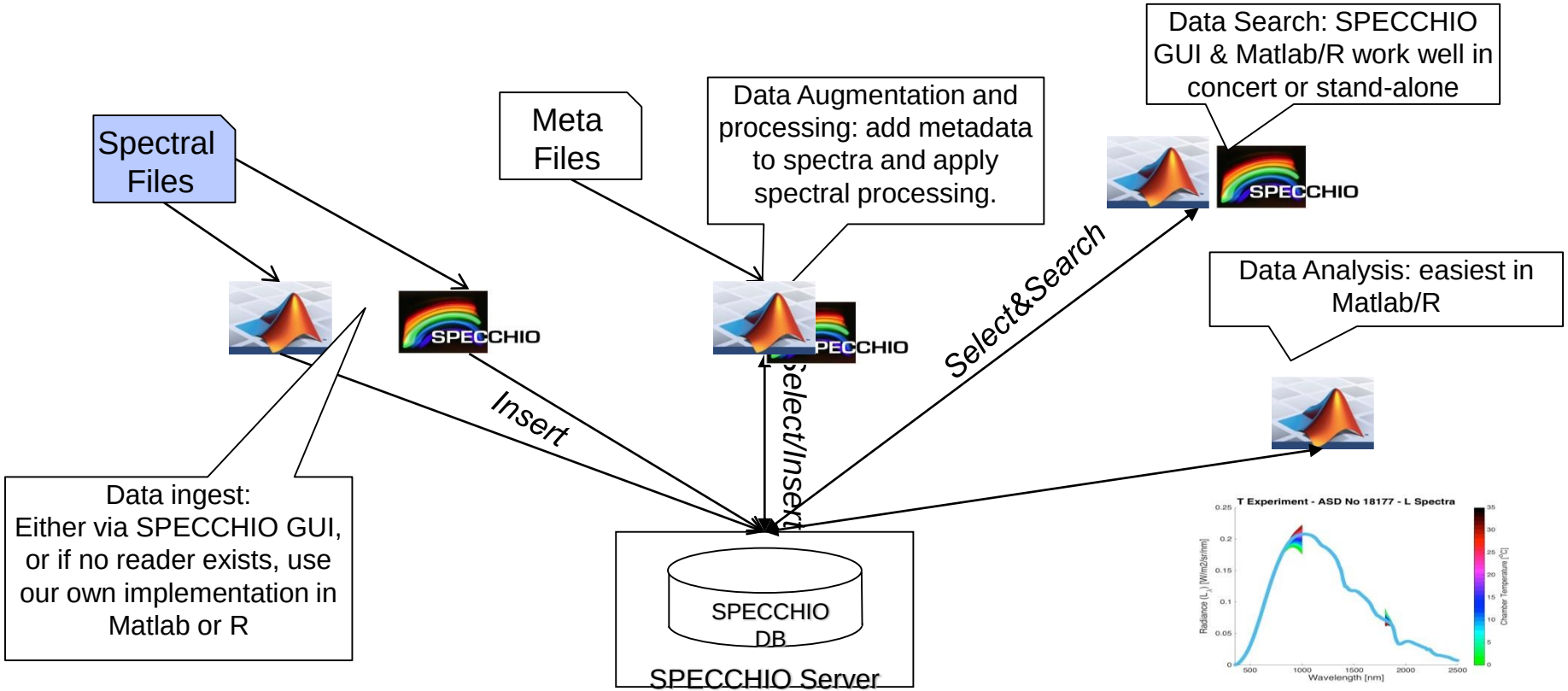
Pictures

Target Picture:



Sampling Setup Picture:

Spend your research time analysing data instead of trying to find it on your file system



For the proximal and remote sensing community, AUS-SPECCHIO demonstrates…

- Improved use and re-use of data
- Full support of the data lifecycle
- Enhanced collaboration to address research questions
- Value-adding due to API analytical functions
- Capability building
- Return on research investment

Digital Earth Australia

- “…series of data structures and tools which organise and enable the analysis of large Earth observation satellite data collections.
- …key element of DEA is the calibration and standardisation of the data.
  - increases the value which can be derived from Earth observation
  - allows for the rapid development of information products
  - enables informed decision making across government and private industry."

http://www.ga.gov.au/about/projects/geographic/digital-earth-australia

AUS-SPECCHIO in support of DEA

Validating foundation products within Digital Earth Australia

Guy Byrne · Medhavy Thankappan

Goal: Working to develop and identify protocols and data sets to support the validation of both the historic and future epochs of Geoscience Australia' analysis ready Landsat archive.

Geoscience Australia has agreed to host a National Spectral Database (Aus-SPECCHIO) that will support data analysis and validation for Australia' Earth Observation community.

The database is currently managed by the University of Wollongong who have been active developing, documenting and promoting SPECCHIO within the Australian research community.

It is expected the national node for Aus-SPECCHIO will be launched in the first quarter of 2018.

https://www.researchgate.net/project/Validating-foundation-products-within-Digital-Earth-Australia?discoverMore=1


The “SPECCHIO for Australia” spectral information system is designed to collate, share and discover new and existing spectral libraries, assisting the researcher through all phases of the spectroscopy data life cycle.