CONSIGLIO NAZIONALE DELLE RICERCHE

Istituto di Fisica Applicata "Nello Carrara"

Sesto Fiorentino - ITALIA

CAL/VAL activities for hyperspectral sensors at San Rossore test area

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ASI Workshop

'Data Exploitation della missione PRISMA, precursore

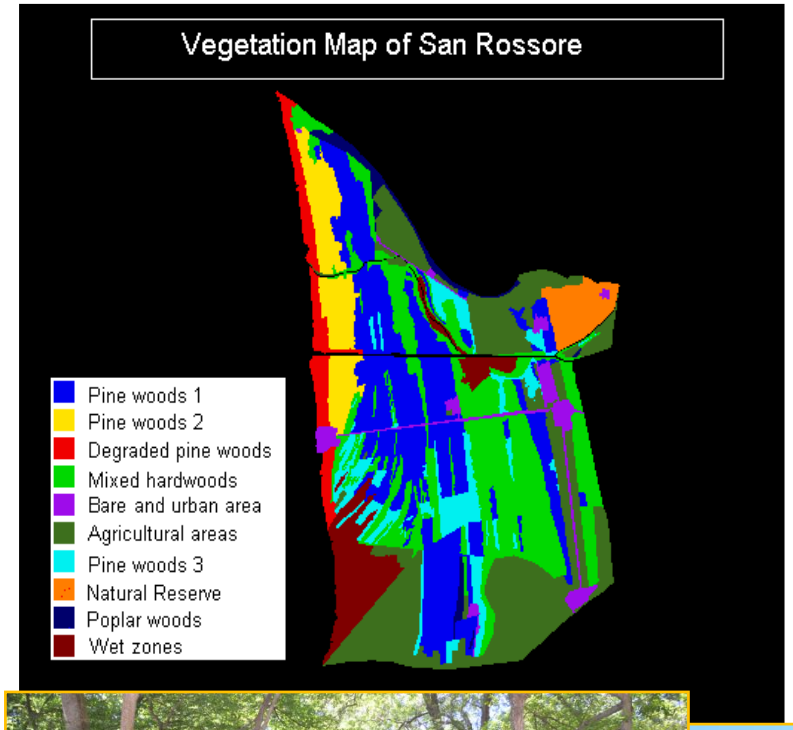
delle missioni iperspettrali nazionali'

ROMA - 1–3 March 2017

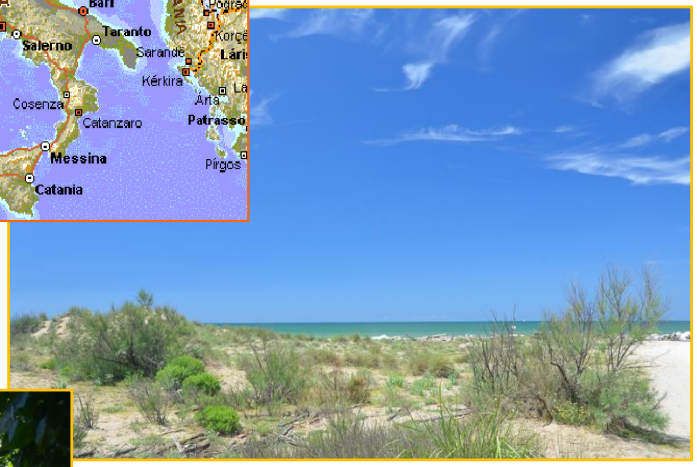
METEORS group

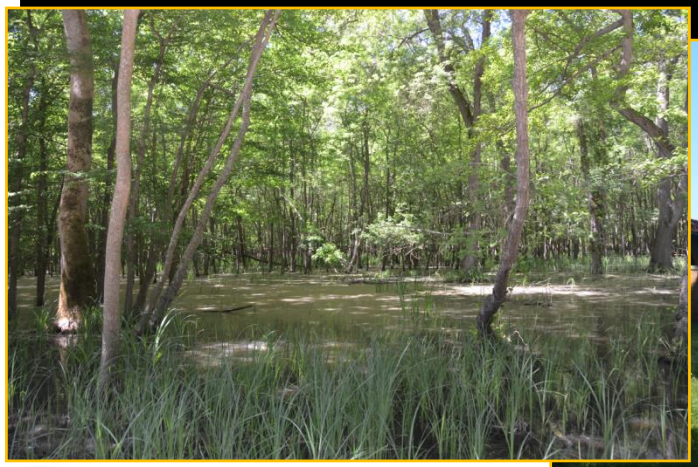
MEthods and TEchniques for active and passive Optical Remote Sensing

San Rossore Regional Park



Humid area of international relevance within RAMSAR convention



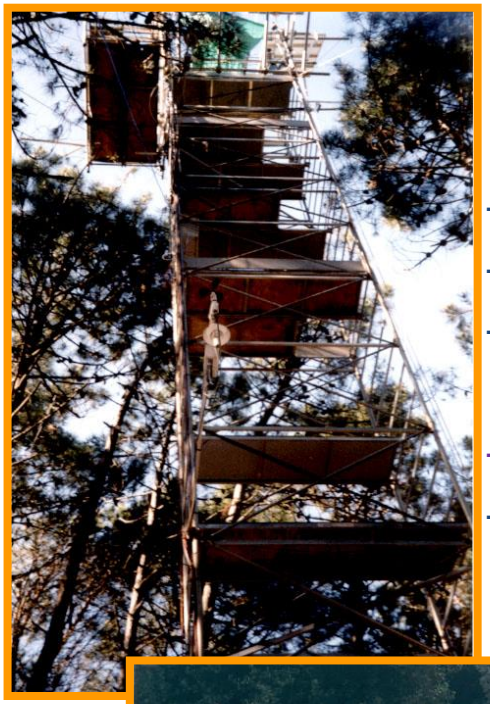


San Rossore Cal/Val test site

Cal/Val campaigns performed at San Rossore:

- MIVIS and VIRS imaging spectrometers on board of CASI-212 airplane (2000 – 2005)
- CHRIS on PROBA-1 imaging spectrometer (2002 – 2013) in the framework of ESA-EOPI Cat.1-LBR Project ID.2832
- HYPER-SIMGA imaging spectrometer on board of CASI-212 airplane CASI-212 (15/12/2005)
- SASI and CASI airborne imaging spectrometers during the ESA Sen3Exp campaign (June 2009)
- ASTER on ENVISAT imaging spectrometer during the ESA Sen3Exp campaign (June 2009)
- DAEDALUS – TELAER multispectral imager on board of Vulcanair AP68TP-600 airplane (10/08/2012)
- HYPERION on EO-1 imaging spectrometer (10/08/2012)

San Rossore Cal/Val test site

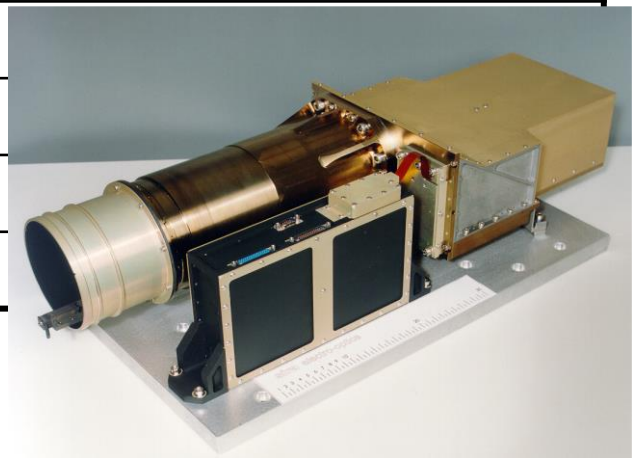


Parameters measured during Cal/Val activities:

- Air temperature, pressure, humidity
- Wind direction and intensity
- Total and diffused solar irradiance (400 nm – 1000 nm)
- CO_2 and H_2O fluxes (Fluxnet site – JRC)
- At ground spectral reflectance (spectral databases)

CHRIS - Compact High Resolution Imaging Spectrometer on PROBA-1 Cal/Val activities 2002-2013

Operational mode:	push-broom
Field of view:	1.3º
Number of images:	5 acquisitions of the same area at +55°, +36°, 0°, -36°, -55 °nadir angles along the same orbit
Spectral range:	410 - 1050 nm
Configurations:	6 related to the required applications
Min. Imaging area:	13.5 km x 13.5 km (748 X 744 pixels)
Spatial resolution:	18 m or 36 m
Number of bands:	18, 37 or 63
Spectral resolution:	5 - 40 nm
Digitalization:	12 bits

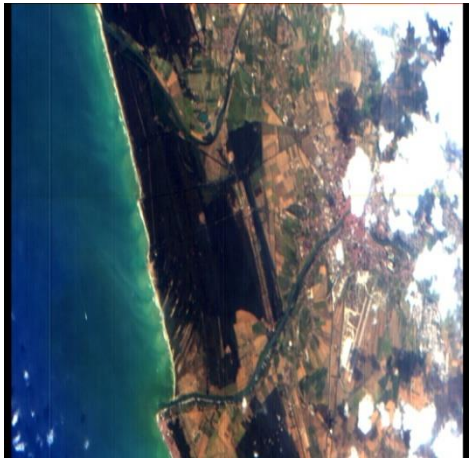


CHRIS acquisitions

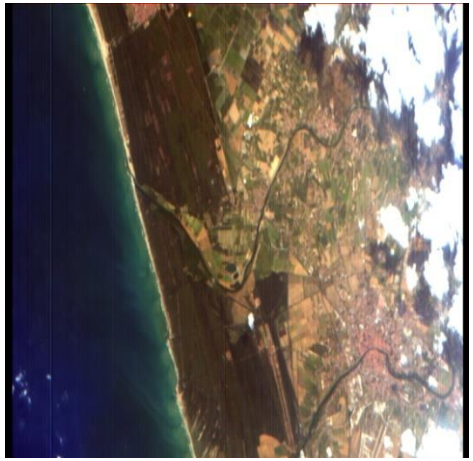
"Response Corrected Images" by SIRA Ltd

Project ESA-EOPI Cat.1-LBR Project ID.2832 "Assimilation of biophysical and biochemical variables in biochemical and hydrological models at landscape scale"

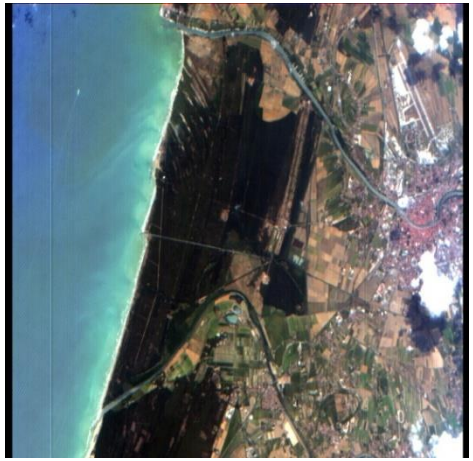
MZA= - 2°
FZA= +55°



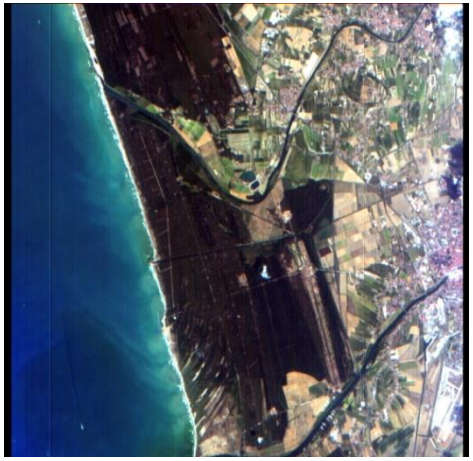
San Rossore (Italy) 25 July 2003



MZA= - 2°
FZA= - 55°



MZA= - 2° FZA= +36°

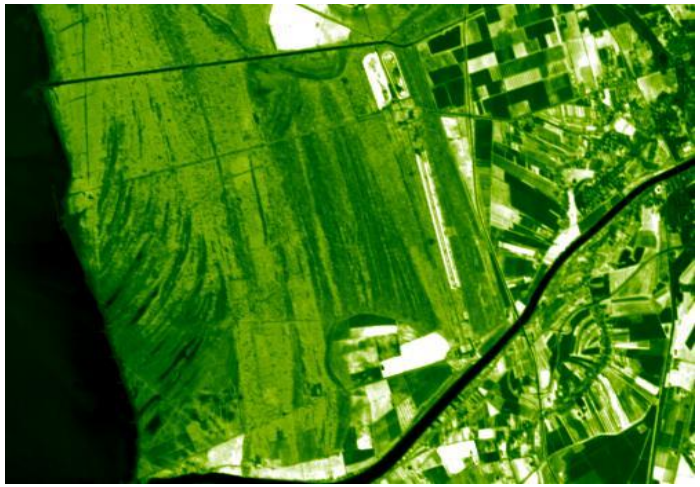


MZA= - 2° FZA= 0°

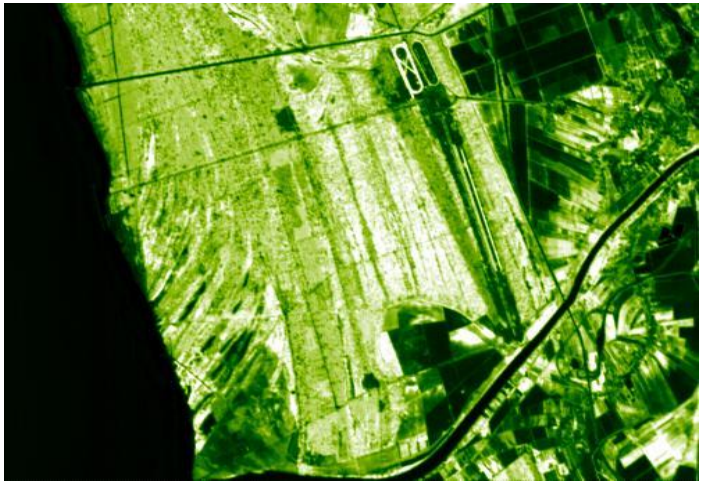
MZA= - 2° FZA=-36°

Red: 621 nm - Green: 530 nm – Blue: 442 nm

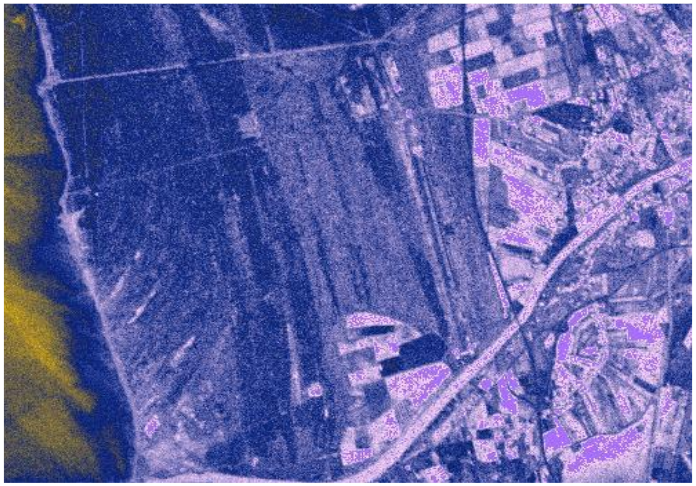
CHRIS remote sensing campaigns



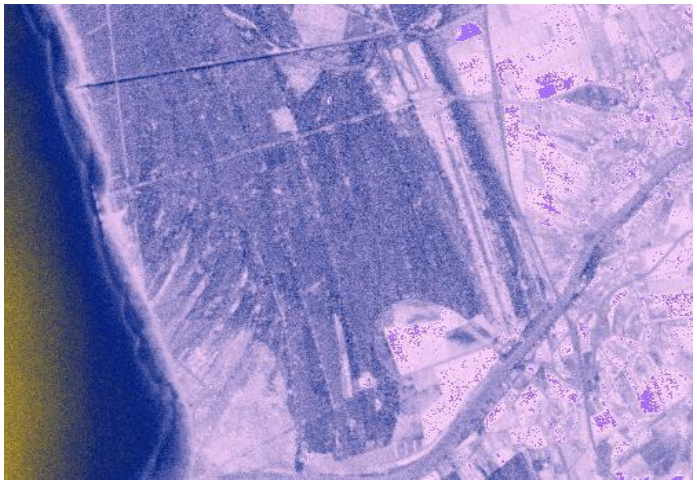
SAVI image computed from CHRIS acquisition March 27, 2004 at FZA=00



SAVI image computed from CHRIS acquisition September 8, 2004 at FZA=00

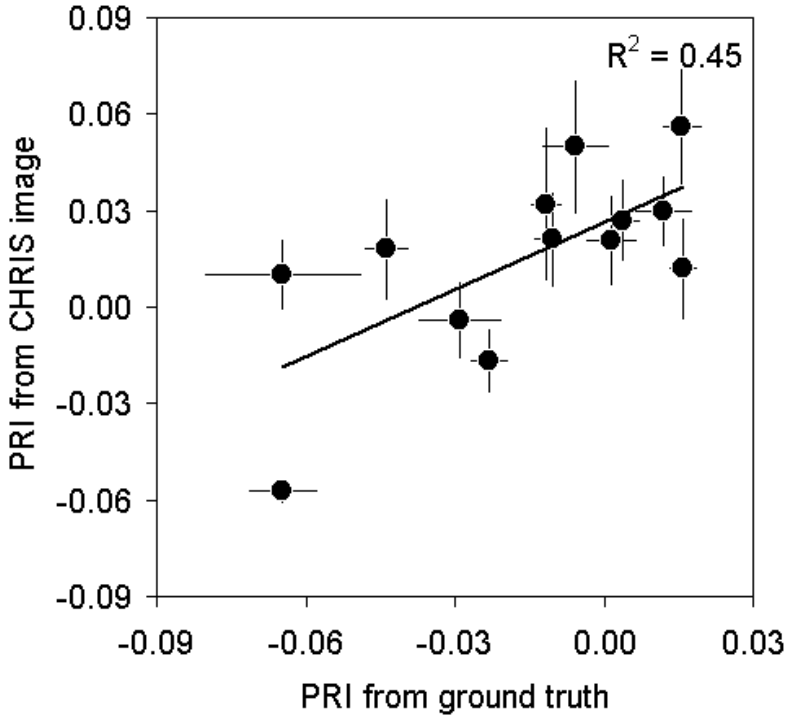


PRI image computed from CHRIS acquisition March 27, 2004 at FZA=00



PRI image computed from CHRIS acquisition September 8, 2004 at FZA=00

CHRIS: Biogeochemical parameter retrieval and validation



PRI image computed from the CHRIS acquisition on August 9, 2005 at FZA=0^0 and MZA=-6^0

Daedalus – TELAER campaign 10/08/2012

DAEDALUS Airborne Thematic Mapper (ATM-2) AA1278M2 (2011) on Vulcanair AP68TP-600 VIATOR

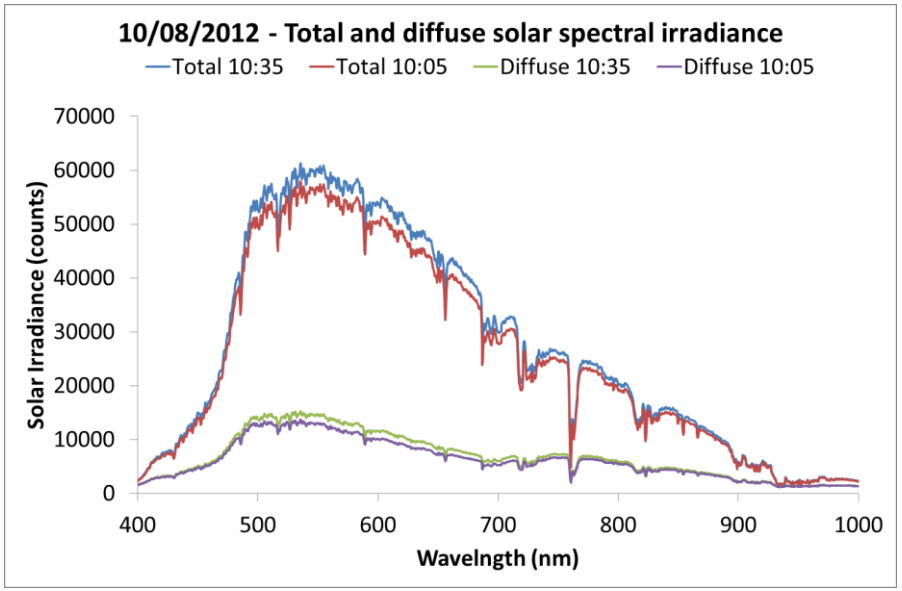
GSD	Begin	End	Heigth	Air temperature
1.3 m	10.00	10.35	1110 m	26 C°

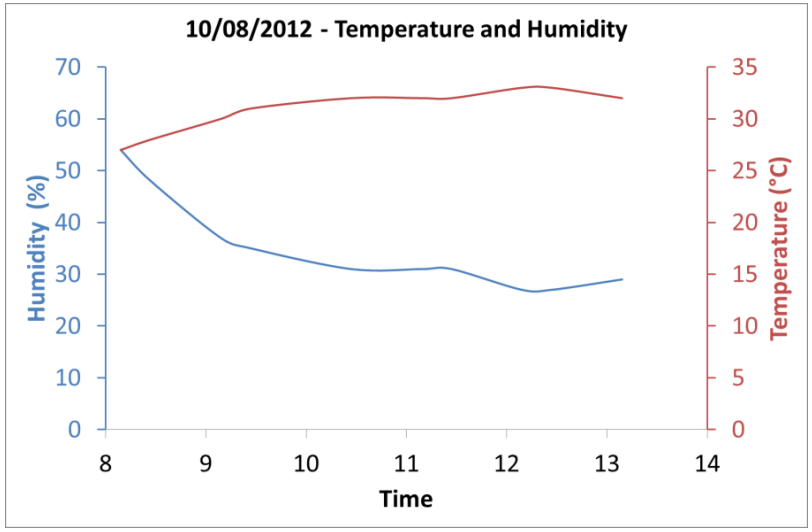
Four overflights over San Rossore park

DAEDALUS Airborne Thematic Mapper	
FOV	90°
IFOV	1.25 mrad
Spatial corrections	Roll, pitch, heading, GPS/INS

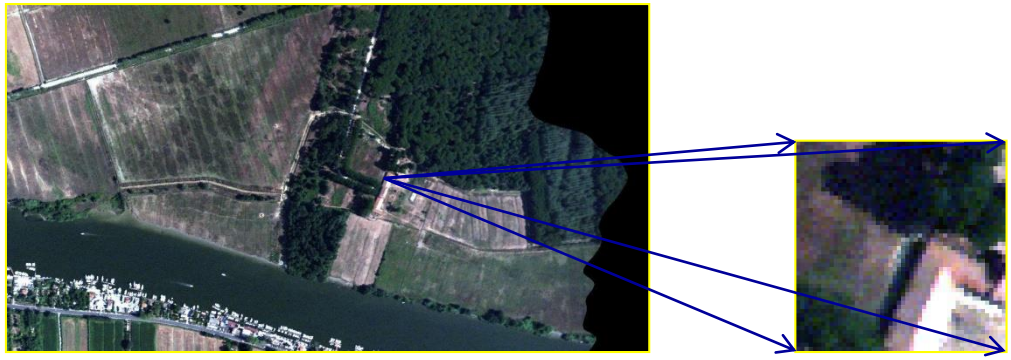
Daedalus ATM wavelength (micron)	
0.44	0.665
0.49	0.7
0.51	0.75
0.53	0.81
0.55	0.88
0.57	1.65
0.595	2.2
0.625	11

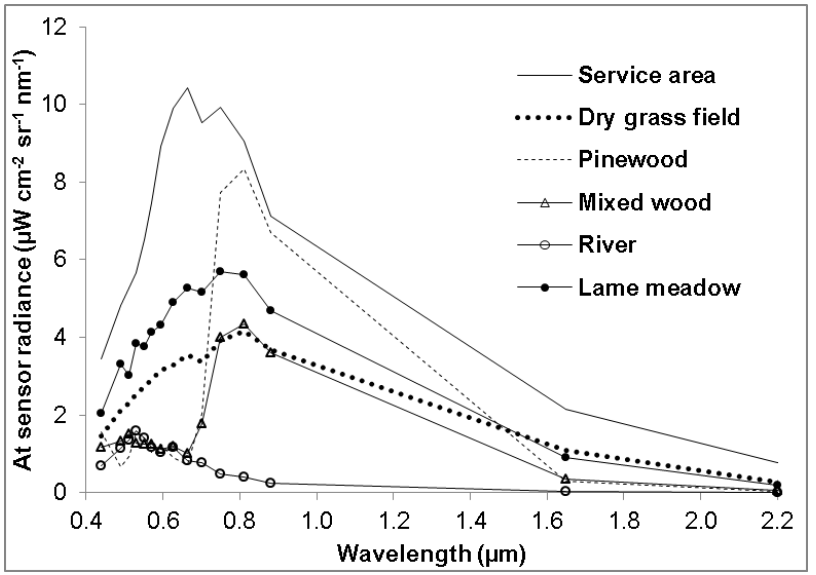
Daedalus – TELAER campaign 10/08/2012



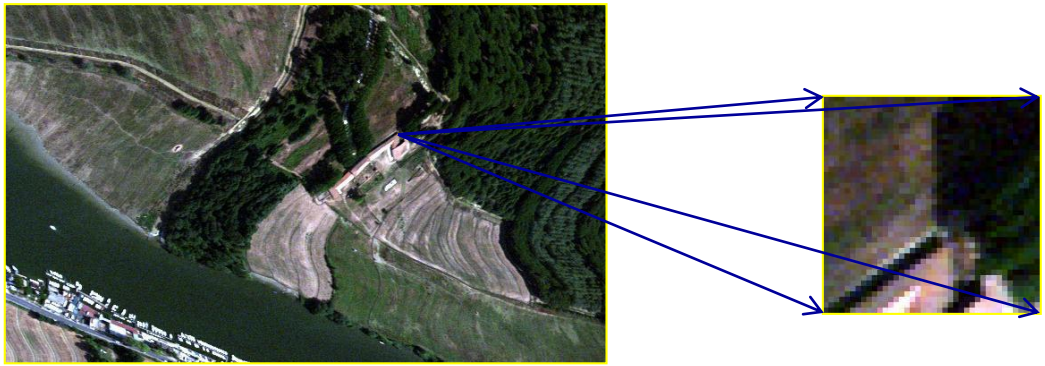


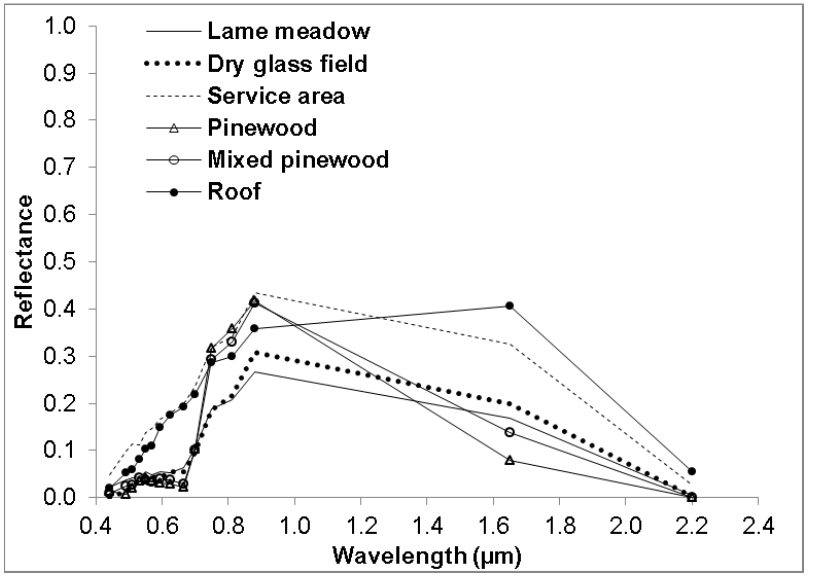
Daedalus acquisition over Boschetto site 10/08/2012





At-sensor radiance image and spectra.

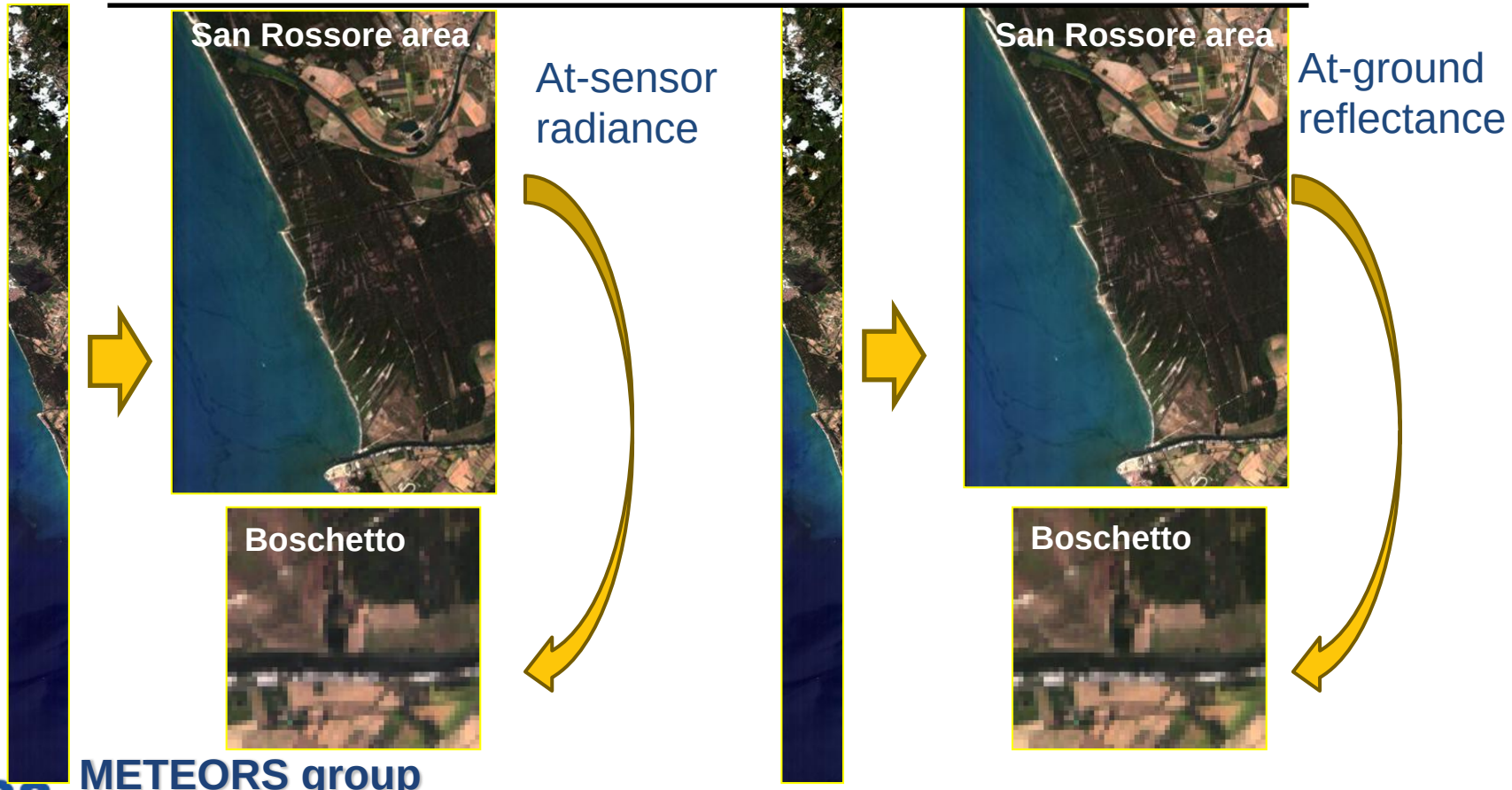




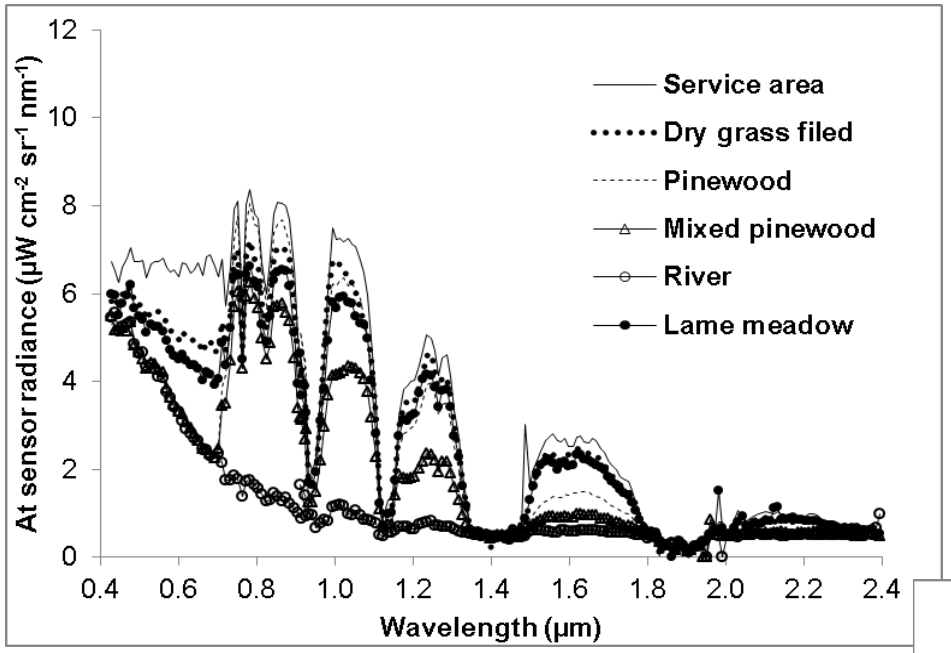
At-ground reflectance image and spectra.

Hyperion acquisition - 10/08/2012

Type:	Push-broom
Height:	700 Km
FOV:	7.5 km
Spatial resolution:	30 m
Bands:	220
Spectral range:	0.4 µm – 2.5 µm
Spectral resolution:	10 nm

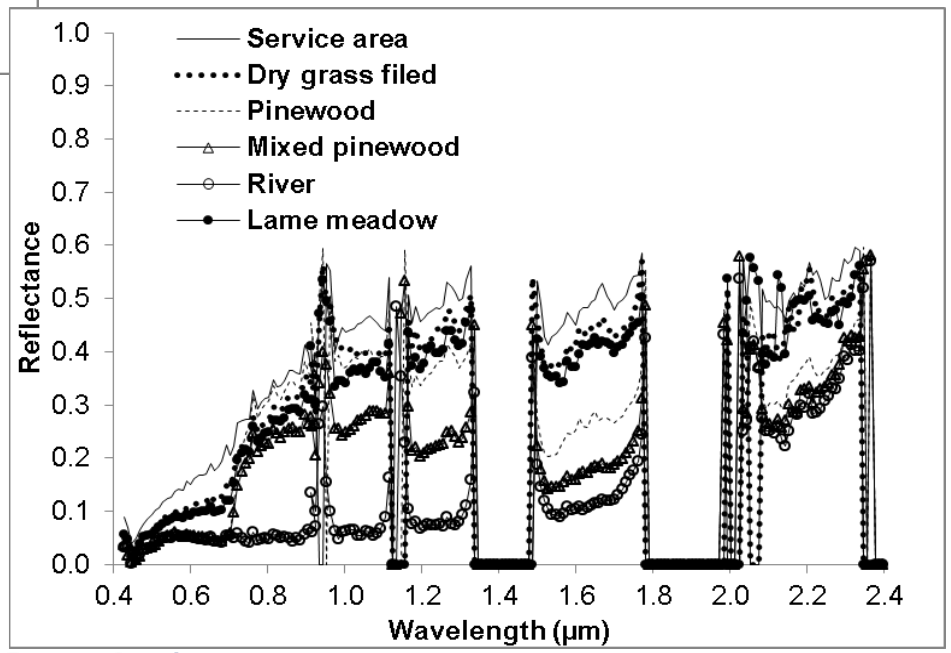


Hyperion acquisition - 10/08/2012

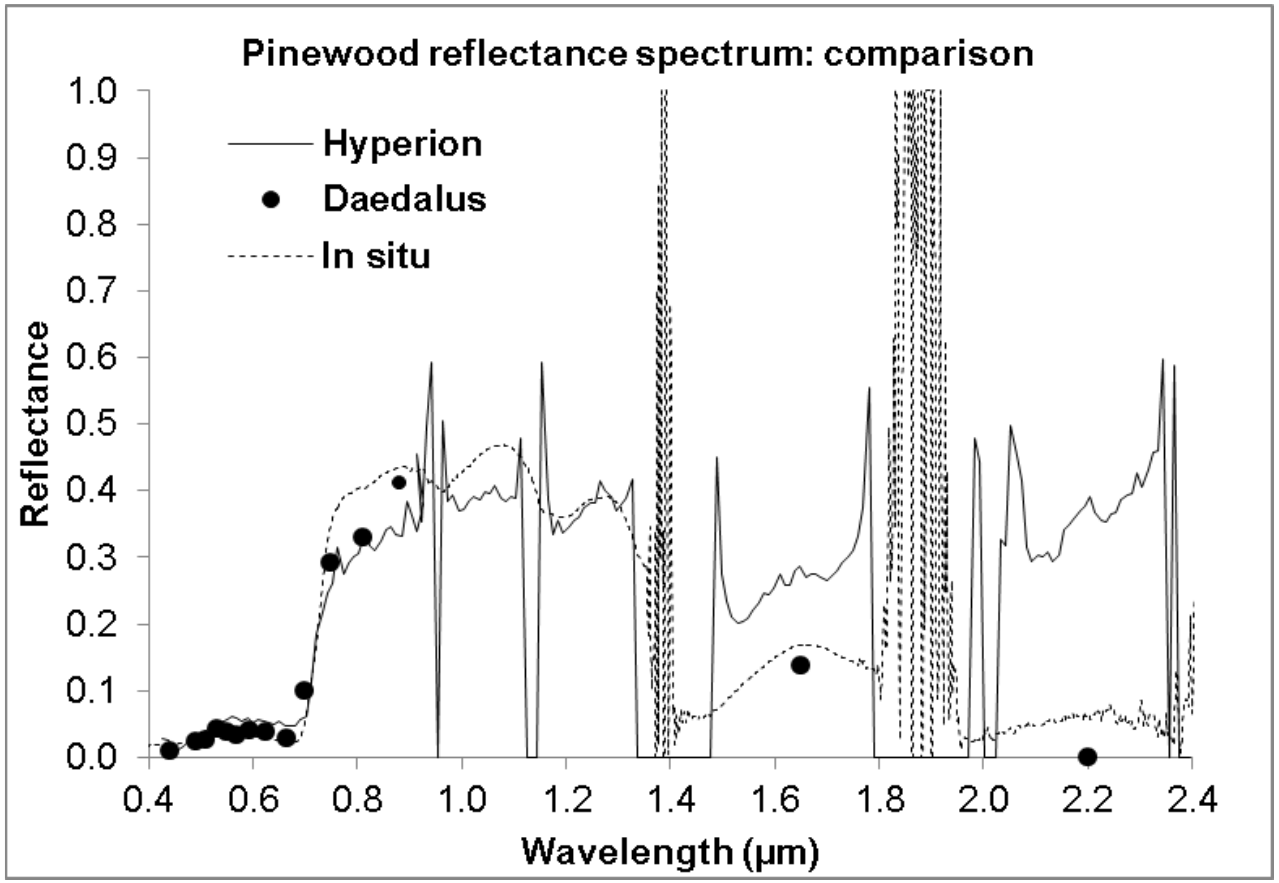


Spectra extracted from at-sensor radiance image over Boschetto area.

Spectra extracted from at-ground reflectance image over Boschetto area.



Hyperion, Daedalus and in-situ acquisitions 10/08/2012



Measurements simultaneosly performed at ground, by airplane and from satellite on the same area of interest, conveniently scaled and / or processed, allowed cross-checked results.

Conclusions

- San Rossore Cal/Val test site managed by IFAC-CNR has been presented.
- Activities performed during CHRIS acquisitions in the framework of ESA project ESA-EOPI Cat.1-LBR Project ID.2832 have been illustrated.
- Activities performed during the TELAER campaign on 10/08/2012 and the simultaneous Hyperion acquisitions have been illustrated. Results coming from Daedalus and Hyperion acquisitions have been compared and discussed.
- **Perspectives for Cal/Val activities at San Rossore in the frame of PRISMA mission.**