Results of Tuz Gölü comparison: Surface based measurements

CEOS WGCV IVOS workshop, Ispra 18th-20th October 2010

Irina Behnert, National Physical Laboratory

NPL National Physical Laboratory

Agenda

- Tuz Gölü new CEOS reference standard test site
- CEOS Key Comparisons
- 2009 results
- Summary
- Conclusions

Reference standard test sites

Infrared, Visible and Optical Sensors (IVOS) Sub-group of the CEOS established 8 ground targets, LandNet 2007

Need for a Global,Integrated Network of Calibration Sites

http://calval.cr.usgs.gov/sites_catalog_map.php

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Tuz Gölü (= Salt Lake in Turkish)

The third largest lake in Turkey
Surface 1 600 km^2
900 m altitude
Dries during July-August

Salt water springs 1.5 m

Easy access
Cycling & walking, no traces

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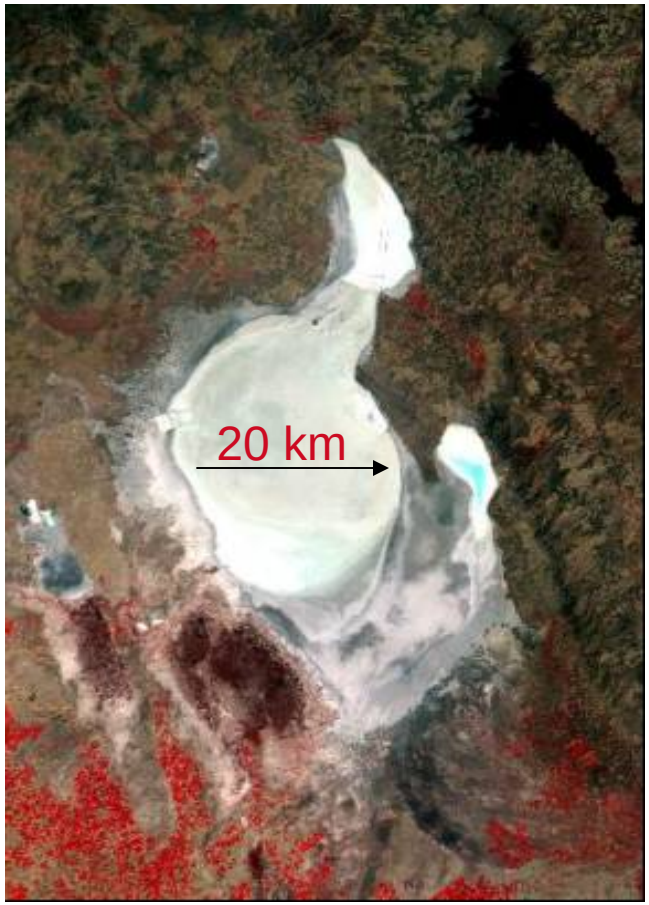


Site characterisation 2008

2 teams:
NPL,UK
TU,Turkey

CEOS pilot Comparison 2009

5 teams from:
NPL, DLR, TU,
CNES, ONERA

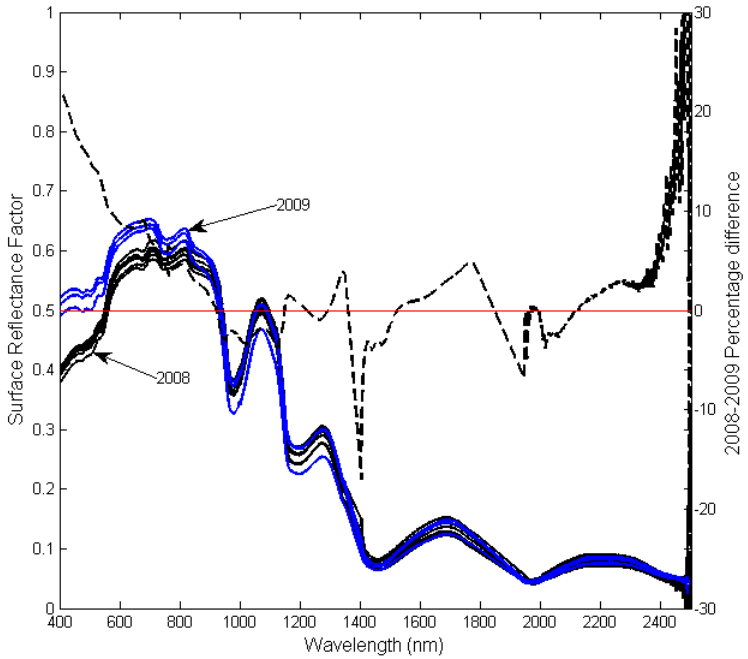
CEOS Key Comparison 2010

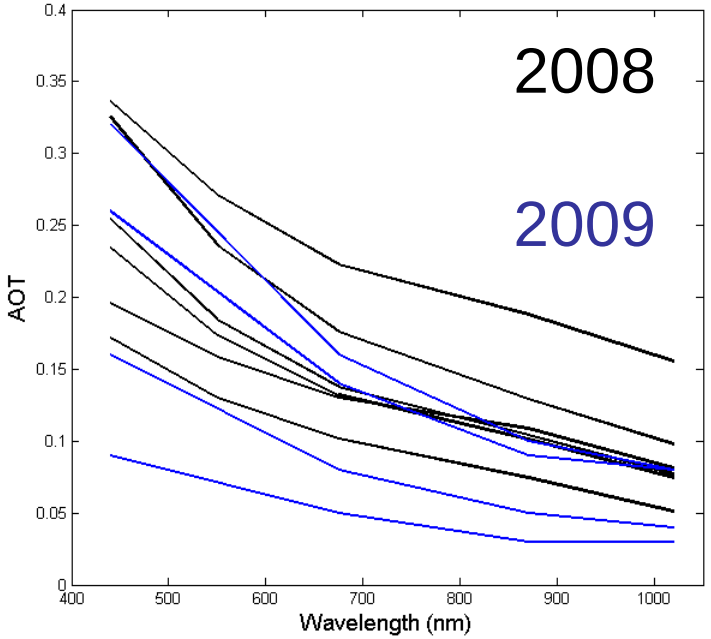
Tuz Gölü

38 50ºN 33 20ºE

10 teams,
4 continents

Site characteristics, August 2008 & 2009





Surface reflectance factor
VNIR > 0.4 --- OK
SWIR < 0.2 --- low

Aerosol optical thickness
AOT(550) > 0.15
$\alpha_{440\text{-}870}$ = 0.96 -1.70

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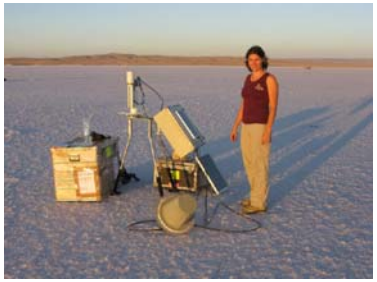
CEOS comparisons 2009 & 2010

Why CEOS Land comparisons ?

To define the “best practice” to characterise a LandNet site and to report the uncertainties according to the QA4EO

Radiometric site characterisation



Atmospheric characterisation

Sampling techniques for high and medium resolution in flight sensors

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Activities according to the Land protocol

Laboratory

Cross-comparison of radiometers against a standard source

Calibration of participants reference panels (2010 only)

Field

Cross-comparison of radiometers against a reference panel

Cross-comparison of participants' reference panels (2010 only)

Sampling same points of 100*300 m (2009) & 50*3 m (2010)

Site surface characterisation over: 100*300 m & 1 km*1 km

BRDF using GRASS (NPL)

Atmospheric characterisation

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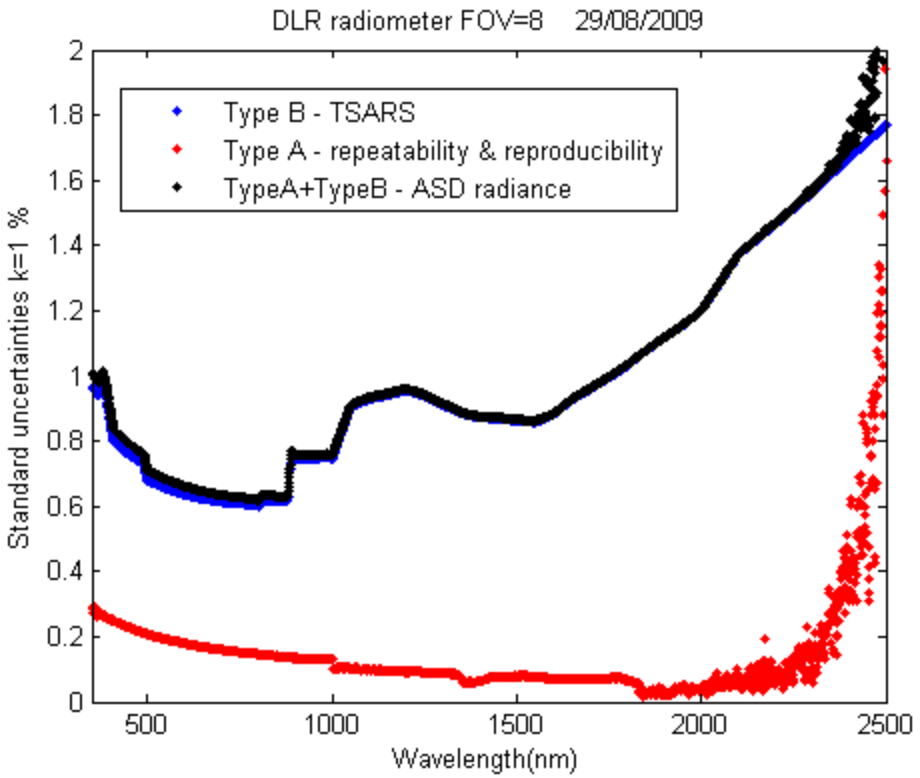
Laboratory radiometric calibration 2009
Type A + Type B standard uncertainty NPL



Type B
major source of uncertainties

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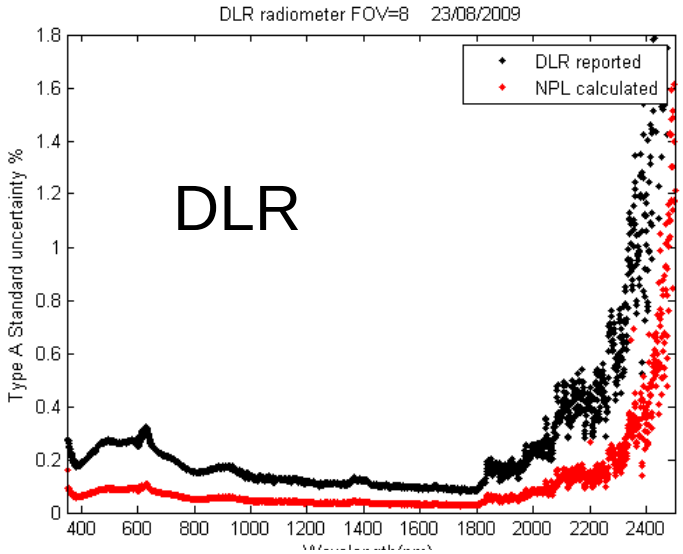
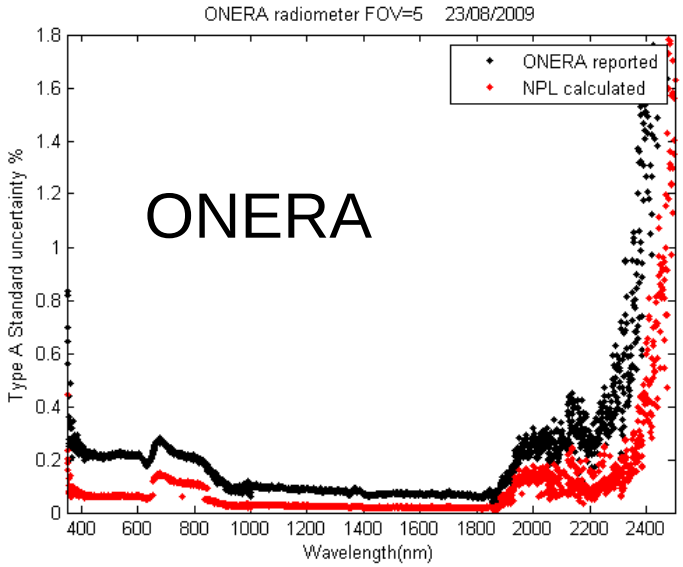
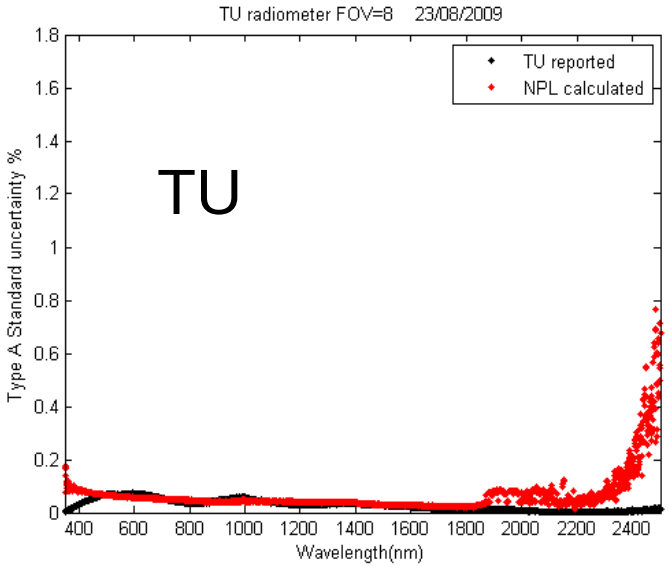
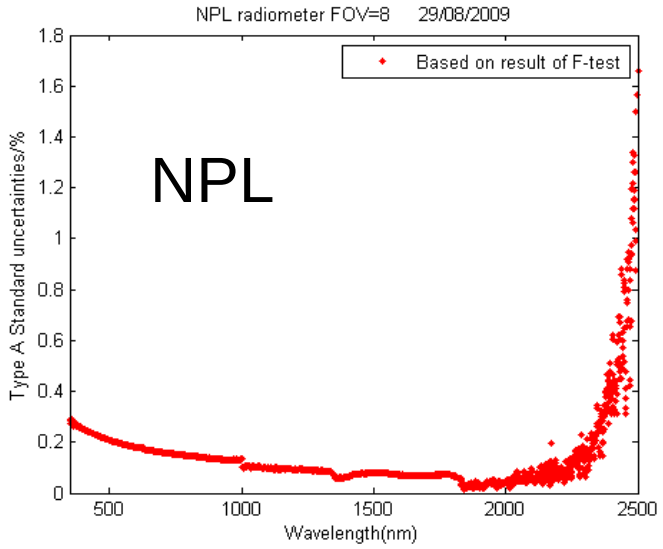
Type A std uncertainty, performance/noise









2009

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Laboratory & In field characterisation of participants' reference panels, 2010

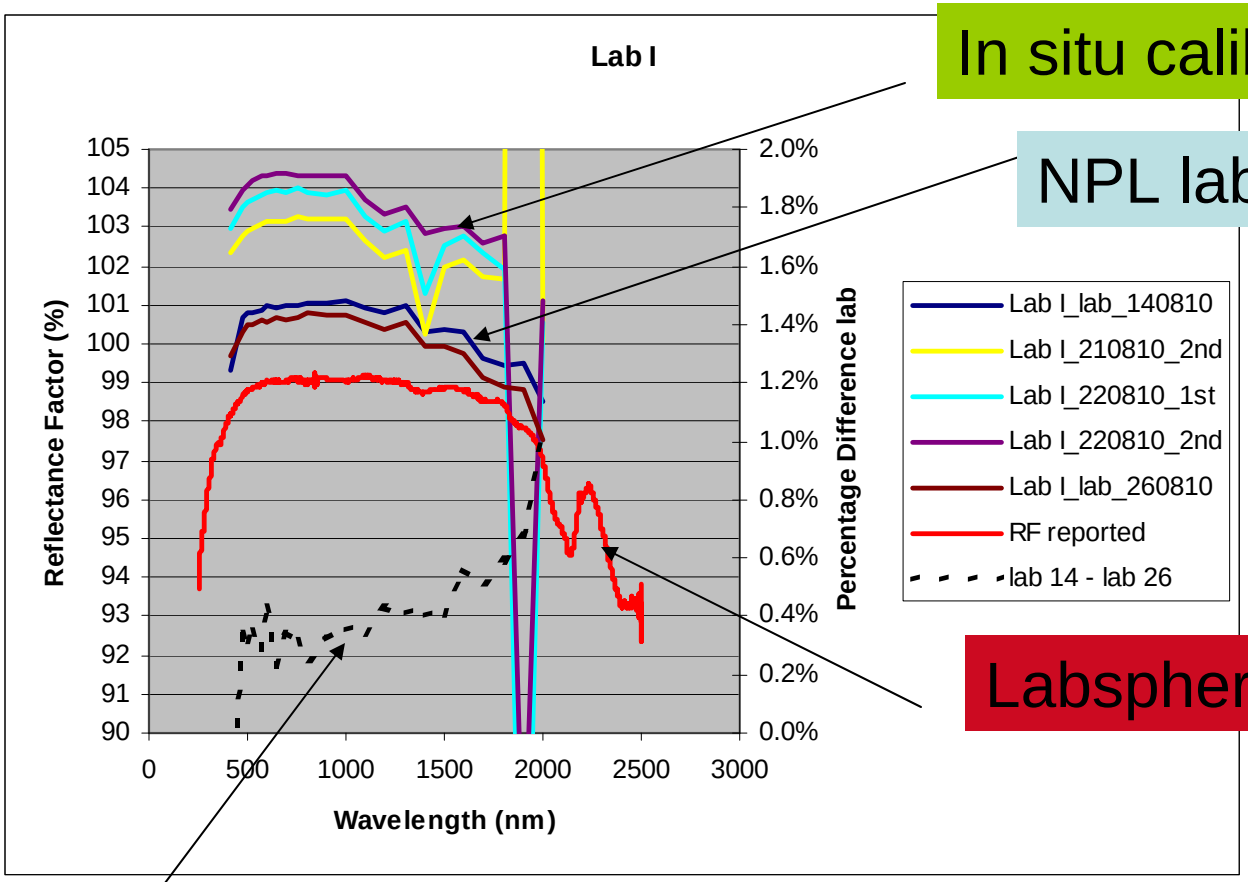
Labsphere calibration → Diffuse illumination, 8º view

NPL lab calibration → Bidirectional illumin 45º, nadir view
1 kW FEL lamp

In field calibration → Diffuse and Direct illumination
Sun zenith & irradiance variability

Laboratory & In field panels calibration 2010

What RF panel value to use further ???



In situ calibration

NPL lab calibration

Labsphere calibration

Difference between 2 NPL lab calibrations

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Cross-comparison of radiometers against the reference panels in field

26th Aug 2009 cirrus

Changing illumination conditions not ideal for reference panels calibration

27th Aug 2009 good day

Cross comparison against NPL panel

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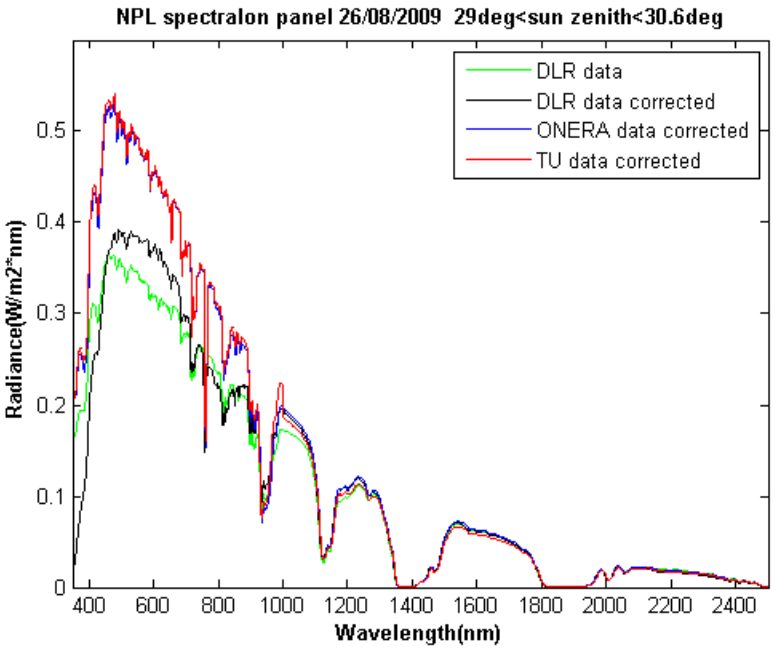
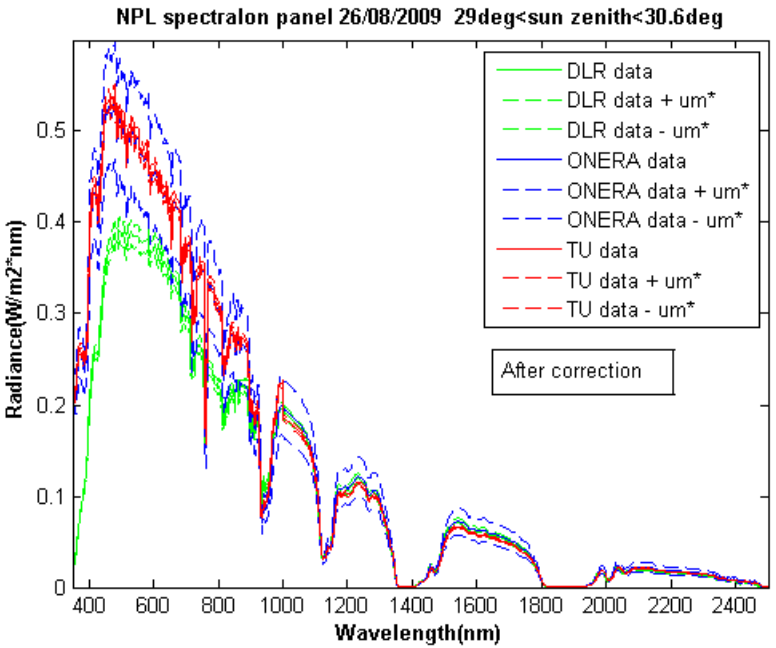
26th August 2009





DLR, TU & ONERA data were corrected using the gains from 23rd August

DLR radiance calculated with different software, different corrections

Standard uncertainty recalculated using GUM

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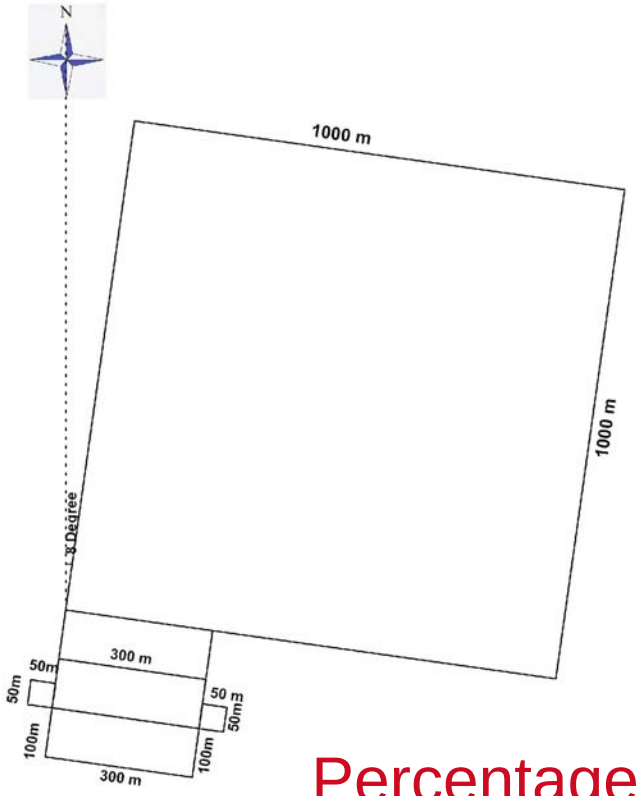
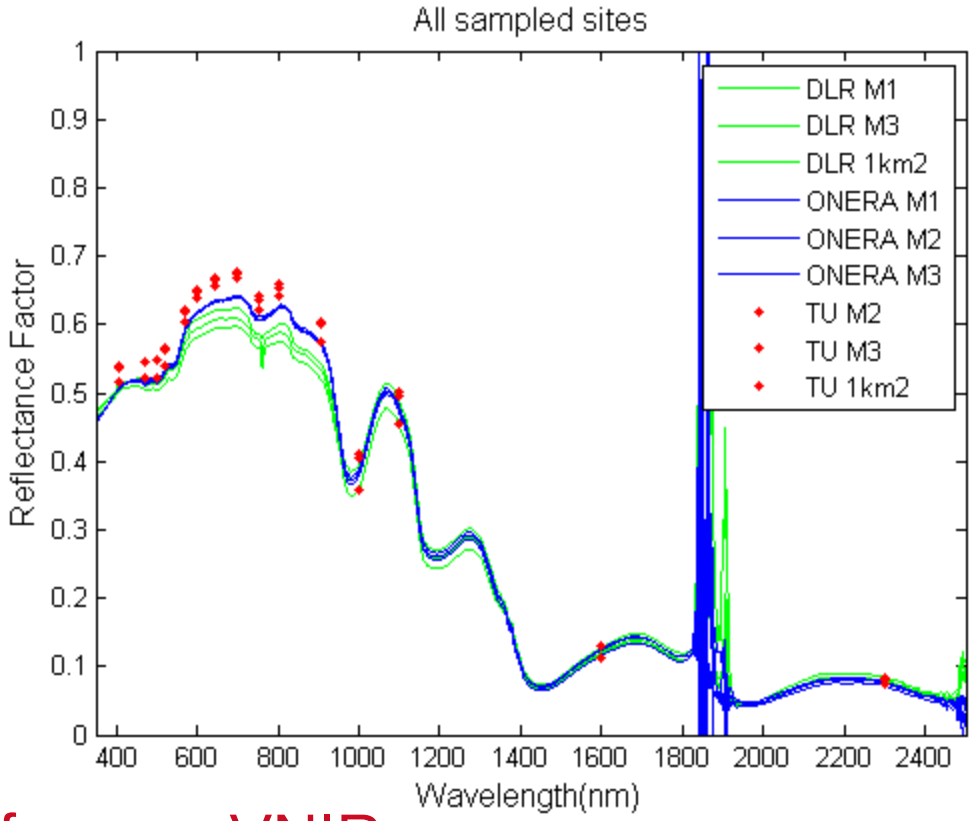
Site surface characterisation 2009





Percentage difference VNIR

Max 7% between ONERA and DLR

Max 5% between ONERA and TU

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Summary 2009

	Instrument	Software	Panel calibration
ONERA	ASD, 2005 Type A ~ 0.1% 400 – 1800 nm	ASD software	Diffuse illumination
DLR	ASD, 2005 see ONERA	DLR software different Radiance VNIR RF 6% lower	Diffuse illumination
TU	ASD, 2008 Type A < 0.5%	ASD software	Bidirectional illumination for θ_s =47º,37º,30º, nadir RF is 5% higher

Conclusions

- Differences in the RF values of the site were the result of software and panel calibration methodologies used
- 2010 CEOS Key comparison results will help in the further understanding of the sources of uncertainties related to the “surface measurements”
- It is important to report the uncertainties associated with the measurements and the traceability of the calibration