DA-09-01a-6: Ground based cal/val campaign (comparison)

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Division of Engineering

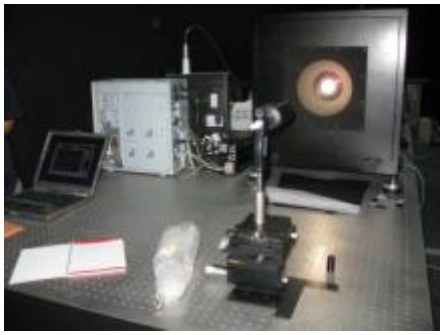
NPL
National Physical Laboratory

GEO actions:

Obtain support and resources to complement those of ESA to initiate and plan an international cross-comparison of ground Cal/Val support techniques and instrumentation for both IR emitted radiance (SST) (spring 09) and VIS/SWIR reflected radiance (Land) Summer 10)

2009 CEOS Pilot Campaign

The objectives are:

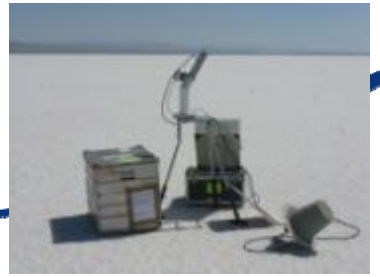


- **Evaluate differences in field instrument primary calibrations**

- **Evaluate differences in methods for characterising and assigning "radiometric value" to a site, for multiple view angles**

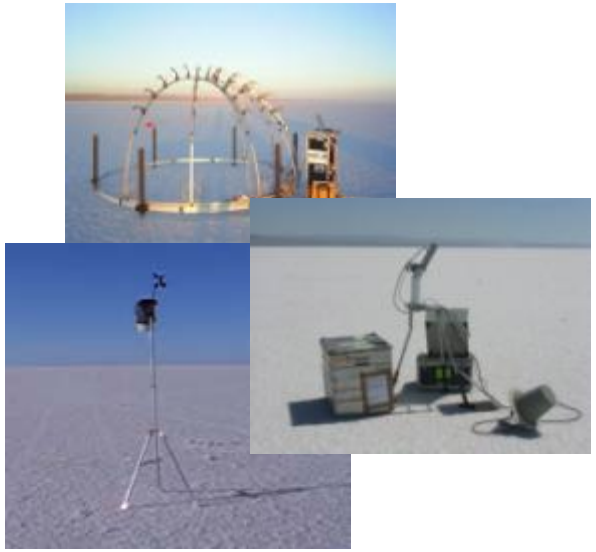
- **Establish formal traceability of Tuz Gölü reference site based on an evaluation of all comparison results.**

•Minimum specifications for characterisation/instrumentation for a CEOS "reference standard"



Instrumentation

Equipment	Measurement	Institute
GRASS	BRDF	NPL
CIMEL Sun Photometer	AOD, water vapour, ozone data	CNES
Meteorological Station	Temperature, wind, humidity, pressure, irradiance, UV index	TÜBİTAK UZAY
Microtops II Sun Photometer	AOD	DLR
Microtops II Ozoneometer	Ozone content	DLR
ASD Spectrometers	Radiance/ Reflectance	DLR, TÜBİTAK UZAY, ONERA, NPL
KT19 Heitronics thermoradiometers	Spectrum measurements over thermal region.	ONERA
HYMAP	Hyperspectral measurements	DLR



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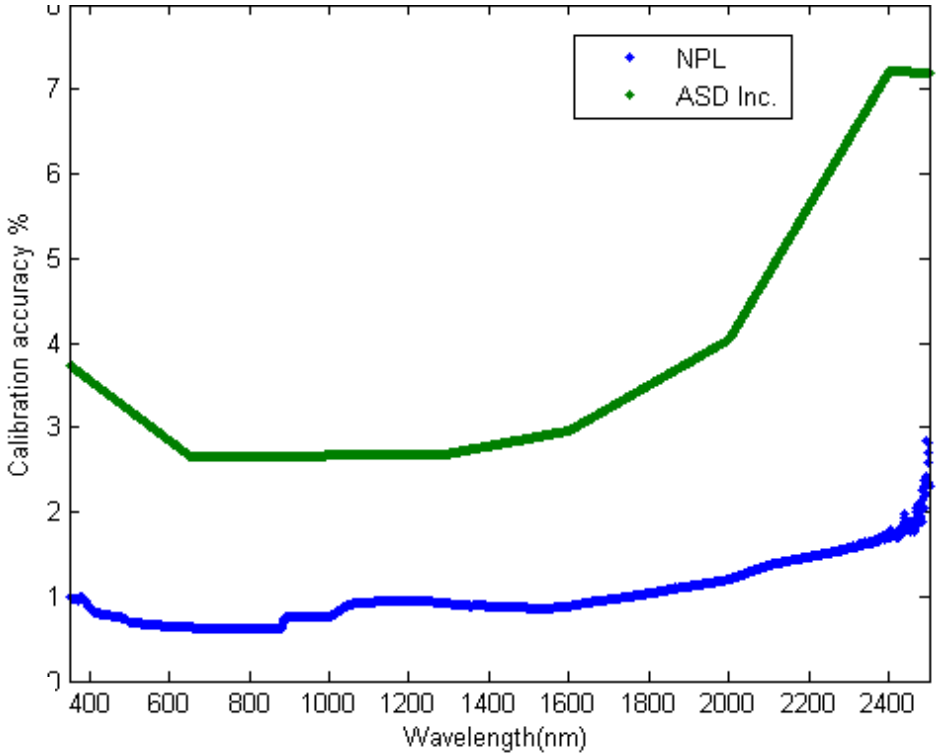
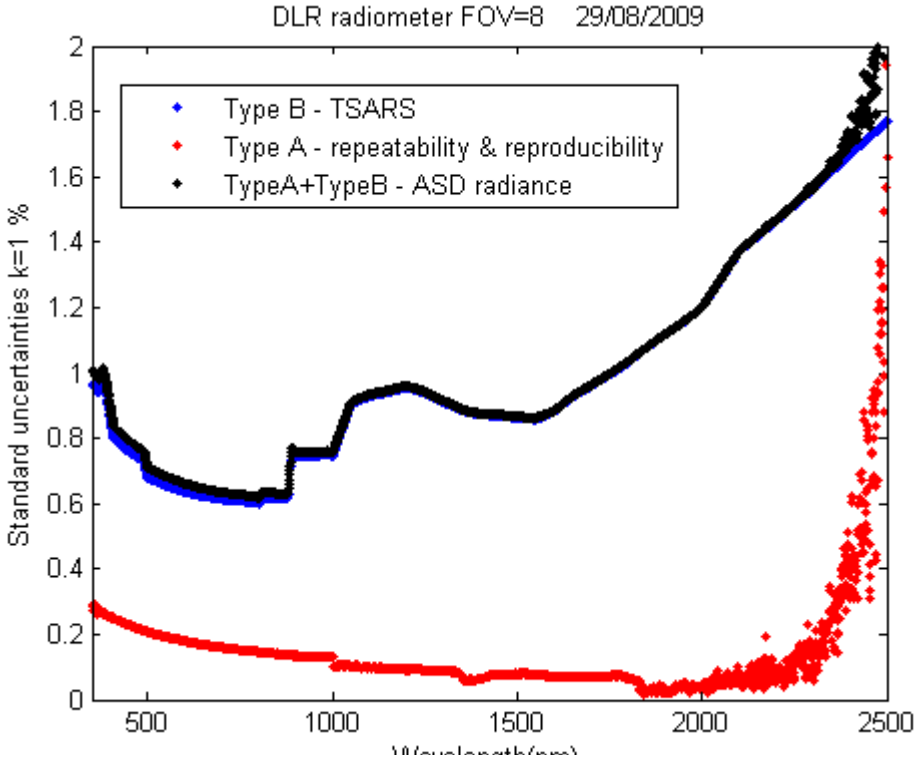
Comparison 1: Cross-comparison of all instrumentation (identify and removal of biases from subsequent comparisons)

- All radiometers characterised using TSARS, NPL standard radiance source at TU Laboratory, Ankara

- Nadir and 30º measurements of a Lambertian panel diffuser, NPL reflectance reference standard in Sun and all participant panels

Uncertainty of radiance calibration of ASD spectrometers





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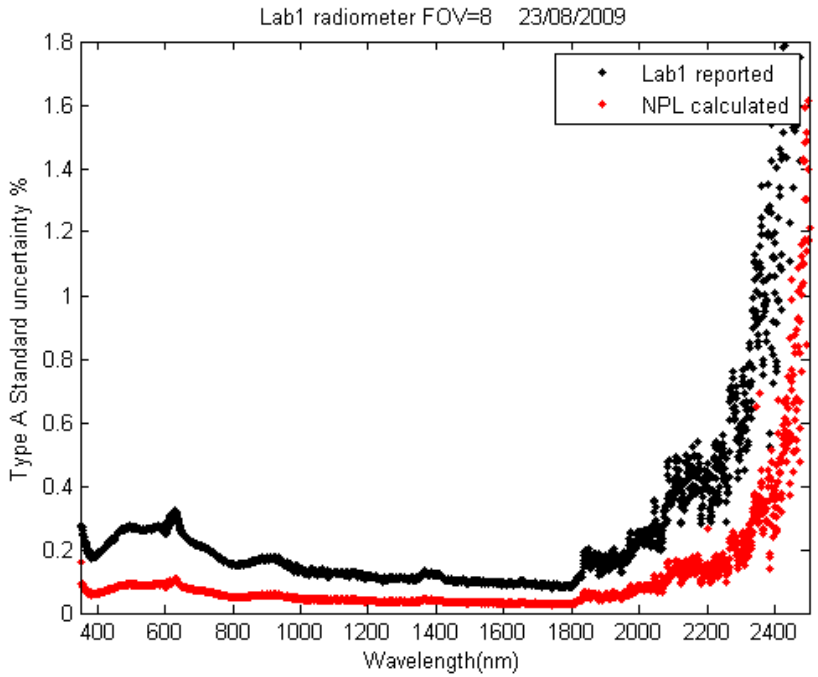
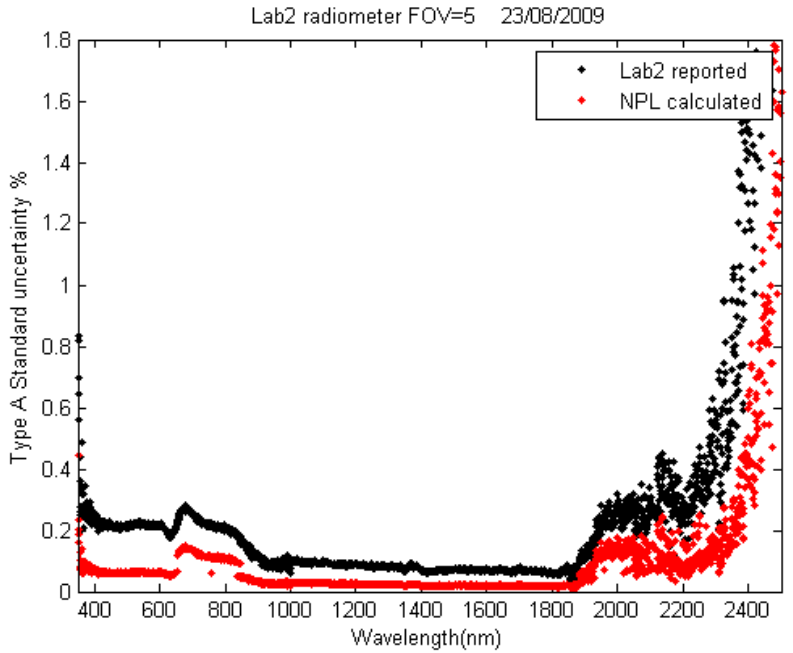
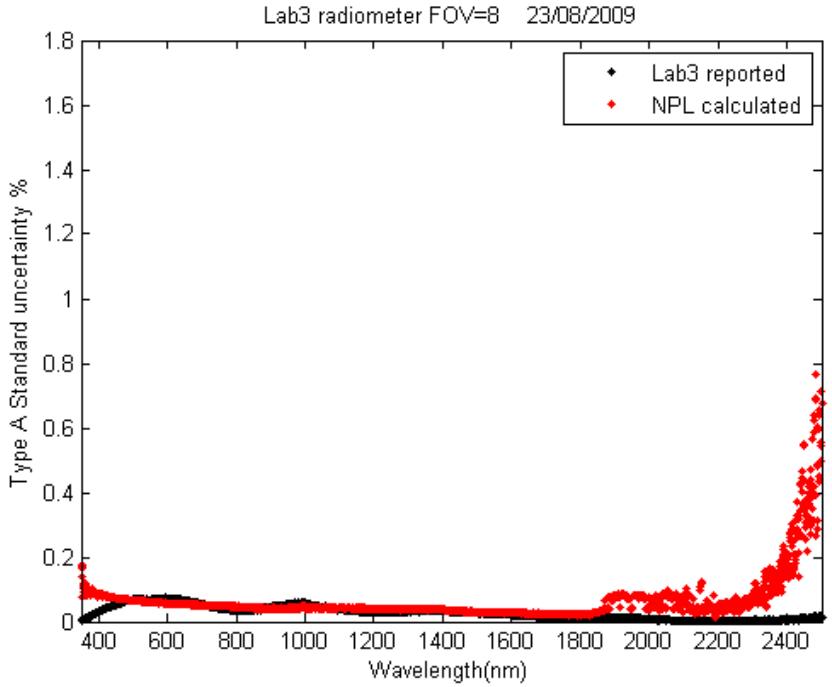
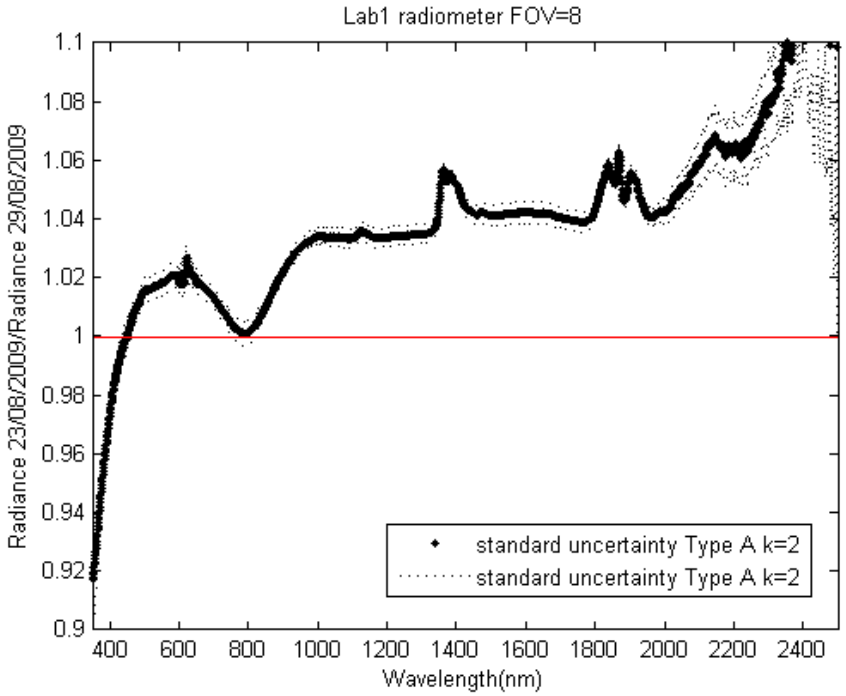


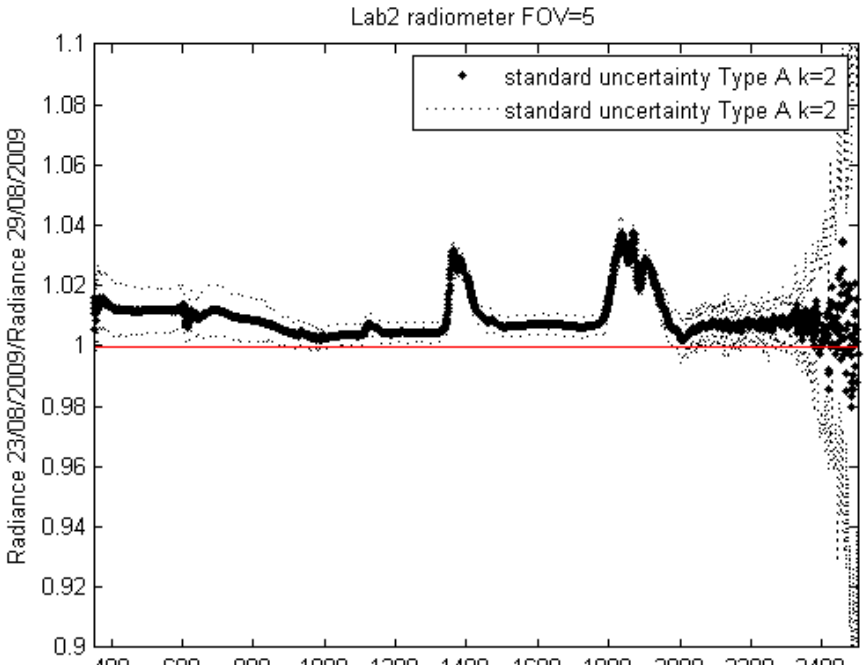


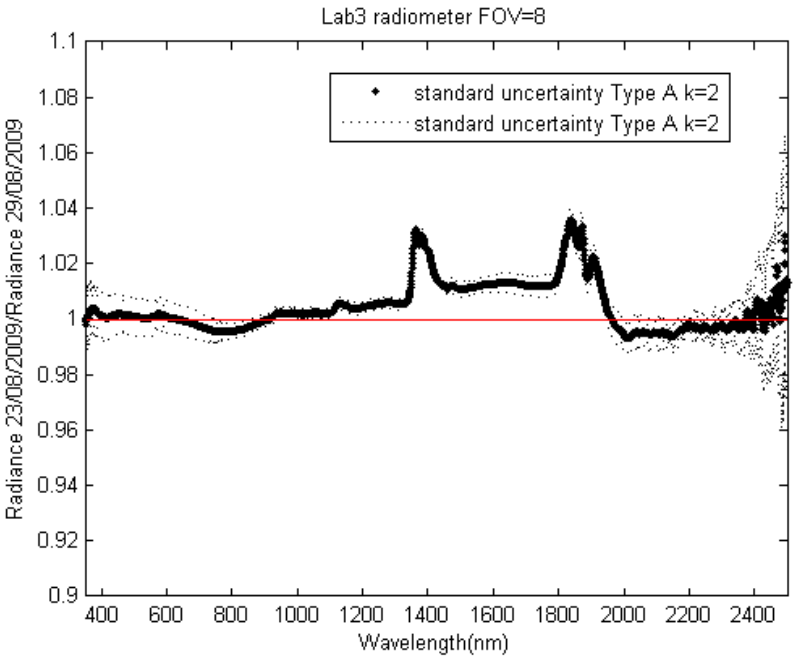


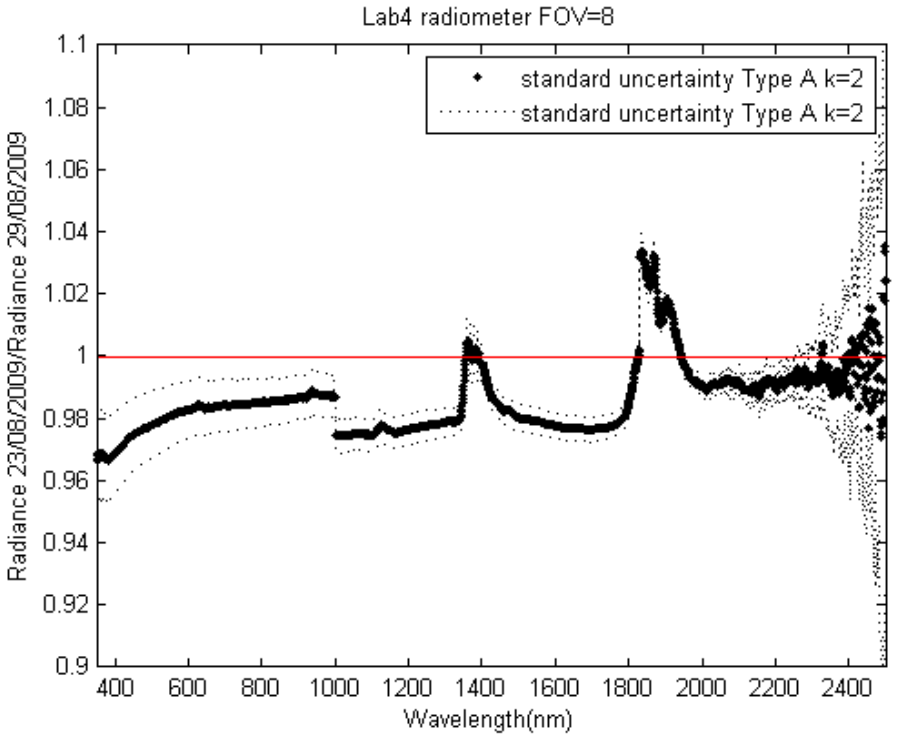
Type A (random) uncertainties reported cf re-calculated by NPL Statisticians.

Age of instruments a factor in performance

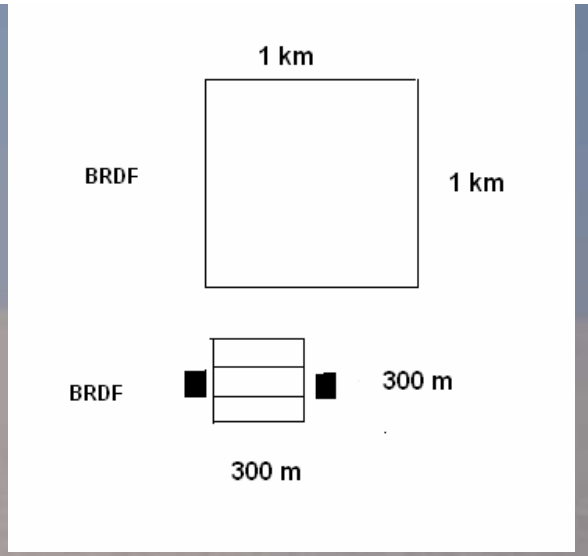

Lab1 radiometer FOV=8
Radiance 23/08/2009/Radiance 29/08/2009
Wavelength(nm)
standard uncertainty Type A k=2
standard uncertainty Type A k=2


Lab2 radiometer FOV=5
Radiance 23/08/2009/Radiance 29/08/2009
standard uncertainty Type A k=2
standard uncertainty Type A k=2

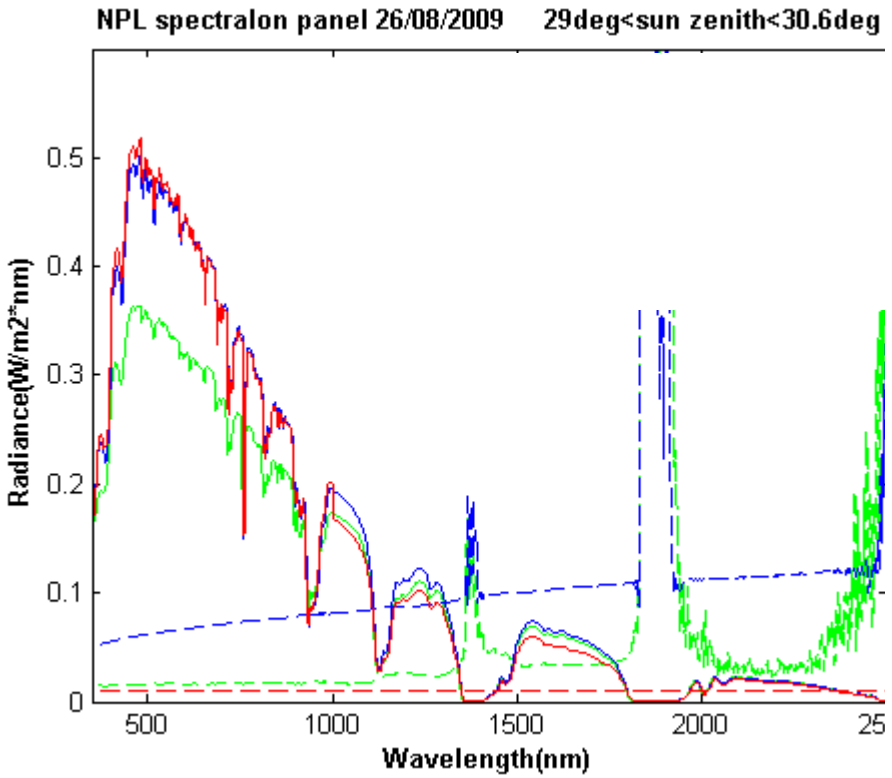

Lab3 radiometer FOV=8
Radiance 23/08/2009/Radiance 29/08/2009
Wavelength(nm)
standard uncertainty Type A k=2
standard uncertainty Type A k=2

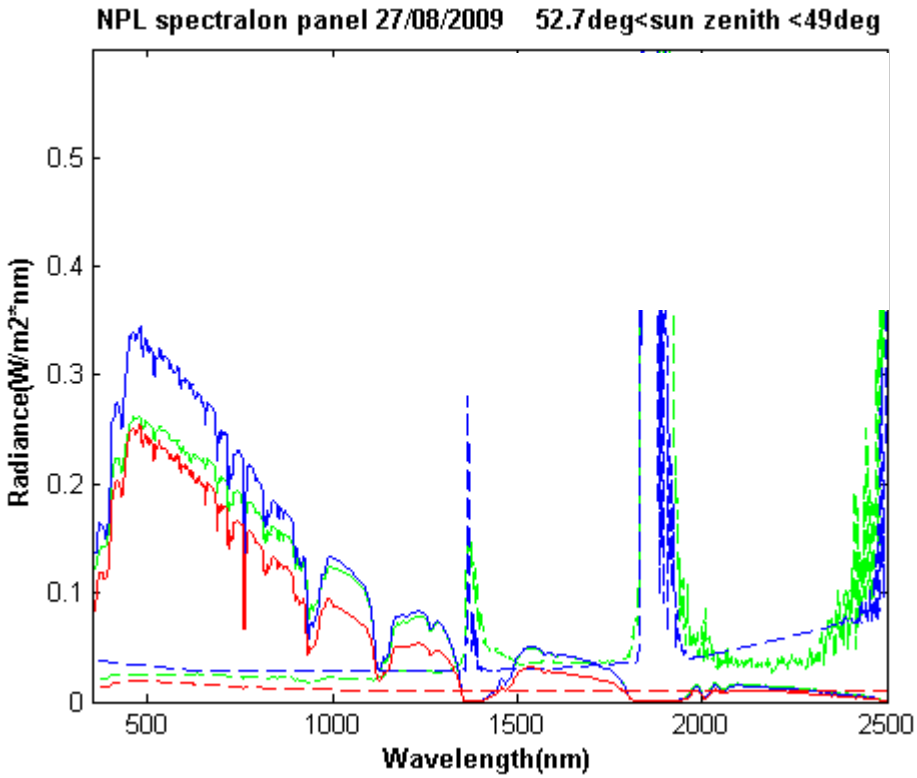

Lab4 radiometer FOV=8
Radiance 23/08/2009/Radiance 29/08/2009
Wavelength(nm)
standard uncertainty Type A k=2
standard uncertainty Type A k=2

Protocol comparison 2: site characterisation



- **Radiance/reflectance measurements at nadir, by each participant using own panel for 100m*300m targets & 1000*1000m site (by rotation on different days)**
- **All participants characterise the same target at the same time (sun angle) but on different days using their own method & sampling strategy**
- **All results will be considered blind to all participants only the pilot will have access.**
- **Participants results will be provided as "site values" for surface and as TOA for nominated satellites with uncertainty budgets.**
- **BRDF measurements (NPL) taken near M1, sampled near 1000m*1000m site**
- **Final day participants agree common methodology and all characterise one site at the same time**





- Left panel has some variable Cirrus cloud and so higher uncertainty

- Some real differences in baseline calibrations which will be removed from comparison of methods

Comparison 3: sensor to sensor using site and ground to sensor.

Example Satellite overpasses 22-29 August 2009

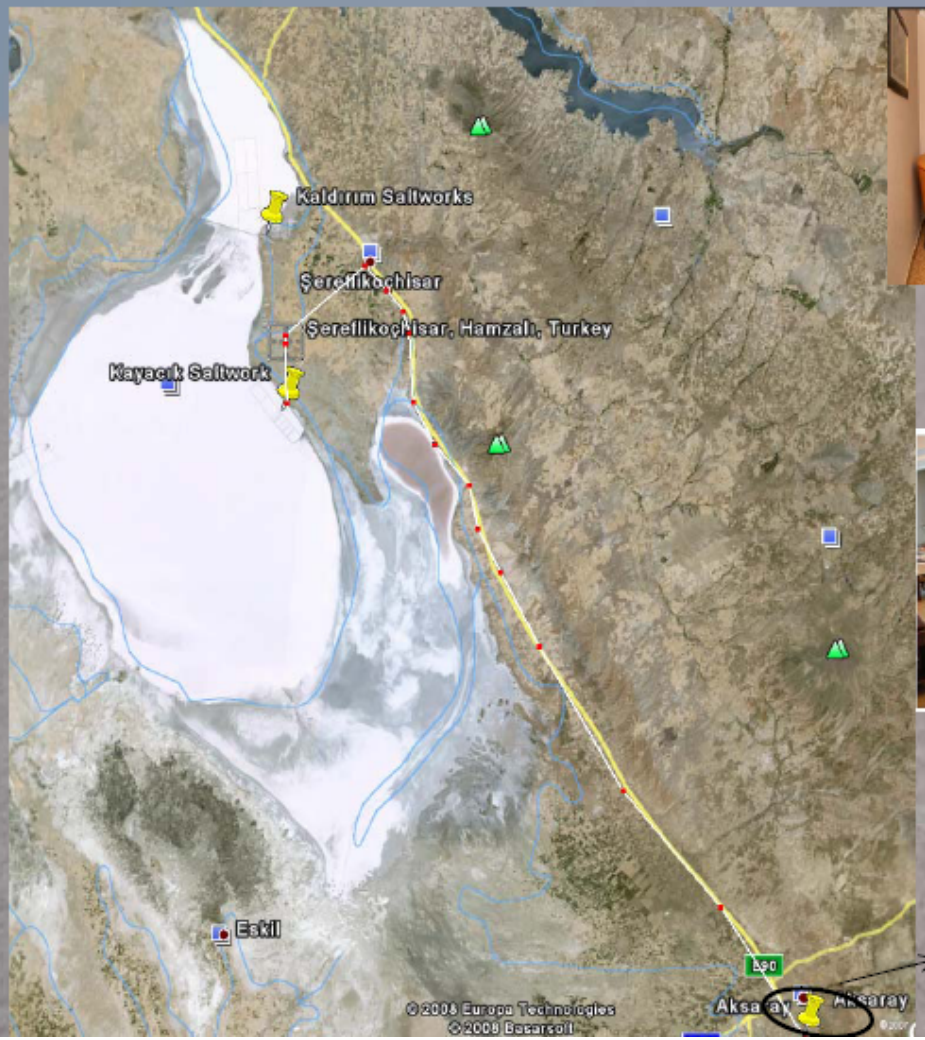
	Scheduled (GMT)	Satellite view zenith
UK-DMC	6:15 – 6:28	11-12
Nigeriasat1	6:18 – 6:31	5 -12
PROBA	7:38 – 7:49	7.6 – 15.9
ENVISAT	8:10 – 8:22	4 – 14
SPOT 5	8:27 – 8:31	9 – 15
SPOT4	8:33 – 8:37	1 – 4
LANDSAT5	8:09 – 8:22	7.1 – 13.7
Terra	8:32 – 8:50	4 – 16.5
ALOS	8:37 – 8:54	12 – 17

Schedule

Measurements 9am - 12am local time (6 UTC – 9 UTC)
approx 2 to 3 characterisations per day matched to satellite

Journey time ~ 1.5 hrs from hotel

Logistics / Accommodation



Wireless Internet Access,
Meeting Rooms
For TUBITAK , 35 Euro single room

Closest hotels (4 star, 5 star) are located in Aksaray. It is aproximately 100 km from Aksaray to Kayacık Saltworks

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Logistics / Transport (Courtesy ESA)

From TUBITAK UZAY to Tuz Gölü Test Site is about 150 km.

Personnel transportation by hired cars (ESA funded).

Equipments can be collected in TUBITAK UZAY and transported at the same time with one hired car. From the site entrance to the site transportation will be performed many times since the car should not be too heavy.

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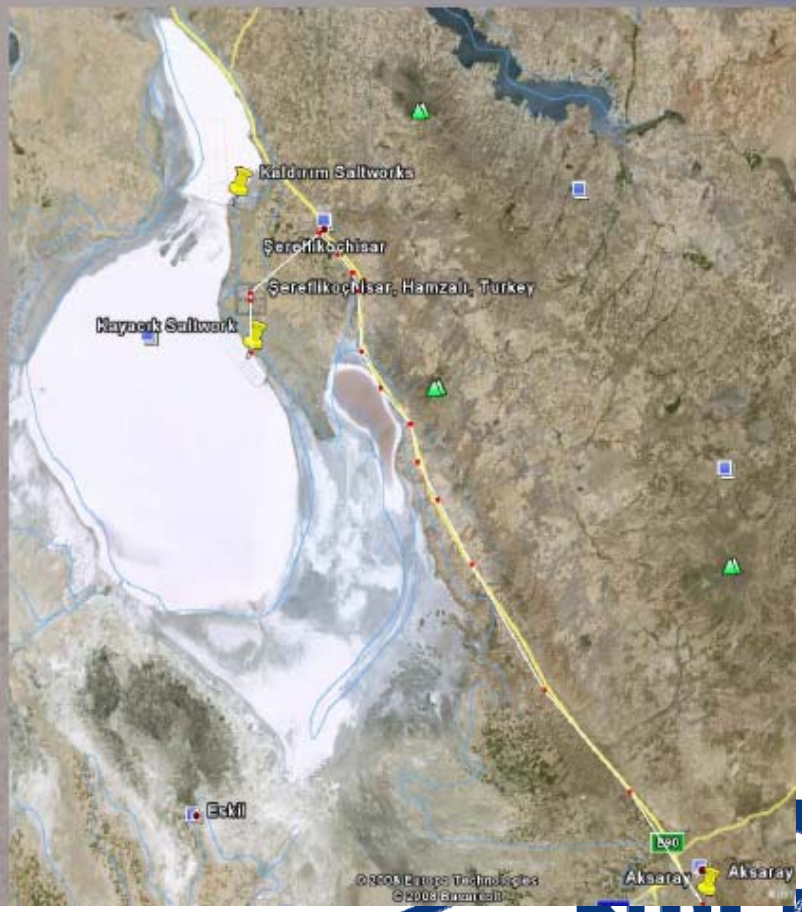
Logistics / Food-Water

Breakfast, Lunch and Dinner in Aksaray hotel

Mineral Water during the field measurements



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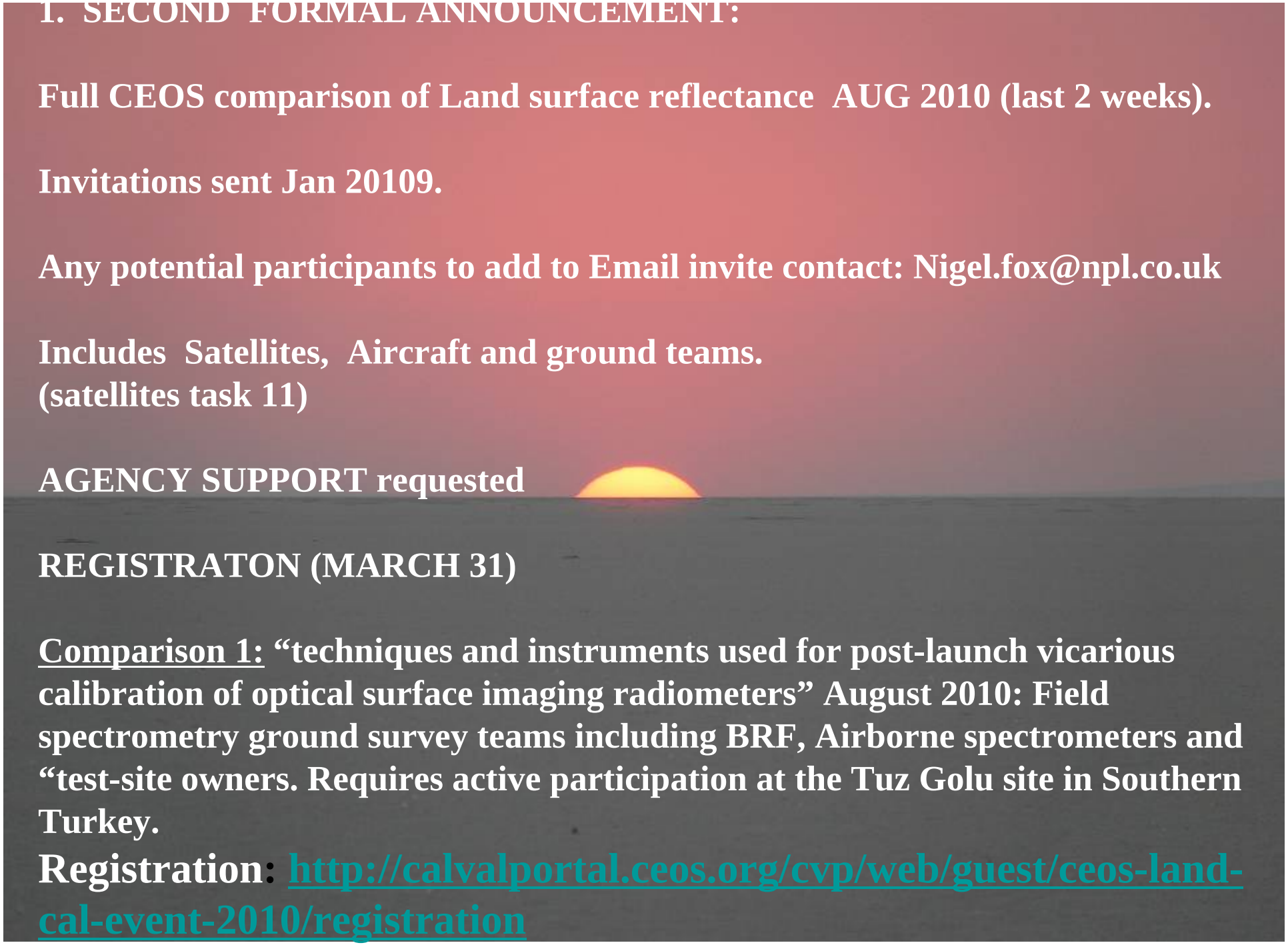
Facilities on the site

Power Facilities: 3KWA Petrol Generator, cables, inverter 12 volt DC to 220 volt AC 500 watt, Battery charging circuit using solar panels (12V, 9V, and laptop output)

Communication Facilities: Mobile phone, walkie-talkie (3km).

First Aid Facilities: First Aid Kit, 3 personel from TU has completed first aid training courses. The nearest hospital is approximately 15 km from the entrance of the test site.

Others: Tents, chairs, tables, tool bag, fire extinguisher, bicycles, chemical toilet



1. SECOND FORMAL ANNOUNCEMENT:

Full CEOS comparison of Land surface reflectance AUG 2010 (last 2 weeks).

Invitations sent Jan 20109.

Any potential participants to add to Email invite contact: Nigel.fox@npl.co.uk

Includes Satellites, Aircraft and ground teams.
(satellites task 11)

AGENCY SUPPORT requested

REGISTRATON (MARCH 31)

Comparison 1: "techniques and instruments used for post-launch vicarious calibration of optical surface imaging radiometers" August 2010: Field spectrometry ground survey teams including BRF, Airborne spectrometers and "test-site owners. Requires active participation at the Tuz Golu site in Southern Turkey.

Registration: http://calvalportal.ceos.org/cvp/web/guest/ceos-land-cal-event-2010/registration