# 2013 IRC Working Group Reports

1. BSRN (Baseline Surface Radiation Network); Gert König-Langlo; Michalsky new chair
2. CR (Clouds and Radiation); Stefan Kinne, Rapporteur
3. GEB (Global Energy Balance); Martin Wild and Norman Loeb (WG Co-chairs)
4. ITWG (International TOVS [Advanced TIROS (Television and Infrared Observational Satellite) Operational Vertical Sounder)] Working Group); Niels Bormann
5. UV (Solar UltraViolet Radiation); Co-Chairs: Julian Gröbner and Mario Blumthaler
6. Continuous Intercomparision of Radiation Codes (CIRC)
7. Three-Dimensional Radiative Transfer (3DRT)
8. International Polarized Radiative Transfer (IPRT)

# 3 Additional IRC Working Groups

1. Atmospheric Spectroscopy Applications (ASA)
2. GEWEX Data Assessment Panel (GDAP)
3. International Coordination group for Laser Atmospheric Studies (ICLAS)

# Global Energy Balance (GEB)

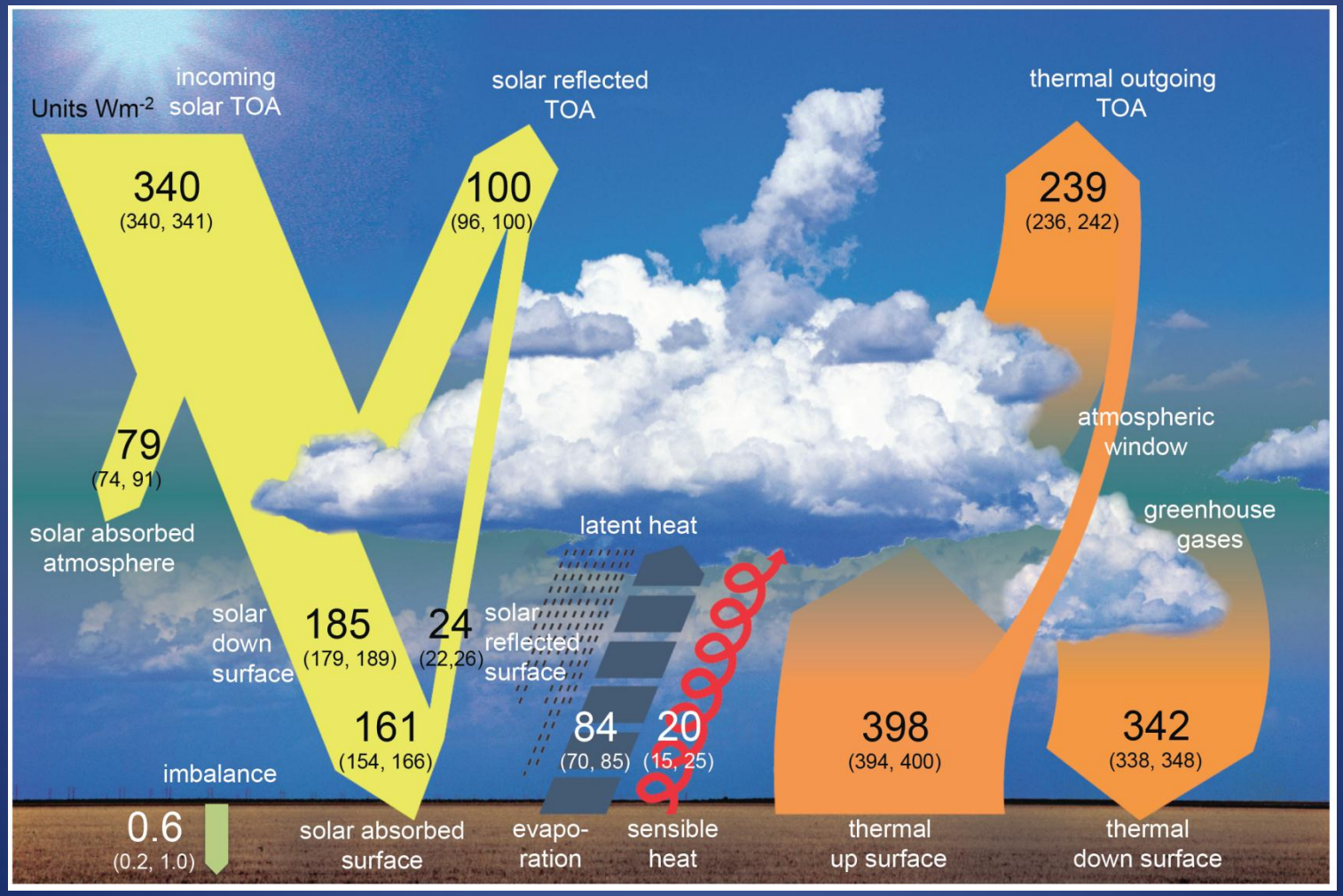
Co-chairs, Martin Wild and Norman Loeb

# Current Activities

- Involvement 5th IPCC assessment report.
  - Wild is a lead author of Chapter 2, Observations: Atmosphere and Surface
  - Loeb is contributing author for the part on the changes in the Top of Atmosphere Radiation Budget.
- Co-chairs organized the IRS session *Radiation Budget & Forcing*
- EGU session *Earth radiation budget, radiative forcing and climate change*.
- May 2013, at ETH Zurich, continued the project *Towards an improved understanding of the Global Energy Balance: absorption of solar radiation*

# Results

New global energy balance [*Wild et al.*, 2013].



# Recommendations

International community endorsements

- Next generation of ERB instruments should:
  - include onboard calibration capabilities
  - provide sufficient time for ground calibration
  - re-verify the traceability of ground calibration targets.
  - collaborate with other international standard labs
- Provide guidance on the creation of Earth Radiation Budget climate data records.

# Recommendations

Surface/atmospheric radiation budget

- IRC help to raise the recognition of the importance of BSRN anchor sites.
- Global Energy Balance in IPCC report needs revision
- Continued and expanded operation and maintenance of a well calibrated network of long term surface radiation stations

# Clouds and Radiation (CR)

Rapporteur, Stefan Kinne

# Report Summary

- Consistent deviations appear between satellite observations and model simulated TOA radiative fluxes.
  - regional differences attributed to a poor representation of cloud radiative properties in modeling.
- The representation of clouds is generally poorer over oceans than over continents.
- Important differences in net-flux imbalance at the surface , mainly driven by cloud effects over oceans.
- GDAP (GEWEX) panel is preparing a global closure study with the best available satellite data for the year 2007.

# Baseline Surface Radiation Network (BSRN)

Gert König-Langlo, Rapporteur

# BSRN Report Summary

- BSRN is a GEWEX Radiation Panel project aimed at detecting important changes in the Earth's surface radiation budget.
- BSRN is designated as the global surface radiation network for the Global Climate Observing System (GCOS) and contributes to the Global Atmospheric Watch (GAW).
- Joseph Michalsky, NOAA/ESRL has kindly volunteered to be the new interim chair for BSRN.
- 58 stations are providing data to the World Radiation Monitoring
- The 12th meeting of BSRN was held 1-3 August 2012 at the Alfred Wegener Institute (AWI) Research Unit in Potsdam, Germany. (http://www.gewex.org/bsrn.html)

# Research Results

Data from the BSRN are used in many publications to:

- Monitor the background short-wave and long-wave radiative components and their changes with the best methods currently available.
- Provide data for the validation and evaluation of satellite-based estimates of the surface radiative fluxes and
- Produce high-quality observational data for comparison with GCMs
- Archive is used in solar energy research.
- A list of publications based on BSRN data can be found at http://www.bsrn.awi.de/en/other/publications/.

# Three-Dimensional Radiative Transfer (3D RT)

Alexander Marshak & Jean-Luc Widlowski,
Co-chairs

# Objectives

- Comparing methods available for 3D atmospheric RT calculations
- Providing benchmark results for testing 3D RT codes
- Publishing an open source toolkit (community 3D MC code)
- Providing resources related to I3RC and 3D RT (codes, models, workshops, publications)

# Activities

What's now available:

- Online 3D calculator
- A new image archive about 3D radiative processes
- Consensus results of I3RC intercomparison for model verification
- Publicly available codes on 3D radiative transfer
- Expanded publication list on website: over 400 publications in the I3RC publication database

# Plans

- Creating an educational web pages on 3D RT;
- Adding polarization to the I3RC community code.
- Adding Rayleigh scattering to the I3RC community code.
- Adding aerosols to the I3RC community code.

# International Polarized Radiative Transfer (IPRT)

Claudia Emde and Bernhard Mayer,
Co-chairs

# Goals

- Compare and improve polarized radiative transfer models
- Provide benchmark results
- Develop publically available codes
- Provide information about free codes
- Provide input data (scattering matrices, BPDFs)
- Bring community together (workshops, . . . )

# New tools and codes on website

(www.meteo.physik.uni-muenchen.de/~iprt/)

- ANAPOL: A tool provide by F.-M. Breon for POLDER and PARASOL data visualization and analysis
- Ray-Tracing codes by A. Macke to compute scattering matrices by aspherical partices with large size parameters
- T-matrix codes by M. Mishchenko to compute scattering matrices by aspherical particles with moderate size parameters

# Model Intercomparison Studies

- Comprehensive SCIATRAN and MYSTIC intercomparison.
- A 3D model intercomparison study planned
  - three groups are involved.
  - start with very simple cases including “chess-board” clouds.
- The intercomparison of the radiative transfer codes used for GOSAT retrievals is ongoing, unfortunately not much progress has been made within the last year.
  - Groups do not use the same surface reflection matrices.
- A graduate workshop on polarization, February 2014, in Leipzig, organized by IPRT working group member A. Macke.


# International TOVS Working Group activities

Niels Bormann, Mitch Goldberg,
Stephen English, Allen Huang

# ITSC-18

## 18th International TOVS Study Conference

- Hosted by Météo France in Toulouse, 21-27 March 2012
- Attended by 154 participants from 20 countries
- 50 oral, 100 poster presentations, key topics:
  - Data from S-NPP: ATMS, CrIS
  - Data compression, PCA, apodisation for hyperspectral IR sounders
  - Use of cloud-affected radiances in NWP
  - Surface emissivity estimation and use of surface-sensitive radiances over land
- Working groups on:
  - Radiative transfer
  - Climate
  - Data assimilation and NWP
  - Advanced Sounders
  - International Issues and Future Systems
  - Products Software

INTERNATIONAL ATOVS WORKING GROUP

# ITSC-18: Key recommendations

- To IRC, CGMS and Satellite Agencies: Support for line-by-line (LBL) reference model development is of paramount importance and should be continued to ensure that users (in both operational and non-operational institutions) have access to the latest updates in LBL forward modelling.
  - Concern that active developments in this area have been limited in recent years.

- Encourage validation and intercomparison of LBL models/spectroscopy to assess the impact of spectroscopic uncertainties and the differences between line-by-line models.
- To NWP centres: Contemplate the possibility of an intercomparison study for cloudy radiance models.
- To CGMS and space agencies: Conduct studies to trade-off benefits of spectral, radiometric, and spatial resolutions of infra-red sounders and to pursue the development of next generation sounders.

- Full working group report at:
  http://cimss.ssec.wisc.edu/itwg/itsc/itsc18/WGR_v1.pdf

INTERNATIONAL ATOVS WORKING GROUP

# Other Developments

- Mitch Goldberg (NOAA) and Niels Bormann (ECMWF) have been elected as new co-chairs, to organise the next 3 International TOVS Study Conferences.
- Huge thank you to outgoing co-chairs Stephen English and Allen Huang.

- Relationship with Coordination Group for Meteorological Satellites (CGMS):
  - ITWG is one of four International Science WGs that report to CGMS (TOVS, RO, precipitation and winds).
  - However, unlike the other three, ITWG had no formal link to CGMS.
  - In close discussion with IRC ITWG has become a formal sub-group of CGMS last year whilst remaining a sub-group of IRC.

INTERNATIONAL ATOVS WORKING GROUP

# ITSC-19

- To be hosted by KMA on Jeju Island, South Korea
- 26 March – 1 April 2014
- First circular:
  http://cimss.ssec.wisc.edu/itwg/itsc/itsc19/ITSC_19_First_Circular.pdf

INTERNATIONAL ATOVS WORKING GROUP

# The Continual Intercomparison of Radiation Codes (CIRC)

Status report to IRC, July 2013

*Lazaros Oreopoulos[1] and Eli Mlawer[2]*

[1]NASA-GSFC, Greenbelt, MD, USA (Chair)

[2]AER, Lexington, MA, USA (co-Chair)

# What CIRC is about

- RT model intercomparison to serve as the standard for documenting the performance of RT codes used in GCMs
- Working group within IRC and GEWEX's GASS (ex-GCSS)
- Goal is to have RT codes of GCMs (incl. IPCC) report performance against CIRC
- Website: http://circ.gsfc.nasa.gov
- Two papers, BAMS 2010 and JGR 2012.

***How CIRC differs from previous intercomparisons:***

- *Observation-tested* (LW) LBL calculations are used as radiative benchmarks
- Benchmark results are publicly available
- Observationally-based input (chiefly from an ARM product named BBHRP)
- Intended to have flexible structure and be continual (i.e. updated periodically)

# CIRC status report – activities since IRC Berlin BM

- CIRC now integrated into GEWEX's GASS (ex-GCSS) structure; Oreopoulos is member of GASS Science Steering Committee
- CIRC plenary presentation at Pan-GASS meeting September 2012, Boulder, CO
- All CIRC Phase I participants consented on having their submissions posted on CIRC website (not yet completed)
- CIRC served as main validation source for UMD's CAR "Ensemble Modeling System" (http://car.umd.edu)
- CIRC section for upcoming ARM book (in chapter on "Radiative Transfer Improvements in GCMs") has been drafted
- Discussions underway on possible CIRC involvement in a "structured comparison of radiation codes in CMIP/CFMIP GCMs" as part of CMIP6
- CIRC remains unfunded

# GEWEX Data and Assessments Panel (former Radiation Panel) report by Chris Kummerow (Chair)

1. GDAP meeting 1-3 Oct 2012 (hosted by LMD in Paris)

Summary of meeting in GEWEX news (http://www.gewex.org/gewexnews/Feb2013.pdf)

**Integrated GEWEX product:**

GEWEX data sets (common grid, auxiliary data) of global energy & water variables to get budget closure; first focus on 2007, to be released soon

**Assessments:**

Radiative Flux Assessment & Cloud Assessment finished (WCRP reports 2012)

Cloud Assessment Database available at http://climserv.ipsl.polytechnique.fr/gewexca/

2nd workshop of Water Vapor Assessment 30 Sep – 2 Oct 2013, CIRS, Fort Collins, USA

Aerosol Assessment: review and synthesis of literature in preparation

LandFlux Assessment: 4th workshop was held in Oct 2012 in Paris

**GDAP Reference Products:**

**ISCCP** for cloud properties, reprocessing in 2013

**SRB** Version 4 used in integrated product

**SeaFlux** produces ocean turbulent fluxes (one element of GEWEX reference products)

**LandFlux**: Evapotranspiration, challenge because infered variable

**AEROCOM** aerosol products used in integrated product

**GPCP** Version 3 for precipitation in integrated product

Next GDAP meeting: jointly with GHP in Rio de Janeiro 2-6 Sep 2013

# Working Group-Ultraviolet

Julian Gröbner and Mario Blumthaler

pmod wrc

# Overview of Activities 2012/2013

- The WMO has formally appointed the PMOD/WRC with the operation of a World Calibration Center for UV Radiation since January 2013.

- European Metrology Research Programme:
  - Project ENV03-SolarUV has just reached half-time, with very promising results so far.

- Quality Assurance using QASUME reference spectroradiometer
  - La Reunion Island, April 2013
  - 8th RBCC-E Campaign, Spain, June 2013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# EMRP-ENV03 "Solar UV"

http://projects.pmodwrc.ch/env03/

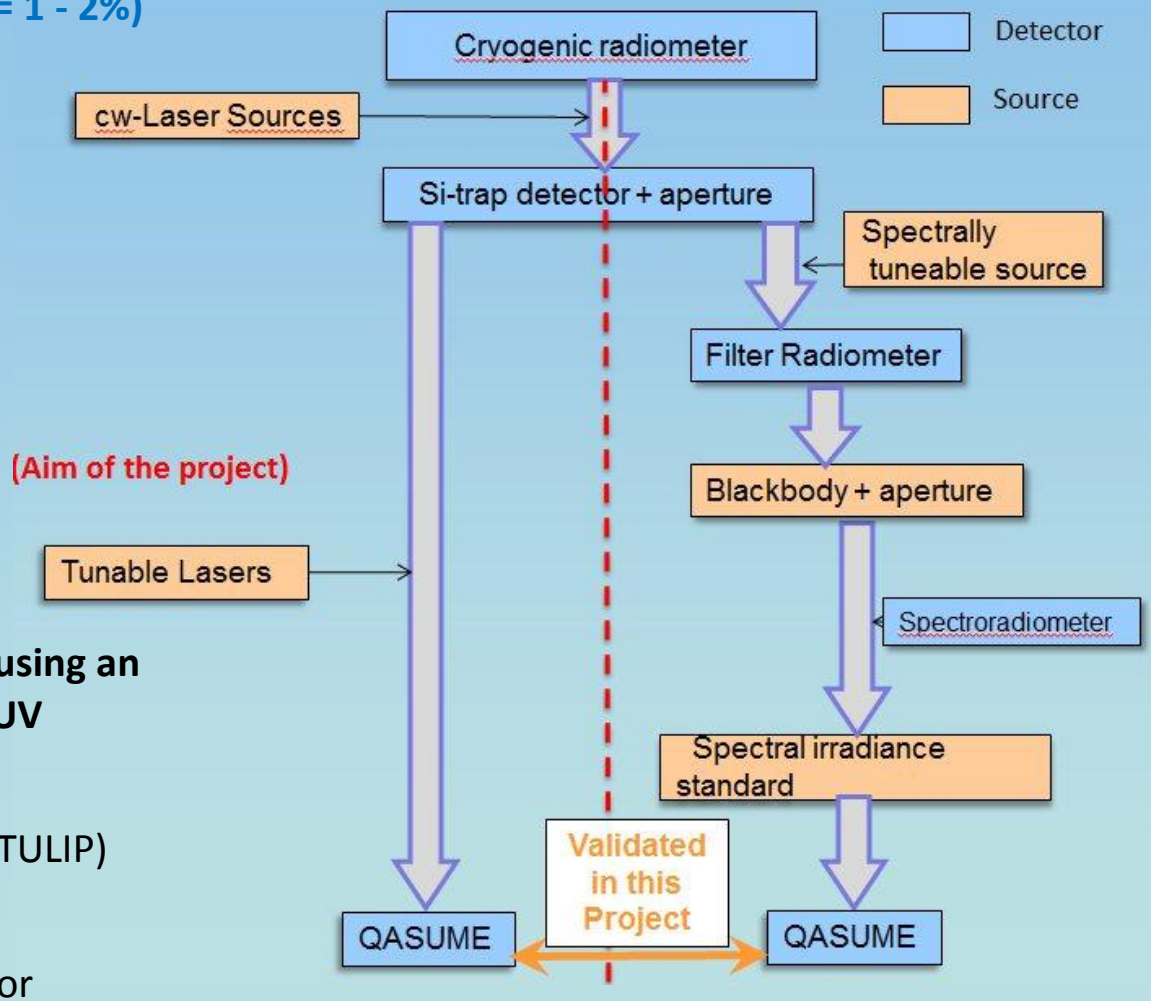
- Enhance the **reliability** of spectral solar UV radiation measured at the Earth surface
- Develop new **techniques and devices** for **traceability** better than 2% (now 5%) and for **cost-effective** array-spectroradiometer in UV monitoring networks
- Intercomparison Campaigns and Workshops

Primary Irradiance Standard | Transfer Standard | Reference Spectroradiometer | End-User Devices | Calibrated UV Network

- **Project Coordination:** pmod wrc *Dr. Julian Gröbner, Davos*
- **Duration:** 2011 - 2014
- **Total Budget:** 3.9 M€
- **8** Partners EU-NMI; **2** Industry; **2** Universities; > **5** Collaborators

# Spectral Irradiance Traceability

**Goal: Shorten the traceability chain of solar UV measurements to SI units and reduce transfer uncertainties (*U* = 1 - 2%)**




- **Detector-based traceability chain using an absolute radiometer and tunable UV laser facility (PTB)**

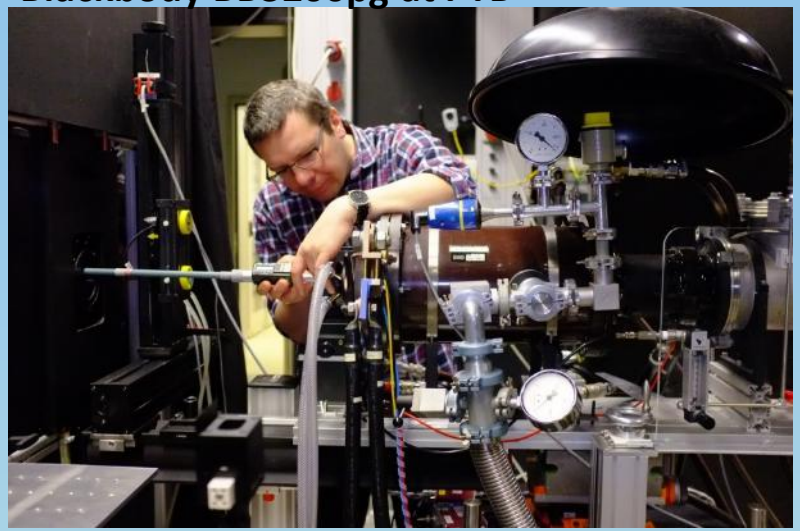
•Tuneable laser source 280 – 500 nm (TULIP)

• Traceability to the **primary standard** cryogenic radiometer via a trap detector

EMRP
European Metrology Research Programme
Programme of EURAMET
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

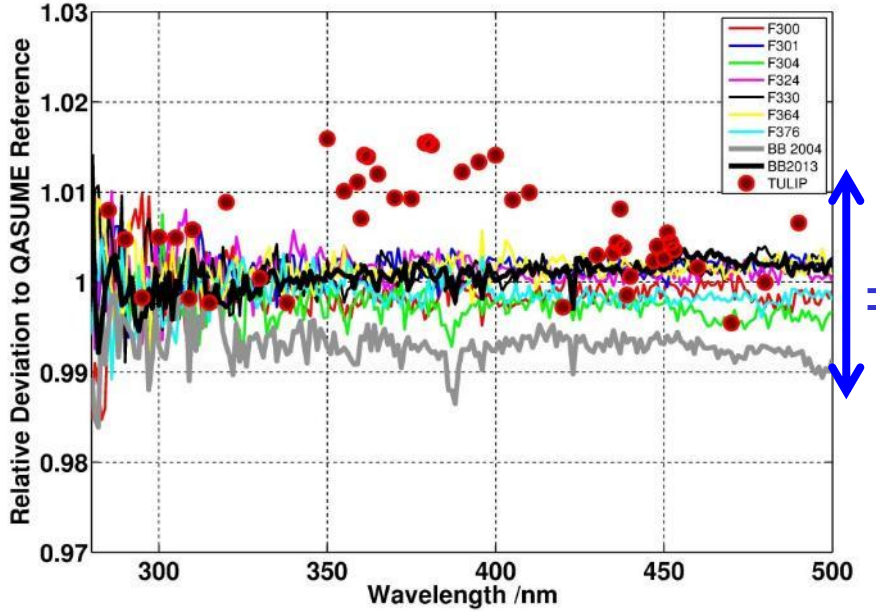
# Validation of the QASUME irradiance reference at PTB

**Blackbody BB3200pg at PTB**



**Tuneable Laser facility TULIP**

QASUME Validation at PTB in 2004 and 2013




**Gröbner J.,** and **P. Sperfeld**, Direct traceability of the portable QASUME irradiance scale to the primary irradiance standard of the PTB, Metrologia, **42**, 134—139, 2005.

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# Outlook

- Follow-Up Proposal for ENV03 is under way – Submission deadline 1 October 2013
- UV Workshop at PMOD/WRC on 27 – 28 August 2013
- Solar UV Intercomparison of spectroradiometers in July 2014 at PMOD/WRC
- New IRC Members to participate at the Working-Group

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# DACA-13 Solar UV Radiation in Mountainous Regions

10 Presentations , 7 Oral Presentations (one cancelled), 3 Poster

2 main Themes:

1) Solar UV radiation at high elevations
   - FR-49_B6 : High solar UV exposures at Plateau Rosà (3500 m a.s.l) in Valle d´Aosta region, Italy
   - FR-50_B6 : UV radiation statistics at two stations over Tibetan Plateau and Loess Plateau
   - Fr: 10:45 UV measurements at mountain sites (Europe, and South America)

2) Albedo effects on solar UV radiation: Mountains and Polar Regions
   - Fr: 8:15 Effective solar UV albedo retrieval to reconstruct the areal mean snow depth
   - Fr. 8:45 Effective albedo retrieval from spectral UV measurements using 3-D modelling of inhomogeneous topography
   - Fr: 9:00 Solar irradiance in the Arctic: measurements and 3D modelling
   - Fr. 9:15 Determination of the underlying effective albedo at Izaña high mountain station

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