IRS Business Meeting 2016

18 April 18:00 – 20:00 at IRS 2016
Auckland, New Zealand
Welcome

- Attending list signed and agenda approved
Welcome

Approval of Agenda:

1. Welcome (Schmutz)
   Introduction of Commissioners
2. Approval of Agenda (Schmutz)
3. President’s Report (Officers)
   a. Remembrances
   b. Treasurer’s Report
   c. Web site Update
   d. Recent IRC Activities (Publications, Recommendations, Meetings)
4. Working Group Status Updates
   a. Short Presentations by Working Group Chairs
   b. Updates to Working Groups’ Status
5. Financial Update of 2016 IRS (Roger Davies)
6. Highlights of IRS2016 Sessions of Interest (Contributed by Commissioners)
7. Report on IAMAS (Schmutz)
   a. General update and status.
   b. IAMAS 2017 and IRC Business Meeting in Cape Town, S. Africa
8. Election of the IRC president and Officers for the 2017-2020 term
9. Other Business (Schmutz)
In Remembrance

Prof. Dr. Karin Labitzke
1935 - 2015
**Treasurer’s Report** (Peter Pilewskie): 2013-2016 Budget Summary

All transaction amounts in USD

<table>
<thead>
<tr>
<th>Date</th>
<th>Transaction</th>
<th>Amount</th>
<th>Fees</th>
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<tr>
<td>12/3/2013</td>
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<td>14255.00</td>
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<tr>
<td>28/6/2015</td>
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<td>30/3/16</td>
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<td>30/3/16</td>
<td>IRS2016 Gold Medal</td>
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<td>-35.00</td>
<td>10698.26</td>
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<td>31/3/16</td>
<td>Cumulative Interest (31 Mar 2016)</td>
<td>1.21</td>
<td></td>
<td>10699.47</td>
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</tbody>
</table>
President’s Report

Web Site:
• The web-site is updated.
• Please advertising upcoming events on the IRC webpage http://www.irc-iamas.org/ by contacting Luca, legli@irc-iamas.org

![Image of the IRC website]
President’s Report

Recent IRC Activities:
- Preparing the meeting
  - Publications:
    - Proceedings of IRS2016
    - Advances in Atmospheric Sciences (AAS), an IAMAS associated journal: article about IRS2016 (Nick Edkins first author).
  - Recommendations:
    - Letter of support by IRC for ACTRIS (Andreas Macke)
  - Past meetings:
    - IUGG 2015: 22 June - 2 July 2015, Prague, Czech Republic
  - Future meetings:
Working Group Status Update

Short presentations by Working Group Chairs or Peter Pilewskie

1. Atmospheric Spectroscopy Applications (ASA); Chair: Laurence Rothman
2. Baseline Surface Radiation Network (BSRN); Rapporteur: Gert Koenig-Langlo
3. Clouds and Radiation (CR); Rapporteur: Stefan Kinne
4. Continuous Intercomparison of Radiation Codes (CIRC); Co-Chairs: Lazaros Oreopoulos & Eli Mlawer
5. GEB (Global Energy Balance); Martin Wild and Norman Loeb (WG Co-chairs)
6. International Coordination group for Laser Atmospheric Studies (ICLAS); Chair: Alex Papayannis
7. International Polarized Radiative Transfer (IPRT); Co-Chairs: Bernhard Mayer & Claudia Emde
8. Solar UltraViolet Radiation (UV); Co-Chairs: Julian Gröbner and Mario Blumthaler
9. Three-Dimensional Radiative Transfer (3DRT); Co-Chairs: Alexander Marshak & Jean-Luc Widlowski
BSRN Current Stations

59 Stations have provided data to the BSRN Archive, 5 planned, ~10 proposed, 6 closed

Upcoming 14th BSRN Science and Review Workshop
Canberra, Australia, 26-29 April 2016
Presently in the BSRN Archoive: 8391 station-months available

As of 2014 BSRN Workshop

~700 years of radiation measurements
BSRN Scientific Impact (mid-2015)

Cited almost 1500 times without self-citations
In almost 1200 articles
Producing an h-index of 19...
And climbing!
WE are making an impact!
recent highlights

• missed super-cooled water: a likely explanation of the southern flux biases in global modeling
• the quality of solar RT modules in gl. modeling is often a limiting factor in some applications
• continued attempts to constrain the energy budget at the surface (radiation vs SH/LH)
• new activities towards process understanding
  – GEWEX - PROcess Evaluation Studies
  – ACPC activities (aerosol – clouds – precip.)
supercooled water to reduce TOA biases

Forbes et al. 2016 (ECMWF Newsletter 146)

cross section across Southern Ocean cold air outbreak

- Ice only
- Liquid (supercooled or warm) and rain

CALIPSO satellite lidar cloud phase

annual differences of top-of-atm SW flux to CERES-EBAF
not reflective enough too reflective

ECMWF IFS along-track lidar forward modelled cloud phase

ECMWF IFS with increased supercooled water from convection
solar absorption - in global modeling

- most CMIP5 models are not absorbing enough (poor temperature dependence) for correct hydrological cycle

**x-axis**
sensitivity of solar absorption to precipitable water in the atmospheric column

**y-axis**
clear-sky solar absorption increases due to increases in atmospheric temperature from CO2 increases

solar water vapor absorption is underestimated → precipitation increase is overestimated
**surface energy budget**

- **GEWEX-GDAP** (radiation panel) continues to work on a (satellite based) ‘integrated data-set’

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DATA-set</th>
<th>satellite SENSOR data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td>GPCP v. 2.2, MERRA, CMAP</td>
<td>SSMI, SSMIS, GOES-IR, TOVS, AIRS, TRMM</td>
</tr>
<tr>
<td>Latent Heat Flux (Evaportranspiration)</td>
<td>Princeton, MERRA, GLDAS, SeaFlux</td>
<td>AIRS, CERES, MODIS, TRMM, AVHRR, MSU, HIRS, SSU, AMSU, SSMI, SSMIS, ERS1/2, QuikSCAT, GOES, TOVS</td>
</tr>
<tr>
<td>Sensible Heat Flux</td>
<td>Princeton, MERRA, GLDAS, SeaFlux</td>
<td>AIRS, CERES, MODIS, TRMM, AVHRR, MSU, HIRS, SSU, AMSU, SSMI, SSMIS, ERS1/2, QuikSCAT, GOES, TOVS</td>
</tr>
<tr>
<td>Radiative Fluxes</td>
<td>GEWEX-SRB ISCCP-FD 2B-FLXHR-LIDAR C3M</td>
<td>CERES, AVHRR, AVHRR, CloudSat, CALIPSO, MODIS, AMSR-E CERES, CloudSat, CALIPSO, MODIS</td>
</tr>
</tbody>
</table>
-106 W/m² - surf imbalance – constrained

L’Ecuyer et al., J. Climate (2015)

Earth’s Energy Budget
process understanding

- ACPC activities (aerosol – clouds – precip.)
  - Danny Rosenfield and Johannes Quaas
- convective system (Houston case study)
- shallow clouds (VOCALS)

- GEWEX - PROcess Evaluation Studies
  - Claudia Stubenrauch and Graeme Stephens
- cirrus clouds and convection
  - others leads on
- ice mass balance, radiative kernels for climate
- mid-latitude storms, soil moisture climate

- ongoing WCRP activities (4 major challenges)
surface fluxes - global averages

- **constr.** consistent with latent / sensible heat (L’Ecuyer, 2015)
- **unconstr.** best guess of individual data (L’Ecuyer, 2015)
- **Wild** global modeling scaling at BSRN sites (Wild, 2015)
- **CIS** mean of CERES, ISCCP and SRB 00-03 (Raschke, 2015)
- **CMIP 3** average in global modeling (Raschke, 2015)

<table>
<thead>
<tr>
<th>data</th>
<th>global</th>
<th>land</th>
<th>ocean</th>
<th>S+L land</th>
<th>S+L ocea</th>
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<td>-106</td>
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<td>38/39</td>
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<td>unconstr</td>
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<td>23/75</td>
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<tr>
<td>Wild</td>
<td>-105</td>
<td>-70</td>
<td>-117</td>
<td>32/38</td>
<td>16/100</td>
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<td>CIS</td>
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<td>-83</td>
<td>-146</td>
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<tr>
<td>CMIP3</td>
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<td>-71</td>
<td>-127</td>
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</table>
why process understanding?

- we need a better representation of clouds and cloud-systems in global modeling to have more confidence in future climate predictions

- to make progress focus on few questions accelerates progress
  - by spurring model development
  - by pursuing new observations
  - by stimulating new analyses
  - by exploiting paleo-records
  - via new collaborations on common goals
• observations to probe process understanding
  – upper tropospheric clouds & convection
    • (lead C. Stubenrauch, G. Stephens), SPARC
  – ice mass balance
    • (lead E. Larour, S. Nowicki), GEWEX - CLiC
  – radiative kernels for climate
    • (lead B. Soden)
  – mid-latitude storms
    • (lead G. Tselioudis, C. Jakob)
  – soil moisture climate
    • (lead S. Seneviratne)
• UTCC – Upper Troposph. Clouds & Convection

Motivation: understanding their feedback

– tropical convective systems
  • explore relation between convection, cirrus anvils & radiative heating
  • provide obs. based metrics to evaluate detrainment processes in models

– cirrus originating from large-scale forcing

• resources:
  – obs. of cloud systems & atmos. environment
  – simulation at diff. scales (parcel, CRM, GCM)
  – radiative transfer
importance of UT Cloud systems

- cirrus modulates Earth’s energy budget & UT heat transport
  - build cloud systems from adjacent high-altitude clouds
  - distinguish convective from non-convective systems
  - examine their horizontal extent, composition, vertical structure → heating rates
  - using synergetic data base

build a simulator of UT cloud systems for the evaluation of convection schemes / microphysics in climate models

meetings: first meeting in Nov 2015, upcoming meetings: Apr 2016 at IRS & in Paris and in fall 2016 in USA
ACPC

• Questions
  – understanding entire lifecycles of clouds?
  – what environmental parameters matter?

• focus on 2 major (simulations/data) closure experiments (deep convection & shallow cu)
  – fine-tuning of joint activities during April 2016 at Oxford

• summer conference 2017 at Bad Honnef, GER
  – contact J. Quaas for participation
• Deep convection experiment
  – Where: Houston during summer
  – When: Aug/Sep 2013: SEAC4RS/Discover-AQ
  – Tools: radar signature with u-physics, satellite simulator, prognostic aerosol CCN and IN
  – Budgets: water (all types), radiation, aerosol
  – Evaluations: consider observational errors, examine specific diagnostic (radar retrievals, T-Reff satellite retrieval profiles, glaciation temperatures [PDF, joint histograms])
experiment plan 2 – shallow Cu

- shallow cumulus experiment
  - where: VOCALS 1000x1000km, mon
    future opportunities: ORACLES 2016-2018), Gaziosa (Azores)
  - when: Oct/Nov 2008
  - why: how changes in met and aerosols project radiative forcing and energy/moisture budgets
  - tools: modeling at different scales (WRF, LES)
  - evaluations: comparisons with harmonized input and bound.cond (1km Met-Off reanalysis)
  - diff aerosol scenarios: total vs natural, pre-ind
process understanding!

- We need a better representation of clouds and cloud-systems in global modeling to have more confidence in future climate predictions.

- To make progress, focus on few questions that accelerates progress:
  - By spurring model development
  - By pursuing new observations
  - By stimulating new analyses
  - By exploiting paleo-records
  - Via new collaborations on common goals
polar seasonality of surf.rad.energy

Sc – key processes identified by Rob Wood

- Large scale subsidence
- Longwave cooling
- Solar heating
- Entrainment
- Evaporative cooling
- Latent heating
- Turbulent mixing
- Drizzle
- Surface fluxes energy & moisture

Sea surface
FREE TROPOSPHERE
BOUNDARY LAYER
• overall goal: conduct box closure experiments … covering full cloud life- / daily- cycles

• GISS workshop goal: identify …
  – target cloud regimes of interest (shallow, deep)
  – suitable geographical regions (conditions/data)
  – required numerical study properties (aerosol, microphysics, domain, boundary conditions)
  – the adequacy of available observational data sets (data needs and/or data gaps ?)
The Continual Intercomparison of Radiation Codes (CIRC) and more

Status report to IRC, April 2016

Lazaros Oreopoulos$^1$ and Eli Mlawer$^2$

$^1$NASA-GSFC, Greenbelt, MD, USA
$^2$AER, Lexington, MA, USA
What CIRC is about

- RT model intercomparison intended to be 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
  - to some extent, this has morphed into RFMIP (see last slide)
- 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 – recent activities

- Section about CIRC in “Contributions of the ARM Program to Radiative Transfer Modeling for Climate and Weather Applications” in ARM monograph - in press
- Major new release of LBLRTM planned for 2016 -- in the spirit of “Continual” we will update the reference calculations of CIRC Phase I
- 30 peer-reviewed references for main CIRC paper, 15 for shorter BAMS paper on CIRC. Recent works have referenced CIRC:
  - to test aspects of RT code performance (e.g. Masek et al. 2016)
  - as a general reference for the status of RT code accuracy (e.g. De Angelis et al., 2015 - “Intermodel variability in the accuracy of shortwave parameterization schemes probably results from model developers’ ongoing challenge of balancing the need for accurate radiative transfer calculations against considerations of computational efficiency and realistic simulation of other climate system component ... As computational capabilities have grown, improvement in longwave schemes and other model components (for example, cloud processes) seem to have taken precedence over parameterization of shortwave gaseous absorption, with many modelling institutions continuing to implement outdated schemes for the latter in CMIP5”)
- Related note: BBHRP dataset (foundation for CIRC Phase I) used to determine clear-sky bias of observed surface CO₂ radiative forcing (Feldman et al., Nature)
- Future plans
  - Support RFMIP (see next slide)
  - Ice cloud flux intercomparison for CIRC Phase II: On hold due to instrumental issues with ARM shortwave spectrometers, needed to provide observational foundation for CIRC ice cloud cases
  - CIRC remains unfunded
Radiative Forcing Model Intercomparison Project (RFMIP)

- A satellite MIPs around CMIP6 aiming to disentangle variability in radiative forcing from variability in response across the CMIP ensemble
- Extending the goals of CIRC to the global scale requires replacing observed cases with synthetic cases
- Pilot study on 4xCO2, led by Pincus, Mlawer, Oreopoulos used CIRC cases and has been published in GRL (Pincus et al. 2015, 2015GL064291)
- Substantial diversity in estimates of model instantaneous radiative forcing. Some diversity in forcing is due to errors, some due to model climatology (i.e. depends on atm. state)
- Three components of RFMIP:
  - assess forcing by greenhouse gases against reference calculations
  - assess forcing by aerosols also against benchmarks when possible; will try to untangle sources of diversity in model aerosol forcing (e.g., aerosol burden/type, optical properties, state of the model)
  - linking above with estimates of effective forcing inferred from global model integrations via careful diagnosis
- Accuracy of greenhouse gas and aerosol radiation parameterizations in present-day, future, and strongly-forced conditions can be assessed with offline calculations.
The main goals of this working group are the assessment of the magnitude and uncertainties of the components of the global energy balance, their decadal changes and underlying causes as well as their significance for other climate system components and climate change.
Activities: Meeting organization

- **European Geophysical Union (EGU) General Assembly 2015**, Vienna, April 2015. Organization of the session “Earth radiation budget, radiative forcing and climate change”, closely linked to the aims of this working group. (Convenor Martin Wild). “10th anniversary” (consecutive till 2006)

- **International Union of Geodesy and Geophysics (IUGG) Prague July 2015**
  Organization of session “Radiation in the climate system” (Convenors Martin Wild, Werner Schmutz, Norman Loeb, Graeme Stephens). Talks by Kevin Trenberth, Teruyuki Nakajima, Bill Collins, Peter Pilewskie, Werner Schmutz


- **International Radiation Symposium IRS2016**, Auckland, April 2016. Organization of session “Radiation budget & Forcing” (Convenors Martin Wild, Peter Pilewskie, Stefan Kinne, Arturo Sanchez)

- **European Geophysical Union (EGU) General Assembly 2016** Vienna, April 2016, Organization of session “Earth radiation budget, radiative forcing and climate change” runs in parallel to IRS 2016
Activities

• WG-GEB Co-Chairs Norman Loeb and Martin Wild are involved in the CLIVAR Research focus “Consistency between planetary heat balance and ocean heat storage”.

• Both Co-Chairs were part of the ISSI (International space Science Institute) initiative "Consistency of Integrated Observing Systems Monitoring the Energy Flows in the Earth System", with meetings in Bern, Switzerland. => perspective letter in Nature Climate Change “An imperative to monitor Earth’s energy imbalance” has been published online on January 27, 2016, co-authored by both WG-GEB Co-chairs (von Schuckmann et al. 2016).

• Swiss National Science Foundation (SNF) : “Towards an improved understanding of the Global Energy Balance: Temporal variation of solar radiation” funded for 3 years.
Challenges: Global energy balance from a surface perspective

• **Consistency between energy and water cycle on a global scale**
  Room for adjustments in surface energy budget:
  - Surface albedo
  - Partitioning of surface net radiation into sensible and latent heat

• **Thorough evaluation of surface energy budgets on regional scales**
  - requires thorough assessment of all available information on surface fluxes as derived from satellites, reanalyses and models.
  - Validation with direct (in situ) observations wherever possible. Improve methodology to evaluate gridded datasets with point observations.
  - Urge responsible institutions to expand (or at least continue!) ocean in situ radiation measurements.

• **Better quantification of surface energy flux changes**
  - Need to bring together all available information on surface flux changes as derived from direct observations, satellites, reanalyses and climate models. Consistency in satellite-derived surface radiation trends? How useful are reanalyses for decadal variations?
  - Better quality assessment of historic radiation records: Homogeneity, Representativeness, Urbanisation effects
  - Diagnose multidecadal clear sky variations in observational records
  - Make use of proxies to expand spatial and temporal coverage
  - Interpretation of the changes: forced versus unforced variations
Recommendations

Recommendations Surface Observations:

• Letters of support to some of the National agencies funding BSRN stations may help to rise the recognition of the importance of anchor sites for global energy budget studies

• Establish international mechanism for funding stations in developing countries (WMO operated world funding pool)
Selected references


Loeb, N. and co-authors, 2016: Observational constraints on atmospheric and oceanic cross-equatorial heat transports: revisiting the precipitation asymmetry problem in climate models. Climate Dynamics online


Working Group-Ultraviolet

Julian Gröbner and Mario Blumthaler
Overview of Activities 2015/2016

• 4 CMCs accepted in the Key Comparison database of BIPM

• European Metrology Research Programme:
  – Project ENV59-ATMOZ has just reached half-time, with very promising results so far.

• New Uncertainty Budget for QASUME as outcome of EMRP SolarUV

• Quality Assurance using QASUME reference spectroradiometer
  • 10th RBCC-E Campaign, Spain, June 2015
  • NIWA, Lauder Intercomparison January 2016
CMCs for PMOD/WRC in Photometry and Radiometry

- Responsivity, solar, irradiance. Broadband detector, 0.0001 V/(Wm-2) to 40 V/(Wm-2)
  Relative expanded uncertainty (k = 2, level of confidence 95%) in %: 6
  Weighting: Erythema CIE
  Wavelength range: 280 nm to 400 nm

- Responsivity, solar, irradiance. Broadband detector, 0.0001 V/(Wm-2) to 2 V/(Wm-2)
  Relative expanded uncertainty (k = 2, level of confidence 95%) in %: 6
  Weighting: uniform, 280 nm to 315 nm
  Wavelength range: 280 nm to 315 nm

- Responsivity, solar, irradiance. Broadband detector, 0.0001 V/(Wm-2) to 0.1 V/(Wm-2)
  Relative expanded uncertainty (k = 2, level of confidence 95%) in %: 6
  Weighting: uniform, 315 nm to 400 nm
  Wavelength range: 315 nm to 400 nm

- Responsivity, solar, irradiance. Broadband detector, 0.0001 V/(Wm-2) to 0.1 V/(Wm-2)
  Relative expanded uncertainty (k = 2, level of confidence 95%) in %: 6
  Weighting: uniform, 280 nm to 400 nm
  Wavelength range: 280 nm to 400 nm

http://www.bipm.org/exalead_kcdb/exa_kcdb.jsp?p=AppC&q=pmod&x=72&y=15

http://kcdb.bipm.org/appendixc/
## Improved uncertainty Budget for spectral solar measurements with QASUME

<table>
<thead>
<tr>
<th>Uncertainty Parameter</th>
<th>Relative Std Uncertainty %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>QASUME</td>
</tr>
<tr>
<td>Radiometric calibration</td>
<td>0.55</td>
</tr>
<tr>
<td>250 W lamp stability (one year) +0.25%/sqrt(2)</td>
<td>0.10</td>
</tr>
<tr>
<td>Nonlinearity ... From PMT or PC</td>
<td>0.25</td>
</tr>
<tr>
<td>ND filter transmission</td>
<td>n/a</td>
</tr>
<tr>
<td>Stability</td>
<td>0.6 diurnal var. +1%</td>
</tr>
<tr>
<td>Temperature Dependence of the Entrance optic (-0.11%/K)</td>
<td></td>
</tr>
<tr>
<td>Angular Response (Clear Sky) ( uarf=0.3% )</td>
<td>1.2 (2.1/sqrt(3))</td>
</tr>
<tr>
<td></td>
<td>0.7 (&lt;65°SZA)</td>
</tr>
<tr>
<td></td>
<td>0.6 (1.1/sqrt(3)) &lt;350nm</td>
</tr>
<tr>
<td>Angular Response (Overcast), ( uarf=0.3% )</td>
<td>0.6</td>
</tr>
<tr>
<td>Repeatability (std noise) ( WI&gt;=310nm )</td>
<td>0.2</td>
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<tr>
<td>Repeatability (std noise) ( WI=300nm &amp; sza=75 )</td>
<td>3.5</td>
</tr>
<tr>
<td>Wavelength shift (after matSHIC) 0.02 nm</td>
<td>0.1, 0.5% (bei 300 nm)</td>
</tr>
<tr>
<td>Combined Uncertainty ( k=2 )</td>
<td>1.5 (overcast, &lt;65°: 1.1)</td>
</tr>
<tr>
<td>Expanded Uncertainty ( k=2 )</td>
<td>3.1 (overcast, 2.2)</td>
</tr>
<tr>
<td>Expanded Uncertainty ( k=2 ) 300 nm</td>
<td>7.4</td>
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To be submitted to Applied Optics
Working Group Status Update

Report of the 3D RT (atmospheric part) working group
Alexander Marshak
(June 2015 – March 2016)

I3RC status (I3RC is an ongoing project initiated in the late 1990s): http://i3rc.gsfc.nasa.gov/

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
- Due to security upgrades the online 3D calculator is down. 5 people (from US and France) have downloaded the file containing all the source code of the I3RC Monte Carlo code (http://code.google.com/p/i3rc-monte-carlo-model/downloads/list). It is a drop in downloads comparing with the previous years. On the other hand, the I3RC website remained popular: during the last 9 months, 614 visitors made 1023 visits to the website. This is similar to the previous year’s numbers (also around 1000 visits), and the frequency of visits remained fairly steady throughout the year, with no obvious annual cycle or trend. While 40% of the visitors visited a single page, 60% of the visitors went to more than one page. The average length of visits was 3.2 pages per visit (including single-page visits), slightly up from last year’s 3 pages per visit.

- The 3D session at the 2015 Joint AGU Assembly that was held on May 3-7, 2015 in Montreal. Conveners: T. Várnai, A. Davis, H. Barker, C. Chiu. Title: Challenges for 3D radiative transfer in the Earth and atmospheric sciences. The session included 15 oral presentations and 13 posters.

What’s now available:
- Online 3D calculator (currently not available due to GSFC security issues)
- 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 3D RT.

Plans
- creating an educational web pages on 3D RT;
- adding Rayleigh scattering and aerosols to the I3RC community code;
- adding polarization to the I3RC community code;
- adding thermal emission to the I3RC community code.

More detailed results’ comparisons have been included in http://rami-benchmark.jrc.ec.europa.eu/HTML/RAMI-IV/RAMI-IV.php. Six actual canopies were based on detailed measurements of the spectral, architectural properties encountered in a variety of existing vegetation canopies. 12 RT models were used to perform the experiments from BRF to vertical profile of fluxes. The large variability between several model results is explained by the vastly increased complexity of the scenes, and the implementation of by modellers. The level of detail in the 3D models is approaching the limit of what can be measured and/or represented in the 3D models e.g. trees down to the individual needle level. This allows for very direct comparisons of 3D models for realistic scenes (which hasn’t been achieved before) but of course it means that models which are not capable of full 3D representation, require generalizing/simplifying assumptions. The impact of these on the results is also interesting and instructive. A further advance in RAMI IV was the first attempt to compare LiDAR simulation capabilities. This is already becoming important due to the wide use of airborne lidar but also increased use of ground-based terrestrial lidar scanners, UAV-mounted lidar, and of course spaceborne (NASA GEDI mission, and ICeSAT-2). It is likely that in the next iteration of RAMI, 3D canopies generated from direct lidar measurement will be used, rather than from computer-generated architecture modelling software.

The novelty in RAMI IV was also mimicking of various ground-based measurements but only a few models participated in this aspect, in part due to the difficulty of generalizing 3D structure as mentioned above. Nevertheless the 3D model-based approach for improving EO land validation has been start as for example in the FP7 Quality Assurance For Essential Climate Variable (QA4ECV) project (http://www.qa4ecv.eu/), as well as in the FP7 METEOC-2 (Metrology for EO and Climate) project (http://www.emceoc.org/).
No presentations from two IRC working groups

1. GEWEX Data Assessment Panel (GDAP)
2. International TOVS Working Group (ITWG)
Working Group Status Update

• Updates to Working Groups’ Status

There are no changes or modifications suggested by chairs or commissioners
IRS2016 Budget
April 15th

Roger Davies
Physics Department, The University of Auckland, New Zealand
In NZ$$ after GST

• Total registration income $152,739
• Addition income (events) $6,652
• Sponsorship: physics, exhibitors $13,250

• Total Income $172,641
Expenses

- Fixed $33,397
- Variable (proportional to number of delegates@270) $125,563
- Total expenses $158,960
Bottom Line

- **Income** $172,641
- **Expenses** $158,960
- **Difference** $13,681
- **To IRC** $13,104 (273@$48) [US$8,900@0.68]
- **Reserve** $577

Changes pending due to actual consumption, expanded excursion, volunteer book vouchers
Highlights of IRS2016

• Sessions of Interest:

Suggestions by commissioners or attending guests:

There are no particular recommendations.
Report on IAMAS

• General update and status:

- Teruyuki Nakajima thanks IRC for submitting a symposium to IAPSO-IAMAS-IAGA. There are now 33 sessions for IAMAS, 40 session for IAPSO and 15 sessions for IAGA proposed,
- 2019 IUGG will be in Montreal.

• Next IAMAS meeting 2017 in Southafrica.
Next Business Meeting

- IRC Business meeting at IAMAS meeting 2017 in South Africa.

CAPE TOWN WELCOMES YOU

IAPSO-IAMAS-IAGA

27 August – 1 September 2017
Cape Town, South Africa

www.iapso-iamas-iaga2017.com
Election

- Election of the IRC president and Officers for the 2017-2020 term.


C. Election of the President and His/Her Slate of Vice-President and Secretary:

«Business Meeting Election Rule: The election of a new President of the IRC must be an item on the agenda of the last IRC business meeting of a membership term, held normally during the International Radiation Symposium of that year. The Nominee for President is presented to members in attendance at the IRC business meeting. The Nominee for President in turn presents his or her “slate” of nominees for Vice-President and Secretary, followed by discussion and then a vote of all members present at the business meeting for or against electing the Nominee as the new President»
Nominees for term 2017-2020:

For President:

**Byung-Ju Sohn**, Nat. University Seoul, Seoul, Korea (presently IRC vice-president)

For Vice President:

**Peter Pilewskie**, LASP, Boulder CO, USA (presently IRC secretary)

For Secretary:

**Marcia Akemi Yamasoe**, Univ. Sao Paulo, Sao Paulo, Brazil (presently IRC commissioner)
Election

• Result of the Election:

Byung-Ju Sohn, Nat. University Seoul, Seoul, Korea (presently IRC vice-president) was unanimously elected for IRC President.

Peter Pilewskie, LASP, Boulder CO, USA (presently IRC secretary) was unanimously elected for IRC Vice-President.

Marcia Akemi Yamasoe, Univ. Sao Paulo, Sao Paulo, Brazil (presently IRC commissioner) was unanimously elected for IRC Secretary.
Other Business

• No other business
IRC Business Meeting 2016 closed