

### 2021 International Radiation Commission (IRC) Business Meeting

10 September 2021 12:00-14:00 UTC





### Agenda

- I. Welcome (5)
- II. President's Report (20)
  - a) Remembrances
  - b) IRC Financial Status
  - c) Recent IRC Activities
  - d) Upcoming meetings
- III. IRS 2022 Plans and Updates (15)
- IV. Call for bids for IRS2024 (15)
- V. Working Group Chair Presentations (5 min. each = 50 min.)
- VI. Proposal for new Solar Irradiance Working Group (10)
- VII. Next Business Meeting @ IRS2022 (5)
- VIII. Other Business



### In Remembrance

### Kuo-Nan Liou (1943-2021)







### Treasurer's Report

### 2017-2021 Budget Summary

All amounts in USD

Date	Transaction	Amount (in)	Fees (out)	Balance
25/4/2017	Transfer from Peter Pilewskie	15634.93	8.9	15626.03
11/8/2017	Cumulative Interest (11 Aug 2017)	6.38		15632.41
29/8/2017	IRC website domain use (yearly till Oct '18)		30.00	15602.41
29/8/2017	IRC BM dinner (@Cape Town BM)		738.99	14863.42
10/7/2018	@IRC BM in Vancouver Food 857.59 (CAD) 648 USD A/V 1,102.08(CAD) 831 USD		1479.00	13384.42
29/1/2019	Loan to IRS2020 LOC for convention hall deposit		3490.14	9894.28
2018-2019	Charge for the IRC Homepage domain fee (31.57+31.57CHF) = (32.18+32 = 64.18 USD)		64.18	9830.10
20/10/2020	IRC domain fee (31.57 CHF) (23 Oct 2020- 23 Oct 2021)		37.13	9792.97
5/4/2021	Cumulative interest (up to 05 Apr 21)	214.23		10007.20
5/4/2021	Transfer from B.J. Sohn Sohn To Hajime Okamoto	10007.20	25.00	9982.20
5/4/2021	Local transfer fee to receive		17.00	9965.20
10/9/2021	Estimated differences due to exchange rate differences (4/5 1USD=109.29 JPY to 10/9 1USD=109.71 JPY)		38.16	9927.04
10/9/2021	Cumulative Interest (5 Apr. to 10 Sep.)	0.08	0	9927.12



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### **International Radiation Commission Activities**

Eleven new commissioners were selected to replace the commissioners who completed their second four-year term.

- We welcome: Odele Coddington (US), Jason Cole (Canada), Maya García Comas (Spain) Maria Hakuba (US), Xianglei Huang (US), Stelios A. Kazadzis (Switzerland), Chao Liu (China), Daniela Meloni (Italy), Tomoaki Nishizawa (Japan), Lazaros Oreopoulos (US) and Robert Pincus (US).
- Thank you to our departing commissioners: Alkiviadis Bais, Roger Davies, Alcide Di Sarra, Robin Hogan, Yasuko Kasai, Zhengquiang Li, Manuel López Puertas, David Tobin, Alexander Trishchenko, Ping Yang and Tatiana Zhuravleva





#### **GEOGRAPHICAL DISTRIBUTION**

### IRC has a new website!

https://www.iamas.org/irc/; the old site at http://www.irc-iamas.org/ will redirect you



#### International Radiation Commission

IAMAS > IRC

#### Home

IRC is a global network of scientists engaged in research of atmospheric radiation and related disciplines. Founded in 1896, IRC is the oldest of the ten commissions of IAMAS (International Association of Meteorology and Atmospheric Sciences) and is currently comprised of experts from 18 countries working in universities, research institutions, government agencies and private industry. The Commission coordinates research, guides priorities, and supports international cooperation and collaboration. IRC also organizes scientific symposia open to all scientists that provide forums for the scientific community to present, discuss and promote the latest achievements in atmospheric radiation science.

#### **News and Updates**

- A tribute to Dr. Kuo-Nan Liou (1943-2021)
- IRS2022 rescheduled to 4-8 July 2022
- Official page of commemorating the life of Dr. Michael I. Mishchenko (1959-2020)
- read more.....





### Upcoming meetings

- <sup>1</sup>SCOSTEP 15th Quadrennial Solar-Terrestrial Physics Symposium (STP-15) 21-25 February 2022, Alibag, India. Now fully remote.
- 2. Sun-Climate Symposium, May 16-20 2022, Madison, WI USA
- 3. IRS2022, 4-8 July 2022, Thessaloniki, Greece
- 4. <sup>2</sup>COSPAR 44th Scientific Assembly, 16-24 July 2022 Athens, Greece
- 5. <sup>3</sup>AMS 16th Conference on Cloud Physics/16th Conference on Atmospheric Radiation, 8-12 August 2022, Madison, WI USA
- 6. <sup>4</sup>IUGG2023, 11-20 July 2023, Berlin, Germany
  - 1. Scientific Committee on Solar-Terrestrial Physics
  - 2. Committee on Space Research
  - 3. American Meteorological Society
  - 4. International Union of Geodesy and Geophysics



### IRS 2022 Plans and Updates



#### The IRC quadrennial symposium was twice delayed.

- ➢ Over 550 authors submitted over 600 abstracts
- > Now scheduled for 4-8 July 2022 in Thessaloniki.
- See https://www.irs2022.org/ for additional updates.



# 4–8 July 2022

# 2022 Lender Thessaloniki

IRC Business Meeting 10 Sep. 2021





IRC Business Meeting 10-9-2021

# What has been done so far

- Irregular meetings with the IRC officers started again (Autumn 2020)
- The Conference center has been re-booked for the new dates (option for additional rooms)
- Registration fees were increased by ~5% (to account for extra work by the agency and more/larger conference rooms)
- Session conveners were reconfirmed (except a few co-conveners)
- ► The web site **www.irs2022.org** has been updated
- Keynote speakers were reconfirmed (except Roger Sunders)
- ▶ The 1<sup>st</sup> and 2<sup>nd</sup> announcements were distrubuted to ~2800 e-mails

# Scientific organizing committee

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**Peter Pilewskie**, University of Colorado, CO USA– President of IRC **Manfred Wendisch**, Leipzig Institute for Meteorology, Germany – Vice President of IRC Hajime Okamoto, Kyushu University, Japan – Secretary of IRC Alkiviadis Bais, Aristotle University of Thessaloniki, Greece **Iouli E. Gordon**, Harvard-Smithsonian Center for Astrophysics, MA USA Ping Yang, Texas A&M University, USA **Piet Stammes**, Royal Netherlands Meteorological Institute, The Netherlands Seiji Kato, NASA Langley Research Center, USA Jhoon Kim, Yonsei University, Korea Ann Webb, University of Manchester, United Kingdom Jeremy Werdell, NASA/GSFC, MD USA **Dimitris Balis**, Aristotle University of Thessaloniki, Greece

# Symposium sessions

- Topical Union Session
- Radiative Transfer Theory and Modeling
- Particle Radiative Properties
- General Remote Sensing
- Ground-based Measurements and Field Observations
- Radiation Budget and Forcing
- Weather, Climate and Environment Applications
- Solar UV Radiation
- Ocean Optics
- Climate Change in the Mediterranean and Radiative Impacts of a Changing Environment

#### \*\*Abstracts will be submitted to one session only

#### IRS 2022 Thessaloniki, Greece

# Important dates

1 September 2021	Opening of submission of abstracts and registration		
15 December 2021	Submission of Abstracts closes (with possible extension to 10 Jan)		
15 February 2022 Notification of acceptance of Abstracts			
15 February 2022	2 Application for students' support opens		
29 February 2022 Application for students' support closes			
15 March 2022	Notification of student's support		
<b>15 March 2022</b> Selection of oral/poster presentations			
16 April 2022      Preliminary Programme			
15 May 2022	Final Programme		

IRS 2022 Thessaloniki, Greece

IRC Business Meeting 10-9-2021

# **Registration fees**



	Regular	Students
Early Bird (30 March 2022)	470	235
Regular (30 June 2022)	550	275
On site	630	315
Accompanying persons	80*	-

#### The registration fee includes:

- Admission to conference sessions
- Conference material
- Coffee breaks (2 per day)
- Light lunch (all days)
- Welcome reception \*
- Symposium banquet \*

# Conference Venue The Thessaloniki Concert Hall



- ► A modern architecture building
- ► Fully air conditioned
- Main auditorium of 510 seats (Plenary)
- Three 100-seat rooms (Parallel sessions)
- People with disabilities: All facilities are accessible with elevators
- Audio-visual equipment and technical support
- Four poster-session areas for 500 posters (more space if needed)
- Free Wi-Fi in all areas
- Spacious area for coffee and lunch breaks
- Easily accessible by foot, bus or taxi

IRC Business Meeting 10-9-2021

IRS 2022 Thessaloniki, Greece

# The main auditorium



Plenary and regular sessions IRC Business Meeting 10-9-2021

16

IRS 2022 Thessaloniki, Greece

# The Concert Hall Foyer





Poster session areas at 4 levels

IRS 2022 Thessaloniki, Greece

IRC Business Meeting 10-9-2021

# Depending on restrictions due to Covid-19 Post symposium excursions





#### Mount Athos:

A World Heritage Site and self-governed state in the Hellenic Republic, Athos hosts 20 Eastern Orthodox monasteries under the direct jurisdiction of the Patriarch of Constantinople. Bus-trip duration about 2.5 hours Boat tour around the Monasteries Swimming and launch at the small island Amouliani At least 140 persons are required for exclusive boat trip

#### Vergina:

The museum and the burial site of the kings of Macedonia, including the tomb of Philip II, father of Alexander the Great. Bus-trip duration 2.5 hours (both ways). Lunch an relaxing at a mainland village

### Call for Bids for IRS2024

- In October 2021 we will open the bidding for proposals for IRS2024.
- Proposals will be due by May 2022.
- A selection will be determined at the 2022 Business Meeting in Thessaloniki in July 2022.
- Please refer to the Resources page on the IRC website: <u>https://www.iamas.org/irc/resources/</u>. Under "Quadrennial Symposium" you will find a "Symposium Bid Proposal Template" along with several proposals from past symposia.
- Here are locations for the past 7 Symposia:

2022: Thessaloniki, Greece; 2016: Auckland, New Zealand; 2012: Berlin, Germany; 2008: Foz do Iguacu, Brazil; 2004: Busan, Korea; 2000: St. Petersburg, Russia; 1996: Fairbanks, AK, USA

Europe (3), South America (1), North America (1), Asia (1), Oceania (1)



Bids from Asia and North America would be most welcome but all bids will be considered!



### Working Group Presentations

The 10 IRC Working Groups		
ASA - Atmospheric Spectroscopy Applications		
Chair: Iouli Gordon		
BSRN - Baseline Surface Radiation Network		
Co-Chairs: Amelie Driemel and Christian Lanconelli		
CR - Clouds and Radiation		
Chair: Andreas Macke		
GEB - Global Energy Balance		
Co-Chairs: Norman Loeb and Martin Wild		
ICLAS - International Coordination group for Laser Atmospheric Studies		
Chair: Alex Papayannis		
IPRT - International Polarized Radiative Transfer		
Co-Chairs: Claudia Emde and Bernhard Mayer		
ITWG - International TOVS Working Group		
Co-Chairs: Liam Gumley and Vincent Guidard		
UV - Solar UltraViolet Radiation		
Co-Chairs: Julian Groebner and Ann Webb		
3DRT (I3RC) - Three-Dimensional Radiative Transfer		
Chair: Alexander Marshak		
HRMM - Hyperspectral Radiation: Measurements and Modelling		
Chair: Piet Stammes		





# WG 1: ASA - Atmospheric Spectroscopy Applications

# ASA report. HITRAN2020 edition



I. Gordon, L. Rothman, R. Hargreaves, E. Conway, E. Karlovets, R. Hashemi, F. Skinner, A. Finenko, K. Nelson, R. Kochanov, Y. Tan, C. Hill...

## Major improvement over previous editions

- Improved spectral parameters for existing lines of the majority of HITRAN molecules.
- Non-Voigt line shapes. Every line of CO<sub>2</sub>, N<sub>2</sub>O and CO now has speed-dependent Voigt and first order line mixing parameters.
- Extended spectral coverage and added new isotopologues for many molecules
- Six new molecules (e.g. a very potent greenhouse gas NF<sub>3</sub>). Bringing total to 55
- Broadening by  $H_2O$  added
- Added new experimental cross-sections
- Major update of the CIA section
- Extensive validations against laboratory and atmospheric spectra were carried out

HAPI and HAPIEST updated



# Example: H<sub>2</sub>O

- Update based on Conway et al. (2020) JQSRT 241, 106711 and ACP 20, 1005.
- The dataset extended from ~25500 to 42000 cm<sup>-1</sup>
- Updated VP "Diet" for half-widths ( $\gamma$ ) and shifts ( $\delta$ ). Fixes issues in HITRAN2016





**Figure above.** HITRAN2020 and HITRAN2016 compared at modelling the atmospheric transmittance. Compared to high-resolution solar spectrum Baker et al. ApJ 2020

#### **Figure on the left.** Comparison of the HITRAN2020 and HITRAN2016 line lists against the empirical water-vapor cross sections from Harder and Brault, JGR 102 (1997) 6245.

# Ozone consistency from MW to UV

Effectively the intensities of bands in the MW, 5 and 10 µm regions are increased by 2.8-3.8%. While different effective scaling factors are observed elsewhere. Substantially reduced RMS



Absolute VSF values are meaningless in this plot..

G.C. Toon (JPL) Evaluations

https://mark4sun.jpl.nasa.gov/report/O3\_Spectroscopy\_Eval\_2021\_07\_14.pdf

# WG 2: BSRN - Baseline Surface Radiation Network

WRMC-BSRN World Radiation Monitoring Center- Baseline Surface Radiation Network

### Amelie Driemel (WRMC Archive Director),

### Christian Lanconelli (BSRN Project Manager) and

### Laura Riihimaki (BSRN deputy PM)









Running, inactive, planned and closed BSRN Stations, May 2021

#### WRMC-BSRN

World Radiation Monitoring Center- Baseline Surface Radiation Network

### Archive status:

- 74 (was 71) official stations with data (58 currently operational)
- 16 of those closed (last closed Sapporo, Alert, Eureka)
- three new stations in candidate status: ABS (Japan), MRS (Romania), TNB (Antarctica)
- Jambi Station (Indonesia), Nakhon Pathom (Thailand), CyI PROTEAS (Cyprus) still pending status to complete implementation.
- About **12,200** (was 12,000) months of radiation data in the archive
- Dr. Laura Riihimaki (CIRES NOAA, deputy PM)

### Web of Science:

- Cited over 4800 times without self-citations
- In 3300 articles
- Producing an h-index of 34





- Interim BSRN 2020 virtual meeting (presentations are available <u>here</u>)
- Infrared WG further investigates the possibility to review archive based on World Infrared Standard Group (WISG) infrared offset (PMOD/WRC project on-going)
- DQWG reinforced the Data Quality check (pilot web tool setup)
- Ocean Working Group established (Laura Riihimaki(CIRES-NOAA) interacting closely with Ocean Best Practices System (OBPS) radiation WG (M. Cronin, NOAA)
- VAP WG (J. Badosa/LMD tentative) and Albedo WG (Z. Wang/NASA) on the way to be established
- Cold Climate Issue WG dropped as terminated its activities
- **Uncertainties WG** was revitalized and chaired now by L. Vuilleumier (Meteoswiss)

### Active, new and dropped BSRN Working Groups and chairs

no.	Name	Chair	E-mail
1	Infrared	Julian Groebner	Julian.Groebner@pmodwrc.ch
2	Spectral/UV	Kathy Lantz	kathy.o.lantz@noaa.gov
3	Broadband	Allison McComiskey	amccomiskey@bnl.gov
4	Uncertainties	Laurent Vuilleumier	Laurent.Vuilleumier@meteoswiss.ch
5	Use of BSRN in Solar Renewable Energy	Enio Pereira	enio.pereira@inpe.br
6	Manual Review Committee	Gary Hodges	gary.hodges@noaa.gov
7	Data Quality	Wouter Knap	wouter.knap@knmi.nl
8	Ocean	Laura Riihimaki	laura.riihimaki@noaa.gov
9	Albedo	Zhuosen Wang	zhuosen.wang@nasa.gov
10	Value Added Products	Jordi Badosa	LMD (tentatively)
<del>5</del> -	Cold Climate Issues	Chris Cox-	christopher.j.cox@noaa.gov-

# WG 3: CR - Clouds and Radiation

# **Clouds** and **Radiation**

# report for IRC 2021

Andreas Macke (TROPOS), Stefan Kinne (MPI-Met) and Johannes Quaas (LIM)

# a MISR analysis: the mean annual cloud fraction (CF) between 50N to 50S reduced from 0.65 to 0.47

- Larry Di Girolomo writes: I understand that's shocking and difficult to believe, but the evidence is clear and the validation (as done in the paper below) is difficult to dispute. The validation is traceable and is trivial to reproduce. Simply randomly choose a handful of 15-m resolution ASTER scenes and look.
  - Dutta <a href="https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL090313">https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL090313</a>)
- Larry Di Girolomo also writes: some of the reduction is related to the lack of side viewing (narrow swath in MISR) with MODIS wide swath CF = 0.66 but MODIS-in-MISR-swath = 0.59.



# in other news ...

### corona impact

• fewer large contrail fields, but climate impact is small (Quaas et al Env. Res. Lett. 2021) ... also MODIS / SLSTR fine-mode AOD reductions (as expected from reduced pollution during lookdowns) are local and minor (Kinne in prep)

### new cloud assessment

• Claudia Stubenrauch (LMD) has updated her long-term mon 1x1 GEWEX cloud data products and working on a new cloud assessment.

### EarthCare

• the instrument is assembled and there is a launch slot (spring 2023)

### on the lighter side

rap video on clouds and climate sensitivity (<u>https://youtu.be/Luu7k6RU5Ug</u>)

# stronger future foci on processes

we suggest to change the working group focus and name

- from CLOUDS and RADIATION
- to CLOUD PROCESSES and RADIATION (CPR)
- the idea is a special focus on processes between environment and cloud (macro-, microphysical and radiative) properties
- this new group will be lead by Andreas Macke (TROPOS) and by Johannes Quaas (Uni Leipzig).

# WG 4: GEB - Global Energy Balance

## **Report of the IRC working group Global Energy Balance**

Co Chairs: Martin Wild and Norman Loeb

**Objectives**: 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:

#### Finalization of IPCC 6th assessment report (AR6), released on August 9, 2021

Martin Wild Lead Author Chapter 7 "The Earth's energy budget, climate feedbacks, and climate sensitivity" Norman Loeb and Seiji Kato (contributing authors).

Meeting organization:

- European Geophysical Union (EGU) General Assembly 2021 (virtual meeting), April 2021. Organization of the session "Earth radiation budget, radiative forcing and climate change", closely linked to the aims of this WG (Convenors Martin Wild, Paul Stackhouse, Jörg Trentmann, Maria Hakuba). (consecutive since 2006)
- American Geophysical Union (AGU) General Assembly 2020 (virtual meeting). Dec 2020. Organization of the session "GC034: Earth's Energy Balance and Energy Flows through the Climate System", closely linked to the aims of this working group (Convenors Maria Hakuba, Seiji Kato, Lijing Cheng, Martin Wild).
- **IRS postponed to 2022**. Organization of the session "Radiation Budget and Forcing", closely linked to the aims of this working group (Convenors Seiji Kato, Norman Loeb, Martin Wild).

#### **Recommendations** > see full 2021 report

### Research example (I): Satellite and Ocean Data reveal a marked increase in Earth's heating rate





**Figure 2.** Global mean top-of-atmosphere flux anomalies and trends. Anomalies in (a) absorbed solar radiation (ASR), (b) emitted thermal radiation (ETR) and (c) Net for 2002/09–2020/03. Thin lines correspond to monthly anomalies, thick lines are 12-month running averages. Trends in (d) ASR, (e) ETR and (f) Net associated with contributions from changes in clouds, water vapor (WV), combined contributions from trace gases and solar irradiance (labeled as "Other"), surface albedo (SFC), aerosols (AER) and combined contributions from skin temperature and profiles of temperature ("Temp"). "Total" corresponds to the sum of the individual contributions. Error bars correspond to 5–95% confidence intervals determined using the methodology in Santer et al. (2000). Positive anomalies and trends correspond to heat gain, and negative to loss. ETR is defined positive downwards and is thus equal to –outgoing longwave radiation.

**Figure 1.** Comparison of overlapping one-year estimates at 6-month intervals of net top-of-the-atmosphere annual energy flux from the Clouds and the Earth's Radiant Energy System Energy Balanced and Filled Ed4.1 product (solid red line) and an in situ observational estimate of uptake of energy by Earth climate system (solid blue line). Dashed lines correspond to least squares linear regression fits to the data.

Loeb et al. 2021 GRL

#### **Research example (II):**

### Historic evolution of energy balance components in climate models since 1980s

Climate model Generation	Atmos. clear sky SW absorption Multi-model global mean	Surface downward longwave radiation Multi-model global mean
<b>Pre-AMIP</b> (late 1980s models) Wild et al. 1995 JCLIM	63 Wm <sup>-2</sup>	<b>327</b> Wm <sup>-2</sup>
<b>AMIP II</b> (1990s models) Wild et al. 2006 JGR	67 Wm <sup>-2</sup>	<b>336</b> Wm <sup>-2</sup>
CMIP3 (early 2000s) Wild et al. 2006 JGR	69 Wm <sup>-2</sup>	<b>337</b> Wm <sup>-2</sup>
<b>CMIP5</b> (2010s) Wild et al. 2015/2019 CD	<b>70</b> Wm <sup>-2</sup>	<b>340</b> Wm <sup>-2</sup>
<b>CMIP6</b> (2020s) Wild 2020 CD	<b>73</b> Wm <sup>-2</sup>	<b>344</b> Wm <sup>-2</sup>
Reference values	<b>73</b> Wm <sup>-2</sup> (Wild et al. 2019) <b>73</b> Wm <sup>-2</sup> (Kato et al. 2018)	<b>344</b> Wm <sup>-2</sup> (Kato et al. 2018) <b>342</b> Wm <sup>-2</sup> (Wild et al. 2018)

Wild 2020 Climate Dynamics

# WG 5: ICLAS - International Coordination group for Laser Atmospheric Studies

# International Coordination-group for Laser Atmospheric Studies (ICLAS) Working Group Report for 2020-2021

Alex PAPAYANNIS, ICLAS President National Technical University of Athens, Greece <u>Upendra N. SINGH</u>, Past ICLAS President NASA Langley Research Center, Hampton, VA, USA

- ICLAS: Promotes the development and application of laser sensing techniques and laser instrument architectures used to study the atmospheres of the Earth and other planets.
- ICLAS: Takes care of the promotion and organization of the International Laser Radar Conferences (ILRCs), gathering the laser remote sensing community and are convened every 2 years. The ILRCs are held under the auspices of the ICLAS.

# **ICLAS**

5 new elected members Terms ending on 2021 are extended to 2022 due to COVID-19 pandemic

NAME SURNAME	COUNTRY	TERM
PRESIDENT		
Papayannis A.	Greece	2015-2021
VICE-PRESIDENT		
Singh U.	USA	2015-2021
TREASURER		
McGee T.	USA	No term limit
EUROPE		
Rairoux P.	France	2020-2026
Ptashnik I.	Russia	2020-2026
Balis D.	Greece	2015-2021
Fix A.	Germany	2015-2021
Donovan D.	The Netherlands	2017-2023
Tzeremes G.	ESA	2017-2023
USA/CANADA		
Chu X.	USA	2015-2021
Leblanc T.	USA	2020-2026
Moshary F.	USA	2017-2023
ASIA-PACIFIC		
Okamoto H.	Japan	2020-2026
Ishii S.	Japan	2017-2023
Liu D.	China	2017-2023
S. HEMISPHERE		
Bencherif H.	S. Africa/La Reunion	2020-2026

#### IRC Business Meeting, August , 2021

### Report on the upcoming 30<sup>th</sup> International Laser Radar Conference (ILRC-30)





The next (30<sup>th</sup>) ILRC Conference will be held at Big Sky, Montana (USA) on June 26<sup>th</sup> – July 1<sup>st</sup>, 2022.

It will be organized by scientists of NASA (from Jet Propulsion Laboratory-JPL and Goddard Space Flight Center-GSFC)

Expected Registrations

300 scientists and 100 students

IRC Business Meeting, August, 2021

# WG 6: IPRT - International Polarized Radiative Transfer

# International Working Group on Polarized Radiative Transfer

#### Aims of working group IPRT:

- bring the community together (workshops)
- compare and improve models, 3D model intercomparison
- provide benchmark results
- provide information about free codes
- develop new and faster, publically available codes
- provide input data (scattering matrices, BPDFs – bidirectional polarization distribution functions, ...)

Project website:

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



### VRT in fully spherical geometry

Atmos. Meas. Tech., 14, 3953–3972, 2021 Systematic comparison of vectorial spherical radiative transfer models in limb scattering geometry

Daniel Zawada<sup>1</sup>, Ghislain Franssens<sup>2</sup>, Robert Loughman<sup>3</sup>, Antti Mikkonen<sup>4</sup>, Alexei Rozanov<sup>5</sup>, Claudia Emde<sup>6</sup>, Adam Bourassa<sup>1</sup>, Seth Dueck<sup>1</sup>, Hannakaisa Lindqvist<sup>4</sup>, Didier Ramon<sup>7</sup>, Vladimir Rozanov<sup>5</sup>, Emmanuel Dekemper<sup>2</sup>, Erkki Kyröliä<sup>4</sup>, John P. Burrows<sup>5</sup>, Didier Fussen<sup>2</sup>, and Doug Degenstein<sup>1</sup>

<sup>1</sup>Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatchewan, Canada <sup>2</sup>Royal Belgian Institute for Space Aeronomy, Brussels, Belgium <sup>3</sup>Department of Atmospheric and Planetary Sciences, Hampton University, Hampton, Virginia, USA <sup>4</sup>Finnish Meteorological Institute, Helsinki, Finland <sup>5</sup>Institute of Environmental Physics, University of Bremen, Bremen, Germany <sup>6</sup>Meteorological Institute, Ludwig-Maximilians-Universität, Munich, Germany <sup>7</sup>HYGEOS, Lille, France

- Atmospheric setup: molecules & stratospheric aerosol
- various sun-observer geometries (limb viewing) and surface albedos
- Multi-model-mean available as benchmark results



Model intercomparison for more general sun-observer-geometries (e.g. twilight) in preparation (Korkin et al.)

### VRT in atmosphere-ocean systems

#### J. Quant. Spec. and Rad. Trans., 2020

Testbed results for scalar and vector radiative transfer computations of light in atmosphere-ocean systems

#### Jacek Chowdhary 44, Peng-Wang Zhai<sup>b</sup>, Feng Xu<sup>c,1</sup>, Robert Frouin<sup>d</sup>, Didier Ramon<sup>e</sup>

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- 4 different approaches to solve VRT
- agreement for degree of polarization better than 0.2%
- benchmark results available

#### 482/3

#### Definition of test cases:

- molecular atmosphere above rough ocean surface
- 2 pure water body below rough ocean surface
- fully-coupled simple atmosphere-ocean system (molecular atmosphere, rough ocean surface, pure water)
- fully-coupled complex atmosphere-ocean system (including hydrosols)

Claudia Emde and Bernhard Mayer (LMU)

# WG 7: ITWG - International TOVS Working Group

IRC Business Meeting, 10 Sept 2021

# ITWG report to IRC

# Vincent Guidard (Météo-France) Liam Gumley (SSEC, UWisconsin)



# Conference ITSC-23 in June 2021

- ITSC-23 was held as a virtual conference, between 24 and 30 June 2021
- 252 participants from 19 countries
- 6 working group meetings + 2 technical sub-group meeting before the conference
- 5 x 4h30 ''days'' of conference, more than 120 online participants each day
  - 40 scientific presentations + 5 Space agency reports + 11 NWP centre reports
  - 77 posters in 4 non-thematic sessions
  - All sessions chaired by women
- Working Groups were formed to consider six key areas of interest to the ITWG: Radiative Transfer, Climate, Data Assimilation and Numerical Weather Prediction, Advanced Sounders, International Issues and Future Systems, and Products and Software

website http://cimss.ssec.wisc.edu/itwg/itsc/itsc23/index.html

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# Conference ITSC-23 in June 2021

- Numerous recommendations and actions (see full report). For instance:
- Recommendation : the group recommends IR support for follow on from CLARREO
- Recommendation to community: coordinate efforts for land surface Emissivity modeling to cover spectral and physical requirements, development of modeling framework.
- Recommendation to community: new sea surface temperature / emissivity measurements across all spectral ranges highly encouraged, in coordination with RT model developers / researchers with particular emphasis on temperature dependence.

- ITSC-24 is planned for fall 2022 as an in-person meeting possible adaptations:
  - Move to spring 2023
  - Go to a virtual meeting again
- To keep the momentum in between 2 ITSCs, interim meetings of the sub-working groups are planned Q1.2022 (remotely)

# WG 8: UV - Solar Ultra-Violet Radiation

### UV Working Group – Overview Ann Webb, Julian Groebner, Andreas Kazantzidis



## **Overview of Recent Activities**

Monitoring at many sites around the world has continued

 ESP-IUPB International Photobiology Meeting, August 25-30, 2019 Barcelona, Spain

Included session on UV measurements, and several on UV effects

#### Hiatus – many cancelled or postponed activities during 2020

• NOG – Nordic Ozone and UV Group Meeting, 20-21 April, 2021 (virtual)

#### **Upcoming:**

- EUROSKIN UV and Skin Cancer Prevention Conference, including UV Index workshop. September 7-9, 2021 (virtual)
- Biennial Brewer Intercomparison, September 6-17, 2021, El Arenosillo, Spain
- ECUVM
  - European Conference on Solar UV Monitoring and personal UV exposure, February 23-25, 2022, Vienna, Austria
- IRS, July 4-8, 2022, Thessaloniki, Greece: Solar UV Session

# WG 9: 3DRT (I3RC) - Three-Dimensional Radiative Transfer



#### **I3RC status** (I3RC is an ongoing project initiated in the late 1990s)

#### Objectives

- comparing methods available for 3D atmospheric RT calculations
- providing benchmark results for testing 3D RT codes
- publishing an opensource toolkit (community 3D MC code)
- providing resources related to I3RC and 3DRT (codes, models, workshops, publications)

#### I3RC Monte Carlo community model of 3D radiative transfer

#### Activities

We gave the I3RC MC code to 5 people (2 from China, 2 from the US, and 1 from France). This is up from 4 last year, but lower than the typical number in previous years (12-14). The drop may have come from the release in 2017 and 2018 of two other versions of the I3RC code by Alexandra Jones, which include thermal emission and broadband capability. Because these codes were released through GitHub, our statistics do not include these downloads.

The I3RC online simulator gained 21 new users (5-5 from the US and Germany, 3 from China, 2-2 from France and Israel, and 1 from Switzerland, Spain, Russia, and Belgium each). The total number of old and new users is 57 at the end of July 2020.

The session at the 2019 AGU Fall Meeting was entitled "Observing and simulating aerosol-cloud-radiation interactions in a 3D atmosphere" and was held in SF on Dec. 10, 2019. The session included 9 posters. The special issue in the journal Remote Sensing is entitled "Remote Sensing of Cloud and Aerosol Properties in a Three-Dimensional Atmosphere". So far, three articles have been published in the special issue.



# Radiative Transfer Model Intercomparison (RAMI-V)

### An overview of the fifth phase of RAMI, launched in 2020

Nadine Gobron, Christian Lanconelli & Mat Disney



# RAMI concept

- RAMI proposes a mechanism to benchmark models designed to simulate the transfer of radiation at or near the Earth's terrestrial surface, i.e., in plant canopies and over soil surfaces.
- As an open-access, on-going activity, RAMI operates in successive phases each one aiming at re-assessing the capability, performance and agreement of the latest generation of radiation transfer (RT) models. This in turn, will lead to model enhancements and further developments that benefit the RT modelling community.
- The fourth phase of RAMI (RAMI-IV) included a new set of architectural scenarios conveniently subdivided into "abstract" and "actual" canopies.



# RAMI-V (2020-2021)

#### https://rami-benchmark.jrc.ec.europa.eu

- RAMI-V maintains the abstract and actual scene definition of RAMI-IV phase.
  Additionally, two actual scenes, defined through a semi-parametric (Savanna) and an empirical (Wytham Wood) approaches, were included.
- Measurements are substantially unchanged with a focus on bidirectional reflectance factor (BRF), albedo in direct and diffuse illumination (DHR and BHR), radiant flux Transmission and Absorption through and below the canopy, and Digital Hemispherical Photography (DHP).
- RAMI-V focuses in particular on OLCI, MSI, MODIS spectral bands, and actual geometry configuration.
- Result Submission period: Oct 2020-Sep 2021.

RAMI V phase			
2020 - on going			
Home The new YPast Y <u>Scenes</u> Measurem	ents Y How to Guidance Y News and RAMI4ATM participate events		
- Actual Canopies	- Abstract Canopies		
– Parametric	– Heterogeneous		
Järvselja Pine Stand (Summer) (HET07_JPS_SUM)	Anisotropic background (HET10,11,12/HET20,21,22)		
Ofenpass Pine Stand (Winter) (HET08_OPS_WIN)	Two-layer canopy (HET16,17,18/HET26,27,28)		
Järvselja Birch Stand (Summer) (HET09_JBS_SUM)	Constant Slope (HET23,24/HET33,34)		
Wellington Citrus Orchard (HET14_WCO_UND)	– Homogeneous		
Järvselja Birch Stand (Winter) (HET15_JBS_WIN)	Anisotropic Background (HOM23,24,25/HOM33,34,35)		
Agricultural crops: Short Rotation Forest (HET16_SRF_UND)	Two-layer canopy (HOM26,27,28/HOM36,37,38)		
– Semi-empirical	Adjacent canopies (HOM29,HOM30)		
Savanna pre-fire (HET50_SAV_PRE): new files, see news section			
– Empirical			
Wytham Wood (HET51_WWO_TLS): experiment in stand by, see news section			

# Total and Spectral Solar Irradiance Proposal for a new IRC Working Group

Odele Coddington, LASP, USA

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# Importance & Applicability to the IRC

- The top of atmosphere solar irradiance is a key input for diverse applications studying the Earth system.
- A new Total and Spectral Solar Irradiance working group will:
  - allow discussions about the adequacy of the solar irradiance datasets for the various purposes.
  - primarily focus on the solar irradiance external to Earth's atmosphere (i.e. distinct from the existing UV Radiation working group)

## **Mission Statement**

 To facilitate the proper representation of total solar irradiance (TSI) and solar spectral irradiance (SSI) as input to radiative transfer models, remote sensing algorithms, instrument calibration and intercalibration efforts, and global models (e.g., general circulation models and atmospheric chemistry/transport models).

Due to the broad applicability of TSI and SSI in diverse Earth science applications, collaborative discussions with all IRC working groups are foreseen.

# Key Responsibilities



- To achieve the objective, the WG responsibilities will be to:
  - Discuss TSI and SSI implementation in Earth science applications
  - Report advances from NASA's Solar Irradiance Science Team (SIST).
  - Foster international relationships between the solar irradiance measurement and modeling communities
  - Foster coupled solar-terrestrial system research with SCOSTEP (Predictability of the Solar-Terrestrial Coupling "PRESTO" program; Pillar 3).
  - Disseminate key updates at international meetings

15TH QUADRENNIAL SOLAR-TERRESTRIAL PHYSICS SYMPOSIUM (STP-15)



\*Indicates a current leadership role for O. Coddington



# Group Leadership & Members







- Co-chairs: Odele Coddington (LASP, USA) & Mustapha Meftah (LATMOS, France)
- Membership will be drawn from:
  - the TSI and SSI measurement and modeling community,
  - the proxy measurement and modeling community,
  - developers of solar reference spectra,
  - developers of composite solar irradiance records,
  - the radiative transfer community, and
  - the climate modeling community.

# Some Recent Solar Irradiance Research



## Some Recent Solar Irradiance Research



**Right**: New historical TSI reconstructions suggesting a smaller solar forcing between 1750 and 2011 than adopted in IPCC AR5 report [Wang & Lean, *ApJ*, 2021, *in press*]

Alternative TSI reconstructions also ongoing as part of NASA/SIST.

**Left**: Observed TSIS-1 SIM solar variability and validation of the Solar Irradiance Climate Data Record (i.e., NRLSSI2; developed from SORCE SIM observations). [Coddington et al., *in progress*]

**Left**: Development of a high-resolution (0.1-0.5 nm) solar irradiance model (NRLSSI2h) from 115 to 500 nm [Lean et al., *EASS*, 2021, *to be submitted*]



**Next Business Meeting** 

### IRS2022 in Thessaloniki

### Hope to see all of you there!



