

18th WMO/IAEA Meeting on

Carbon Dioxide, Other Greenhouse Gases, and Related Measurement Techniques (GGMT)

September 13-17, 2015
La Jolla, California

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Agenda

Sunday, September 13, 2015

All day: Kayak La Jolla Shores and beach activities

18:00 ICE BREAKER

Monday, September 14, 2015

8:00 REGISTRATION

9:00 **Opening Remarks**

9:30 **Keynote: T1** Airborne measurements of oxygen concentration from the surface to the lower stratosphere, **Britt Stephens*

10:00 PHOTO AND COFFEE BREAK

Urban Networks and Megacities – Chair: Britt Stephens

10:30 **T2** Assessing CO₂ emissions from Paris megacity: first lessons from our atmospheric CO₂ network, co-emitted species and carbon isotopes; observation strategy for future urban CO₂ networks, **Irène Xueref-Remy*

10:50 **T3** Indianapolis flux (INFLUX) in-situ network: quantification of urban atmospheric boundary layer greenhouse gas dry mole fraction enhancements, **Natasha Miles*

11:10 **T4** Early results from the Los Angeles megacity carbon project: exploring spatial and temporal variability in urban greenhouse gas observations, **Kristal Verhulst*

11:20 **T5** Observations of atmospheric CO₂, CO and CO₂ isotopes across an experimental tower network in California, **Heather Graven*

GHG Standards & Comparison Activities – Chair: Britt Stephens

11:30 **T6** History of WMO CO₂ X2007 scale: long-term reproducibility **Pieter Tans*

11:50 **T7** Results from the latest Round-Robbin comparison, **Lingxi Zhou*

12:00 LUNCH BREAK

GHG Standards & Comparison Activities, continued – Chair: Gordon Brailsford

13:20 **T8** Comparison of CO₂ in air standards for background and urban GHG measurements, **Joële Viallon*

13:40 **T9** Update and expansion of the WMO X2004 methane mole fraction scale, **Ed Dlugokencky*

14:00 **T10** WMO/GAW greenhouse gas calibration scales: definitions, uncertainties, and future directions, **Brad Hall*

14:20 **T11** Reference standards for carbon dioxide and other high impact greenhouse gases, **Paul Brewer*

- 14:40 **Recommendations on Chapters 1, 2: Calibration of GAW & CO₂ Calibration**
Discussion leader: Brad Hall
- 15:10 BREAK
- 15:30 **Poster Session A**
- 16:30 **Recommendations on Chapters 6, 7, 8: Calibration of CH₄, N₂O, SF₆**
Discussion leader: Andrew Crotwell
- 17:00 ADJOURN

Tuesday, September 15, 2015

GHG Standards & Comparison Activities, continued – Chair: Brad Hall

- 8:30 **T12** Update on the WMO H₂ X2009 scale, **Armin Jordan*
- 8:50 **T13** Tracking drift in WMO primary CO standards, **Andrew Crotwell*
- 9:10 **T14** A new scale for measurements of atmospheric carbon monoxide, **Paul Novelli*

Isotope Measurements – Chair: Brad Hall

- 9:30 Keynote: **T15** Stable isotopes of atmospheric gases measured by the NOAA-CU INSTAAR Cooperative Program, **James White*
- 10:00 COFFEE BREAK

Isotope Measurements, continued – Chair: Heather Graven

- 10:20 **T16** Jena ISO-CCL and the JRAS-06 scale for atmospheric CO₂, **Willi Brand*
- 10:35 **T17** IAEA stable isotope reference materials: addressing the needs of the atmospheric monitoring, **Sergey Assonov*
- 10:50 **T18** Compatibility of low level counting (LLC) and accelerator mass spectrometry (AMS) techniques for atmospheric radiocarbon measurements: a status report of the buildup of the ICOS Central Radiocarbon Laboratory (CRL), **Samuel Hammer*
- 11:10 **T19** A proposal for a suite of isotope reference gases for CH₄ in synthetic air, **Peter Sperlich*
- 11:30 **Recommendations on Chapters 3, 4: Stable isotopes and radiocarbon**
Discussion Leader: Willi Brand
- 12:00 LUNCH BREAK (including vendor presentations)

GHG Standards & Comparison Activities, continued – Chair: Armin Jordan

- 13:20 **T20** Traceability of measurements within the Global Atmosphere Watch programme: results from the World Calibration Centre WCC-EMPA, **Christoph Zellweger*
- 13:40 **T21** An update of comparisons of non-CO₂ trace gas measurements between AGAGE and NOAA at common sites, **Paul Krummel*
- 13:50 **T22** Compatibility of atmospheric greenhouse gas measurements in Europe as assessed by the 'Cucumbers' Intercomparison Programme, **Andrew Manning*

Measurement Techniques & Calibration – Chair: Tim Lueker

- 14:00 **T23** Regular airborne GHG observations within IAGOS: QA/QC approach, **Christoph Gerbig*
- 14:20 **T24** PERSEUS: a sample pre-concentration and GC/MS detector system for analysis of flask air samples for atmospheric trace halocarbons, hydrocarbons and sulfur-containing compounds, **Benjamin Miller*
- 14:40 EXCURSIONS
- 17:30 BREAK
- 18:30 BANQUET AT BIRCH AQUARIUM
- 22:00 ADJOURN

Wednesday, September 16, 2015

Ocean Measurements – Chair: Ralph Keeling

- 8:30 **T25** An overview of the Scripps program to produce and distribute reference materials for oceanic CO₂ measurements, **Andrew Dickson*
- 8:50 **T26** Recommendations for ocean and atmospheric measurements of CO₂ on ships of opportunity, **Colm Sweeney*

Site and Network Updates – Chair: Ralph Keeling

- 9:10 **T27** UK DECC & GAUGE tall tower networks and integration with other greenhouse gas data streams, **Ann Stavert*
- 9:30 Speed talks
- 9:50 COFFEE BREAK

Site and Network Updates – Chair: Martina Schmidt

- 10:20 Speed talks
- 10:40 **Poster Session B**
- 11:40 **Recommendations on Chapter 13, Cooperative WMO/GAW network**
- 12:10 LUNCH BREAK (including vendor presentations)

Measurement Techniques & Calibration, continued – Chair : Andrew Manning

- 13:30 **T28** Trends of methane emissions in southern Germany derived from 24 years of atmospheric methane and radon measurements at Schauinsland station, **Martina Schmidt*
- 13:50 **T29** High-precision in situ atmospheric measurements of COS, CO₂, CO and H₂O at the Lutjewad tower in the Netherlands, **Huilin Chen*
- 14:10 **T30** A system for continuous measurements of atmospheric O₂/N₂ and Ar/N₂ ratio, stable isotopic ratios of N₂, O₂ and Ar and its application in preparing gravimetric standards for atmospheric O₂/N₂ ratio, **Shigeyuki Ishidoya*

14:30 **T31** Interferometric and mass spectrometric measurements of O₂/N₂ ratio at the Scripps Institution of Oceanography, **Ralph Keeling*

14:50 BREAK

15:10 **Side sessions and lab tours**

16:40 **Recommendations on Chapters 9, 10: CO and H₂ calibration**
Discussion Leader: Armin Jordan

17:10 **Additional lab tours**

18:10 Adjourn

Thursday, September 17, 2015

Emergent Techniques – Chair: Pieter Tans

8:30 **T32** Regional and global atmospheric CO₂ measurements using 1.57 micron IM-CW Lidar
**Bing Lin*

8:50 **T33** In situ methane in the third dimension – using drones to 3000m in Ascension Island, to sample tropical air, **Rick Thomas*

9:10 **T34** Long open path Fourier Transform spectroscopy measurements of greenhouse gases in the atmosphere, **David Griffith*

9:30 **T35** Keynote: An update on recent results from OCO-2 and the TCCON network
**Paul Wennberg*

10:00 COFFEE BREAK

Emergent Techniques, continued – Chair: James Butler

10:30 **T36** Trace gas measurements by GC-PDD, **Blagoj Mitrevski*

Integration of Observations, Data Products and Policy – Chair: James Butler

10:50 **T37** Complementary ObsPack data products: a new way to think about cooperative data products, **Ken Masarie*

11:10 **T38** Proposed new interface for metadata input at the WDCGG website, **Mayu Yamamoto*

11:30 **T39** Informing policy with observations and modeling – an opportunity, **James Butler*

11:50 LUNCH BREAK (including vendors presentations)

13:10 **Recommendations on Chapter 12. Data management and archiving**
Discussion Leaders: Ken Masarie, Hiroshi Koide

Isotope Measurements, continued – Chair: Willi Brand

13:40 **T40** A 21st century shift from fossil-fuel to biogenic methane emissions indicated by ¹³CH₄,
**Sara Mikaloff Fletcher*

- 14:00 **T41** 60 years of southern hemisphere $^{14}\text{CO}_2$ observed at Wellington, New Zealand
** Jocelyn Turnbull*
- 14:20 **T42** Measurements of the stable isotopes ^{13}C and ^{18}O in atmospheric CO at IMAU, Utrecht university (NL), **Maria Elena Popa*
- 14:40 BREAK
- 15:10 **Expert group recommendations**
- 17:00 FINAL ADJOURNMENT

WMO Expert Group Recommendations:

Chairs : Pieter Tans and Christoph Zellweger

Chapter title (2014 WMO report)	Revision leads	Discussion leads
1. Calibration of GAW measurements - WMO central calibration laboratories	Pieter Tans, Ed Dlugokencky	Brad Hall
2. Specific requirements for CO ₂ calibration	Pieter Tans, Brad Hall	
3. Specific requirements for stable isotope calibration	Willi Brand, Hitoshi Mukai	Willi Brand
4. Specific requirements for radiocarbon in trace gases calibration	Jocelyn Turnbull	
5. Specific requirements for O ₂ /N ₂ calibration	Ralph Keeling, Britton Stephens	not plenary
6. Specific requirements for CH ₄ calibration	Ed Dlugokencky	Andy Crotwell
7. Specific requirements for N ₂ O calibration	Brad Hall	
8. Specific requirements for SF ₆ calibration	Ed Dlugokency, Brad Hall	
9. Specific requirements for CO calibration	Paul Novelli	Armin Jordan
10. Specific requirements for H ₂ calibration	Armin Jordan	
11. Recommendations for ground based remote sensing techniques	David Griffith	not plenary
12. Recommendations for data management and archiving	Ken Masarie Hiroshi Koide	Ken Masarie, Hiroshi Koide
13. Recommendations for the cooperative GAW network	WMO Secretariat	James Butler

Poster Session A

- A1** GAS ADSORPTION AND DESORPTION EFFECTS ON CYLINDERS AND THEIR IMPORTANCE FOR LONG-TERM GAS RECORDS, ***M. Leuenbeger**
- A2** LONG-TERM CO AND OZONE MEASUREMENTS ON A GLOBAL SCALE FROM IAGOS IN-SERVICE AIRCRAFT, ***R. Blot**
- A3** ESTIMATION IN CO₂ FLUX IN FOREST OF REGIONAL SCALE BY OBSERVATION OF ATMOSPHERIC CO₂ CONCENTRATION BY TOP-DOWN METHODS, ***S. Nomura**
- A4** Withdrawn
- A5** INFERRING 222RADON SOIL FLUX FROM AMBIENT 222RADON ACTIVITY AND EDDY COVARIANCE MEASUREMENTS, ***S. van der Laan**
- A6** ICOS ATC METROLOGY LAB: METROLOGICAL PERFORMANCE ASSESSMENT OF GHG ANALYZERS ***O. Laurent**
- A7** NETWORK OF CARBON DIOXIDE MEASUREMENTS IN THE SOUTHEAST UNITED STATES – RESULTS FROM THE GULF COAST INTENSIVE, ***S. Richardson**
- A8** EVALUATION AND QUALITY ASSESSMENT OF 8 YEARS (2006-2013) OF N₂O AND SF₆ OBSERVATIONS AT LUTJEWAD MONITORING STATION, THE NETHERLANDS, ***B. Scheeren**
- A9** ISOTOPE RATIO INFRARED SPECTROMETER TO CONTINUOUSLY MONITOR CARBON AND OXYGEN ISOTOPOLOGUES OF CO₂, ***H. Jost**
- A10** CHARACTERIZATION OF CONTINUOUS OCS, CO, AND CO₂ MEASUREMENTS AT A TOWER SITE IN LIVERMORE, CA USA, ***B. LaFranchi**
- A11** AMAZON BASIN: AN IMPORTANT SOURCE OF METHANE?, ***L. Basso**
- A12** STUDY OF SF₆ CONCENTRATIONS IN AMAZON BASIN AND BRAZILIAN COAST, ***L. Gatti**
- A13** FOUR YEARS CARBON MONOXIDE VERTICAL PROFILES STUDY AT THE AMAZON BASIN ***L. Domingues**
- A14** CO MEASUREMENT ISSUES ENCOUNTERED BY MPI-BGC GASLAB, ***A. Jordan**
- A15** A STUDY OF EXTERNAL FACTORS PROMOTING VARIABILITY IN μECD RESPONSE, ***L. Gatti**
- A16** A SENSITIVITY STUDY ON THE ESTIMATION OF CONTINUOUS ANTHROPOGENIC CO₂ USING CO₂, CO, δ ¹³C-CO₂, O₂/N₂ AND Δ¹⁴C-CO₂, ***S. Varda**
- A17** AIRCORE OBSERVATIONS OF CO₂/CH₄/CO OVER THE SODANKYLÄ TCCON SITE, ***H. Chen**
- A18** COMPARISON OF CARBON DIOXIDE MIXING RATIOS FROM IN-SITU MEASUREMENTS BY NDIR AND CRDS ANALYZERS AND BOTTLE SAMPLING MEASUREMENTS AT HATERUMA ISLAND ***K. Katsumata**
- A19** NOAA/GMD STANDARDS PREPARATION AND CO₂ CALIBRATION TRANSFER, ***D. Kitzis**
- A20** "RESULTS OF FLASK AIR SAMPLING INTERCOMPARISON PROGRAMS AT THE ALERT, NUNAVUT GHG COMPARISON SITE", ***Ernst**

- A21** A EUROPEAN-WIDE INTERCOMPARISON OF ATMOSPHERIC ²²²RADON AND ²²²RADON ROGENY MEASUREMENTS, **I. Levin*
- A22** COMPARISONS OF CO₂ AND OTHER GREENHOUSE GASES SAMPLED BY THREE DIFFERENT METHODS IN THE CONTRAIL PROJECT, **Y. Sawa*
- A23** INTER-COMPARISON EXPERIMENTS OF STANDARD GASES FOR JMA/WCC ACTIVITY
**T. Kawasaki*
- A24** RECENT ACTIVITIES OF WMO GAW WORLD CALIBRATION CENTRE-SF₆, **H. Lee*
- A25** ASSESSING THE IMPACT OF C₂H₆ ON ATMOSPHERIC δ¹³CH₄ MEASUREMENTS AT INDUSTRIAL SITES WHEN USING A CAVITY RING DOWN SPECTROMETER, **S. Assan*
- A26** FOSSIL FUEL AND BIOGENIC PARTITIONING IN CO₂ EMISSIONS FROM EAST ASIA DETERMINED BY HIGH-FREQUENCY RADIOCARBON MEASUREMENTS AT HATERUMA ISLAND, **Y. Terao*
- A27** TESTING THE DELTA RAY INSTRUMENT TO MEASURE ISOTOPE RATIOS OF CARBON DIOXIDE IN AIR UNDER LABORATORY CONDITIONS AND AT BARING HEAD, NEW ZEALAND, **Sperlich*
- A28** CHARACTERIZATION OF THE RESPONSE OF CAVITY RING-DOWN SPECTROMETER METHANE STABLE ISOTOPIC RATIOS TO CHANGES IN METHANE CONCENTRATION, **D. Martins*
- A29** INSTALLATION AND CURRENT STATUS OF CAMS SYSTEM AT NIES, **Y. Osonoi*
- A30** STABLE ISOTOPE MEASUREMENTS ON AIR SAMPLES FOR THE ICOS NETWORK, **M. Erritt*
- A31** RADIO-METHANE PROCESSING AND MEASUREMENT AT CU-INSTAAR, **S. Lehman*
- A32** RISING GLOBAL METHANE – USING δ¹⁴C IN CH₄ TO DECIPHER THE CAUSES, **E. Nisbet*
- A33** ONLINE MEASUREMENTS OF GREENHOUSE GASES AND CARBON ISOTOPES IN A CO₂ EXTRACTION SYSTEM USING A CAVITY RING-DOWN SPECTROMETER, *F. Vogel*

Poster Session B

- B1** AN ASSESSMENT OF AIR POLLUTION LEVELS IN ATHI RIVER TOWNSHIP AND OLKARIA ECOSYSTEMS, KENYA, ***Z. Shilenje**
- B2** GGMT-2015 IZAÑA STATION UPDATE: INSTRUMENTAL AND PROCESSING SOFTWARE DEVELOPMENTS, SCALE UPDATES, AIRCRAFT CAMPAIGN, AND PLUMBING DESIGN FOR CRDS ***A. Gomez-Pelaez**
- B3** GREENHOUSE GASES MONITORING AT CHACALTAYA GAW STATION, BOLIVIA, ***M. Ramonet**
- B4** THE DETERMINATION OF REGIONAL CO₂ MOLE FRACTIONS AT THREE WMO/GAW REGIONAL STATIONS IN CHINA, ***S. Fang**
- B5** "GREENHOUSE GAS OBSERVATION NETWORK OF JAPAN METEOROLOGICAL AGENCY IN THE WESTERN NORTH PACIFIC", ***K. Dehara**
- B6** MOBILE LABORATORY AS A PART OF INTERNAL QUALITY CONTROL OF ICOS ATMOSPHERIC STATION NETWORK, ***K. Saarnio**
- B7** QUANTIFYING THE NET EXCHANGE ECOSYSTEM FOR DIFFERENT LAND USE IN PAMPA BIOME IN SOUTHERN BRAZIL, ***D. Roberti**
- B8** NEW CRDS OBSERVATIONS (CO, CH₄, CO₂) AT THREE PERMANENT OBSERVATORIES IN THE SOUTH OF ITALY IN THE FRAMEWORK OF THE I-AMICA PROJECT, ***R. Duchi**
- B9** NATIONAL GREENHOUSE GASES MONITORING NETWORKS IN INDIA, ***SD. Attri**
- B10** IMPLEMENTATION OF LONG-TERM GREENHOUSE GAS OBSERVATION CAPACITIES IN CHILE AND VIETNAM, ***M. Steinbacher**
- B11** THREE YEARS OF CONTINUOUS VERTICALLY RESOLVED CO₂/CH₄/CO MEASUREMENTS AT THE AMAZON TALL TOWER OBSERVATORY SITE (ATTO, BRAZIL), ***J. Lavric**
- B12** OBSERVATION NETWORK FOR GREENHOUSE GASES AND RELATED SPECIES IN THE NEW ZEALAND REGION, ***G. Brailsford**
- B13** ICOS ATMOSPHERE THEMATIC CENTER, ***L. Hazan**
- B14** INITIAL OPERATION OF THE FLASK AND CALIBRATION LABORATORY FOR ICOS (INTEGRATED CARBON OBSERVATION SYSTEM), ***D. Rzesanke**
- B15** "MONITORING OF ATMOSPHERIC CARBON DIOXIDE AND OTHER GHG'S IN INDIA: IMPLICATIONS FOR CONSTRAINING INDIAN EMISSIONS", ***Y. Tiwari**
- B16** CONTINUOUS MEASUREMENTS OF CO₂ AND CH₄ DURING 2011-2014 AT PONDICHERRY, INDIA ***I. Nuggehalli**
- B17** LONG-TERM MEASUREMENTS OF ATMOSPHERIC TRACE GASES (CO₂, CH₄, N₂O, SF₆, CO, H₂), O₂, AND δ¹³CH₄ ISOTOPES AT WEYBOURNE ATMOSPHERIC OBSERVATORY, UK: PAST, PRESENT AND FUTURE, ***G. Forster**
- B18** AMAZON AND COAST BRAZILIAN GREENHOUSE GAS MEASUREMENT PROGRAM AND THE EFFORTS IN CONSTRUCT THE GHG NETWORK, ***L. Gatti**

- B19** "THE CARBON RELATED ATMOSPHERIC MEASUREMENT (CRAM) LABORATORY: A UNITED KINGDOM NATIONAL REPORT", **A. Manning*
- B20** EIGHT YEARS OF IN SITU MEASUREMENTS OF CH₄, N₂O AND CO MADE WITH A PROTOTYPE FOURIER TRANSFORM TRACE GAS ANALYSER AT LAUDER, NEW ZEALAND, **G. Brailsford*
- B21** GROUND AND AIRBORNE BASED OBSERVATIONS OF GREENHOUSE GASES MIXING RATIOS AT US-DOE ATMOSPHERIC RADIATION MEASUREMENT FACILITIES, **S. Biraud*
- B22** THE FRENCH METROPOLITAN GREENHOUSE GASES MONITORING NETWORK: SNO-ICOS FRANCE, **M. Delmotte*
- B23** DEVELOPMENTS IN THE CSIRO AUSTRALIAN GREENHOUSE GAS OBSERVATION NETWORK **M. van der Schoot*
- B24** 5 YEARS OF BRAZILIAN GREENHOUSE GASES BACKGROUND CONCENTRATIONS, **VF Borges*
- B25** IMPROVEMENTS OF THE SPECTRONUS FTIR INSTRUMENT FOR APPLICATION IN STATIC MODE AT TALL TOWERS, **A. Vermeulen*
- B26** IMPROVEMENTS TO PICARRO'S G2401 AND G2301 – ICOS-COMPLIANT REPRODUCIBILITY, AND IMPROVED DRIFT SPECIFICATIONS IN RESPONSE TO RESULTS FROM ICOS INSTRUMENT COMPARISON, **G. Leggett*
- B27** JAPAN METEOROLOGICAL AGENCY'S SHIP-BASED OBSERVATION FOR THE PARTIAL PRESSURE OF CARBON DIOXIDE IN THE WESTERN NORTH PACIFIC, **H. Ono*
- B28** THE IN-SITU MEASUREMENT OF GREENHOUSE GASES (CO₂, CH₄, N₂O & CO) DISSOLVED IN INLAND WATERS AND THEIR WATER-ATMOSPHERE EXCHANGE, **D. Griffith*
- B29** CONTINUOUS MEASUREMENTS OF XCO₂ AND XCH₄ IN THE SEAWATER AND OVERLYING AIR IN THE WESTERN ARCTIC OCEAN, **D. Sasano*
- B30** "IMPROVEMENTS IN SHORT-TERM ATMOSPHERIC OXYGEN MEASUREMENT PRECISION BY FASTER SAMPLE-REFERENCE SWITCHING", **P. Pickers*
- B31** PRELIMINARY RESULTS ON O₂/N₂ SCALE COMPARISON BETWEEN SIO AND NIES BASED ON FLASK SAMPLING AT LA JOLLA, **Y. Tohjima*
- B32** OBSERVATIONS OF AN INTERHEMISPHERIC GRADIENT, AND STRATOSPHERIC DEPLETION IN THE ATMOSPHERIC AR/N₂ RATIO DURING THE HIPPO GLOBAL CAMPAIGN, **J. Bent*
- B33** PROGRESS IN DATA MANAGEMENT AND INFORMATION PROVISION OF WDCGG, **H. Koide*
- B34** ESTIMATING CO₂ SINKS AND SOURCES IN NEW ZEALAND FROM ATMOSPHERIC MEASUREMENTS AND LAGRANGIAN MODELLING, **S. Mikaloff Fletcher*
- B35** REVISIT THE GLOBAL AVERAGE OF GHGS ABUNDANCES BY THE WDCGG METHOD, **H. Tatsumi*
- B36** THE TRICKS OF THE CLIMATE POLITICIANS, **J. Butler*
- B37** PROCESSING OF CO₂, CH₄ AND CO MOLE FRACTIONS AT THE ICOS ATMOSPHERIC THEMATIC CENTER, **L. Hazan*

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