15th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases and Related Tracer Measurement Techniques (September 07–10, 2009, Jena, Germany)

Monday, September 07

8:00–9:00 Registration

9:00–9:10 Organizers Information on general aspects of the meeting

General presentations

9:10–9:20 **Martin Heimann,** Welcome to MPI-BGC Jena

9:20–9:40 Leonard Barrie, **Oksana Tarasova**, An Integrated Global Greenhouse Gas Observations and Analysis System: WMO-GAW

Greenhouse gases observations I: measurement networks (Chair: Martina Schmidt)

9:40–10:00 **Jim Butler**, Observation System Requirements to Support Greenhouse Gas Management Strategies

10:00–10:20 **Justus Notholt**, Thorsten Warneke, Paul Wennberg, Janina Messerschmidt, The TCCON network for the calibration of greenhouse gas column data and satellite validation

10:20-10:50 Coffee Break

10:50–11:10 **Marcel van der Schoot**, L. P. Steele, D. A. Spencer, P. B. Krummel, R. J. Francey, M. Schmidt, M. Ramonet, B. Wastine, Australian regional high precision GHG observation network : Southern Ocean network (CO_2 sink) and Australian tropical atmospheric research station.

11:10–11:30 **Alex Vermeulen**, P. Bergamaschi, M. Ramonet, M. Schmidt, E. Popa, B. Verheggen, R. Thompson, M. Heimann, S. van der Laan, R.E.M. Neubert, J. Moncrieff, L. Haszpra, Verifying the Emissions of non-CO_2 GHG of NW Europe Using the European Network of Tall Towers

11:30–11:50 **Ingeborg Levin** et al., The planned European ICOS network including Central Analytical Laboratory

11:50–12:15 **Discussion on ICOS and other regional network calibration strategies (Chair: D. Worthy / J. Butler)**

12:15–13:30 Lunch

Calibration / propagation of scales for CO_2 in air (Chair: Jim White)

13:30–13:50 **Pieter P. Tans**, Do we need the WMO Mole Fraction Scale for CO_2 and other gases?

13:50–14:05 **Kazuto Suda**, Hidekazu Matsueda, Kazuhiro Tsuboi and Shinya Takatsuji, Recent history of CO_2 standard gases in JMA

14:05–14:20 **T. Machida**, Y. Tohjima, K. Katsumata and H. Mukai, A new CO_2 calibration scale based on gravimetric one-step dilution cylinders in National Institute for Environmental Studies; NIES 09 CO_2 Scale

14:20–14:35 **Zoe M. Loh**, L. P. Steele, P. B. Krummel, M van der Schoot, D. M. Etheridge, D. A. Spencer, Linking Isotopologue Measurements to Existing Mole Fraction Scales

14:35–14:50 **Jörg Klausen,** Christoph Zellweger, Brigitte Buchmann, World Calibration Centre for Carbon Dioxide: Supporting the Quality of the Global Observation System

14:50–15:15 Coffee Break

15:15–16:00 **General discussion on CO_2 calibration (Chair: P. Tans/ T. Laurila)**

Calibration / propagation of scales for CH_4, CO, SF_6, N_2O, and H_2 in air (Chair: Ralph Keeling)

16:00–16:15 **Brad Hall,** Geoff Dutton, Ed Dlugokencky, Nitrous Oxide: Are We Making Progress?

16:15–16:30 **Nobuyuki Aoki**, Kenji Kato, Takuya Shimosaka, Nobuhiro Matsumoto, Keiichi Katsumata, Toshinobu Machida, Preparation of nitrous oxide (N_2O) in air standard being traceable to SI by gravimetric method

16:30–16:45 **H.E. Scheel**, Report of the WCC-N_2O

16:45–17:00 **Armin Jordan**, Bert Steinberg, Is it time for a WMO Hydrogen calibration scale?

17:00–17:15 **Kazuto Suda**, Atsuya Kinoshita, Yukio Kurihara and Rie Nakamura, Quality assurance and quality control of WDCGG data

17:15–18:00 **General discussion on GHG calibration and quality assurance (Chair: T. Machida / C. Zellweger)**

Tuesday, September 08

Intercomparison activities (Chair: H. Mukai)

8:30 –8:50 **Paul Krummel**, S.A. Montzka, C. Harth, B.R. Miller, J. Mühle, E.J. Dlugokencky, P.K. Salameh, B.D. Hall, S. O'Doherty, L.P. Steele, G.S. Dutton, D. Young, J.D. Nance, J.W. Elkins, L. Miller, P.J. Fraser, N. Derek, R.F. Weiss, P.G. Simmonds, and R.G. Prinn, Overview of comparisons of non-CO_2 trace gas measurements between AGAGE and NOAA at common sites

8:50–9:10 **Ken Masarie**, D. Chao and P. Tans, New Capabilities For Interpreting Comparison Data

9:10–9:30 **Lingxi Zhou**, D.R.Kitzis, P.P.Tans, K.Masarie, D.Chao, WMO Round-Robin Intercomparison: Progress and a New Website

9:30–9:50 **Andrew C. Manning**, What have we learnt from global intercomparison programmes and what should we do next?

9:50–10:20 Coffee Break

10:20–10:40 **Armin Jordan**, W.A. Brand, B. Steinberg, M. Rothe, M. Schmidt, M. Delmotte, M. Ramonet, P. Ciais, I. Levin, C. Facklam, S. Hammer, M. Sabasch, R.E.M. Neubert, H.A.J. Meijer, R. L. Langenfelds, C.E. Allison, L.P. Steele, R.J. Francey, T. Machida, H. Mukai, T. Conway, P. Novelli, B. Hall, B. Vaughn, D. Worthy, M. Ernst, L. Huang, A.C. Manning, A. Etchells, Evaluating CarboEurope / IMECC Quality Control Activities: Do intercomparison results help us to further improve our measurements?

10:40-11:20 Various short contributions (~ 3', max 10') on flask / in situ intercomparison results at individual stations not already presented within national reports

11:20-11:40 **General Discussion on intercomparison programs (Chair: K. Masarie / B. Stephens)**

Isotope calibration and measurements (Chair: Lingxi Zhou)

11:40–12:00 **Jim White**, C. B. Alden, B.H. Vaughn, S.E. Michel, J. Winokur, and V. Claymore: Uses and Limitations for Isotopes of Carbon Dioxide and Methane

12:00–12:20 **Thomas Röckmann**, Robina Shaheen, Christoph Janssen, Isotope exchange between CO_2 and O_3 in the stratosphere: atmospheric and laboratory measurements

12:20–13:30 Lunch

13:30–13:50 **S.S. Assonov**, **C.A.M. Brenninkmeijer**, T. Schuck , A. Zahn, P.Taylor, High precision CO_2 isotope analyses of air samples from the free tropical troposphere and upper troposphere-lowermost stratosphere region: The CARIBIC project

13:50–14:10 **Lin Huang**, A. Chivulescu, C. Allison, G. Brailsford, W. A. Brand, M. Wendeberg, A. Bollenbacher, R. Keeling, I. Levin, M. Sabasch, M. Leuenberger, H, Mukai, T. Nakazawa, S. Aoki, R. Neubert, A. Aerts-Bijma, M. Verkouteren, J. White, B. Vaughn, S. Michel, L. Zhou, L.X. Liu, A Report of $\delta^{13}C$ & $\delta^{18}O$ Measurements in NBS19 and NBS18 pure CO_2: Traceability Uncertainty in CO_2 Isotope Measurements

14:10–14:30 **Jan Kaiser**, How accurate do we know $^{13}C/^{12}C$, $^{18}C/^{16}O$ and $^{17}O/^{16}O$ ratios in CO_2 and their corresponding delta values?

14:30–14:50 **Magnus Wendeberg**, J. M. Richter, M. Rothe, W.A. Brand, JRAS Isotope reference: A generalized VPDB scale anchor for CO_2 in air?

14:50-15:20 Coffee Break

15:20–15:40 **Bruce Vaughn**, J.W.C. White, S.E. Michel, J. Winokur and V. Claymore: Calibrations, Corrections, and Challenges for isotopes of Methane and Carbon Dioxide

15:40–16:00 **Colin Allison**, Jim White, Merging atmospheric $\delta^{13}C$ data sets

16:00–16:30 **General discussion on isotope calibration and measurements (Chair: R. Francey / M. Wendeberg**)

16:30-18:00 Poster Session I

17:00 Departure for MPI-BGC for Lab Tours (Bus lines #10, #13, #40)

17:30–18:30 Lab Tours MPI-BGC: (IsoLab, GasLab, ^{14}C Accelerator)

Important notes:
1. There will be an opportunity to visit the BGC Labs on Friday with more time to spend. The tour today is for those who want to leave earlier.
2. Tours will be restricted to groups of 10, hence more than 30 people today will be difficult.

19:30 **Conference Dinner** at the down-town Tower Restaurant '**Scala**' (http://www.scala-jena.de/)

Wednesday, September 09

Measurement techniques and comparison (Chair: Doug Worthy)

8:30–8:50 **David Griffith**, Nicholas Deutscher, Paul Fraser, Paul Krummel, FTIR analyzer for simultaneous high precision measurements of CO_2, δ13-CO_2, CH_4, CO and N_2O: intercomparison measurements at Cape Grim

8:50–9:10 **Doug Baer**, Manish Gupta, Tom Owano, Robert Provencal, Ian McAlexander, Feng Dong, Novel Instrumentation for Real-time Measurements of N_2O, CO, CO_2 and CH_4

9:10 –9:30 **Scott Richardson**, Natasha Miles, Kenneth Davis, Eric Crosson, Field testing of cavity ring-down spectroscopy instruments measuring CO_2

9:30–9:50 **Aaron Van Pelt**, Eric Crosson, Natasha Miles, Scott Richardson, Ken Davis, Christoph Thomas, Beverly Law, Recent developments in instrumentation for greenhouse gases and related tracer measurements

9:50–10:10 **Benoit Wastine**, D. Lowry, J. Lavric, M. Ramonet, M. Schmidt, C. Kaiser, C. Vuillemin, S. Sriskantharajah, R. Fisher, M. Lanoiselle, and E.G. Nisbet, Evaluation of the use of EnviroSense 3000i analysers (now called G1301) for continuous CO2/CH4 measurement in ambient air by CRDS

10:10–10:40 **Open discussion on measurement techniques (Chair M. Ramonet / G. Brailsford)**

10:40–11:00 Coffee Break

11:00-12:30 **Side Event:** TTorch (ESF RNP) Steering Committee meeting (please contact Alex Vermeulen)

11:00-12:30 Poster Session II

12:30–13:50 Lunch

Measurements and techniques for O2/N2 and Ar/N2 (Chair: A. Manning)

13:50 –14:10 **Roberta C. Hamme**, Tegan Blaine, Ralph F. Keeling, William Paplawsky, and Lauren Rafelski, Refinement Of Atmospheric Ar/N_2 Techniques: Implications For O_2/N_2 Measurement

14:10–14:30 **Markus Leuenberger**, Chiara Uglietti and Peter Nyfeler, Tracing local natural gas oxidation by means of oxygen to carbon dioxide ratio measurements

14:30–14:50 **Ingrid T. Luijkx**, R.E.M. Neubert, S. van der Laan, and H.A.J. Meijer, Continuous measurements of atmospheric oxygen and carbon dioxide on a North Sea gas platform

14:50–15:20 **Open discussion on O2/N2 (Chair R. Keeling / M. Leuenberger)**

15:20–15:50 Coffee

Related Tracer Observations and Analysis (Chair: Paul Krummel)

15:50-16:10 Jocelyn Turnbull, **Scott Lehman**, Pieter Tans, John Miller, John Southon, $^{14}CO_2$ Measurements in the NOAA/ESRL Co-operative Air Sampling Network: An update on measurements and data quality

16:10–16:30 **R. E. Fisher**, S. Sriskantharajah, M. Lanoisellé, D. Lowry, C.M.R. Fowler, and E.G. Nisbet, Development and use of CF-GC-IRMS and small airbag sample techniques to investigate Arctic methane sources 2008-9: wetland, clathrates and gas leaks - the isotopic picture

16:30–16:50 **Celia Sapart,** T. Roeckmann, R. v.d. Wal, T. Blunier, T. Sowers, I. Vigano, C. v.d. Veen, P. Martinerie, J. Chappellaz, J. Kaiser, H. Fischer, and M. Bock, Methane and Nitrous Oxide Isotope Ratios measurements on NEEM firn air

16:50–17:10 **Camille Yver**, Martina Schmidt, Michel Ramonet, Mathilde Grand, Tropospheric hydrogen measurement in the RAMCES network

17:10–17:30 **Ingeborg Levin**, Tobias Naegler, Renate Heinz, Daniel Osusko, Emilio Cuevas, Andreas Engel, Johann Ilmberger, Ray L.Langenfelds, Bruno Neininger, Christoph v. Rohden, L. Paul Steele, Rolf Weller, Douglas E. Worthy, Sergej A. Zimov, Atmospheric observation-based global SF_6 emissions – comparison of top-down and bottom-up estimates

17:30-19:30 **Side Event:** ICOS Atmospheric stations instrumentation. For participation please contact Leo Rivier.

Thursday, September 10

Greenhouse gases observations II: Vertical distribution (L. Haszpra)

8:30–8:45 Colm Sweeney, Anna Karion, **Pieter Tans**, Validation of high altitude measurements of CO_2 and CH_4 using the AirCore

8:45–9:00 **Charles Miller**, Challenges for Validating Space-based XCO_2 Data

9:00–9:15 **Gordon Brailsford,** V Sherlock, A Gomez, K Riedel, D Smale, M Kotkamp, J Robinson, B Connor, B Stephens, S Mikaloff-Fletcher, In situ and ground-based remote sensing measurements of atmospheric CO_2 in New Zealand

9:15–9:30 **Open discussion on gaps and future needs in integrated observation systems (Chair: C. Gerbig / A. Vermeulen)**

Greenhouse gases observations III: national and site reports (Chair: H.E. Scheel)

9:30–9:45 **Luciana V. Gatti,** Monica T. S. D´Amelio, John B. Miller, Andrew Crotwell, Luana S. Basso, Alexandre Martinewski, Ed Dlugokencky, Pieter Tans, GHG Inter-comparison NOAA/IPEN and Efforts in to start a GHG Network in Brazil

9:45–10:00 **Jooil Kim**, Bayarmaa Lkhagvadorj, Kyung-Ryul Kim, Understanding Northeast Asian CO_2 emissions from continuous monitoring at Gosan station

10:00-10:15 **E-G. Brunke**, C. Labuschagne, B. Parker and H-E. Scheel, Recent results from measurements of CO_2, CH_4, CO and N_2O at the GAW station Cape Point

10:15–10:30 **Jan Winderlich**, Huilin Chen, Annette Höfer, Christoph Gerbig, Martin Heimann, Continuous CO_2/CH_4 measurement at Zotino Tall Tower Observatory (ZOTTO) in Central Siberia

10:30-11:00 Coffee Break

11:00–11:15 **Michela Maione**, Umberto Giostra, Francesco Furlani, Jgor Arduini, Francesco Graziosi, Paolo Bonasoni, Paolo Cristofanelli, Rocco Duchi, Angela Marinoni, Long term observations of climate altering gases at the "O. Vittori" observatory at Monte Cimone (Italy)

11:15–11:30 **Alex Vermeulen**, Elena Popa, Pim van den Bulk, Piet Jongejan, Cabauw station report

11:30–11:45 **Martina Schmidt**, Greenhouse gas measurements at Trainou Tower (France)

11:45–12:00 **Lingxi Zhou**, Lixin LIU, Shuangxi FANG, Fang ZHANG, Bo YAO, Min WEN, Lin XU, Shuai GU, Kunpeng ZANG, Lingjun XIA, Xiaochun ZHANG, Yupu WEN, Xiuji ZHOU, Network Observation of Greenhouse Gases and Related Tracers in China

12:00–12:15 **N.K. Indira**, Efforts in measuring greenhouse gases by setting up stations in India

12:15–13:30 Lunch

13:30–16:00 **Plenary discussion and approval of the draft recommendations**

(Chair: I. Levin)

14:30 - 15:00 Coffee Break

16:00 End of the meeting

POSTERS

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Ed Dlugokencky and GHG SAG Members, Current Activities of the GHG SAG

P2
Christoph Zellweger, Jörg Klausen, Brigitte Buchmann, Summing Up 13 Years of Intercomparison Activities of the World Calibration Centre at Empa (WCC-Empa): Methane, Carbon Monoxide and Ozone

P3
Lee, Jeongsoon, Jin Bok Lee, Dong Min Moon, GawngSub Kim, TaeYoung Goo, Goan-Young Park, and Jin Seog Kim, Preparation Of Standard Gas Mixtures For Measurement Of Ambient Level Of Greenhouse Gases

P4
P.C. Novelli, A.M. Crotwell, B.D. Hall, K.A. Masarie, P.M. Lang, Review of NOAA/GMD CO measurements: methods and reference gases

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Keiichi Katsumata, Toshinobu Machida, Hiroshi Tanimoto, Hideki Nara, Hitoshi Mukai, Re-evaluation of NIES CO Scale using High Concentration Gravimetric CO Standard Gases

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Brad Hall, Brad Hall, David Nance, Geoff Dutton, Debbie Mondeel, Ed Dlugokencky, Gabrielle Petron, James Butler, James Elkins, NOAA SF_6 Measurements from 1986-2009

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Magnus Wendeberg, W.A. Brand, High precision isotopic analysis of CO_2 in air using a non-cryogenic GC-IRMS approach

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Hitoshi Mukai, K. Tohmine, and Y. Kajita, Reevaluation of isotopic scale for CO_2 in NIES and its relation with inter-comparison works

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R.A. Werner, Matthias J. Zeeman, Werner Eugster, Rolf T.W. Siegwolf, Joachim Mohn, Nina Buchmann, Measurement of d13C of Atmospheric CO2 on a Routine Basis

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Jan Kaiser, Thomas Röckmann, Isobaric correction of mass-spectrometric isotope ratio measurements of O_2, CO, CO_2 and N_2O

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S.S. Assonov, C.A.M. Brenninkmeijer, P. Taylor, Use of CO_2 dynamic mixing for mass-spectrometric isotope analyses of air CO_2

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Xiaomei Xu and Susan E. Trumbore, $\Delta^{14}C$ of Atmospheric CO_2 at Point Barrow, Alaska

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Ivo Svetlik, Activity concentration of $^{14}CO_2$ as a tool to estimate ^{14}C quantity in the troposphere

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Felix Vogel, Jaroslaus Jeschka, Bernd Kromer, Axel Steinhof, Samuel Hammer and Ingeborg Levin, Evaluation of a new setup for long-term monitoring of fossil fuel CO_2 and other trace gases

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Mihály Molnár, László Haszpra, István Major, János Szádai, Ivo Svetlik, Performance test of a mobile fossil fuel CO_2 monitoring station developed in ATOMKI

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R. A. Werner, B. Tuzson, J. Mohn, L. Emmenegger, M. J. Zeeman, Performance test, calibration and validation of a novel optical analyzer for continuous and high precision CO_2 isotope ratio measurements

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Eric Crosson, Marc Fischer, Colm Sweeney, Aaron Van Pelt, Vertical profiles of greenhouse gas concentrations via airborne measurements

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George Burba, Tyler Anderson, Liukang Xu, and Dayle McDermitt, Fast Portable Open-Path Gas Analyzer for Methane Flux Measurements

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George Burba, Michael Furtaw, and Dayle McDermitt, New Compact Gas Analyzer for Eddy Covariance Measurements of Carbon Dioxide and Water Vapour Fluxes

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D. Lowry, S. Sriskantharajah, R. E. Fisher, M. Lanoisellé, and E.G. Nisbet, Long-term laboratory performance of Picarro instruments prior to S. Atlantic remote deployment

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Huilin Chen, Christoph Gerbig, Jan Winderlich, Annette Hoefer, A high accuracy analyzer for airborne measurements of greenhouse gases (CO_2 and CH_4)

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Julia Steinbach, Christoph Gerbig, Karl Kübler, Reimo Leppert, Frank Voigt, and Bernd Schlöffel, ICON; a new In-situ Capability for O_2/N_2 Measurements from airborne Platforms

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Theo Manuel Jenk, T. Blunier and D. Dahl-Jensen, A new system for isotope measurements of CO2 from ice cores at the Centre for Ice and Climate developed in view of obtaining the first CO2 ice core record from Greenland

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Benoit Wastine, C. Kaiser, C. Vuillemin, Jost V. Lavric, Martina Schmidt, M. Ramonet, F. McGovern, P. O. Brien, S. O'Doherty, Evaluation of the Picarro G1301 analysers for continuous CO_2/CH_4 measurements and deployment at three Irish stations.

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Elena Kozlova, Andrew C. Manning, Methodology and calibration for continuous atmospheric measurements of oxygen and biogeochemical trace gases at field stations

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Atsuko Sunaga, Yukihiro Nojiri, Hitoshi Mukai, Development of CO_2 measurement system in remote areas under harsh observation environment - a case of Mt. Fuji

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Philip A. Wilson, Andrew C. Manning, Andrew J. Macdonald, Alexander Etchells and Elena A. Kozlova, Greenhouse gas measurement capability at the new Carbon Related Atmospheric Measurement (CRAM) Laboratory at the University of East Anglia, United Kingdom

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Britton Stephens, Sean Burns, Andrew Watt, Sherri Heck, David Moore, Ankur Desai, David Bowling, The Rocky Mountain Regional Atmospheric Continuous CO_2 Network

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Alex T. Vermeulen, M.E. Popa, D. Brunner, M. Heimann, G. Hansen, A. Lindroth, J.A. Morgui, P. Seibert, T. Vesala, TTORCH: an ESF Research Networking Program on the (Tall Tower) high precision observations of greenhouse gases in Europe

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Patricia Lang, Molly Heller, Ken Masarie and Dan Chao, A Web-based Application to Manage Carbon Cycle Network Operations

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D. Worthy, M. Ishizawa P. Bergamaschi, J.F. Meirink, M. Krol, D. Chan, and E. Dlugokencky, The Sensitivity of Canada's atmospheric CH4 observational program to detect Canadian wetland sources. Is the network size sufficient?

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Mi-Kyung Park, Alane Bollenbacher, R.F. Keeling, Martin Wahlen, Kyung-Ryul Kim, A Study on the atmospheric CO2 and its carbon isotopes at Gosan, Korea

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Samuel Hammer, Luisa Müller, Frank Meinhardt, Ludwig Ries, Steffen Knabe, Felix Vogel, Hartmut Sartorius and Ingeborg Levin, From background to urban stations: A comparison of H_2 and other trace- and greenhouse gases within central Europe

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M. Elena Popa, A.T. Vermeulen, W.C.M. van den Bulk, P.A.C. Jongejan, T. Röckmann, A. Batenburg, Measurements of H_2 vertical profiles at Cabauw tall tower station, in Netherlands

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Bert Scheeren, Peter Bergamaschi, Niels R. Jensen, Carsten Gruening, Ignacio Goded, and John van Aardenne, First results from the new JRC greenhouse gas monitoring site at Ispra, Italy

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R. Curcoll, J-A. Morguí, I.Pouchet, A. Font and X. Rodó, Four years of atmospheric research at LMU station (Tall Tower, La Muela, Spain