40th Global Monitoring Annual Conference

Boulder, Colorado
May 15-17, 2012

www.esrl.noaa.gov/gmd/annualconference
Purpose of the Conference

Looking forward to the next 55 years of monitoring . . .

• Goals:
  - to advance understanding of the research that drives, and derives from, long-term, global monitoring
  - to share information on the latest observing techniques, approaches, and systems
  - to enhance collaboration among national and international partners

• Side meetings this year
  - Observatory operations (2 meetings)
  - CarbonTracker workshop
  - Training workshop for Aerosol Federated Network
  - Observatory Safety Training
  - AGAGE meeting
Guests from a Distance
Make-up of the 2012 GMAC

<table>
<thead>
<tr>
<th>Attendees</th>
<th>Authors &amp; Co-Authors</th>
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<tbody>
<tr>
<td>• 250+ Attendees</td>
<td>• 108 Presentations</td>
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<tr>
<td>• 52 Foreign national</td>
<td>• 108 Lead authors</td>
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<tr>
<td>• 86 GMD</td>
<td>• 320 “unique” co-authors</td>
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<td>• 116 Other US</td>
<td>• Organizations</td>
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<td>• 18 Countries</td>
<td>• 10 NOAA laboratories</td>
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<td>• 10 International agencies &amp; organizations</td>
<td>• 15 “other” federal agencies/labs</td>
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<tr>
<td>• 5 International universities</td>
<td>• 20 Countries</td>
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<td>• 12 Federal agencies</td>
<td>• Academics</td>
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<tr>
<td>• 12 US universities</td>
<td>• 28 US universities</td>
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<td>• 36 International universities</td>
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On-line Agenda with Links (Presentations, Abstracts Available)
Meeting Organization
(GMD in a Nutshell)

Themes

- Climate Forcing
- Ozone Depletion
- Baseline Air Quality

Research Groups and Networks

- Carbon Cycle & Greenhouse Gases
- Halocarbons and Trace Gases
- Ozone and Water Vapor
- Aerosols
- Surface Radiation

Baseline Observatories

- Summit Greenland
- Barrow, Alaska
- Mauna Loa, Hawaii
- Trinidad Head, California
- American Samoa
- South Pole, Antarctica
GMD Observing Networks

Carbon Cycle

Halocarbons

Ozone & Water Vapor

Aerosols & Radiation

ESRL Global ▲
Surface-based Networks – Carbon Cycle

- ICOS
- NOAA
- TCCON
- WMO Global Atmospheric Watch
- Earth Networks
- FluxNet (not WMO)
- AGAGE
Keynote Presentations

• Dr. Stephen Wofsy
  ➢ Abbott Lawrence Rotch Professor of Atmospheric and Environmental Science at the Harvard School of Engineering and Applied Sciences (SEAS)

• Dr. Ron Prinn
  ➢ TEPCO Professor of Atmospheric Science, Director of Global Change Science, Co-Director of the Joint Program on the Science and Policy of Global Change
Wofsy: Atmospheric Chemical Composition, Climate, and Societal Implications

- Focus on CO$_2$, CH$_4$, N$_2$O
- Analyzed data from four HIPPO missions, the CalNEX studies, and NOAA’s Atmospheric Baseline Observatories
- Demonstrated the need to coordinate land-based and in-situ measurements to get the best results
Wofsy (cont’d): Evaluating Models

- CarbonTracker does pretty well for free troposphere, high altitudes
- Not so well for the sub-tropics
- Differences depend upon season
Prinn: Merging Earth System Measurements, Global Social Data and Earth System Models

- Evaluated need for coordinated observations and modeling
- Introduced the human element
  - Economics
  - Social Systems
- Showed relevance of key scientific questions
  - Where are we going?
  - How does research help us change that?
Tans: Are Oceanic and Terrestrial Sinks of CO₂ not Able to Keep up with Emissions?

• “The reporting of my death was an exaggeration . . . “
  ➢ Mark Twain, May, 1897

• Analyzed the 2 most certain data sets available – global trends and global fossil fuel emissions

• Inclusion of land use emissions does not change conclusions but increases statistical uncertainty

• Large “missing” CO₂ sinks are alive and well.

• Fossil fuel emissions are an ever more dominant factor in the carbon cycle

• Actual uptake by the lands and ocean has doubled over the past 50 years

“You heard it here first . . . .”
Carpenter (York Univ.): Marine Influence on Oxygenated VOCs

- Cape Verde Atmospheric Observatory launched in 2005
- Purpose is to advance understanding of climatically-significant interactions between the atmosphere and ocean
- Cooperative Initiative between German and UK Research Programs
- The ocean strongly modulates acetaldehyde and methanol in the boundary layer

“You heard it here first . . . .”
Fraser (CSIRO, Australia): Australian Trends and “Missing” CCl₄ Sources

• Evaluated trends and variability of atmospheric CCl₄ at Cape Grim, Tasmania
• Sinks identified included contaminated soils, landfills, toxic waste dumps
• Chlorination of swimming pools postulated as a possible significant source
• “You heard it here first . . .?”
1994 postulation that net ocean flux of CH$_3$Br would decrease permanently as anthropogenic, atmospheric emissions decreased

Three mid-90’s cruises repeated in 2010-2011

Results showed that ocean is no longer a net sink of atmospheric CH$_3$Br

Now a small net source

Degradation rate constants remain consistent with earlier work

“You heard it here first . . . .”
What we do now . . .

Januray (net CO₂ emission)

July (net CO₂ uptake)

CarbonTracker™

“Carbon Weather”

Long-term Observations
NOAA Climate Working Group
July 30-31, 2012

ESRL Global Monitoring Conference

Where we need to go

Current Network

"Carbon Weather"

Satellites

TCCON

Earth Networks
Questions?

www.esrl.noaa.gov/gmd/annualconference