WMO/IOC/UNEP/ICSU
GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)

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1st GRUAN Implementation-Coordination Meeting (ICM-1)
Norman, Oklahoma, USA
2-4 March 2009

Item 3

NDACC Working Group structure as a guide for GRUAN implementation?

(Submitted by M. Kurylo)

Summary and Purpose of Document

This talk introduces the Network for the Detection of Atmospheric Composition Change (NDACC) working group structure as a possible model for GRUAN implementation.

Network for the Detection of Atmospheric Composition Change: *Tracking Changes in the Earth's Atmosphere*

Can the NDACC Working Group Structure Serve as a Guide in GRUAN Implementation?

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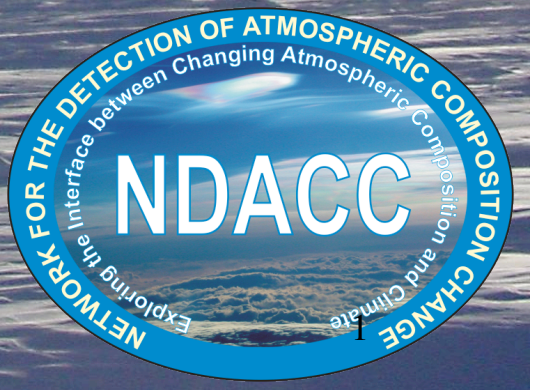
On behalf of the NDACC Science Team and the NDACC Steering Committee

GRUAN ICM-1; Norman, OK

2-4 March 2009



Jonathon Berry

What is the NDACC?

A set of more than 70 high-quality, remote-sensing research stations/sites for

- *observing and understanding the physical / chemical state of the stratosphere and upper troposphere*
- *assessing the impact of stratospheric changes on the underlying troposphere and on global climate*

Goals of the NDACC

1. *To study the temporal and spatial variability of atmospheric composition and structure*

2. *To provide early detection and subsequent long-term monitoring of changes in the chemical and physical state of the stratosphere and upper troposphere, thereby providing the means to discern and understand the causes of such changes*

3. *To establish the links between changes in stratospheric O_3, UV radiation at the ground, tropospheric chemistry, and climate*

Goals of the NDACC

4. *To provide independent validation, calibration, and complementary data for space-based sensors of the atmosphere*

5. *To support process-study field campaigns occurring at various latitudes and seasons*

6. *To provide verified data for testing and improving multidimensional chemistry and transport models of the stratosphere and troposphere*

Quality Control

A Commitment to Data Quality

- *Investigators subscribe to protocols designed to ensure that archived data are of as high a quality as possible within the constraints of measurement technology and retrieval theory.*
- *Validation*
  - *Instruments and data analysis methods are evaluated and continuously monitored.*
  - *Formal intercomparisons are used to evaluate algorithms and instruments.*

Data Archiving and Availability

- *Data are submitted to the Data Host Facility within one year of measurement*
- *Data are publicly available within two years of measurement*
  - *However, many PIs approve immediate availability upon submission to the DHF*
- *Many NDACC data are available on shorter timescale via collaborative arrangement with the appropriate PIs.*

NDACC Operational Structure

✧ *NDACC Steering Committee*

- *Primary managerial body*
  - *Two Co-Chairs*
  - *Science Team Working Group Representatives*
  - *Peer Reviewers and Cooperating Network Representatives*
  - *Ex-Officio Representatives from Sponsoring / Partnering International Agencies / Institutions*

✧ *NDACC Science Team*

- *Forum for Conducting Network Operations*
  - *PIs from All Sites / Stations*
  - *Coordinated through Working Groups (WGs) – Annual Meetings*
    - *Specific Instrument Types*
    - *Measurement Parameter / Species (currently O_3 & H_2O)*
    - *Relevant Activities (Satellites, Theory & Modeling, etc.)*
    - *Ad Hoc (Future Measurement Strategies and Emphases)*

Instrument WG Functions

- ***Measurement Quality Control***
  - *Protocol Development*
    - *Instrument-specific Performance Requirements*
    - *Validation*
    - *Calibration*
  - *Recommendations on Proposed Affiliations*
  - *Instrument / Measurement Intercomparison Campaigns*
  - *Algorithm Intercomparisons*
    - *Decisions on Common Basis Parameters*
- ***Data Reporting and Archiving***
  - *Adherence to Data Protocol*
  - *Archiving Formats*
  - *Consistency in Reporting the Same Quantity*
    - *Important in Utilizing Measurements from Existing Networks*

Parameter / Species WG Functions

- ***Assess Various Measurement Techniques***
  - *Accuracy and Precision*
  - *Operating Procedures for Different Sensor Types*
  - *Future Potential*
  - *Calibration / Validation for Multiple Techniques*
    - *Best Practices for Data Comparison or Satellite Validation*
  - *Retrieval Aspects*
    - *Basis Parameter Issues*
- ***Building a Homogeneous Dataset***
  - *Combining and Merging Different Datasets*
  - *Development of Trends*

Examples from NDACC Ozone and Water Vapor Working Group Meetings

NDACC / GAW / IGACO Ozone Theme Meeting
21-23 April 2008

- ***Dobson & Brewer Column Measurements***
  - *Systematic Comparison with Satellites*
    - *Leverage from WMO Ozone SAG*
    - *Indication of Need for Some Data Reprocessing*
  - *SAUNA Campaigns*
  - *Interferences and Seasonal Dependencies*
- ***UV/Vis and FTIR Column Measurements***
- ***Ozone Profile Measurements***
  - *Sondes, Lidars, Microwave Radiometers, FTIR, UMKEHR, Satellites*

NDACC / GAW / IGACO Ozone Theme Meeting
21-23 April 2008

- ***Absorption Cross-Section Needs***
  - *UV and Visible – focus of 2009 Ozone Theme meeting (May 11-13)*
  - *Infrared*
- ***Co-Located FTIR & Brewer Measurements Differ Systematically by ~5% (1% goal)***
- ***Lack of Knowledge / Appreciation of the Specific Strengths and Weaknesses of Various Measurements***

NDACC H_2O Workshops
July 2006, February & September 2008

Aim

Investigate in detail aspects of H_2O measurements:

- Accuracy of different sensor types:
  - In situ (balloon or aircraft): radiosondes, frost point and Lyman-alpha hygrometers, ...
  - Remote sensing: Fourier transform infra-red spectrometers (FTIR), Raman and differential absorption (DIAL) lidar, microwave radiometers, solar and star occultation sensors, ...
- Calibration issues
- Spectroscopic issues
- Retrieval aspects (volume mixing ratio, number density, averaging kernels, altitude resolution etc.)
- Synergy of combining and merging data obtained by different techniques
- Validation and campaigns

NDACC H_2O Workshops
July 2006, February & September 2008

Outcome

- Characterise techniques, data and sites ⇒ fact sheets ☼
- fact sheets about each technique and in particular for every specific instrument should be established
- Relevant information to appear also on CEOS Cal/Val portal ☼
- For every technique, identify (published or commonly agreed) best practices for data comparison and for satellite validation ⇒ Database ☼

NDACC H_2O Workshops
July 2006, February & September 2008

Homework

- Provide data sheet of technique
- Provide data sheet of individual instrument
- Draft versions of book chapters
  1. In situ measurements
     - 1.1 Cryogenic frost point technique (H.Vömel)
     - 1.2 FLASH (A.Yushkov)
     - 1.3 MOZAIC (H.Smit)
     - 1.4 Vaisala sensors (E.Kyrö)
  2. FTIR (R.Sussman, J.Notholt, M.Schneider)
  3. LIDAR (Th. Trickl, Th. Leblanc)
  4. Microwave (G.Nedoluha, N.Kämpfer)
  5. Satellites (J.Urban)
  6. CEOS, GEOS (J.C. Lambert)
  7. Validation achieved so far and published, cross references (K.Hocke)

Recommendations for GRUAN

- ***Don't Reinvent the Wheel***
  - *Draw On Capabilities of Established High-Quality Networks*
  - *Augment These Capabilities as Needed to Provide Key Climate Variables on a Global Scale*
- ***Instrument-Specific WGs First***
  - *GRUAN is the Reference Network for GUAN*
    - *Emphasis on the Quality (Accuracy & Precision) of Various Measurement*
    - *Build-Up Phase is Better Supported by an Instrument-Specific Organization*
    - *Mirror NDACC Instrument WG Functions*
- ***Parameter-Specific WGs Second***
  - *Once Instruments Are Fully Characterized*

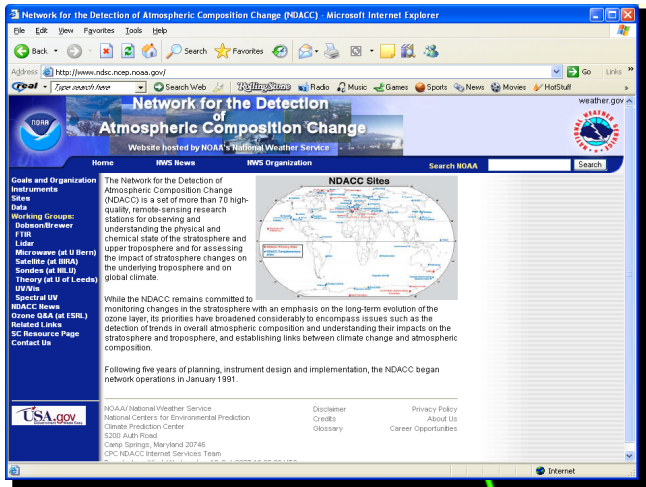
NDACC / GRUAN Collaboration

- ***Commonality of Interests***
  - *Water Vapor Profiles*
    - *Possible joint NDACC/GRUAN intercomparison campaign for characterization of water vapor sondes*
  - *Ozone Profiles – strong NDACC heritage*
- ***How can GRUAN benefit from NDACC?***
  - *Infrastructure & instruments at NDACC sites can aid in intercomparison campaigns – e.g., Raman Lidar for water vapor profiles*
- ***How can NDACC benefit from GRUAN?***
  - *GRUAN Measurements May Be More Frequent at Some Locations*
  - *Useful in Resolving Measurement / Model Differences*
    - *UV Irradiance Example Shown in Next Slide*

From: McKenzie, R.L.; Weinreis, C.; Johnston, P.V.; Liley, B.; Shiona, H.; Kotkamp, M.; Smale, D.; Takegawa, N.; Kondo, Y. (2008). Effects of urban pollution on UV spectral irradiances. *Atmospheric Chemistry and Physics 8*: 5683–5697.

	Spectral Range	UVB			UVA		
		Summer		Winter	Summer		Winter
Effects	Solar Zenith Angle (SZA)	25°	70°	70°	25°	70°	70°
	Observed	-39±11	-38±11	-22±11	-30±10	-31±10	-19±10
E1	Ozone column	- 9	-16	- 0.7	0	0	0
E2	O_3 & T Profiles	-3.5	-0.1	-0.1	-0.2	0	0
E3	Sun-Earth Distance	- 2.6	2.2	+ 2.5	- 2.6	-2.2	+2.5
E4	Altitude	- 1.7	- 1.9	- 1.9	- 1.0	-1.4	-1.4
E5	Horizon obscuration	- 1.5	- 1.9	- 1.9	- 1.0	-1.0	-1.0
E6	NO_2 column	- 0.9	- 0.7	- 1.1	- 1.5	-1.7	-2.5
E7	SO_2 column	- 0.5	- 0.1	- 0.4	- 0.1	0.0	-0.1
E8	Trop O_3/Aerosol inter	- 1.0	- 1.0	- 1.0	0.0	+0.0	+0.0
E9	Clouds/Aerosols	-18±11	-14±11	-17±11	-24±10	-25±10	-17±10

Table 3. Mean percentage differences in UVB and UVA between Tokyo and Lauder and the inferred attribution effects.
Results are shown for summer (SZA: 25º and 70º) and winter (SZA: 70º).
The effect of clouds and aerosols (E9) is defined as the remaining extinction after all identified factors have been considered, (E9 = Obs – (E1+E2+E3+E4+E5+E6+E7+E8)). The uncertainty is the 2σ quadrature sum from the measurements at both sites.



- *http://www.ndacc.org*
- *New informational leaflet*
- *Annual newsletters now available*
- *"News and Highlights" section*
- *Protocols being updated*

Network for the Detection of Atmospheric Composition Change

Newsletter

Volume 3, No. 1, November 2007

NDACC: NETWORK FOR THE DETECTION OF ATMOSPHERIC COMPOSITION CHANGE

TRACKING CHANGES IN THE EARTH'S ATMOSPHERE

CONNECTING GROUND- AND SPACE BASED OBSERVATIONS