

## **IGACO-Ozone Workshop on IGACO-O3 implementation Anavyssos, Greece, 15-17 May 2006**

### **Meeting summary DRAFT**

Prepared by Anssi Mälkki and Anders Lindfors (IGACO-O3 Secretariat, FMI)  
Updated 6 July 2006

### **Participants and agenda.**

See attachment #1.

For meeting agenda see attachment #2. On day 2, part time was used for working in smaller ad-hoc groups discussing practical implementation steps.

### **Scope of the meeting**

- To discuss the scope of IGACO-Ozone from viewpoints of
  - o Where are we? – Current status of Integrated and Global Ozone observation system.
  - o Where should we be going? – Discuss needs and practical steps for ensuring continuous measurements and improvements on the existing system.
- Define activities to be undertaken under the IGACO-O3 framework.

### **Highlights of the discussion**

#### Programmatics

- The IGACO Theme Report provides a framework for the GAW programme (2008-2015). IGACO will be implemented through GAW, with WMO in the lead.
- The IGACO challenge is to find ways to better harness the full power of global O3 observations and deliver powerful data analysis tools and products. "All observations are valuable, integrated they are powerful".

#### Current Status of Ozone observations

- Stratospheric O3 is currently well covered from ground, airborne and space observations.
- Thanks to GAW activities, great improvement in the consistency and accuracy of world-wide observations of O3 from ground has been achieved.
- Current satellite fleet is providing good data on O3 and related chemical constituents: total O3 measurements from space are consistent and can be considered mature.
- Aircraft measurements provide the link between ground and space measurements with products: local profiles (take-off and landing) and flight profile close to tropopause height.
- Satellite data are assimilated, ground-based currently not.

#### Future Outlook

- Ozone is not a solved issue. From the politicians' point of view, increasing aircraft emissions close to tropopause height may be used as an argument for continuous funding.
- Continuous ozone profile measurements (sondes) from ground are essential for satellite validation. Satellite measurements serve as a quality control of the ground-based network. Strong common interest in maintaining sonde network.
- Well-instrumented (measuring multiple species with multiple methods) and well-supported stations are needed („super-sites“) to enable continuous validation. Continuity of worldwide Dobson / Brewer network cannot be taken for granted, continuous effort is needed.
- NOAA and EUMETSAT will provide continuity of O3 monitoring from space at least until 2020. In addition to these operational missions, research missions with more extensive

- instrumentation/better resolution and more constituents are needed also in the future (post-AURA/ENVISAT).
- Limb/occultation satellite missions are needed for stratospheric Ozone profiling and UT/LS studies also after SAGE. I.e.: solar occultation, limb emission experiments and/or specific UTLS mission (microwave).
  - The transition from first generation satellite ozone instruments such as TOMS/SBUV to hyperspectral instruments (GOME, SCIAMACHY, OMI) can be considered analogous to the potential provided by the (newer) Brewer instrument over the (simpler) Dobson in terms of potential data products.
  - Brewer is a very good instrument and retrievals from raw data can be further improved, providing new data products (e.g., aerosols, better profiling using multi-spectral UV measurements).
  - Follow-on for Aircraft measurements (MOZAIC): IAGOS proposal to EU Research Infrastructure programme: timeframe 2008-2028, provides continuity if funded.
  - Focus areas in EU programmes (FP-7): Cooperation, Ideas, People, Capacities
    - o Capacities: European Research Infrastructure, support in 10-20 year time perspective (see IAGOS).
    - o IGACO-O3 community is encouraged to propose funding for long-term monitoring.
  - DLR has an agreement with ICSU to host World Data Center for Remote Sensing of the Atmosphere (WDC-RSAT; see [wdc.dlr.de](http://wdc.dlr.de))
    - o Value-adding products: emphasis on modeling and data assimilation.
    - o Dedicated to long-term archiving, could become a new WMO service?

#### Challenges for IGACO-O3

- Key Factors (User's point of view)
  - o Easy unbureaucratic access to data.
  - o Visible easy to find data sets.
  - o Near-real-time delivery (needed also for research).
  - o Balance between high resolution and global overview data.
- Improve data quality (comparability) of ground-based observations: Quality of data from different stations is variable. Detailed information of that is not regularly visible in the data or the metadata.
- Differences between different instrument types (and, as a consequence, stations) need to be documented.
- Continuous validation activities with satellite community.
- Combine and homogenise data records from different satellites.
- Solar Zenith Angles (SZA) larger than 70 degrees (low sun) are a challenge for both satellite and ground-based instruments.
- Data centers need harmonisation:
  - o Metadata, documentation, calibration.
  - o Possibility of introducing a single entry point (one-stop facility) for data submission should be considered. CEOS (WG Calibration and Validation) activity?
  - o Improve cooperation with other networks (e.g. NDACC).
- Need for data protocols:
  - o Data providers also need identity
  - o Quality control requires communication between data user and provider in any case.
  - o NDACC data protocol seen as good balance (1 + 1 year grace time for PI).
- Near-real-time data
  - o How to solve availability/agreement/distribution issues of NRT data?
  - o WOUDC experience: in 70 % cases the NRT data and off-line products submitted later are identical.

## **Further work (Tasks/goals - group work; see also separate task descriptions)**

### Data access

- (i) Better data access and archiving
  - Develop a plan on how to accomplish one-stop facilities for both data submission and retrieval; start immediately.
- (ii) More total ozone and sondes on the GTS/WIS
  - Get more stations to provide data in near real-time; should be started immediately.
- (iii) Meteorological data
  - Provide easier access to meteorological data, including both analyses and forecasts.

### Continuous satellite validation

- (i) Improve Groundbased Measurements at High SZA/latitudes
  - Needed for validation of satellites, problematic for GB techniques; immediately.
- (ii) Dobson/Brewer Absolute Calibration Comparisons
  - Compare absolute calibration of Brewer versus Dobson; 2007.
- (iii) Acquire Brewer Umkehr Data
  - Useful information that has not yet been processed; 2008.
- (iv) US-EPA Brewer Upgrading
  - Upgrade the EPA decommissioned Brewers and to deploy the instruments across NOAA network; 2008.
- (v) Measurement Platform Workshop
  - Enhance interactions between satellite and groundbased/aircraft/balloon communities; 2007.
- (vi) Re-evaluation/maintenance of trop/sub-trop TOZ datasets
  - Have improved/homogeneous datasets for validation and trend studies; 2008.

### Data assimilation

- (i) Assimilation of GB ozone data
  - Assess added value and stand-alone value of ground-based ozone data; 2007-2008.
- (ii) Assimilation of surface ozone measurements
  - Assess contribution of tropospheric ozone measurements to air quality models; 2008-2010.

### Gaps

- (i) Continue/augment ozonesonde network
  - Ozonesondes, high-vertical-resolution profiling satellite instrument, MOZAIC/IAGOS, automated surface-based LIDAR, UTLS - limb-emission satellite; immediately.

### **Next steps / Actions:**

- Refine task/activity descriptions with working group leads. (FMI IGACO-O3)
- Communicate outcome of meeting to outside world. (FMI IGACO-O3)
- Start preparations for next meeting (possibility: US). (WMO, FMI IGACO-O3)
- Discuss role of UV within IGACO-O3. (FMI, WMO, O3 and UV SAG)
- Discuss relation of IGACO-O3 to other IGACO Focus Areas. (WMO, O3 and UV SAG, FMI)
- Continue preparations for IGACO-O3 Implementation plan. (FMI IGACO-O3)
- Proposals for IGACO-O3:
  - o Make recommendation to maintain (ground) O3-sonde network and (satellite) occultation instruments. (see Gaps (i) above)
  - o Develop a prioritised list of wanted missions. This would potentially have great impact (at ESA). (no AI agreed at meeting)

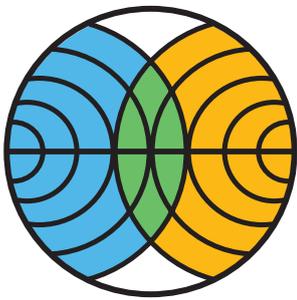
## IGACO-O3 Meeting, Greece 15-17 May 2006

Participants list

Updated:

6-Jul-2006

Akimoto, Hajime	Japan Agency for Marine-Earth Science and Technology
Baier, Frank	German Aerospace Center (DLR)
Balis, Dimitris	Aristotle University of Technology
Barrie, Len	WMO Atmospheric Research and Environment Programme
Bhartia, Pawan	NASA Goddard Space Flight Center
Bojkov, Bojan	NASA Goddard Space Flight Center
Braathen, Geir	WMO Atmospheric Research and Environment Programme
Bruening, Claus	European Commission
Fioletov, Vitali	World Ozone and UV Data Center, MSC Toronto
Fishman, Jack	NASA Langley Research Center
Godin-Beekmann, Sophie	Service d'Aeronomie - CNRS
Koehler, Ulf	Meteorological Observatory Hohenpeissenberg
Lindfors, Anders	IGACO-O3 Secretariat, Finnish Meteorological Institute
McElroy, Tom	Meteorological Service of Canada
Mälkki, Anssi	IGACO-O3 Secretariat, Finnish Meteorological Institute
Oss, Roeland van	Royal Dutch Meteorological Institute (KNMI)
Rex, Markus	Alfred Wegener Institute - Potsdam
Sasaki, Toru	Japan Meteorological Agency
Smit, Herman	Research Centre Jülich GmbH
Stähelin, Johannes	Swiss Federal Institute of Technology Zürich (ETHZ)
Vanicek, Karel	Czech Hydrometeorological Institute
Weber, Mark	University of Bremen
Viatte, Pierre	Swiss Meteorological Institute
Vik, Aasmund	Norwegian Institute for Air Research (NILU)
Zehner, Claus	European Space Agency, ESRIN
Zerefos, Christos	University of Athens



# IGACO-Ozone workshop

## 15-17 May 2006

### Monday - Theme: Where are we?

#### 10:00 Welcome

Christos Zerefos, National Observatory of Athens, Local Organising Committee  
Anssi Mälkki, IGACO-Ozone, FMI

#### 10:30 Introduction

Leonard A. Barrie, WMO Atmospheric Research and Environment Programme

#### 11:00 Where are we?

Current status: Presentations followed by discussion after each presentation.

#### Ground based networks of total column and profiling instruments

Johannes Stähelin, Chairman, WMO-GAW Science Advisory Group on O<sub>3</sub>, ETHZ

#### Satellite observations: Total O<sub>3</sub> and profiles

Pawan K. Bhartia, NASA Goddard Space Flight Center

#### Data centres and dissemination

Vitali Fioletov, World Ozone and UV Data Centre, Environment Canada  
Dimitris Balis, WMO Ozone Mapping Centre, University of Thessaloniki

#### 13:00 Lunch

#### 15:00 Session on modelling, assimilation, organisation and end users' point of view

##### Modelling and assimilation

Roeland van Oss, Royal Netherlands Meteorological Institute

##### Organisation: Existing (international) programmes

Leonard A. Barrie

##### User point of view on current status

Markus Rex, Alfred Wegener Institute of Marine and Polar Research, Potsdam

#### 18:00 Adjourn

#### 19:30 Social Programme

## Tuesday - Theme: Where should we be going?

**9:30**      **Introduction: Existing infrastructures and programmes revisited (summary of Monday)**

Anssi Mälkki

**10:00**      **Discussion around the following questions:**

Discussion chair: Johannes Stähelin

- ✓ Where are the gaps in the Integrated and Global System?
- ✓ Can we say where the gaps will be in the future?
- ✓ What can we do to improve the future situation?
- ✓ Who is working on the gaps and gap-fillers?
- ✓ Where does GAW and its IGACO strategy fit in this?
- ✓ Who are the users?
- ✓ Look 10 years ahead

### **Short introductions:**

**Current and planned Japanese activities on global ozone observations**

Hajime Akimoto, Frontier Research Center for Global Change

**Outlook for O<sub>3</sub> and trace gases from satellites**

Mark Weber, University of Bremen

**ESA GSE activities on Ozone/UV and future planned missions**

Claus Zehner, ESA/ESRIN

**The European Programme**

Claus Brüning, European Commission, DG Research

**Ozone data products at the World Data Centre for Remote Sensing**

F. Baier, DLR

**Outlook for global ozone observations beyond 10 years. Ideas for possible improvements over existing ground-based systems**

Lunch and coffee breaks as appropriate

**18:00**      **Adjourn**

## Wednesday - Meeting summary and next steps

**9:30**      **Conclusions from day 1 and day 2**

**10:00**      **Practical implementation (as derived from conclusions)**

- ✓ Pilot Projects
- ✓ GAW-IGACO-Ozone Implementation Plan
- ✓ Communication and coordination with other programmes: Who and how?

**11:20**      **Next steps**

**12:00**      **Close**

During the lunch break there will be a ceremony for the presentation of the *WMO Professor Mariolopoulos Trust Fund* award. Leonard A. Barrie will give an address on behalf of the Secretary General of WMO and the award will be presented to two young scientists.