IGACO and the CEOS Atmospheric Composition Constellation (CEOS-ACC)

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DECLARATION OF THE EARTH OBSERVATION SUMMIT

We, the participants in this Earth Observation Summit held in Washington, DC, on July 31, 2003:

Recalling the World Summit on Sustainable Development held in Johannesburg that called for strengthened cooperation and coordination among global observing systems and research programmes for integrated global observations;

Recalling also the outcome of the G-8 Summit held in Evian that called for strengthened international cooperation on global observation of the environment;

Noting the vital importance of the mission of organizations engaged in Earth observation activities and their contribution to national, regional and global needs;

Affirm the need for timely, quality, long-term, global information as a basis for sound decision making. In order to monitor continuously the state of the Earth, to increase understanding of dynamic Earth processes, to enhance prediction of the Earth system, and to further implement our environmental treaty obligations, we recognize the need to support:

(1) Improved coordination of strategies and systems for observations of the Earth and identification of measures to minimize data gaps, with a view to moving toward a comprehensive, coordinated, and sustained Earth observation system or systems;

(2) A coordinated effort to involve and assist developing countries in improving and sustaining their contributions to observing systems, as well as their access to and effective utilization of observations, data and products, and the related technologies by addressing capacity-building needs related to Earth observations;

(3) The exchange of observations recorded from in situ, aircraft, and satellite networks, dedicated to the purposes of this Declaration, in a full and open manner with minimum time delay and minimum cost, recognizing relevant international instruments and national policies and legislation; and

(4) Preparation of a 10-year Implementation Plan, building on existing systems and initiatives, with the Framework being available by the Tokyo ministerial conference on Earth observations to be held during the second quarter of 2004, and the Plan being available by the ministerial conference to be hosted by the European Union during the fourth quarter of 2004.

To effect these objectives, we establish an ad hoc Group on Earth Observations and commission the group to proceed, taking into account the existing activities aimed at developing a global observing strategy in addressing the above. We invite other governments to join us in this initiative. We also invite the governing bodies of international and regional organizations sponsoring existing Earth observing systems to endorse and support our action, and to facilitate participation of their experts in implementing this Declaration.

Recommendation (1) is IGOS! (already in existence in 2003)
WHAT IS IGOS?

The Integrated Global Observing Strategy (IGOS) unites the major satellite and surface-based systems for global environmental observations of the atmosphere, oceans and land.

*IGOS has adopted a theme approach to implement its strategy*
Who is IGOS?

IGOS – Partnership brings together:

**Space agencies**

[CEOS] [JAXA] [NASA] [esra]

**UN organizations**

[FAO] [WFP] [UNESCO] [UNEP]

**Global observing systems**

[GTOS] [GOS] [GOS/GAW]

**International science and research programmes**

[GLOBAL CHANGE] [WORP] [IGFA]
IGOS Developed Observing Strategies Based on Themes

a Oceans;

b Terrestrial - initially Estimation of Global Net Primary Production (NPP);

c Atmospheric Chemistry & Climate;

d Weather Prediction (this is assumed to be covered by ongoing WMO activities);

e Coastal Areas;

f Disaster Management;

g Carbon Cycle - initially Carbon sinks: global mapping & monitoring;

h Climate Impacts and Climate Variability & Change;

i Water Cycle.

ESA and WMO GAW Provided Leadership
Theme Report for Atmospheric Chemistry
(IGACO: Integrated Global Atmospheric Chemistry Observations)
Published in September 2004
IGACO Identified 4 “Grand Challenges”

• Tropospheric Air Quality
• Oxidation Efficiency of the Atmosphere
• Stratospheric Chemistry
• Chemistry-Climate Interactions
IGOS – Partnership brings together:

**Space agencies**
- CEOS
- NASA
- JAXA
- ESA
- 43 CEOS Members

**UN organizations**
- FAO
- UPU
- UNESCO
- WMO
- UNEP

**Global observing systems**
- GTOS
- The Global Ocean Observing System
- GOS/GAW

**International science and research programmes**
- ICSU
- IGFA
- WCRP
- CLIVAR
- GCOS
- CIESIN
- IGFA
Atmospheric Composition Constellation

From Presentation Given by
Ernie Hilsenrath (NASA)
Joerg Langen (ESA)
to
CEOS Working Group
Frascati, Italy
December 2006
Atmospheric Composition Constellation

One of Four “Virtual” Constellations Being Considered as Part of the Original IGOS Themes:

- Land Surface Characterization
- Precipitation
- Ocean Topography
- Atmospheric Composition
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Planning Meeting to Discuss CEOS-ACC Held at USGS in March 2007

• CEOS has agreed to provide the space component for GEOSS and deliver data to meet the GEO Societal Benefit Areas (SBAs)

• The ACC will prioritize user requirements and define missions or a “virtual system” consisting of space and ground segments including archives that meet user requirements

• The ACC considers only the space component of atmospheric composition and applications, but recognized the need for ground-based measurements and modeling to fully address science priorities
User requirements have been developed by national and international panels and are mature

- CEOS-ACC supports five of the nine GEO SBAs:
  - Health, Energy, Climate, Hazards, Ecosystems

- Specific users include:
  - Forecasting: National weather services
  - Environmental protection services
  - Monitoring and Assessment:
    - Montreal and Kyoto Protocols
    - IPCC, WMO/UNEP, CCSP, PROMOTE, etc.
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Two Projects to go Forth for Consideration

• Use of OMI and SCIAMACHY/GOME-2 NO$_2$ products to determine diurnal aspect of emissions: Source apportionment

• Dissemination of Global Fire/Aerosol product for use in real-time forecasting: Extension and expansion of “IDEA” Project for potential global use
OMI Measurements Capture Pollution Event In Houston Area for June 22

Elevated TOR from OMI
Elevated NO₂ from OMI
Elevated Surface O₃ from EPA Sites

Surface O₃ Concentrations
- 0-60 ppb
- 61-79 ppb
- 80-99 ppb
- 100-110 ppb
- 111-124 ppb
- 125+ ppb

Tropospheric O₃ Residual from OMI
NO₂ Column from OMI
Good Agreement Between NO$_2$ Column from OMI and CMAQ Simulation

June 22, 2005, 1900 Z

Model-Integrated NO$_2$ from CMAQ (12-km resolution)

OMI NO$_2$

The OMI Measurement Can Only Capture a Snapshot at One Moment
Houston Surface NO₂ Exhibits Highly Variable Diurnal Behavior
Integrated Column NO₂ Accurately Captures Diurnal Behavior

Surface Concentrations and Integrated NO₂ Column Calculated by CMAQ Plotted as a Function of Hour: June 22-23, 2005

- Measurements from GeoTRACE Capture Daylight Portion of Diurnal Cycle
- Measurements from OMI
- Measurements provided only once per day provide relatively little information that can be used to examine how well AQ models perform

GeoTRACE Makes NO₂ Measurements Every 30-60 Minutes Throughout Sunlit Hours