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

Jack Fishman

Science Directorate

NASA Langley Research Center

Hampton, Virginia

NASA Applied Sciences Air Quality Applications Program Team Meeting

Potomac, Maryland

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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)

IGOS homepage

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

esa

43 CEOS Members

UN organizations

FAO FIAT PANIS

UNESCO

UNEP

Global observing systems

GTOS

The Global Ocean Observing System GOOS

IOC WMO ICSU UNEP GCOS GLOBAL CLIMATE OBSERVING SYSTEM

GOS/GAW

International science and research programmes

GLOBAL CHANGE IGBP

WCRP Climate

ICSU

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;

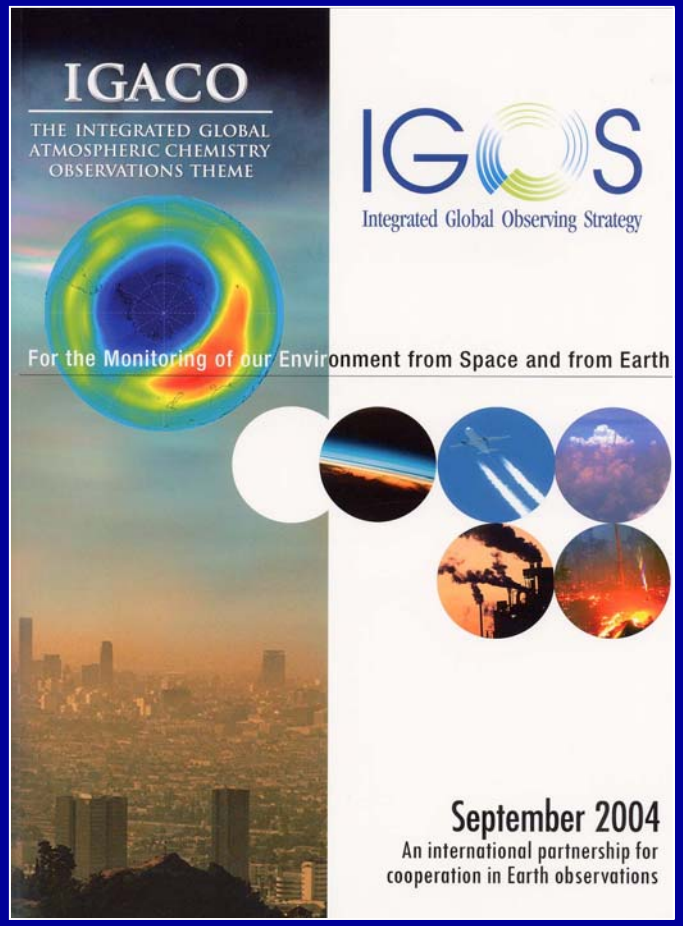
g Carbon Cycle - initially Carbon sinks: global mapping & monitoring;

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

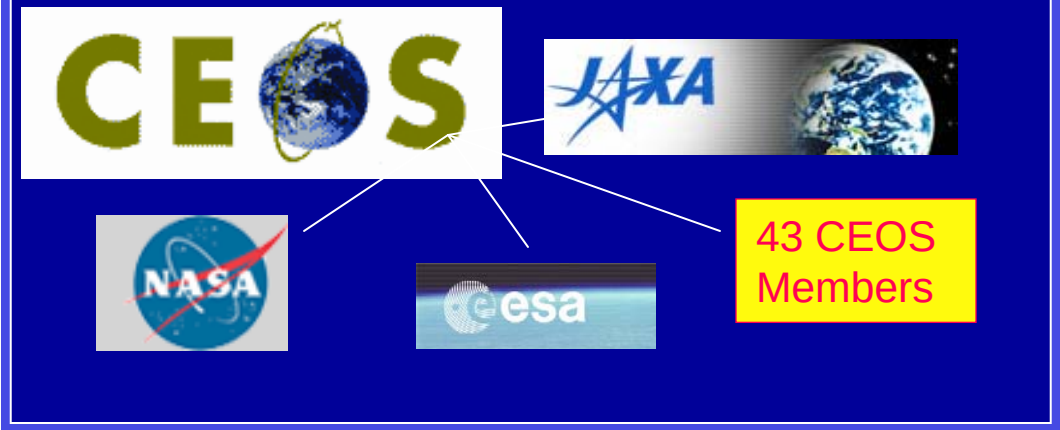
IGACO Identified 4 “Grand Challenges”



- **Tropospheric Air Quality**
- Oxidation Efficiency of the Atmosphere
- Stratospheric Chemistry
- Chemistry-Climate Interactions

IGOS –Partnership brings together:

Space agencies



UN organizations

Global observing systems

International science and research programmes

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**

Atmospheric Composition Constellation

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 prioritorize 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

Atmospheric Composition Constellation

User requirements have been developed by national and international panels and are mature

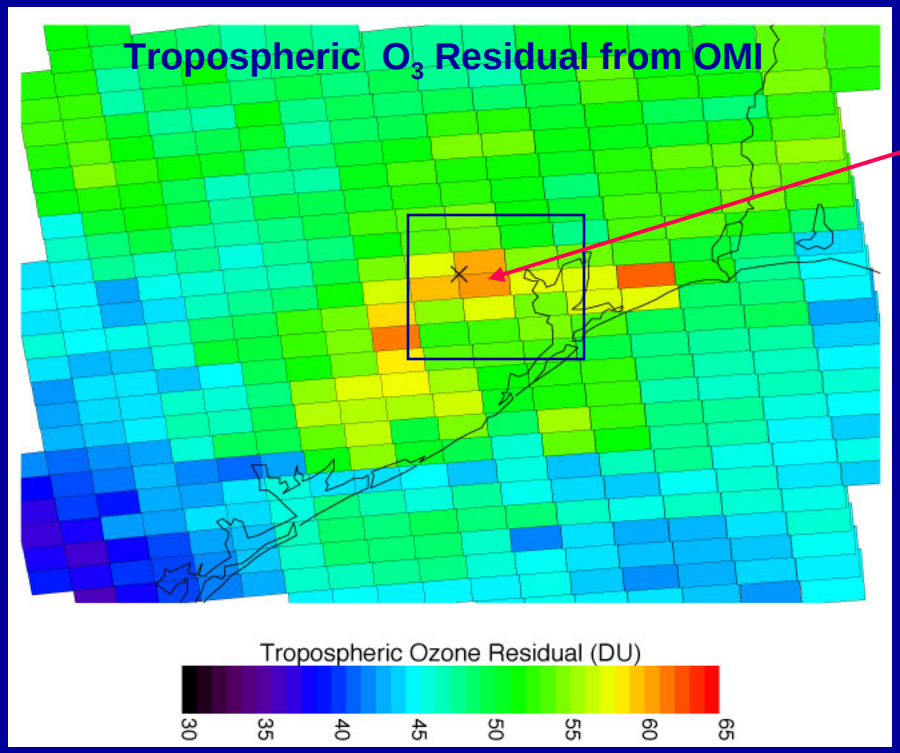
- CEOS-ACC supports five of the nine GEO SBAs:
  - Health, Energy, Climate, Hazards, Ecosystems
- Specific users include:
  - Forecasting: National weather services
    Environmental protection services
  - Monitoring and Assessment:
    Montreal and Kyoto Protocols
    IPCC, WMO/UNEP, CCSP, PROMOTE, etc.

Atmospheric Composition Constellation

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

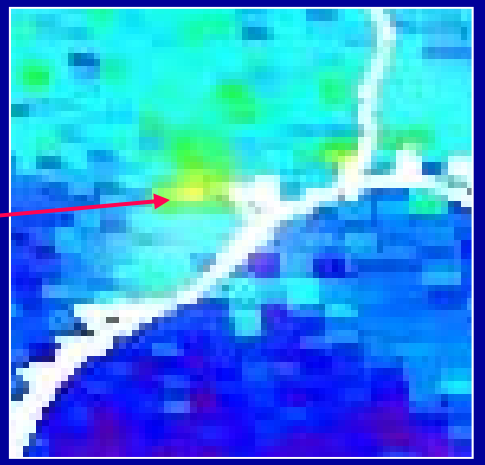
OMI Measurements Capture Pollution Event In Houston Area for June 22



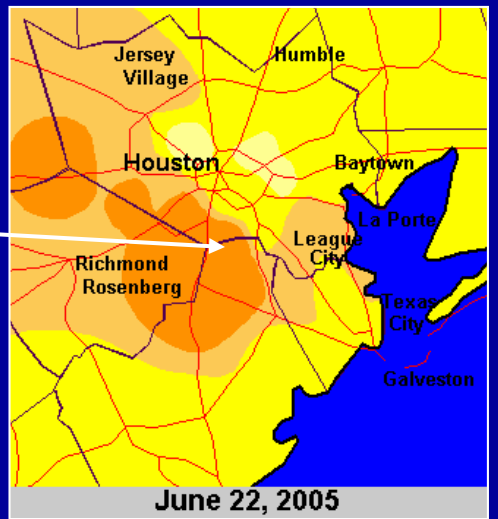
Elevated TOR from OMI

Elevated NO_2 from OMI

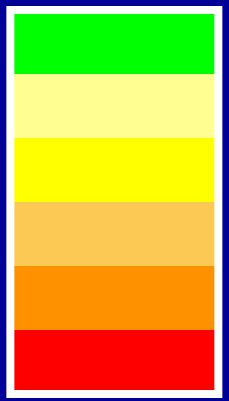
NO_2 Column from OMI



Elevated Surface O_3 from EPA Sites



Surface O_3 Concentrations



0-60 ppb

61-79 ppb

80-99 ppb

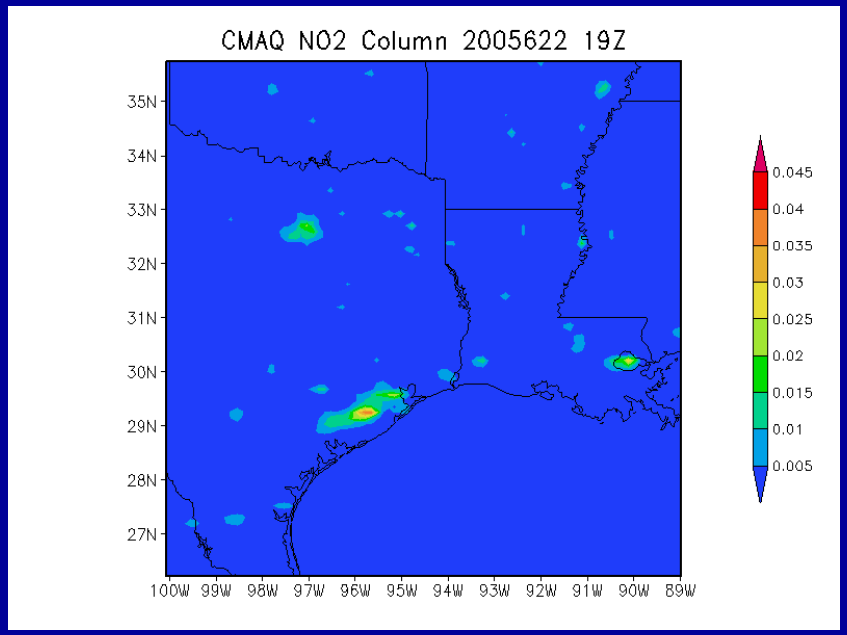
100-110 ppb

111-124 ppb

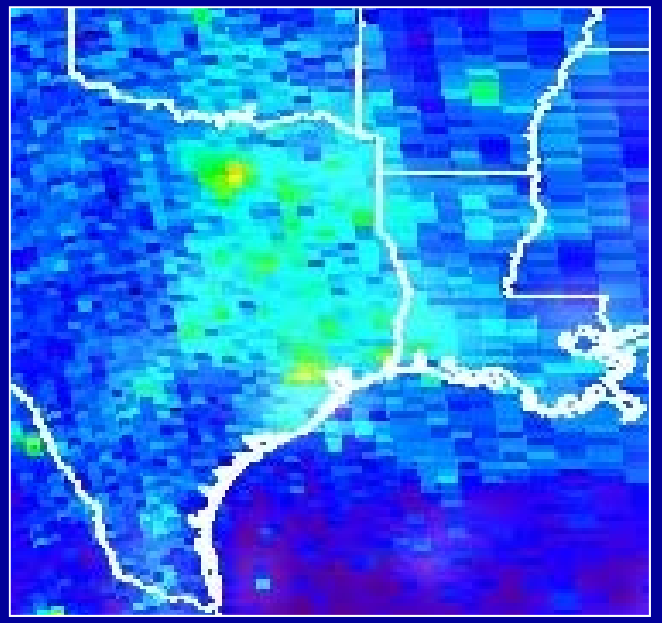
125+ ppb

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)

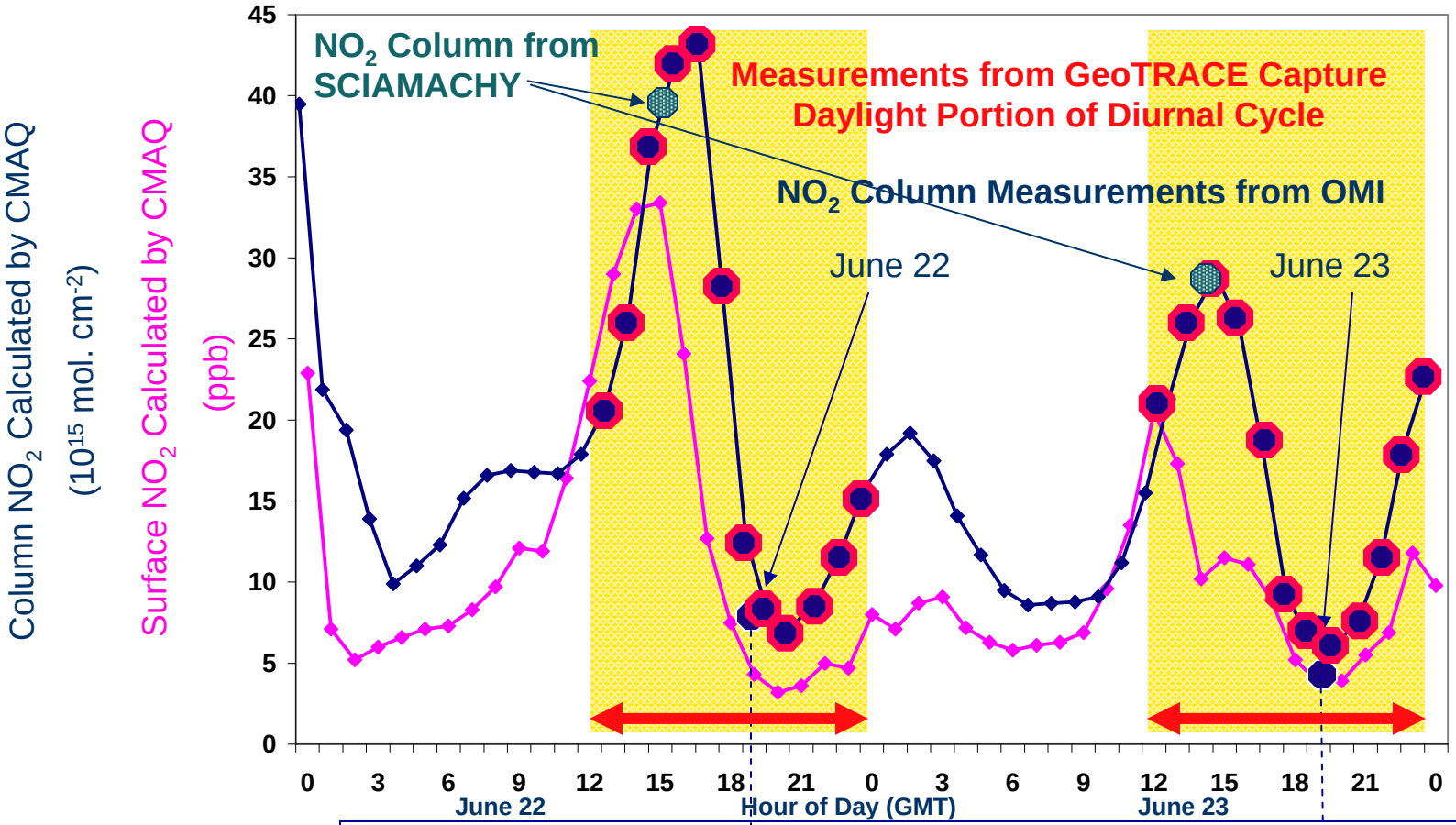


OMI NO_2

The OMI Measurement Can Only Capture a Snapshot at One Moment

Houston Surface NO_2 Exhibits Highly Variable Diurnal Behavior
Integrated Column NO_2 Accurately Captures Diurnal Behavior

Surface Concentrations and Integrated NO_2 Column Calculated by CMAQ Plotted as a Function of Hour: June 22-23, 2005



Measurements provided only once per day provide relatively little information that can be used to examine how well AQ models perform

GeoTRACE Makes NO_2 Measurements Every 30-60 Minutes Throughout Sunlit Hours