



**GROUP ON  
EARTH OBSERVATIONS**

**GEO User Interface Committee  
Status of Task US-09-01a**

**UIC Member Task Lead:  
Lawrence Friedl, USA-NASA**

**UIC Co-Chair Task Lead:  
Ellsworth LeDrew, IEEE (Canada)**

**Task Coordinator:  
Amy Jo Swanson, USA-NASA**

***11<sup>th</sup> UIC Meeting • Stresa, Italy  
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### **Sections of Presentation**

- **Quick Review of Task**
- **Status**
- **Preliminary Results**
- **CEOS Item**
- **Discussion**
- **Recommendations/Decisions**



### **GEO Task US-09-01a:**

**Establish a GEO process for identifying critical Earth observation priorities common to many GEOSS societal benefit areas, involving scientific and technical experts, taking account of socio-economic factors, and building on the results of existing systems' requirements development processes.**



# Group on Earth Observations

## *Task US-09-01a*

### GEO UIC US-09-01a Process: Nine Steps

- The process lists the steps serially, yet some of them can be done in parallel.
- Analyst and Advisory Group for each SBA will develop a detailed schedule

Step 1: UIC Members identify Advisory Groups and Analysts for each SBA

Step 2: Determine scope of topics for the current priority-setting activity

Step 3: Identify existing documents regarding observation priorities for the SBA

Step 4: Develop analytic methods and priority-setting criteria

Step 5: Review and analyze documents for priority Earth observations needs

Step 6: Combine the information and develop a preliminary report on the priorities

Step 7: Gather feedback on the preliminary report

Step 8: Perform any additional analysis

Step 9: Complete the report on Earth observations for the SBA

When all SBA analyses complete, UIC will compare across them.

## GEO User Interface Committee: Progress in Task US-09-01 by Societal Benefit Area (as of 27-Apr-09)

Societal Benefit Area	Analyst	# in Advisory Group	# of Documents	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Oct-09	Nov-09
				Major Steps in Process									
Agriculture	Michael Brady	10	15	0	1	2	2	3	4/5/6				
Biodiversity	Greg Susanke	8	17	0	1	3	3	3	3 - 5				
Climate	Molly Macauley	4	22	0	2	4/5	4/5	4/5	4/5/6				
Disasters	Stephanie Weber	12	42	0	3	4/5	4/5	4/5/6	4/5/6				
Energy	Erica Zell	14	27	1	3	7	7	7	7				
Ecosystems	Thomas Gulbransen	11	76	0	2	4/5	4/5	4/5	4/5/6				
Human Health: Aeroallergens	Hillel Koren	0	4	0	0	0/1	1/1	2	3				
Human Health: Air Quality	Rudy Husar & Stefan Falke	0	5	0	0	0	1	2	3				
Human Health: Infectious Disease	Jan Connery	0	4	1	1	1	1	2	3				
Water	Sushel Unninayar	8	55	0	1	2	2	3	1 - 5				
Weather	Michael Nyenhuis	5	47	0	1	1/3/4	1 - 4	1 - 5	6				



# Group on Earth Observations

## Task US-09-01a

### Task Schedule – Revised

Formation of Advisory Groups:	Early 2009
Lists of Documents (for each SBA):	April 2009
Preliminary reports from 4 of 9 SBAs: - <i>Those Analysts report preliminary findings to UIC (ISRSE Symposium)</i>	May 2009
4 Final reports & other 5 SBA Prelim. reports: - <i>Analysts report findings to UIC (UIC Meeting)</i>	Sept/Oct 2009
US-09-01 Presentation to GEO Plenary VI: - <i>Present findings from 4 Final reports</i>	November 2009
Other 5 SBA Final reports: - <i>Other Analysts report findings to UIC (UIC Meeting)</i>	Jan.-Feb. 2010
Initial US-09-01 findings across all SBAs: - <i>UIC Report/Presentation to C4</i>	March 2010
Final Task report and recommendations:	May 2010



# Group on Earth Observations

## *Task US-09-01 – Preliminary Results*

### **US-09-01a: Preliminary Results**

### **Energy Societal Benefit Area**



# GEO Task US-09-01a

## Energy SBA: Advisory Group

### Advisory Group

Current Number on Advisory Group: 14

Number from Developing Countries: 4

Charlotte Bay Hasager, Risoe National Laboratory, Technical University of Denmark

Amit Kumar, The Energy and Resources Institute (TERI), India

Ellsworth LeDrew, University of Waterloo, Canada

Maxwell Mapako, Natural Resource and Environment, CSIR, South Africa

Pierre-Philippe Mathieu, European Space Agency

Richard Meyer, SunTechnics GmbH, Germany

Enio Pereira, INPE (Brazilian National Agency for Space Research), Brazil

Thierry Ranchin, Ecole des Mines de Paris, France

David Renne, National Renewable Energy Laboratory, U.S.

Scott Sklar, Stella Group, U.S.

Gerry Sehlke, Idaho National Laboratory, U.S.

Han Wensink, ARGOSS, The Netherlands

Gu Xingfa, Institute of Remote Sensing Applications, China

Monica Oliphant, International Solar Energy Society, Australia

Also Engaged: Michael Bittner, DLR Remote Sensing Data Center, Germany

Richard Eckman, NASA (and CEOS), U.S.



# GEO Task US-09-01a

## Energy SBA: Documents

**Current Number of Documents: 27 (5 from developing countries)**

**SAMPLE TITLES:**

Remote sensing observation used in offshore wind energy. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (2008), RISO (Hasager et al.)

Wind Energy Resource Atlas of Mongolia. U.S. National Renewable Energy Laboratory (2001)

Renewable Energy: RD&D Priorities, Insights from IEA Technology Programmes, International Energy Agency. 2006.

Prioritising Wind Energy Research: Strategic Research Agenda of the Wind Energy Sector. European Wind Energy Association. 2005.

Assessment of small hydropower potential using remote sensing data for sustainable development in India. Energy Policy 34 (17): 3195–3205. Dudhani et al 2006.

Case Studies on the Use of Solar Irradiance Forecast for Optimized Operation Strategies of Solar Thermal Power Plants. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Vol. 1, No. 1., Wittmann et al 2008.

Evaluation of offshore wind energy potential using SAR and MM5. Proceedings of SPIE - The International Society for Optical Engineering, v 6680, Coastal Ocean Remote Sensing, 2007, (Kozai et al 2007)



# GEO Task US-09-01a

## Energy SBA: Initial Findings

Parameter Category	# of documents
Offshore Wind Speed and Direction	9
Wind Speed and Direction Over Land	8
Solar Measurements	8
Wind Prediction Forecasting	3
Wave Behavior & Forecasting	3
Speed of Ocean Currents	3
Air Surface Temperature and Pressure	2
Land Use Data	2
Gridded Terrain/Topography Data	2
Precipitation	1
Vegetation Indices	1
Upper Air Meteorological Data	1

- Current list of 22 parameters fits into 12 “Parameter Categories” in this table
- Working to increase documents addressing bio-energy, hydropower
- Advisory group members suggested that some updated information on data needs may not be in “document” or “article” per se, but rather in online text on major organization’s websites
- Often, specifics on the parameter characteristic either used or desired are not given (e.g., spatial resolution, temporal resolution, etc.)



# Group on Earth Observations

## *Task US-09-01 – Preliminary Results*

### **US-09-01a: Preliminary Results**

### **Disaster Societal Benefit Area**



# GEO Task US-09-01a

## *Disasters: Advisory Group*

- **Advisory Group**

- **Current Number on Advisory Group: 12      Developing Countries: 5**
- **Major geographic regions missing in Advisory Group:**
  - **Oceania/Australia, Polar Regions, Parts of East Asia**
- **Members:**
  - **Alfaro, Rosario - Instituto Meteorologico Nacional (Costa Rica)**
  - **Baker, Jay - Florida State University (USA)**
  - **Bequignon, Jerome - European Space Agency**
  - **Burgos Sosa, Silvia - Paraguayan Institute for Environmental Protection (Paraguay)**
  - **Casagli, Nicola - International Consortium on Landslides (Italy)**
  - **Kampengele, Mumba Dauti - National Institute for Scientific and Industrial Research (Zambia)**
  - **Koulakov, Ivan - Institute of Petrol Geology and Geophysics (Russia)**
  - **Le Cozannet, Goneri - French Geological Survey (France)**
  - **Leith, William - USGS (USA)**
  - **Marzocchi, Warner - World Organization of Volcano Observatories (Italy)**
  - **Rao, V. Madhava - National Institute of Rural Development (India)**
  - **Takara, Kaoru - International Consortium on Landslides (Japan)**



# GEO Task US-09-01a

## *Disasters: Documents*

- Documents

- Current Number of Documents: **42** Developing Countries: **4**
- Major geographic regions missing in Document list:
  - South/Central America, Africa
- Example Documents:
  - Helz, R. L. and Gaynor, J. E., 2007. “Reducing Loss of Life and Property from Disasters: A Societal Benefit Area of the Strategic Plan for the U.S. Integrated Earth Observation System (IEOS)” :Reston VA, US Geological Survey, OFR 2007-1147, 67 pp.
  - Salichon, J et al., 2007. “2<sup>nd</sup> IGOS Geohazards Theme Report”, BRGM/RP-55739-FR, Bureau de Recherches Géologiques et Minières, August.
  - United Nations Economic and Social Commission for Asia and the Pacific, 2005. “Framework for Regional Cooperation on Space Technology Supported Disaster Reduction Strategies in Asia and the Pacific,” Study report prepared for the Meeting of Experts on Space Applications for Disaster Management, Chiang Mai, China 25-28 July.
  - Plag, H. P., 2006. “National Geodetic Infrastructure: Current Status and Future Requirements: The Example of Norway,” Nevada Bureau of Mines and Geology, Bulletin 112, 94 pp.



# Top 5 Aggregated Observation Categories

## *Disasters: Preliminary Finding and Details*

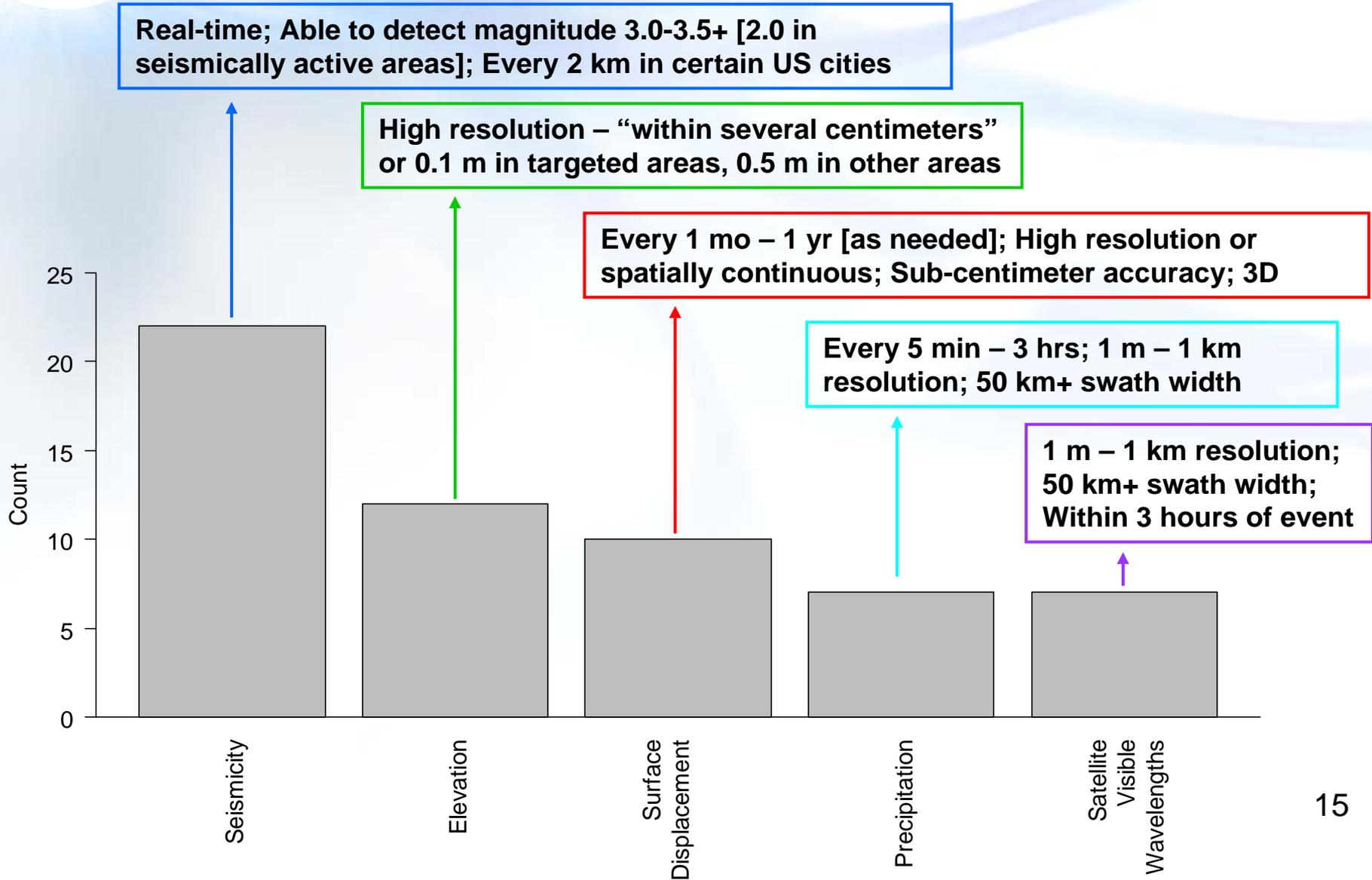
- **Seismicity**
  - Includes surface and ocean-bottom seismometers
- **Elevation**
  - Height above mean sea level
  - Digital topography [*Digital Elevation Models (DEM)*] derived from:
    - Comprehensive Lidar Systems
    - Stereo Aerial Photography
    - High Resolution Satellites
- **Surface Displacement**
  - Measurement of the distance the surface has moved in the three dimensions
  - Derived from:
    - GPS Networks
    - Satellite [e.g. *ERS, JERS, Radarsat1*], airborne and ground-based Interferometric Synthetic Aperture Radar (InSAR)
- **Precipitation**
  - Includes amount, duration and intensity of rainfall
  - Derived from:
    - Surface monitors [rain gauges]
    - Satellite measurements
- **Satellite Visible Wavelengths**
  - 0.5 – 0.9  $\mu\text{m}$  surface reflectance
  - High resolution observations available from a number of satellites
  - Used to map important physical features, monitor extent of disasters and for other applications

Note: not all observations  
require aggregation



# Top 5 Aggregated Observation Categories

- Plus example physical characteristics from documents -





# Group on Earth Observations

## *Task US-09-01 – Preliminary Results*

### **US-09-01a: Preliminary Results**

### **Ecosystems Societal Benefit Area**



# GEO Task US-09-01a

## *Ecosystems SBA: Advisory Group*

- **Advisory Group**

- **Current Number on Advisory Group: 11      Developing Countries: 8**
- **Major geographic regions missing in Advisory Group:**
  - **Polar Regions**
- **Members:**
  - **Ana Laura Dominguez, Instituto de Ecologia A.C., Mexico**
  - **Gray Tappan, U.S. Geological Survey, USA**
  - **Mphethe Tongwane, Lesotho Meteorological Services, Lesotho**
  - **Andrea Ferraz Young, Population Studies Centre, Brazil**
  - **Anna Kozlova, Scientific Centre for Aerospace Research of the Earth, Ukraine**
  - **Jorge López-Portillo, Instituto de Ecologia A.C., Mexico**
  - **Hussam Husein, General Commission for Scientific Agricultural Research, Syria**
  - **Roger Sayre, U.S. Geological Survey, USA**
  - **Sevda Ibrahimova, Azerbaijan National Aerospace Agency, Azerbaijan**
  - **Stuart Phinn, Center for Remote Sensing and Spatial Information Science, University of Queensland, Australia**
  - **Mukund Rao, ESRI India, India**



# GEO Task US-09-01a

## *Ecosystems SBA: Documents*

- **Documents**

- **Current Number of Documents: 76**      **Developing Countries: 24**
- **Major geographic regions missing in Document list:**
  - **All areas represented.**
- **Example Documents:**
  - **Zheng et.al., (2008), "Estimation of Incident Photosynthetically Active Radiation from GOES Visible Imagery", J. of Appl. Meteor. And Climatology, 47, 853-868**
  - **Makkeasorn et.al., (2009), "Seasonal change detection of riparian zones with remote sensing images and genetic programming in a semi-arid watershed", J Environmental Management, 90, 1069-1080**
  - **Rao, M. et.al., (2002). Strategising for the future Indian EO Programme. Acta Astronautica, 51(1-9): 549-557/ (see pdf)**
  - **Cihlar, J. "Land cover mapping of large areas from satellites: status and research priorities." International Journal of Remote Sensing, v. 21 issue 6, 2000, p. 1093-1114.**
  - **Heinz Center, (2006). Filling the Gaps: Priority Data Needs and Key Management Challenges for National Reporting on Ecosystem Condition.**
  - **Bartsch et.al., (2008). "Remote Sensing at high latitudes Observation of hydrological parameters" Regional Science Team Meeting devoted to the High Latitudes of the NEESPI domain, Helsinki, 2nd-6th of June 2008**



# GEO Task US-09-01a

## *Ecosystems SBA: Initial Findings*

### Summarized Parameter List

A list of common parameters tracked in 5 major categories under Ecosystems. Many ecosystem observations become useful only when other key observations are made at the same time. These synoptic dependencies are very important to consider in tracking parameters. Therefore, many of the parameters here, taken from the literature, are derived from observations (e.g., desert is derived from surface reflectance), and many are placeholders for large groups of observations (e.g., hydrology, air sea flux).

#### Atmosphere

- aerosols
- air chemistry
- air sea flux
- air temperature
- atmospheric pressure
- atm. temperature
- black carbon
- CO
- CO2
- O3
- humidity
- methane
- wind velocity
- wind Profile

#### Ocean

- coral reef health
- currents
- fisheries
- ocean color
- sea level
- seabed classification
- red tide
- river discharge
- salinity
- tides
- waves
- water clarity
- sedimentation

#### Land Cover

- albedo
- desert
- drought forecast
- fires
- frozen soil
- impervious surface
- hydrology
- ice velocity
- ice thickness
- groundwater
- lake and reservoir levels
- permafrost
- snow cover
- snow depth
- soil chemistry
- topography
- soil moisture
- soil type

#### Forests

- deforestation
- phenology
- NDVI
- LAI
- evapotranspiration
- PAR/fPAR
- canopy
- canopy chemistry
- nitrogen

#### Biology

- at risk species
- biodiversity
- biomass
- chlorophyll a
- invasive species
- vegetation
- veg. pigments



# Group on Earth Observations

## *Task US-09-01 – Preliminary Results*

### **US-09-01a: Preliminary Results**

### **Climate Societal Benefit Area**



# GEO Task US-09-01a

## *Ecosystems SBA: Advisory Group*

- Advisory Group

**Members:**

- **Ghassem Asrar, World Climate Research Programme**
- **Mitch Goldberg, Chief, Satellite Meteorology and Climatology Division, NOAA/NESDIS**
- **Stephan Bojinski, World Meteorological Organization**
- **K.A. Anaman, Institute of Economic Affairs, Ghana (invited)**
- **G. Flato, Environment Canada**
- **V. Kattsov, Voelkov Main Geophysical Observatory, Russia (invited)**
- **T. Nakajima, University of Tokyo, Japan (invited)**
- **I. Wainer, Universidade de Sao Paulo, Brazil (invited)**
- **Guoxiong Wu, Chinese Academy of Sciences, China (invited)**



# GEO Task US-09-01a

## *Climate SBA: Documents*

### Documents

- **Current Number of Documents: 32**

The documents represent the following categories:

- **High-level International Consensus Documents on Priority Climate Observations**
- **Intergovernmental Panel on Climate Change (IPCC) 2007 Assessment Documents Related to Priority Climate Observations**
- **Post-2007 IPCC Update Documents Related to Priority Climate Observations**
- **Regional Assessment Documents Related to Priority Climate Observations**
- **Relevant Forthcoming Earth Observing Mission Documents**
- **Other Relevant Documents**



# GEO Task US-09-01a

## Climate SBA: Documents

- Documents

- World Meteorological Organization, 2006. Systematic Observation Requirements for Satellite-Based Products for Climate: Supplemental Details to the Satellite-Based Component of the ‘Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC’ (World Meteorological Organization, Geneva, Switzerland) September at <http://ioc3.unesco.org/oopc/documents/background/gcos-107.pdf> (accessed 26 November 2008).
- World Meteorological Organization, 2008. The Space-Based Global Observing System in 2008, Volume I, Satellite Programme Description (GOS-2008), 1 October, at [ftp://ftp.wmo.int/Documents/PublicWeb/sat/DOSSIERGOS-2008\\_Volumes-0-1-2-3-4.zip](ftp://ftp.wmo.int/Documents/PublicWeb/sat/DOSSIERGOS-2008_Volumes-0-1-2-3-4.zip) (accessed 5 April 2009)
- Food and Agricultural Organization, United Nations, 2008. Terrestrial Essential Climate Variables for Climate Change Assessment, Mitigation and Adaptation. (UNFAO, Rome).
- IPCC, 2007a. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- World Meteorological Organization, 2008. “Future Climate Change Research and Observations: GCOS, WCRP and IGBP Learning from the IPCC Fourth Assessment Report,” GCOS-117, WCRP-127, IGBP Report No. 58 (WMO/TD No. 1418), January.
- World Meteorological Organization, 2006. Final Report of the GCOS Regional Workshop Programme GCOS – 111B, WMO/TD No. 1474)
- World Meteorological Organization, 2008. RCOF Review 2008: An International Expert Review Meeting on Regional Climate Outlook Forums (a draft Concept Note, version 1.51, for a meeting in Arusha, Tanzania, 3 – 7 November 2008, hosted by the Tanzanian Meteorological Agency)



# GEO Task US-09-01a

## Climate SBA: Initial Findings

### Priority Climate Variables

Atmospheric Variables		Source Documents
<b>Surface</b>	Air temperature	3,4,5
	Precipitation	3,4
	Air pressure	3,4
	Sea level pressure	3
	Surface radiation budget	3,4,5
	Wind speed and direction	3,4
	Water vapor	3,4
	Evaporation & evapotranspiration	4
<b>Upper Air</b>	Earth radiation budget (incl solar irradiance)	4
	Upper air temperature (incl MSU radiances)	4
	Wind speed and direction	4
	Water vapor	4,5
	Cloud properties	4
<b>Composition</b>	Carbon dioxide	4
	Methane	4
	Ozone	4
	Other long-lived greenhouse gasses	4
	Aerosol properties	4



# GEO Task US-09-01a

## Climate SBA: Initial Findings

### Ocean Variables

<b>Surface</b>	Sea-surface temperature	3,4,5
	Sea-surface salinity	3,4
	Sea level	3,4
	Sea state	3,4
	Sea ice	3,4
	Current	3,4
	Ocean color (for biological activity)	3,4
	Carbon dioxide partial pressure	3,4
	Ocean surface wind & wind stress	4
	Surface air temperature/humidity	4
	Precipitation (fresh water/salinity flux)	4
	Evaporation	4
	Fresh water flux from rivers & ice melt	4
	CO2 flux across air/sea interface	4
	Geothermal heat flux -- ocean bottom	4
<b>Sub-surface</b>	Temperature	3,4
	Salinity	3,4
	Current	3,4
	Nutrients	3,4
	Carbon	3,4
	Ocean tracers	3,4
	Phytoplankton	3,4



# GEO Task US-09-01a

## *Climate SBA: Initial Findings*

### Terrestrial Variables

Snow cover	4, 1a
Glaciers and ice caps	4, 1a
Permafrost and seasonally- adjusted ground	4, 1a
Albedo	4, 1a
Land cover (incl vegetation type)	4, 1a
Fraction of absorbed photo- synthetically active radiation	4, 1a
Leaf area index	4, 1a
Biomass	4, 1a
Land surface temperature	4
Fire disturbance	1a



# Group on Earth Observations

## *Task US-09-01a*

### US-09-01a & CEOS

CEOS volunteered its SBA Leads to be part of the Advisory Groups

CEOS Systems Engineering Office (SEO)

- Interested in products and information from this task
- CEOS/SEO is doing a “thread analysis”

Identifying linkages from decision support tools down through info products, models, measurements, and sensors/platforms

Eventually, this will be a strategic analytic tool to determine what measurements are key to enabling decision making

Wants to incorporate results from US-09-01a

Need information on Visualization/Analysis/Decision Tools, which aligns with one of the activities in Activity Plan



### **Resources to Support Task & Analysts**

- Website: <http://sbageotask.larc.nasa.gov/>
  - Analysts contact information
  - Lists of documents
  - Lists of Advisory Groups
  - Task overview & descriptive
- Email Address: `geo-task-us-0901@lists.nasa.gov`



# Back-up Slides



# Group on Earth Observations

## Task US-09-01

### Task Guidelines:

- Harvest information expressed in existing, publicly-available documents; avoid duplication of efforts of GEO Members & Participating Organizations
- Task must be conducted in a way so the completed product will be credible and acceptable to GEO Members & Participating Organizations
- Representative of GEO Members (regions, developed/developing countries)
- Documents need to span a range of User-Types
- Focus is more on the “demand” side of Earth observations
- Focus is on “observation priorities” – *not* “user requirements”



# Group on Earth Observations

## Task US-09-01

### *Current & Future States of Critical Earth Observation Priorities*

Critical Earth Observation Priorities		Currently Available	
		Yes	No
Available in Future	Planned	Good situation	In waiting
	No Plan	Possible crisis	Major gap