

# Revised Thursday PM session



- ◆ 3:00 Discussion of mission planning and instrument considerations
- ◆ 3:45 Status of STM and near-term needs for Level-1 requirements
- ◆ 4:00 til Adjourn: Discussion of priorities for future work

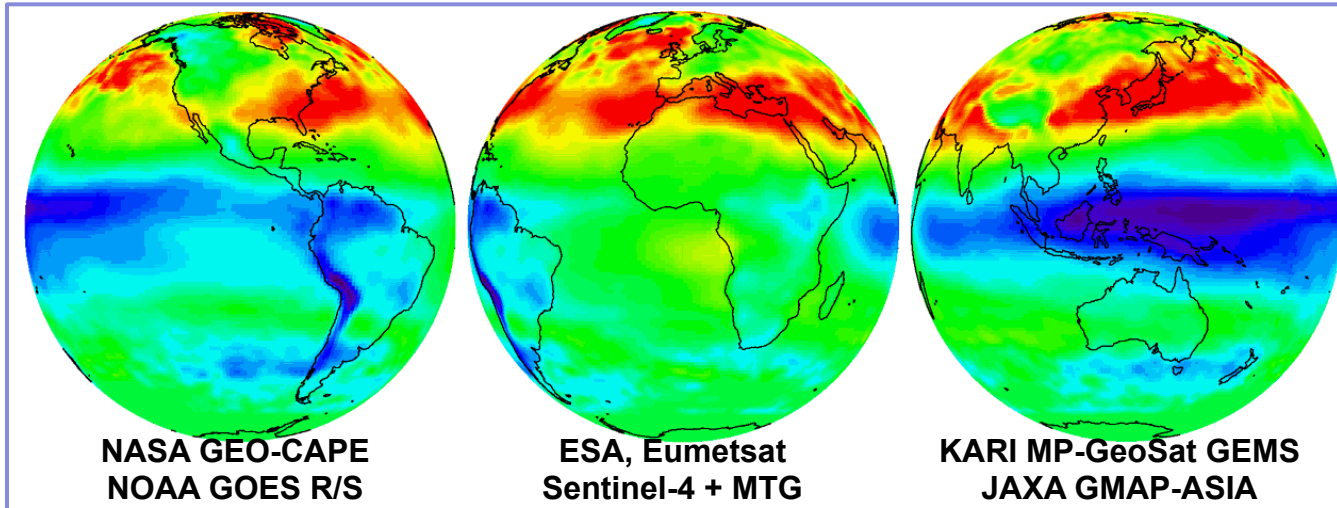
# Workshop Charge



- ◆ Identify strategy for defining “minimally acceptable scientifically viable mission”
  - *You won't solve it this week, but define your process and studies needed to answer it by the end of FY12*
  - ***Descope options, as summarized Wednesday morning, OK for now.***
- ◆ Summarize recent accomplishments for input into workshop report
- ◆ Identify any reasons to not separate the atmosphere and ocean components
  - *Eliminate co-dependent instrument **requirements** while identifying benefits to be **demonstrated** when observations do overlap*
- ◆ Roadmap: identify specific priorities for both near-term (within next 2 years) and longer term science and mission studies
  - *Express/refine minimum desired overlap criteria*
  - *Define draft data products and latencies*
  - *Develop draft survey metrics for science value assessment*
    - We can express what measurement capabilities might be provided, need to progress toward valuing them. Ask **how** the draft products would be used.
- ◆ Time permitting, develop draft mission success criteria
  - *Should correlate with threshold science requirements*

# A Geostationary Air Quality Constellation

[http://www.ceos.org/images/ACC/AC\\_Geo\\_Position\\_Paper\\_v4.pdf](http://www.ceos.org/images/ACC/AC_Geo_Position_Paper_v4.pdf)



- ◆ Geostationary orbit offers the potential for “continuous” (many times per day) observation within the satellite field of view
- ◆ Harmonization of planned geostationary missions for air quality, along with planned low-Earth orbit continuity missions, will enable an integrated global observing system fulfilling the visions of GEO/GEOSS
- ◆ Help address over-arching policy relevant science questions posed by the Hemispheric Transport of Air Pollution report (2007), particularly including the following:
  - *For each region in the Northern Hemisphere, can we define source/receptor relationships and the influence of intercontinental transport on the exceedance of established standards or policy objectives for the pollutants of interest?*
  - *How will changes in emissions in each of the other countries in the Hemisphere change pollutant concentrations or deposition levels and the exceedance of established standards or policy objectives for the pollutants of interest?*

# Geostationary AQ mission parameters (draft, 9/2010)



	Europe Sentinel 4	USA GEO-CAPE	Korea GEMS	Japan GMAP-Asia
Launch	2018	~2020	2018	~2017
Status	Industry Phase B1 started early 2010	Pre Phase-A	MP-GEOSAT funding approved 12/2010	Mission Definition Review 12/2009
Domain	Europe and surrounding	Contiguous US and surrounding	Asia-Pacific	Japan and East China (4000 km×4000 km)
Resolution	8km x 8km at 40N, revisit 1hr	8km x 8km (AOD 2km) at 40N, revisit 1hr	5km x 15km, revisit 1hr	10km, revisit 1hr
Payload	UV-Vis-NIR 305-500, 750-775	UV-Vis/UV-TIR (tbd), 2.3+4.6 micron	UV-Vis (tbd)	UV-Vis, 310-600 nm
Species	O3, NO2, SO2, HCHO, AAI, AOD, height-resolved aerosol	O3, NO2, SO2, HCHO, AOD, CO (CO & O3 with 2 vertical DOF)	O3, NO2, SO2, AOD	O3, NO2, (SO2, HCHO, AOD)
Notes	Includes meteo mission. Use MTG-S TIR (sensitivity to large O3 and CO events); synergy with met. imager w.r.t. aerosol/PM	Includes ocean color mission. Baseline mission to include additional species CH4, NH3, AAOD, AI, AOCH; requires TIR	Includes meteo and ocean color missions. Optional accommodation for small IR instrument (CO, CO2, CH4)	Includes meteo mission. Hyperspectral TIR FTS: O3, CO, HNO3



## (1) What will be achieved from the current system

### 2.6 Constellation products

- ◆ Flight of these missions, along with expected operational meteorological missions such as the GOES-R series, will allow common air quality products to be produced around the globe.
  - *The combination of FCI on MTG and ABI on GOES-R and MP-GEOSAT will allow continued production of the products listed in Table 3 over both Northern and Southern Hemispheres*
  - *Based on current specifications (Table 2), UV-Vis data from Sentinel-4, GMAP-ASIA, GEMS, and Geo-CAPE will allow a set of common products to be produced over the industrialized Northern Hemisphere: tropospheric column O<sub>3</sub>, NO<sub>2</sub>, HCHO, and SO<sub>2</sub> at ~8 km spatial resolution and 1 hour temporal frequency.*
  - *Aerosol detection in the UV will allow absorbing aerosols to be distinguished from total AOD, significantly complementing information available from the meteorological imagers. This will provide some information on aerosol speciation and will be relevant to the air quality/ climate interface associated with aerosol radiative forcing.*

**One criterion for GEO-CAPE minimum mission: comparable to GEMS and S-4. But we don't want to go there unless forced to.**



### 2.6 Constellation products

- ◆ Additional constellation products could be produced given specific developments over each region
  - *Addition of CO to at least one of the Asian platforms (presently under consideration) would potentially allow production of a common CO product.*
  - *A lowermost troposphere O3 product, exploiting multispectral retrievals combining UV, IR, and perhaps visible wavelengths, is a candidate product. This product is planned for Geo-CAPE, possible over Asia if GMAP-ASIA implements its TIR FTS concept, and possible over Europe with combination of data from Sentinel-4 and IRS.*
  - *In the case of both the CO and lowermost troposphere O3 products, additional instrumentation is likely required over Europe, as IRS is not optimized to provide sensitivity for trace gases.*
  - *Depending on which implementation options are selected for Geo-CAPE and GMAP-ASIA, a common thermodynamic profiling capability may be available. IRS will provide this over Europe and it would also be available over Asia and the US if the respective TIR concepts are selected.*

**GEO-CAPE baseline mission supports all these products.**

# Level-1 Requirements



- ◆ Specific needs for Level-1 Requirements Document: only a few more things needed for now
  - *Define data products and latencies*
  - *Overlap/coincidence criteria: is there value in relaxing CO coincidence requirement?*
  - *Ancillary data*
    - Cloud detection requirements and approach for gases and aerosols
    - Other GOES products? (fire detections, clouds for photolysis constraints)
    - Temperature & water vapor profiles? Cloud track winds?
  - *Units for O3 precisions (partial columns? vmr?)*

# Next Steps and Issues (2)



- ◆ GEO-CAPE has not been accelerated because of certain **perceptions**, which are barriers. Are these perceptions accurate, can we alter them?
  - *It's a monolith. Big and expensive.*
  - *Benefit, or urgency, is not as high as other missions (perhaps because its role in an integrated National plan has not yet been **embraced**?)*
    - How is GEO-CAPE part of a system? What else is impacted if it is delayed?
    - E.g., Climate Initiative expresses how pieces fit together for carbon cycle, water
    - There are drafts; current CEOS ACC and IOCCG white papers latest in a series
- ◆ We are working on the cost/risk aspect (instrument size, hosted payloads)
  - *There are issues to be resolved to allow splitting (and make it make sense)*
- ◆ We have so far been working on the benefit aspect in terms of capability
  - *Assessing value (capability vs. cost) is the next step, e.g. Value Matrix*



# Talking points



- ◆ Is there a constituency demanding these observations? Continue to work with user communities to assess value of candidate observations. Generate excitement!
  - *Overheard this week:*
    - “OMI NO<sub>2</sub> is great but only a snapshot. I’d love to see several per day.”
    - “The biggest need for O<sub>3</sub> is distinction between transported and local.”
    - It makes a difference to EPA to hear us talking about how we’re trying to lower the mission cost. Their budgets are shrinking, so lowering the cost of integrated monitoring is appealing.
  - *What will the data products from GEOCAPE look like? A template is GOES-R AQ proving ground. Put a days’ worth of simulated data in the hands of AQ practitioners and let them evaluate utility. A way to tangibly communicate potential value to AQ Agency management (national, state, local) – creating more demand for the mission.*
  - *Regarding trop O<sub>3</sub> vertical content and value of hourly observations: undemonstrated value of convolving with hourly high resolution wind info? (OSE study?)*
  - *GEO-CAPE and the NOAA GOES sounder gap*
    - Advocacy from a segment of NOAA and its users would likely be stronger if GEO-CAPE included sounding capability (IR temperature and H<sub>2</sub>O profiles). But: this is a clear creep in GEO-CAPE requirements that we should not take on. Is there value in expressing that T & q might be demonstrated as research products?  
**(NOT a requirement, we don’t promise to do them.)**