Building the Pathway from TEMPO to GeoXO

Joint Science Meeting for TEMPO, GeoXO ACX, & TOLNet

May 1-5, 2023

Huntsville, AL

Session I: TEMPO Green Paper Experiments Panel

Moderator: Aaron Naeger

NASA / University of Alabama in Huntsville

U.S. Government sponsorship acknowledged.

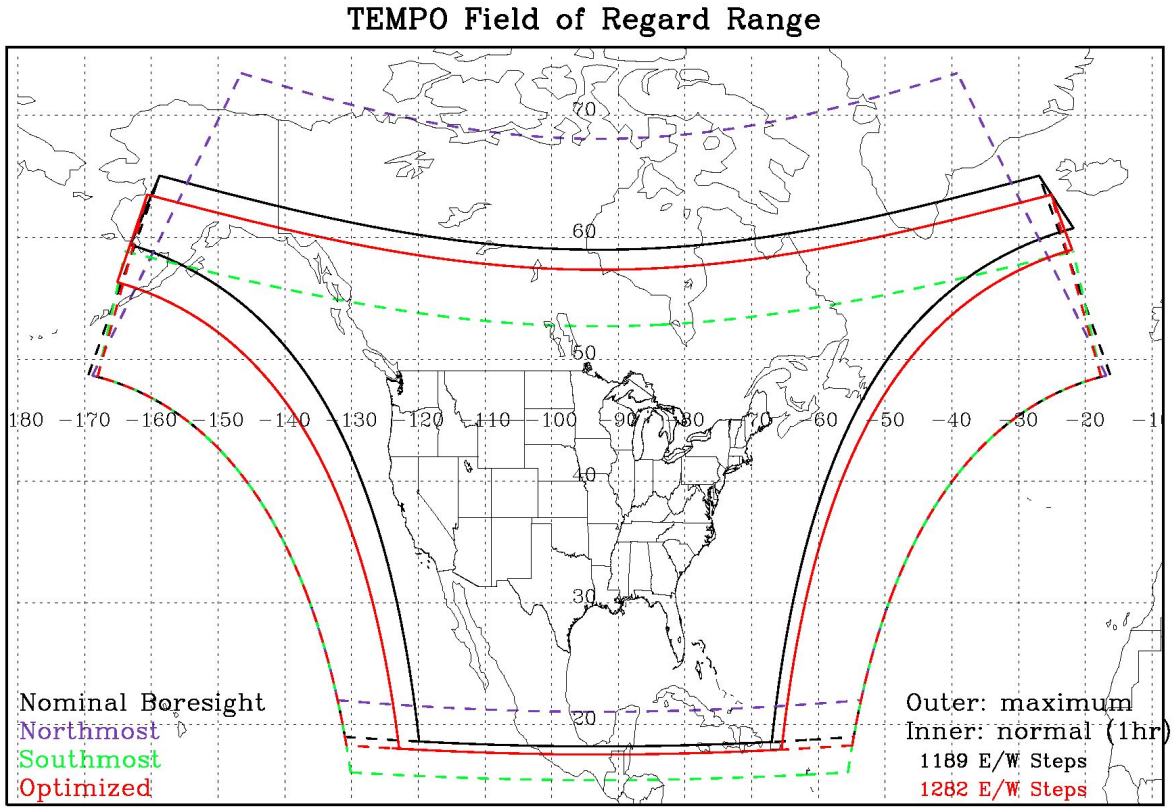
Panelists

- John Houck (SAO)
- Raid Suleiman (SAO)
- Xiong Liu (SAO)
- Barry Lefer (NASA)
- Laura Judd (NASA)
- David Flittner (NASA)
- Michael Newchurch (UAH)

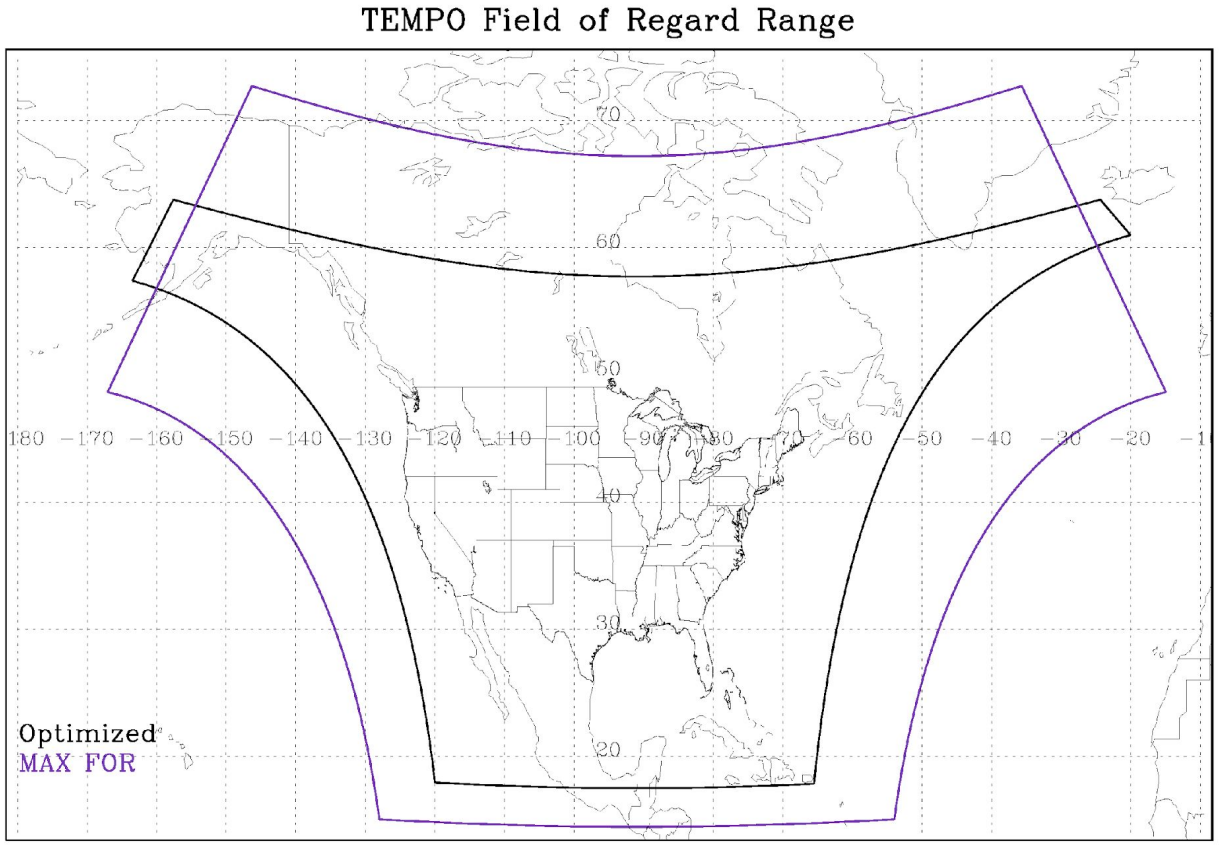
Panel Questions

- How quickly can we implement the special operations mode after notice of a special event?
- How can we best notify and inform the experimenters and users on the timing and location of the special operations?
- When can we start to implement the special operations during the commissioning phase?
- What is the trade space between the nominal and special operations?
  - How can we minimize the impact of the special operations on the nominal operations and broader user community?
- What is the potential of extending the special operation scans further south or north outside of the nominal Field of Regard?
- What are the data distribution plans for special operations data?
  - Will we produce both offline and near real-time products for the special operations mode?
  - Will level 3 products be generated for the special operations mode?
  - What additional resources and tools can be developed for enhancing the use of special operation data?

What is the potential of extending the special operation scans further south or north outside of the nominal Field of Regard?



** Latest updated map showing Field of Regard range for Max FOR **



How quickly can we implement the special operations mode after notice of a special event?

Implementation requires the following steps:

1. Receive specification of approved special scans
2. Prepare to build instrument command load (CL)
   - generate scan sequence with absolute time tags
   - incorporate current spacecraft maneuver schedule
3. Generate CL
4. Validate CL
5. Uplink CL to IS-40e
6. Push CL to TEMPO
   - *must happen before the first scheduled command time*

- Requires ~3-4 hours under ideal conditions[a]
- Response in $\ll 3$ hours is unrealistic/risky

[a] Ideal conditions:

- Scan sequence can be generated quickly
  - existing planning software is adequate
  - no complicated/unanticipated configuration
- No complications generating command load
  - e.g., resulting command load fits in instrument memory
- Command load can be validated quickly (~1 hour)
  - Trained operations staff are on-site
  - Instrument simulator hardware cooperates
  - Few or no new command blocks to validate
- No IS-40e activity preempts TEMPO commanding
- Minimize command load uplink time
  - Uplink to spacecraft may take ~1 hour
  - Intelsat handles push time notice < 75 min as best-effort.

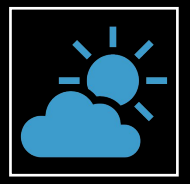
What is the trade space between the nominal and special operations?

Goal: minimize the impact of the special operations on the nominal operations and broader user community

Scrutinize the need:

Is sub-hourly required to answer the science question?

- → More data = more complex analysis
- → Take advantage of times where sub-hourly is routine.



Forecast:

Is this the best day to do this?

- → Minimize need to repeat
- → Clouds, fires, etc.
- → Can it be done when it's a non-AQ day elsewhere?
- → Consider metrics on a weekly time basis

Accountability:

Will requesters follow through?

- → Public blog posting daily status of TEMPO ops?
- → Balance in times you do that type of experiment with normal operations