

Minutes from the MLT meeting at NASA Goddard, April 25th, 2019

tirsdag 30. april 2019 08:04

Grand Challenge MLT



Participants:

Kolbjørn Blix, Andøya Space Centre
Prof. Jøran Moen, University of Oslo
Robert Pfaff, NASA GSFC / Sounding Rocket Project Scientist
Libby West, NASA GSFC / WFF / Sounding Rocket Program Office
Doug Rowland, NASA GSFC
+ other interested members of the GSFC Heliophysics Division

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Agenda

NASA GSFC Building 21, Room 244 (will move to the Building 21 Library if more people want to participate)
930 AM – 11 AM

science motivation and logistics

identification of some of the critical science topics / focus areas –
(e.g., GWs? NLCs/PMSEs? lower atmosphere forcing of the upper atmosphere? to what extent do we include lower ionosphere?)

discussion of existing technologies for studying MLT region
discussion of logistics – which launch ranges / platforms are ideal?
(consider latitude / phenomena, ground-based assets, etc.)

what roles for balloons, aircraft, etc.?
discussion of schedule – when might this fit in best with other plans /
constraints?

NASA GSFC Building 21, Room 183A
11 AM – 12 noon

special seminar (during the normally scheduled ITM and Coupling Science Discussion Forum)

see below for abstract

this is a good way to expose the GCI – MLT to a larger group who can come and listen and share information and ideas

NASA GSFC Building 21 Cafeteria

12 noon – 100 PM

lunch

NASA GSFC Building 21, Room 244

100 PM – 300 PM

science motivation -- additional brainstorming and discussion

here we can talk about ideas for detailed studies that may be possible with the GCI-MLT

NASA GSFC Building 21, Room 244

300 PM – 330 PM

wrapup and future plans / actions

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Morning Session

- Mesosphere Lower Thermosphere
 - Brainstorming for the ESA PAC discussion
 - Knowledge gap 50km - 150 km
 - Room for balloons and aircraft alongside the rocket payloads
 - The recently did launch a summer balloon from Esrange that imaged Noctilucent Clouds
 - Problem with UV on balloons is you have to look through the absorption layer
 - Perhaps a concerted effort between rockets balloons and aircraft - release ROSES proposals for all three platforms to support the GCI - MLT
 - Should we open up the science to also the lower E-region ionosphere - since it couples with the MLT
 - Question - high latitude focus only, or try to add in other latitudes
 - Main focus in Europe will most likely be the high latitude regions - that's where their infrastructure is located.
 - Kolbjorn thinks the ESA PAC and AGU meetings will be an important meeting to discuss the GCI-MLT, to get the word out. Use GCI as an example - present the data of the success of the GCI
- **Proposed agenda for ESA-PAC GCI MLT ESA-PAC meeting** (*Kolbjørn sends out invitations*)
 - Present background
 - Use GCI CUSP as example
 - Invite to a real project, not create it at ESA-PAC
 - Present preliminary topics and time line for GCI MLT
 - Short presentations from interested parties on topics, plans, timelines
 - Form group of Pis
 - How to proceede/ tasks
 - Next meeting (AGU 2019)
 - A possible 2022 UiT Maxi Dusty 2, plus Lehmacher VORTEX mission in 2022 could be precursors and/or anchors to the Initiative
 - Inter-hemispheric coupling - balloon program goes to Antarctica every year - could be a tie in the science gathering

- **Science Topics High Latitude**
 - Meteor/Smoke
 - NLC PMSE
 - GW Propagation/Evolution
 - Ionospheric Coupling/Ion-Neutral
 - Ozone/NO_x - particle precipitation
 - Interhemispheric Coupling
 - Turbulence
 - Tidal/PW/Stratwarm
 - Atmospheric Chemistry/Photo Chemistry/Sample Return
- **Science Topics Mid/Low Latitude**
 - Meteor/Smoke
 - GW Propagation/Evolution
 - Ionospheric Coupling/Ion-Neutral
 - Lightning/High Altitude Discharges
 - Turbulence
 - Tidal/PW/Stratwarm
- **Technology**
 - Falling Sphere
 - 4-D In Situ
 - Chemical Release
 - Maynard Sphere
 - Bobs
 - Ampules
 - Miniature Instruments - Ion Neutral Mass Spectrometer, ESAs
 - Advanced Raleigh/Sodium Lidars (on balloons)
 - Meteor Radars
 - Cone
 - Clemmons Lidar
 - Measuring chaff decent
- **Platforms**
 - Rockets
 - Rockets with High Altitude Parachutes
 - Balloons
 - Aircraft
 - UAV (perhaps for thunderstorm studies)
 - Ground based
- **Potential Observation Sites**
 - ASC - Andoya and Svalbard
 - Esrange
 - Antarctica
 - WFF
 - Kwajalein
- **Institutions**
 - Andøya Space Center, Norway
 - UiO, Norway
 - NASA GSFC, USA
 - IAP, Germany
 - DLR, Germany
 - UiT (Tromsø), Norway
 - MISU (Stockholm), Sweden
 - U of Saskatchewan, Canada
 - Clemson U, USA
 - U of Alaska F, USA
 - Colorado U, USA
 - Washington - Holzworth
 - ISAS (Japan) - Takumi Abe
 - U of Nagoya, Japan

- U of Kyoto, Japan
- NRL, USA
- U LEEDS, UK
- GATS, USA
- ASTRA, USA
- NTNU, Norway
- UiB, Norway
- UNIS, Svalbard, Norway
- Polar Geophysical Institute, Murmansk
- Embry Riddle
- U of New Hamp., USA
- Aerospace Corp, USA
- Utah State Uni, USA
- **Other assets**
 - Arecibo
 - ICON/GOLD
 - AIM
 - TIMED
 - COSMIC-2
 - AURA? May or may not still be available
 - MARSY
 - Alomar
 - NPP/SUOMI?
 - Sentinel-5
 - ALTAIR?
 - ACE/FTS - K Walker

Talk to Hq around AGU time in Dec.

Ruth, Liz, Rob to CEDAR. Spread the GCI MLT word

Seminar - Norwegian Arctic University: University of Tromso, University of Oslo and Andøya Space Center

- **Joran**
 - Why initiate another Grand Challenge - a single rocket project opens more questions than answers. Engage a larger space community to share data and ideas. Improve Modeling with larger data sets than just a single rocket.
 - GCI - 11 science rockets with different trajectories/altitudes to provide large data set to improve modeling
 - GCI - MLT - 50 - 150 km vertical coupling of the Earth Atmospheres. Is a bottleneck for space physics vital contribution to Earth system modeling.
 - U Tromso - specializing on Meteoric Smoke Particles (MSPs)
 - U Oslo - Focus on turbulent coupling between neutral and ionized part of the atmosphere, role of dust component
 - The RockSat-X G-Chaser mission was able to measure dust (or smoke - I didn't capture this part) particles that hadn't been seen before
 - Norway is lacking ear-marked funding for a Rocket Program. Funding available by the 2021 period for a launch in the 23/34 launch season. They plan to apply for 3 rockets from Andøya and 2 Rockets from Svalbard for the GCI-MLT
- **Kolbjorn**
 - Fall 2018 - launched their first hybrid launch. This was the NAMMO developed hybrid. Made it to 100km with 70kg payload. Was used as single stage. However, it was developed for second stage. 40 second burn time - so it ends up too far down range. NAMMO working to reduce burn time.
 - GCI-Cusp - have launched 8 of the 12 rockets. All successful.

- G-CHASER - discussion
- ICI-5 should be ready to go to Sval in October 2019
- Esrange Andoya Special Project (EASP), France, Germany, Switzerland, Norway, and Sweden. GCI-MLT is a way to provide motivation to keep the EASP in place.
- Kolbjørn propose a GCI MLT student rocket as follow-up to GCI CUSP G-CHASER:
 - GHOST - Grand Challenge Mesosphere Student rocket
- Hotel Payload to eject CubeSats (ASC CubeSat eject pod) Kolbjørn's team is working on development.
- ALOMAR discussion: Lidars, Radars (MAARSY, Saura FF, SkyMET), Imaging photometers, spectrometers
- Andoya Spaceport - started as wanting to launch cubesats below the space station - but now looking at launching 1 ton payload capacity. They are talking with US motor manufacturer who would build motors in Andoya

Afternoon Session

- What time of year?
 - Most likely both summer and winter. PMWE is a winter event
- Rocket Launch Seasons
 - Poker - Nov - March (maybe April)
 - NyAlesund - Nov-March (maybe April)
 - Kiruna - No summer launches
 - Andoya - year round
 - WFF - year round
 - Kwaj - year round?
- What is the biggest multi mission in Kwaj that we can support?
- Lots of discussion about lightning research. Florida is the best place to study.
- Gravity wave dynamics and evolution - using sodium Lidar. Breakdown of Gravity waves may cause sprites.
- Meteor Smoke - composition. Could be a great international collaboration. UiT, CU, GSFC, DLR, etc
- Particle precipitation (EPP) - descent of NOx precipitation. Measure the velocity of descent rate. Could possibly be studied by a Lidar on a balloon.
- PMC group called Project Opossum - talking about doing some commercial experiments. A citizen science group.
- How high do organics reach? Puerto Rico looked at this question on G-Chaser. UV fluorimetry could be used to determine the presence.
- GSFC curious about adding some technologies on SubTEC
- Traveling Ionospheric Disturbances (TIDs) - typically measured from ground based instrumentation. There is only one paper for in-situ measurements.
- Conductivity and current closure in the region.
- Visible imaging along with sample returns from captured smoke particles.
- Optical observations from DoD - there must be a big incidental database with information.
- CEDAR - Ruth, Liz, and Rob will be attending.
- Like with GCI CUSP we'll stick to using CEDAR and AGU Fall Meeting as regular meeting points. There may be some PIs that don't want to share their ideas because they are in the process of proposing.
- GC-Cusp - data results presented will show how the open sharing of data can be successful - pathfinder to continued sharing.