



SWC REPORT

Presented at the HPAC Meeting on Sept. 22, 2022

Angelos Vourlidas on behalf of the SWC



NASA SPACE WEATHER CHAIR



- Dr. Pat Doherty (the Chair of SWC) passed unexpectedly on July 14, 2022
- We are deeply saddened by the loss of an excellent scientist and leader in the field of Space Weather research. Our condolences to her family, friends and colleagues

RECOMMENDATION ON SPACE WEATHER COUNCIL ACTIONS AND DIRECTIONS (2 OF 2)

The HPAC recommends the following actions for the SWC:

1. SWC is advised to research the activities of SWARM and SWAG, identify overlaps and gaps, and determine how SWC can complement and leverage ongoing efforts, with specific relevance to the interests of the NASA Heliophysics Division. This may include researching reports on the committee websites; attending their public meetings; organizing a meeting of committee chairs and staff; and defining how the role of the SWC can complement the work of these existing committees.
2. Of specific interest to the HPD and HPAC is an analysis of the gaps in space weather fundamental science, modeling and impacts. Gap analysis studies have been performed by different agencies within the last decade, and a summary review of this material is of importance for HPD future plans. Specifically, the HPD supports development of a range of instruments at different technology readiness levels. Up-to-date understanding of knowledge gaps will assure that HPD can make an informed decision in prioritizing development of certain technologies, instruments, and models.
3. The SWC is advised to address the NASA's ARTEMIS and space biology programs to determine the potential to extend our knowledge with lunar focused space weather measurements and studies.
4. The SWC is advised to work on the development of specific suggestions for interagency NASA-NOAA-NSF-DoD cooperation in order to maximize return on investment in research infrastructure supported by agencies. Specific examples include development of suggestions about better coordination between NASA and NOAA supported space-based instruments and NSF-supported ground-based infrastructure, data fusion from multiple instruments, data assimilation efforts, etc.

SWC ACTIVITY SUMMARY

- SWC held two meetings so far
 - March 2 (telecon): ‘Meet and Greet’; discussions w/ HPD leadership regarding the remit of SWC; brainstorming. Details are given in the meeting notes compiled by J. Woodroffe.
 - August 24 (hybrid at HQ): First in-person meeting. Main topic of discussion were the HPAC requests to the SWC, which are discussed in the rest of the presentation. The meeting notes will be available soon.

SWC ACTIVITY SUMMARY (A FEW KEY POINTS)

- The Decadal Survey process is too slow for the NASA SWx needs.
 - Artemis is on its way and astronauts will follow. But the forecasting of 'Cis-lunar Weather' (or the radiation belts) is not robust enough to meet safety requirements. NASA needs to move quickly to close the science and operational gaps in the next 5 years or so.
 - There has to be a mechanism to get things moving sooner.
 - 'sprint'-like weeklong meetings to solve a gap (a SWx Institute in the vein of LWS institutes)
- We need to take the 'message' to the users
 - Engage/educate industry on what NASA can do to meet their SWx needs. Be proactive and go to the users (i.e., industry meetings). This includes engaging more with HEOMD
- Re-evaluate the economic impacts of SWx (2008 NASEM study) to provide a fresh picture to policy makers. Several studies have been done abroad since 2008. If a NASEM follow-on workshop is not possible, we should at least consider an analysis of the existing studies. It should be done asap.

The Role of the SWC Relative to Other SW Advisory Bodies

- The chairs of SWAG [Dickinson/Meehan] and Space Weather Roundtable (SWR) [Gibson/Crowley] were invited at the SWC Aug meeting to discuss the roles and current efforts of their committees.
 - It was decided to hold a follow-on meeting among the SRAG-SWR-SWC chairs to further clarify roles and responsibilities. The meeting was held (telecon) on Sep 12. The following slides summarize the results of the discussion so far.
 - It was decided to hold regular coordination meetings at a quarterly cadence, to roughly precede SWORM and HPAC meetings.
 - The SWC discussed ways to describe the roles of the various groups to the wider user community. Some ideas are short articles in specialized publications, op-ed articles (e.g., in Space News) or white papers. Dr. Woodroffe has initiated a draft document describing the relative responsibilities of the three groups. A short 1-page version could be published in Space News and other publications in order to encourage readers to think about where the nation is heading with SWx needs. First priority is to articulate the SWC activities/responsibilities to the wider community.

SWAG and Roundtable

SWAG

Members: academic, commercial, nongovernment end users

Advises SWORM on:

- Facilitating advances in the space weather enterprise of the US
- Enabling the coordination and facilitation of R2O2R
- Improving the ability of the US to prepare for, mitigate, respond to, and recover from space weather phenomena
- Developing and implementing integrated strategy

Current Efforts:

- Conduct user needs survey
- Provide input National Space Weather Strategy

SWR

Members: academic, commercial, government (SWORM NSF, NOAA, and NASA ex-officio members - sponsors)

Two SWAG members

One SWC member

Facilitate communication and knowledge transfer among government (SWORM), academic and commercial space weather communities to:

- Facilitate advances in space weather prediction and forecasting;
- Increase coordination of space weather R2O2R;
- Improve preparedness for potential space weather phenomena

SWAG and SWC

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SWC

Members: academic, commercial, government

No overlap in membership with SWAG

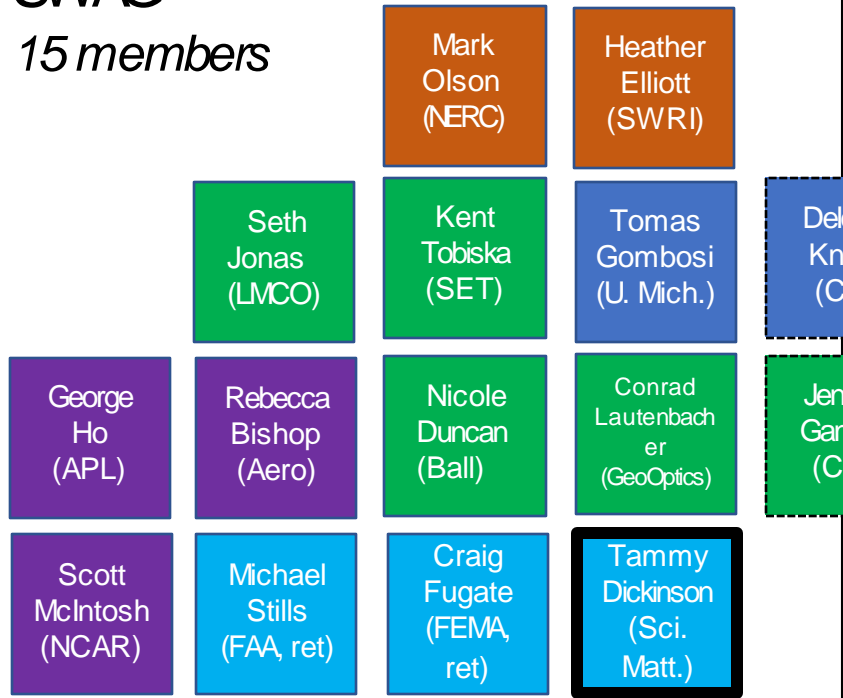
OneSWR member

Advises NASA via HPAC:

- Interdisciplinary forum for soliciting and coordinating community analysis and input and providing advice

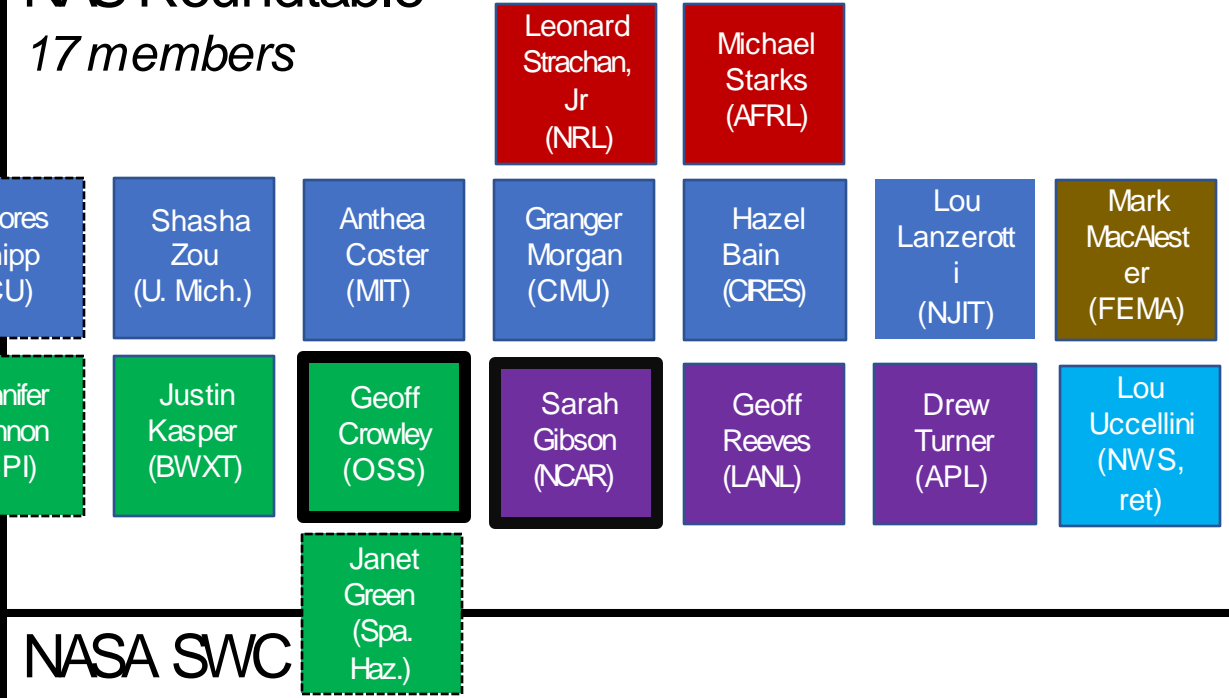
SWAG

15 members



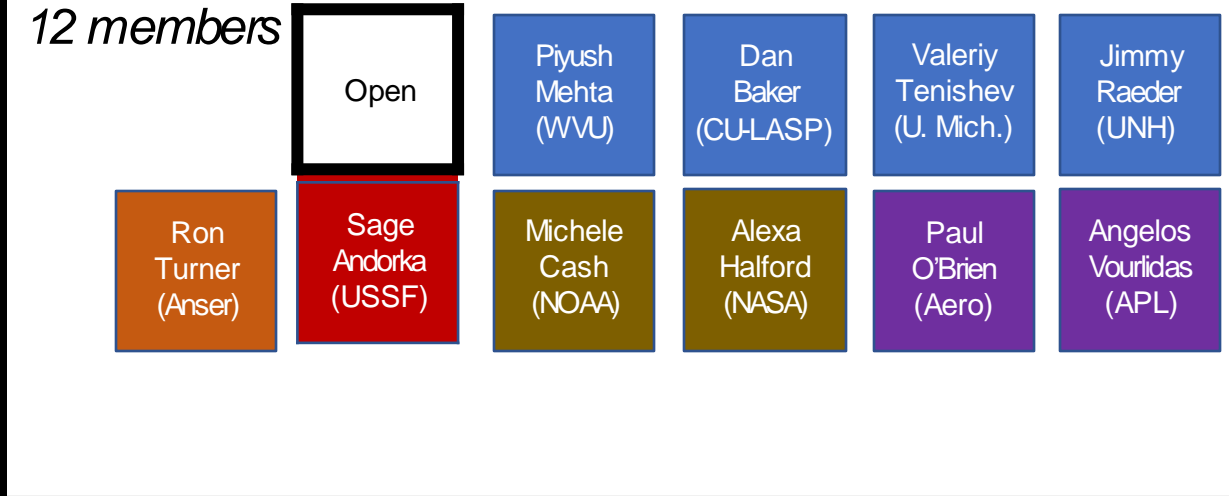
NAS Roundtable

17 members

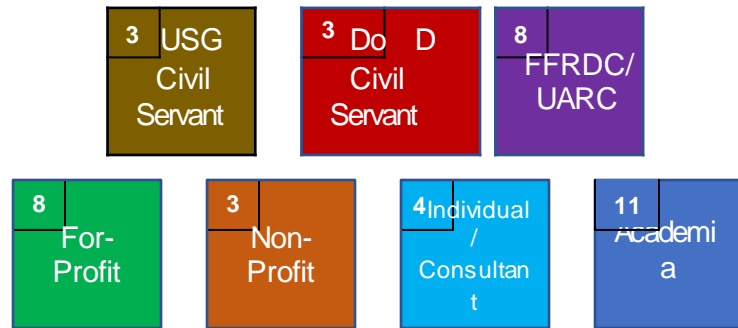


NASA SWC

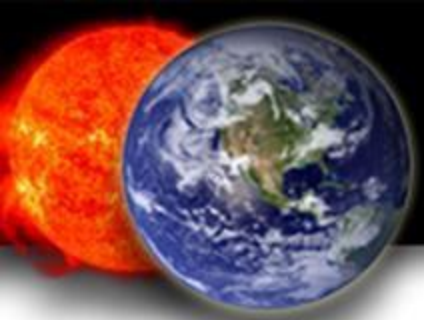
12 members



INSTITUTION TYPES



A dashed outline indicates membership in multiple groups
 A thick solid outline indicates chair or co-chair of a particular group



Collaboration and Coordination

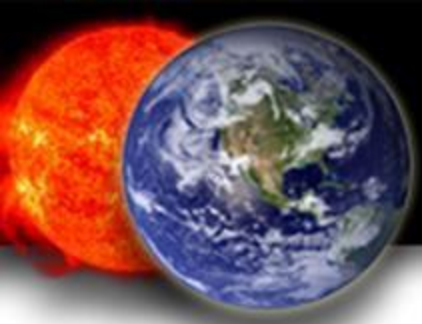
Collaboration and coordination will be key

- Talking to the community
- Created invite list for SWAG meetings to include Roundtable and SWC chair/members
- Coordination meetings between SWAG, Roundtable, and SWC chairs and staff



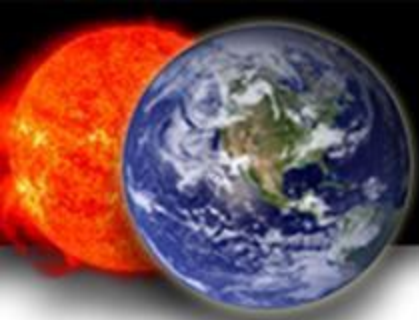
We are all working towards one common goal: to prepare and protect against the social and economic impacts of space weather phenomena.

from T. Dickinson presentation to the SEESAW mtg on 09/13/22



Chairs Coordination Call

- Excellent discussion on the unique roles of the committees
 - SWAG – Congressionally mandated, advisory to SWORM (i.e. interagency), write reports, address issues in PROSWIFT or asked for by SWORM or self-generated, members are representatives
 - Roundtable – Congressionally mandated, venue for communication and discussion, not advisory, few or no reports, outside-the-box thinking, long view of issues, can address topics that may fall through the cracks in other groups/venues, members are representatives
 - Council – Advisory to NASA via the HPAC, mostly NASA-specific issues, can write reports if needed, members are special government employees



Transparency

- Various committees/groups are working to find their niche/swim lane
- Help the community understand the role of each group
- Coordination and collaboration important
- Strive for as much transparency and inclusiveness as possible given charters and applicable laws
 - Notices of meetings – Dr. Dickinson to notify all the members of the SWC and SWR of upcoming SWAG meetings.
 - Posting of draft agendas and zoom information as early as possible
- Regular updates at each other's meetings

GAP ANALYSES

- Vourlidas presented a summary of the NASA Gap Analysis Report
- Baker presented an overview of two NASEM workshops on Planning the Future Space Weather Operations and Research Infrastructure
- The analyses focused on measurements and infrastructure gaps. Modeling, including data ingestion issues, have not been studied in detail.
- Most of the science gaps have been identified. What is missing is to move ahead with the implementation.
- Targeted analyses, e.g. cislunar radiation environment, are also missing.
 - The SWC is proposing a Gap analysis focused on the cis-lunar radiation environment, that takes a comprehensive look into the infrastructure, observations, and modeling gaps.
 - In addition (in parallel?), SWC suggests to pick a specific measurement gap and investigate how best to close it. A particularly relevant example is an L4 monitor in support of cis-lunar radiation forecasting. The SWC could do a cost-benefit analysis of the impact on forecasting from such a monitor and determine what is needed to move forward. This is a good case for working with SWR, as well.

SYNERGIES WITH ARTEMIS & SPACE BIOLOGY PROGRAMS

- Members of the SWC met with the M2M office (Dr. Collado-Vega and her team) and SRAG (Dr. Semones) to discuss ways that SWC can help them in their support of human exploration in deep-space.
 - The M2M-SRAG coordination is proceeding successfully. The Artemis-I launch provides an excellent opportunity to debug operational protocols and procedures and train the new cohort of analysts in the recently-established M2M office.
 - Being the clearinghouse for SW information across NASA, M2M's workload is rapidly increasing. The approaching solar maximum, combined with more Artemis launches and an increasing awareness of SW effects from non-HPD mission teams, will only increase that pressure on M2M. It is important, therefore, that M2M workforce needs continue to be supported by the Agency
 - M2M analysts find that the currently available imagery and in-situ data is inadequate for providing robust predictions of the cislunar radiation environment. The SWC suggested, and M2M agreed, that a comprehensive gap analysis across the full workflow for SEP predictions should be undertaken asap.

SYNERGIES WITH ARTEMIS & SPACE BIOLOGY PROGRAMS (M2M)

- The upcoming Artemis I offers an opportunity to test warning protocols for astronaut protection but it does not include testing of any SEP scenarios, in lieu of an actual SEP event occurring during the mission
 - SWC suggest to HPAC to consider a cislunar radiation tabletop exercise (TTX) involving M2M, SRAG and other stakeholders. The TTX could be run in parallel to the radiation Gap Analysis proposed above.
- Non-HPD missions rarely consider SWx effects during their development or operations. Yet, they increasingly turn to M2M for help in anomaly attribution without providing the necessary funding to cover those efforts. This is an unsustainable model in the long run, so provisions need to be made, across SMD, to properly support this important work

SYNERGIES WITH ARTEMIS & SPACE BIOLOGY PROGRAMS (SRAG)

- Continuing support for M2M and CCMC is essential to SRAG operations
- SRAG is currently responsible for astronaut safety for the lunar missions. It is unclear, however, who takes responsibility once crewed missions begin
 - Is this a topic that SWC should discuss w/ SWAG?
- There are no planned experiments on the lunar surface currently.
 - SWC could investigate such experiments that benefit both research and ops. The Heliophysics Science and the Moon report is a starting point
 - But, current funding horizon is only 3 years and based on the landing schedule