

DTC Science Advisory Board 2020 Report

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Meeting Dates: Sep. 30 and Oct. 2, 2020
(with additional online presentations and recorded materials)

Overview

Due to COVID-19, the 2020 meeting was held 100% remotely, with posted recordings, webinars, and two days with open discussion.

The Science Advisory Board (SAB) **commends the DTC on continuing to navigate a challenging funding landscape while successfully meeting the needs of a wide range of sponsoring agencies and partners.** The DTC-developed tools and research are providing significant value to the R2O communities.

We also **commend the management board moving to longer funding cycles for DTC.** This is a much needed change. Longer term planning is crucial for DTC's success, particularly as its role in the R2O community is changing. We strongly recommend this continues and broadens to include more DTC projects.

The imminent EPIC award will likely have a large impact on DTC decision-making regarding what aspects of the R2O/O2R workflow will be priorities. The SAB hopes that the DTC will be a partner in the decision-making for EPIC post-award to lead to a collaboration that best leverages the DTC expertise and experience.

The SAB identified specific successes, challenges and opportunities which are detailed in the sections below. The feedback is organized into two broad areas of DTC work: Software Tools and Testing & Evaluation.

Software Tools

DTC continues to do excellent work in development of high value software tools. Additionally, training pathways have been expanded and improved which will lead to even broader adoption of these tools. A few highlights from the 2020 updates are listed below. The SAB applauds these activities and recommends continued support.

- Successful wider adoption of CCPP: The CCPP is being used by multiple agencies and groups. There is clear community buy-in, showing that the vision for CCPP as a shared tool for model development, testing, and evaluation is being realized.
- Further improvements to MET and METPlus: MET and METPlus are already broadly used for testing and evaluation, but the further developments discussed in the 2020 update are impressive. The shift to forum-based support will hopefully help DTC shift a portion of staff hours away from individual support to development and community support. The online training is a terrific addition to the more traditional workshop training approach. Use case examples serve as a method for sharing T&E best practices with the broader community and should help more of the community understand how MET/METPlus can be a useful component of their own workflows. The new development in process-oriented diagnostics is a much needed component of T&E that looks beyond the statistics and gets at the physical processes; the SAB recommends further development in this area and encourages partnering with process experts as needed.

As mentioned in the overview, the EPIC initiative is likely to have a significant impact on DTC software development priorities as much of the R2O/O2R software/workflow development, support and training may shift to the EPIC awardee. These projected changes have led to a shift in DTC focus away from software development/support and towards more T&E. However, even with the launch of EPIC, the shifting of workflows and support will be a multi-year process. The SAB recommends the following:

- DTC should be a key partner in the planning for EPIC implementation. The R2O/O2R community should avoid making decisions without input from DTC staff who have significant expertise in many of the EPIC goal areas.
- DTC funding for software support should be continued until sustainably transferred to another entity (e.g., EPIC).

Testing and Evaluation

As highlighted in the overview, the SAB commends the DTC on meeting the varied needs of research sponsors and disseminating the resulting tools and techniques to the broader community.

The SAB recommendations in the area of T&E can be organized into several categories:

1. Specific T&E priorities
2. More holistic approach to T&E
3. DTC as T&E "clearinghouse"
4. Big Data challenges

Each of these four recommendation areas are discussed in more detail below.

1. Specific T&E priority recommendations:

- GFS: Lower-tropospheric sounding structure is too dry and overly mixed. This bias contributes to insufficient buoyancy in warm-season convective environments.
- GFS v16 strengths/weaknesses from EMC's Model Evaluation Group: https://www.emc.ncep.noaa.gov/users/meg/gfsv16/pptx/MEG_9-24-20_GFSv16_MEG_Eval_Overview.pptx. DTC could use this list to identify additional priorities on which to focus in the 0-2 yr time frame leading to GFS v17.
- GEFS comparison with the SREF, especially in the Day 2-3 period to assess suitability of GEFS to subsume current operational capabilities of the SREF
- CAM ensemble design considerations: e.g., stochastic physics, time-lagging strategies, optimal number of members to initialize at a single time, centering perturbations on a control analysis, etc.

2. The SAB recommends a more holistic approach to T&E; i.e., longer-term projects in high impact T&E areas that encourage broader community involvement and funding. While current DTC T&E activities are responsive to specific sponsors and generate results and tools valuable to the broader community, the SAB recommends shifting the DTC project portfolio from primarily responsive projects to more proactive projects. Historically, the DTC was limited to mostly responsive projects because of the short funding cycles; we reiterate our support for the shift to longer funding cycles and our hope that this trend continues. In addition to longer funding cycles, a more proactive approach requires close collaboration with subject matter experts (SMEs). The DTC already works with many SMEs from both the sponsors and community. We recommend:

- Continuing and increasing partnerships with SMEs. All DTC projects should include SMEs, if possible. Some sponsors have their own SMEs, but others do not. We encourage DTC and affiliated scientists to continue to proactively engage with prospective SME collaborators.
- Leverage existing expertise by increasing community engagement on sponsor priorities. Bring in outside SMEs, if appropriate. We recommend increased integration between DTC experts, university experts, and agency experts (including NOAA/NWS forecasters).
- Leverage existing investment by potentially bringing in additional sponsors when they realize there is collaborative synergy on shared T&E priorities.
 - DTC should prioritize problems useful across multiple agencies.

In summary, we recommend a more intentional, longer-term approach to finding and funding the right teams for specific T&E priority areas. We recognize that this is not a trivial task, but DTC is well positioned as a partner of SMEs from many disciplines and institutions to build these

teams. As the funding model for DTC continues to change, we recommend trying various avenues of recruiting SMEs and sponsors and reporting on not only the results of the project, but also the efficacy of different collaboration models. The DTC can hopefully leverage existing partnerships and programs (e.g., Visitor Program) in support of the goal. Further engagement ideas are discussed in recommendation area #3 below.

3. We recommend activities that will build identity for DTC as the main T&E "clearinghouse" for the community, i.e. a leader, resource, and organizer of T&E conferences, software tools, and best practices. We want to highlight the current valuable work that the DTC does in the areas of community engagement and training, including short courses, webinars, workshops, and the Visitor Program. Some specific ideas from the SAB to further increase engagement:

- Currently, there is no consistent venue for T&E research. Could the DTC play a bigger role in organizing workshops and symposia around this theme?
 - The upcoming DTC metrics workshop was discussed at the meeting as a possible venue to bring together a broad swath of the T&E community.
 - The DTC (possibly in partnership with various AMS Committees) could propose an AMS symposium focused on known issues from EMC.
- What can DTC learn from the other testbeds about bringing SMEs together to work on priority problems?
 - Bringing together model developers from both research and operations will attract more of the research community. DTC already effectively partners members of the research community with operational developers on a project scale, but this could be done more broadly via experiments, workshops, and symposia. For example, a chance for university researchers to interact directly with NOAA model developers is a valuable opportunity and may increase engagement from the universities.
 - The SAB suggests focusing on specific phenomena to garner more "buzz" for experiments, workshops, symposia, and ultimately, engagement in DTC research. For example, a symposium focused around atmospheric rivers T&E would broaden engagement to SMEs that do not normally participate in DTC activities. Other examples of phenomena, processes or events that would produce excitement:
 - aviation forecasting
 - precipitation-type forecasting
 - specific discipline, e.g. microphysics, boundary layer
 - phenomenon being studied by recent field campaign

4. Management of Big Data will continue to be a significant challenge. In particular, accessing and processing large operational model outputs remains a significant barrier to broadening community engagement in T&E. Containerization (and cloud deployment) developments are great, but if data proximate computing is not available to the community, many T&E efforts are still not possible except at centers (e.g. firewalls blocking broader accessibility). Our recommendations in sections 2 and 3 above focus on broadening community engagement; these roadblocks in data management and accessibility limit effectiveness of the R2O/O2R

community. As specific approaches to these data challenges will likely be part of the upcoming EPIC award, the SAB doesn't have any immediate action items on this issue. Our recommendation (stated above) is that the DTC be an integral part of EPIC implementation plans. In that capacity, we encourage the DTC to keep these barriers at the forefront of the discussion.