



PACE Early Adopter Program: Terms of Reference



March 2020 (*Updated November 2022*)

Authored by:

Erin Urquhart^{1,2}, Natasha Sadoff^{1,2}, Joel P. Scott^{1,3}

¹ NASA GSFC, ²SSAI, ³SAIC

INTRODUCTION

The NASA Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission seeks to benefit society through the delivery of high-quality observations of the ocean and atmosphere. Its Application Program engages individuals and groups to use PACE data for their projects, including scientists, decision makers, practitioners, and industry professionals across all PACE application areas, including health and air quality, ecological forecasting, water quality and resources, climate, disasters, land/terrestrial, wildfires, and other areas. Additional information about the Application Areas can be found at the NASA Applied Sciences website (<https://appliedsciences.nasa.gov/>). Definitions of key terms can be found in Appendix A.

One of the ways that the Applications Program promotes applied science and applications research across these areas is through its Early Adopter (EA) program. EAs are groups and individuals who:

1. Have a direct, clearly defined need for PACE ocean color, aerosol, cloud or polarimetry data;
2. Have an existing application or new ideas for novel PACE-related applications that directly benefit society;
3. Currently work with application stakeholder, decision-maker, manager, or other type of end user(s) and can describe their decision-making process;
4. Have an interest in utilizing a proposed PACE product; and
5. Can apply their own resources (personnel, tools, funding, facilities, etc.) to demonstrate the utility of PACE data for their application and/or model.

This Terms of Reference (TOR) establishes the working arrangement for Early Adopters (EAs) and the PACE mission and Applications Program, including program description and scope, benefits, application process, expectations, roles and responsibilities, and related definitions.

For relevant information on the proposed PACE mission objectives, applications areas, and more, potential Early Adopters may review the PACE Applications Plan (https://pace.oceansciences.org/docs/pace_applications_plan_v1-2.pdf).

Additional information about the mission and science objectives may be found at the following websites:

- PACE web site; <https://pace.gsfc.nasa.gov/>
- PACE Science web page; <https://pace.oceansciences.org/science.htm>

PROGRAM DESCRIPTION

The EA program provides an important means of building the PACE community, gathering feedback for the PACE team to make PACE data more actionable, and enabling the use of PACE data post-launch. Toward that end, the goals of the EA program are to:

PACE Early Adopter Program: Terms of Reference

1. Expand the user communities with tangible and potential applications that would benefit from the use of PACE data sets;
2. Facilitate feedback on PACE data products pre-launch; and
3. Accelerate the use and integration of PACE products into applications post-launch by providing specific support to Early Adopters who commit to engage in pre-launch applied research.

EAs can expect several benefits by electing to apply for and participate in the program, including but not limited to:

- Support from PACE Science and Application Team (SAT) member and/or Project Science;
- Participation in PACE Applications events, including workshops, focus sessions, and tutorials;
- Information on access to pre-launch simulated, proxy, calibration, and validation PACE data;
- Priority updates on PACE activities from the project office, including anticipated science data products and field campaigns; and
- PACE web presence, project promotion, and advocacy at internal NASA and external scientific events.

NOTE: The PACE Early Adopter Program is a non-funded activity. It is critical that teams can maintain their EA activities independently of PACE.

APPLICATION PROCESS

The PACE Applications team accepts applications and nominations on a rolling basis. Applicants are encouraged to ask questions by email or inquire about a phone call prior to submitting their applications if they would like to discuss ideas first. Note that the PACE Applications team only accepts EA teams who meet specific eligibility requirements. The criteria state that the EA team must:

- Have a direct, clearly defined need for PACE data products;
- Have (or be working toward developing) an existing application or new ideas for novel PACE-related applications that directly benefit society;
- Currently work with application stakeholder, decision-maker, manager, or other type of end-user(s) and can describe their decision-making or management process; and
- Have existing resources (personnel, tools, funding, facilities, etc.) to demonstrate the utility of PACE data in your application/model.

Application Process:

1. Prospective Early Adopters may apply using the short webform, found at https://pace.oceansciences.org/app_form.htm, which includes the following:
 - a. Principal Investigator and Co-PI contact information
 - b. Title of Early Adopter project

PACE Early Adopter Program: Terms of Reference

- c. Description of system or application, including brief background, study region, objective, methodologies, and expected maturation of application (Application Readiness Level, ARL; see Table 1)
- d. Environmental and societal relevance of application
- e. List of application end-user(s) and point of contact (if available)
- f. Milestones and quantitative metrics that will assess impacts of PACE products on the application during the pre-launch phase
- g. Post-launch implementation strategy (if any)
- h. Select references relevant to EA activities

REVIEW & SELECTION

The PACE Applications Coordinators and PACE Project representatives will review the application submissions to determine participant eligibility. Applicants who meet the Early Adopter eligibility criteria will be contacted to schedule a brief “interview” that will take place via telecon, video conference, or in-person. The purpose of the interview is to better understand how the EA program and PACE data products can support the applicant’s applied work, application, and/or decision-making efforts. Participants do not need to prepare a presentation but should plan to discuss their project and proposal in depth and respond to questions from the PACE team.

The selection criteria, which will be discussed during the interview, are based on the:

- Strength of end-user connection
- Potential for reaching ARL-7 or higher post-launch (see Table 1)
- Relevancy of the project scope to PACE
- Likelihood of success
- Justifiable reporting metrics
- Direct impact/benefit of application to society

Table 1. NASA ARL descriptions (adapted from <https://www.nasa.gov/sites/default/files/files/ExpandedARLDefinitions4813.pdf>)

PACE Early Adopter Program: Terms of Reference

Application Readiness Level	Description
ARL-1	Basic research (Baseline idea)
ARL-2	Application concept (Invention)
ARL-3	Proof of application concept (Viability established)
ARL-4	Initial integration and verification in a laboratory or test environment (Prototype/plan established)
ARL-5	Validation in relevant environment (Potential established)
ARL-6	Demonstration in a relevant environment (Potential demonstrated)
ARL-7	Application of prototype in a End-User or partner's operational decision making (Functionality demonstrated)
ARL-8	Application complete, fully developed, and societal value demonstrated (Functionality proven)
ARL-9	Application operationally deployed, supporting decision-making for an external partner (Sustained use)

The application process is confidential until the EA selections are announced. The PACE Applications Coordinators will notify all EA invitation respondents of the selection decision. For EAs accepted into the program, an overview profile of the EA project, including investigators, affiliations, titles, and project description, will be posted to the PACE Applications website. The PACE Applications team may ask the EAs to contribute to or review the online profile before it is published, as well as provide images. Examples of EA profiles can be seen online (https://pace.oceansciences.org/app_adopters.htm).

If an applicant is not selected either before or after the interview, they will be informed and can be added to the PACE Community of Practice (CoP) mailing list if desired. Participants can elect to re-apply to the EA Program later if progress is made in a certain area (e.g., if ARL advancement potential is improved).

PACE APPLICATIONS PROGRAM ACTIVITIES

Once formally approved as a PACE EA, EAs will be invited to PACE Project Science and Applications events that are designed to connect the PACE project and SAT members with EAs. These events will establish channels of communication, focusing on how PACE data may help to serve the needs of EAs' stakeholders and end-users. The PACE EA program is also integrated with CoP activities and is carried out mainly through emails, telecons, workshops, tutorials and focus sessions organized by the CoP. The CoP also takes advantage of member attendance at conferences such as AGU, Ocean Optics, ASLO, and others to meet in-person when possible.

Activities associated with the Applications program where EAs could participate (as a listener, presenter, etc.) include:

- **Workshops** are widely announced meetings that cover a broad diversity of topics to facilitate collaboration among audiences with diverse interests. Workshops will be held

PACE Early Adopter Program: Terms of Reference

every year and will provide feedback to NASA and the PACE Mission about PACE product applications. Workshops are designed to give an update of the mission to the community and to provide information about PACE data products on a broad scale. PACE EAs will be included in the program to provide examples of PACE applications.

- **Focus Sessions** are small events tailored to specific communities, providing detailed information about a connected group of products or applications.
- **Tutorials** are information transfer events that provide introduction on specific tools and utilities for working with PACE data (e.g. – data access and analysis, integration with other observation or model datasets, etc.). These events will also provide opportunities to address potential synergies designed to leverage innovation on how to best combine datasets from other missions (NASA and others) with those of PACE.
- **Town Halls** provide an interface for questions to be answered by the PACE Science and Application Teams.
- **Publications** of various types including White Papers or the quarterly CoP Community Newsletter, which features EAs in each issue.
- **Other** activities may be developed and will be announced with EAs as applicable.

ROLES AND RESPONSIBILITIES

The PACE Applications team hopes that the EA program provides mutual benefits to both the PACE Mission and the EA team themselves. Toward that end, there are specific roles and responsibilities for both parties that will help ensure success.

If selected to join the EA program, **EAs agree to:**

1. Engage in pre-launch activities that will enable integration of PACE data after launch in their application and project description form (provided after initial Early Adopter interview);
2. Provide quantitative metrics prior to launch that enable evaluation of the value of PACE data to the EA activity after launch; and
3. To provide feedback to the PACE Mission upon request concerning the EA experience in using the data;
4. Provide the mission access to calibration/validation (cal/val) data or simulated data generated under the EA activities; and
5. Actively participate in PACE Applications activities regarding utility of PACE mission data products related to their application needs; and by taking lead roles in PACE applications research, meetings, workshops, and related activities.

Other ad-hoc requests may be made of EAs in pursuit of PACE-related outreach and communication. For example, EAs may be asked to contribute images, language, or other materials for inclusion in PACE activities, including presentations or newsletters.

The PACE Applications Coordinators and PACE Project Science agree to:

PACE Early Adopter Program: Terms of Reference

1. Provide information to the PACE Project to facilitate incorporation of Early Adopters contributions into mission reporting and information dissemination;
2. Provide Early Adopters with images or visual representations of PACE simulated or proxy data via the OB.DAAC or other appropriate channels;
3. Provide Early Adopters with planned pre-launch cal/val data from PACE field campaigns, modeling, and synergistic studies, and access to data simulators as available and appropriate;
4. Support the EAs in getting access to and resolving issues with PACE pre-launch data sets;
5. Facilitate EAs efforts and receive and report feedback to PACE science on project metrics;
6. Report on EAs successes, challenges, and progress during PACE meetings (in person when possible, or by proxy); and
7. Attend regular conference calls with all EAs. This will be a chance for EAs to provide feedback and progress updates.

If an EA team is found to be unresponsive, or if their project scope changes significantly reducing PACE applicability, the PACE Applications team may initiate a conversation about the continuation of that EA team in the program. If an EA team would like to drop out of the program, they can also initiate a conversation with the PACE Applications team at any time.

EAs are encouraged to engage with the PACE Applications team as frequently as needed or desired, including offering ideas for other activities, partnerships, or means of engagement that could benefit themselves or the broader EA cohort. The PACE Applications team will make every effort to consider ideas brought forth.

APPENDIX A: DEFINITIONS

Applications are innovative uses of NASA satellite data to help improve decision-making and provide practical solutions to meet the needs of society. Data products produced by PACE will help monitor water resources, terrestrial ecosystems, and air quality, as well as respond to natural disasters, including flood, volcanic, and wildfire events. The PACE Applications Program will foster the expansion of observatory's science data to inform policy and management decisions.

Applied research will provide fundamental knowledge of how PACE data products would be scaled and integrated into users' policy, business, and management activities to improve decision-making efforts.

PACE Community of Practice (CoP) is a group comprised of individuals who are familiar with NASA products, have a well-defined need for proposed PACE data products, will optimize their use of PACE products, possibly even before launch as part of the PACE test-bed activities and PACE calibration/validation, and who can apply their own resources to demonstrate the utility of PACE data for their research, application, or model. The Community of Practice includes PACE Early Adopters who have committed to engage in pre-launch applied research to accelerate the integration of PACE products after launch in their specific application that aids decision-making and directly benefits society.

PACE Early Adopters (EAs) are a subset of PACE CoP members who have a practical application/use of PACE data, and who are planning to apply their own resources (funding, personnel, facilities, etc.) to demonstrate the direct utility of PACE data for their decision support tool (DST), system, model, or application for decision-making or management, and societal benefit.

End-users and stakeholders include individuals or groups in the public or private sectors who may have specific input or uses for future PACE data for applications at local to global scales.