PACE IOP Science Team (IOP-ST) Objectives

1. Provide the theoretical and practical framework needed to define the at-launch inversion algorithms to obtain IOPs for the PACE mission.

2. IOPs inverted will be spectral (spanning from UV to NIR) and will include: Absorption and its partitioning into seawater, dissolved, phytoplankton and non-algal particle absorption contributions. Backscattering and its partitioning into seawater, and particulate contributions. Contributions to Rrs by inelastic scattering due to Raman, CDOM and chlorophyll fluorescence, which affect the inversions, will be addressed. Additionally, given the potential availability of polarized radiometry, we will attempt to invert for the VSF shape in the back direction, the depolarization ratio of scattering, and the beam attenuation of particulate and dissolved fractions.

3. Spectral range of the IOP algorithms must cover the UV, visible and NIR parts of the spectrum and should be applicable to all optically deep bodies of waters, assuming adjacency and atmospheric effects are sufficiently corrected for.

4. The IOP algorithm should be modular, and modules may be redundant, as long as strenghths and weaknesses of different modules have been explored and identified.

5. Theoretical studies are necessary, but insufficient demonstration of a module. Practical demonstration with in-situ data and synthetic data (when in-situ data is not available) in an operational processing environment will be required.

6. The IOP algorithms must have associated uncertainties so that they can be propagated to other products that depend on IOPs. The uncertainties associated with each IOP will depend on the specifics of PACE radiometer and polarimeter design. Realistic accounting of uncertainties will need to take into account uncertainties in atmospheric correction.

7. The IOP algorithms should include flags for cases when it is impossible to obtain consistent IOPs (e.g., negative values below the absolute value of estimated uncertainty).

8. All algorithms and approaches must be published in, or submitted to peer reviewed journals (open-access preferred), in order for consideration in the final PACE report. Similarly, all datasets used for algorithm development and validation will be made public by the date of publication of the final report.

9. At the end of 3 years we expect to still have knowledge gaps. It will be the responsibility of the IOP-ST to identify and organize these remaining questions and unknowns.

10. To reduce the uncertainties associated with data used in algorithm development (and hence in the algorithm products), the IOP-ST will provide recommendations for improved IOP measurements (in-situ and in the lab, including data processing).

Path to meeting objectives

1. An accessible database with relevant field and synthetic data (radiometry, AOPs, IOPs) will be formed ASAP to support all of our activities (and those of the AC group where relevant). All data within the database should have associated uncertainties and necessary metadata.

2. Individual research projects, led by their respective PIs, are expected to pursue the work promised in their proposals, but they are not expected to do this work in isolation.

3. Frequent sharing of immediate results is expected with the full IOP-ST and even more frequently with the relevant subgroups that form naturally around specific topics. This includes sharing and interactions with subgroups and members of the PACE-AC team. Current PACE IOP-ST Subgroups include: Datasets, IOP Inversion, IOP Methodologies, Environmental Methodologies, and Uncertainties. Subgroups are not set in stone and will likely change in scope and charge over the course of the IOP-ST study period.

4. Processing opportunities should be available at NASA Goddard, offered by the liaisons. The expectation is that all approaches adopted be included in NASA software by the end of the award. Similarly, the expectation is that all data used by the ST will be transferred to a NASA repository.

5. As the project proceeds, new directions will arise that go beyond the initial proposed work. If identified as important to the success of the team, PIs may change their focus to these new avenues rather than to continue with their original proposals.

6. As we move into the later stages of the study period, early versions of an algorithm should be made available to run on the same input data so that results can be compared and critically evaluated.

7. All members of the PACE IOP-ST are expected to participate in preparation of the proposal final report and to sign off on the final wording of the document