Guidelines for Collaboration on the HyperInSPACE Community Processor (HyperCP)

1. Introduction

HyperCP is an open science, open-source Collaboration to facilitate community development of a processor for in situ above-water radiometry for aquatic biogeochemistry applications, algorithm development and satellite validations. The Collaboration aims to achieve the highest quality in situ measurement processing, extensions to new field instrument platforms, measurement uncertainty propagation according to metrological standards, and other improvements to the algorithms and the processor package.

The Collaboration is initiated staring from an existing NASA tool called HyperInSPACE (https://github.com/nasa/HyperInSPACE). HyperInSPACE has been developed as an open-source and open science processor to standardize the processing and quality control of hyperspectral above-water measurements from Sea-Bird radiometers for preservation in the publicly open NASA SeaBASS archive. HyperInSPACE has been designed to adhere to the best practices detailed in the legacy NASA Ocean Optics Protocols (Mueller et al., 2003) and to incorporate the advances defined in the IOCCG Optical Radiometry Protocols (Zibordi et al., 2019). HyperInSPACE was released publicly in March 2021 and its subsequent evolutions included contributions from University of Maine and the community. In May 2021, NASA and EUMETSAT came into agreement about further extensions of the processor to include TriOS radiometers and measurement uncertainty propagation in the frame of the FRM4SOC2 activity supported by the EC Copernicus Programme.

HyperInSPACE was originally adapted from an open-source, robust, Python processor developed by the University of Victoria and called PySciDon (Vandenberg 2017). PySciDon was established to replace Satlantic's (now Sea-Bird's) proprietary ProSoft software package for processing autonomous, above-water radiometry data from a ferry-based Sea-Bird HyperSAS SolarTracker platform.

HyperCP development partners under this Collaboration, as defined in these Guidelines, comprise the HyperCP Project. The goal of the Project is to expand community engagement and collaboration, and to manage and support the processor development effort.
The initial partners include NASA, EUMETSAT and FRM4SOC2 affiliates, NPL and ACRI-ST, who were joined in 2023 by University of Victoria and University of Maine. See Appendix for up-to-date list of all Collaborators.

2. Community Support and Management of Community Contributions
    a. User support and the HyperCP Project can be reached using the *Discussion* feature of the GitHub repository.
    b. HyperCP is in its concept a Community Processor and ad hoc or regular community contributions to the HyperCP package are highly encouraged. Reviews or revisions of the existing implementations are also solicited. The GitHub *Issue* feature should be used to initiate a contribution or highlight a software issue. Further details are provided in Section 3.e.

    c. Members of the community, institutions and agencies are welcome to join the HyperCP Project. To join, a short proposal is required, which shall include a description of intended contributions, their time frame and expected organization of work, or a description of existing contributions and their possibility for ingesting into the HyperCP package. Proposals shall be addressed to the co-chairs listed in the Appendix.

    d. Community contributions and HyperCP Project membership proposals are checked, validated, and approved by the HyperCP Project under the leadership of its co-chairs. The contributors may be invited to HyperCP Project Meetings to participate in technical and/or administrative discussions.

3. **HyperCP Management**

    a. To coordinate the development of new features in the HyperCP by collaboration contributors, HyperCP Project Meetings will be held between principal software developers at a cadence to be decided on an ongoing basis depending on the number and complexity of the updates and issues. HyperCP external contributors and collaborators may also be invited to participate as appropriate. At the initial inception, NASA and EUMETSAT will take a lead in co-chairing and organizing the Project Meetings. Subsequent meetings can be coordinated by other HyperCP Project members, potentially on a rotating basis.

    b. As an open-source community processor, HyperCP has no "ownership" and no organizations or individuals hold a "gate keeper" role with respect to its evolution. Anyone is free to create clones of the master Git repository for offline development however they see fit. HyperCP may be adapted to develop derivative products, but such products should be clearly distinguished from HyperCP as such to avoid confusion of provenance for the users and the scientific community. Derivative projects should clearly acknowledge HyperCP and contributors as outlined below in section 4, and clearly state that these derivatives are removed from any oversite or review associated with this HyperCP.

    c. For HyperCP dissemination, there is one authorized HyperCP Project public master repository: https://github.com/nasa/HyperInSPACE. The single repository provides a stable location for the community to acquire the software and to ensure the quality of HyperCP implementation. The quality of the repository is assured by the expertise of the Project members, management by consensus, administration of community contributions, software maintenance and version update, as well as continuing user support.

        The designated HyperCP GitHub master repository is located at NASA as it has a longstanding history of community engagement and official open-source hosting and dissemination through NASA's Software Release System reviews and approvals. Alternatives to the NASA's repository may be considered in the future in the frame of international coordination.

    d. All HyperCP Project partners are required to contribute to the development and evaluation of the HyperCP in a manner consistent with open science principles, e.g., (National Academies of Sciences 2018; UNESCO 2021). This includes maximizing transparency, accessibility, and reproducibility of software

contributions and functionality as well as adherence to intellectual integrity and respect for ethical principles pertaining to research.

e. Software update logistics: HyperCP Project members and external agreed contributors, as confirmed at the regular HyperCP Project Meetings, shall follow the guidance in this section for submitting updates to the HyperCP GitHub repository.

    i. The following is a set of recommendations for how software updates will be managed but should be updated over time as the contributing parties become more familiar with the possibilities and pitfalls of open-source collaboration in a Git environment.

    ii. Contributing developers should fork and/or clone the master repository from the NASA GitHub and pull updates from master before making any new updates to limit merge conflicts.

    iii. Updates should, as much as possible, address issues identified in the NASA GitHub repository *Issues* feature. Issues may be submitted by any contributor or outside party.

    iv. Contributors should, as much as possible, address small, incremental issues to avoid merge conflicts with large overhauls of source code, and submit numerous, small updates frequently rather than large, complex updates after long intervals to limit merge conflicts.

    v. When contributors are ready to send updates to the master repository, they should follow these steps:

        1. Create a fork from the master branch at (https://github.com/nasa/HyperInSPACE)

        2. Create sensibly named branch for the updates made to that fork (if a fork for that issue/update already exists on NASA GitHub, use that name).

        3. Commit all updates to the fork branch and push them to the GitHub fork repository

        4. Submit a pull request (PR) associated with the *Issue* to the branch of the same name on the principal GitHub repository – not the master branch – as described in the next section.

    vi. Submitting PRs (adapted from the Core Flight System project)

        1. For the title, use the title convention Fix #XYZ, SHORT_DESCRIPTION. #XYZ should refer to the *Issue* number identified in the repository.

        2. Describe the contribution. First document which issue number was fixed using the template "Fix #XYZ". Then describe the contribution.

        3. Provide what testing was used to confirm the pull request resolves the link issue. If writing new code, also provide the associated coverage unit tests.

        4. Provide the expected behavior changes of the pull request.

        5. Provide the system the bug was observed on, if applicable, including the hardware, operating system(s), and versions.

        6. Provide any additional context if applicable.

       7. Provide your full name and/or GitHub username and your company or organization if applicable.

       8. Verify that the PR passes all workflow checks. If you expect some of these checks to fail, please note it in the Pull Request text or comments.

    vii. HyperCP Project participants will review PRs and discuss at the next HyperCP Project Meeting – if not sufficiently agreed to by email – to determine whether the PR will be accepted or returned for edits. Once accepted in GitHub, the branch will become public (if it was not already), and then will be merged with the master repository. The Changelog.md file will be updated to reflect the description of the changes and the contributor who submitted them.

4. Acknowledgements and Public Presentation

  a. Recommendation for users:

    i. Always cite the HyperCP key papers listed in Appendix in any publications in which the data presented were processed with HyperCP.

    ii. In public presentations, include the HyperCP logo.

    iii. When publishing results from HyperCP or requesting support, the version number *and* commit code (or date of most recent update/pull) should be noted.

  b. Recommendation for the members of the HyperCP Project:

    i. To avoid confusion within the community between this HyperCP Project, the legacy HyperInSPACE repository, the FRM4SOC2 "CP" development repository, and any other potential derivative versions going forward, the name "HyperCP" or "HyperInSPACE Community Processor" should be used in public presentations of the software or results deriving from the software.

    ii. Acknowledgement statement in the HyperCP's README shall be as in Appendix.

    iii. In the case of oral or poster presentations from members of the HyperCP Project presenting to externals, the logos of all the involved institutions shall be visually identifiable. The full list of people and institutions involved in the HyperCP Project will be maintained in the Appendix.

    iv. Acknowledgements of all people and institutions submitting significant contributions to the software will be made in software release notes and/or similar reports or documents that can be readily cited (e.g., with a DOI) in publications and presentations. See Appendix for the most up-to-date acknowledgement statement, both for users and for internal use.

References

Mueller, J. L. and others 2003. Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Revision 4, Volume III. *In* J. L. Mueller [ed.], Ocean Optics Protocols for Satellite Ocean Color Sensor Validation. NASA Goddard Space Flight Center.

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Vandenberg, N. 2017. A Python Scientific Framework for Development of Ocean Network Applications (PySciDON).

Zibordi, G., K. J. Voss, B. Johnson, and J. L. Mueller. 2019. Protocols for Satellite Ocean Colour Data Validation: In Situ Optical Radiometry. *In* IOCCG [ed.], IOCCG Ocean Optics and Biogeochemistry Protocols for Satellite Ocean Colour Sensor Validation. IOCCG.

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Appendix: Acknowledgement statements (as of 07-FEB-2023)

A) List of contributors of the HyperCP Project:
   a. Dirk Aurin
   b. Nathan Vandenberg
   c. Maycira Costa
   d. Alexis Deru
   e. Ashley Ramsay
   f. Agnieszka Bialek
   g. Marine Bretagnon
   h. Gabriele Bai
   i. Juan Ignacio Gossn
   j. Nils Haentjens
B) List of institutions/programmes conforming the HyperCP Project
   a. NASA
   b. Morgan State University
   c. University of Victoria
   d. ACRI-ST
   e. NPL
   f. EUMETSAT
   g. Copernicus Programme of European Commission
   h. University of Maine

C) Authorship statement as in HyperCP README (detailed version):

Main author: Dirk Aurin, MSU @ NASA Goddard Space Flight Center dirk.a.aurin@nasa.gov

Co-authors: Nathan Vandenberg @ UVictoria, Maycira Costa @ UVictoria (in the frame of PySciDON), Alexis Deru @ ACRI-ST, Ashley Ramsay @ NPL, Agnieszka Bialek @ NPL, Marine Bretagnon @ ACRI-ST, Gabriele Bai @ ACRI-ST, Juan Ignacio Gossn @ EUMETSAT (in the frame of Copernicus' FRM4SOC-2), Nils Haentjens @ UMaine.

Co-Chairs/Contact: Dirk Aurin, MSU @ NASA Goddard Space Flight Center dirk.a.aurin@nasa.gov, Juan Ignacio Gossn @ EUMETSAT JuanIgnacio.Gossn@eumetsat.int

D) Citation:

Dirk Aurin, Nathan Vandenberg, Maycira Costa, Alexis Deru, Ashley Ramsay, Agnieszka Bialek, Marine Bretagnon, Gabriele Bai, Juan Ignacio Gossn, Nils Haentjens: *HyperInSPACE Community Processor (HyperCP)*, accessible online, https://github.com/nasa/HyperInSPACE