

E.4 HABITABLE WORLDS

NOTICE: Proposals to this program will be taken by a two-step process in which the Notice of Intent is replaced by a required Step-1 proposal submitted by an organization Authorized Organizational Representative. No PDF upload is required or permitted for the Step-1 proposal. Step-1 proposers merely must fill in the Proposal Summary text box on the NSPIRES cover pages. Only proposers who submit a Step-1 proposal are eligible to submit a Step-2 (full) proposal. See Section 2.6 for details.

1. Scope of Program

The goal of the Habitable Worlds program is to use knowledge of the history of the Earth and the life upon it as a guide for determining the processes and conditions that create and maintain habitable environments and to search for ancient and contemporary habitable environments and explore the possibility of extant life beyond the Earth.

NASA's Habitable Worlds Program includes elements of the Astrobiology Program, the Mars Exploration Program, the Outer Planets Program (all in the Planetary Science Division) and Exoplanet research in the Astrophysics Division. A common goal of these programs is to identify the characteristics and the distribution of potentially habitable environments in the Solar System and beyond. This research is conducted in the context of NASA's ongoing exploration of our stellar neighborhood and the identification of biosignatures for *in situ* and remote sensing applications. For further information on the science scope of Astrobiology, please refer to the Astrobiology roadmap, which can be found on the Astrobiology web page <http://astrobiology.nasa.gov/>. Information on the habitability-related goals of the Mars Exploration Program can be found in the "Mars Science Goals, Objectives, Investigations and Priorities: 2010" document, available on the Mars Exploration Program Analysis Group web page (<http://mepag.jpl.nasa.gov>). For the Outer Planets Program, refer to the document "Scientific Goals and Pathways for Exploration of the Outer Solar System," found on the Outer Planets Assessment Group web site (<http://www.lpi.usra.edu/opag>).

Theoretical and experimental studies will be considered, as well as quantitative terrestrial field experiments that improve scientific understanding of how *in situ* measurements at analog sites can or will improve our understanding of the potential for the environment to support life. Research areas include, but are not limited to, the presence of water and/or exotic solvents, sources of energy for life, presence of organics and their reactivity, and water body physics and chemistry as they pertain to habitability and habitability over time. The target bodies for this program element include, but are not limited to:

- Mars - the astrobiological potential of past or present environments on or in the Martian surface or subsurface.
- Icy Worlds - the astrobiological potential of icy worlds in the outer solar system, including Europa, Ganymede, Enceladus, and Titan.

- Habitable Exoplanets and/or their moons - A potentially habitable exoplanet implies a planet with conditions roughly comparable to those of Earth (i.e., an Earth analog) and thus potentially favorable to the presence of life.

2. Programmatic Information

Proposals are sought for new projects within the scope of the Habitable Worlds. Proposals submitted in response to this Program Element should be for new work that is not currently supported by the program or for investigations that would extend to their next logical phase those tasks that have been funded in the Astrobiology, Mars Fundamental Research, and Outer Planets (or other) programs.

The Habitable Worlds element will be administered primarily by the Planetary Science Division. As such, this solicitation is governed by information contained in Appendix C.1. However, highly-rated programs of strong programmatic relevance to the Astrophysics Division will be considered for funding by the Astrophysics Division. The Astrophysics Division will consider supporting investigations that are focused upon the characterization of potentially habitable exoplanets and their atmospheres in order to:

- inform targeting and/or operational choices for current NASA Astrophysics missions, or
- provide targeting, operational, and/or formulation data for future NASA Astrophysics observatories.

2.1 Relevance Statement Requirement

Step-2 Proposals to this program element must discuss relevance in a (4000-character maximum) text box on the cover pages via the NSPIRES web interface for this program element. This section is outside of the 15-page Scientific/Technical/Management Section and the relocation of the relevance discussion does not decrease that 15-page limit. This requirement supersedes Section 2.3.5 of the *NASA Guidebook for Proposers* and the *ROSES Summary of Solicitation*, and the omission of this section is sufficient reason for a proposal to be returned without review.

The relevance discussion must explicitly refer to this program element and the section of the solicitation to which the proposal is responsive. If the proposed work is close in scope to research covered by any other program element, this discussion must also justify why it is more relevant to this program element than that other program element. This discussion may not be used to address the proposal's intrinsic merit, budget justification, or any other factor that remains in the 15-page main body, or any other section, of the proposal.

2.2 Program Exclusions

Proposals focused on the formation of complex organic molecules in space and their delivery to planetary surfaces in the Solar System should be submitted to C.2 Emerging Worlds. Proposals focused on the formation and stability of habitable planets should be submitted to either C.2 Emerging Worlds or E.3 Exoplanet Research Program, depending on the nature of the study. Refer to those solicitations for more information.

Biosignature studies of samples from sites thought to be analogs of other planetary environments that might potentially harbor life should be directed to C.5 Exobiology. Models of environments in which organic chemical synthesis could occur and the forms in which prebiotic organic matter has been preserved in planetary materials should be directed to C.5 Exobiology. Work to understand the phylogeny, physiology, and adaptations of extant terrestrial organisms to extreme environments should be directed to C.5 Exobiology.

Field-based investigations focused on exploring the relevant environments on Earth in order to develop a sound technical and scientific basis to conduct planetary research on other Solar System bodies should be directed to C.14 PSTAR (Planetary Science and Technology from Analog Research) program.

Through its data analysis programs, C.8 Lunar Data Analysis Program (LDAP), C.9 Mars Data Analysis Program (MDAP), C.10 Cassini Data Analysis Program (CDAP), C.11 Discovery Data Analysis Program (DDAP), and C.19 New Frontiers Data Analysis Program (NFDAP; to be released later this year), the Planetary Science Division solicits proposals for work that are primarily analysis of planetary mission data. This program element does not accept proposals that are eligible for submission to one of those data analysis programs. If a proposal is not appropriate for one of the data analysis programs, but does fit within the bounds of this program, then it should be submitted to this program.

2.3 Pilot Studies

Proposals for one to two year pilot studies to demonstrate or develop a new technique or a new application of an established technique will be considered. Such proposals may also include the demonstration of a technique new to the proposer, but not new to the field in general.

2.4 Instrumentation: Construction or Upgrade

Proposers to Habitable Worlds are eligible to request funds for Planetary Major Equipment (PME). See Program Element C.17 for information on how to append a PME request to a regular Habitable Worlds research proposal or submit a stand-alone PME proposal to supplement an existing Habitable Worlds award.

2.5 Development of Instruments

This solicitation does not request proposals for the development of advanced instrument concepts and technologies as precursors to astrobiology flight instruments. Such proposals may be submitted to C.12 Planetary Instrument Concepts for the Advancement of Solar System Observations (PICASSO) Program, for technology readiness levels (TRLs) 1-3 or C.13 Maturation of Instruments for Solar System Exploration (MatISSE) Program for TRLs 4-6. Proposals for science-driven field campaigns that are expected to produce new science results, as well as new operational or technological capabilities, should be submitted to the C.14 Planetary Science and Technology Analogs Research (PSTAR) program.

2.6. The Two-Step Submission Process

To facilitate the early recruitment of a conflict-free review panel, given the nature of the new calls, and to ensure proposals are submitted to the appropriate program, this program uses a two-step proposal submission process (see Section IV. (b) vii of the ROSES *Summary of Solicitation*.)

A Step-1 proposal is required and must be submitted electronically by the Authorized Organizational Representative (AOR). No budget is required. Only proposers who submit a Step-1 proposal are eligible to submit a Step-2 proposal. Full (Step-2) proposals must broadly contain the same scientific goals proposed in the Step-1 proposal. The Principal Investigator (PI) cannot be adjusted and proposers that want to add funded investigators between the Step-1 and Step-2 proposals must inform the point(s) of contact below and cc sara@nasa.gov at least two weeks in advance of the Step-2 due date. Submission of the Step-1 proposal does not obligate the proposer to submit a Step-2 (full) proposal later.

2.6.1 *Step-1 Proposal*

Proposers should refer to the "Instructions for Submitting a Step-1 Proposal" under "Other Documents" on the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) page for this program. The Scientific/Technical/Management section of the Step-1 proposal is restricted to the 4000 character Proposal Summary text box on the NSPIRES web interface cover pages and should include a description of the science goals and objectives to be addressed by the proposal, a brief description of the methodology to be used to address the science goals and objectives, and the relevance of the proposed research to this call. The Step-1 proposal may be used to determine whether the proposal has been submitted to the appropriate program element. No evaluation of intrinsic merit will be performed on Step-1 proposals.

NSPIRES will notify proposers whether their Step-2 proposal is encouraged or not, at which point they will be able to submit Step-2 proposals.

2.6.2 *Step-2 Proposal*

This is a reminder that all proposals submitted to ROSES-2016 must strictly conform to the formatting rules in Chapter IV of this announcement and Chapter 2 of the *NASA Guidebook for Proposers*. Those that violate the rules may be rejected without review. In previous years, problems with the formatting of the Scientific/Technical/Management section proposals have been noted. Please pay particular attention to:

- Length: 15 pages
- Margins: 1 inch on all sides, with a standard page size of 8.5 × 11 inches.
- Font: The *NASA Guidebook for Proposers* requires that proposers use a 12-point or larger font. The selected font must meet the requirement of having, on average, no more than 15 characters per inch (e.g., Times New Roman and Arial). Proposers may not adjust the character spacing or otherwise condense a font from its default appearance.

- Line spacing: Font and line-spacing settings should produce text that contains no more than 5.5 lines per inch. Do not adjust line-spacing settings for your selected font below single-spaced.
- Figure captions: must follow the same font and spacing rules as the main text.
- Figures and tables: for text in figures and tables, font and spacing rules listed above do not apply, but all text must be judged to be legible to reviewers without magnification above 100%. Do not place expository text in tables or figures in order to gain space.

2.7 Duration and Size of Awards

NASA anticipates that most proposals will seek three years of funding. Proposals for less than three years are encouraged for projects that can be completed on shorter timescales. In rare cases, funding for the proposed fourth year may be provided, if the need for the longer duration is sufficiently well justified. The appropriateness of the proposed funding period will be reviewed, and adjustments may be requested. Programmatic balance may limit the opportunities for funding in some areas.

The average size of awards resulting from Step-2 proposals submitted to Habitable Worlds in ROSES-2014 was ~\$160 K per year per award, but with a wide range, depending on the nature of the work proposed. When selections are made for proposals submitted in response to ROSES-2015 that data will be included in the grant stats spreadsheet on the SARA [grant stats web page](#). Proposers are encouraged to request what they actually need to conduct the research proposed.

2.8 Planetary Science Division Early Career Fellowship Program

Proposals to this program element may include an application for an Early Career Fellowship (ECF). See Program Element C.16 for a description of the application and evaluation process.

2.9 Access to the Antarctic

Proposals to this program element must follow the rules given in Appendix C.1, §3.7, when requesting access to Antarctica.

2.10 Resources: Information, Data, and Facilities

For proposals that contain mission data analysis, planetary spacecraft mission data to be used in proposed investigations must be available in the Planetary Data System (PDS) or equivalent publicly accessible archive at least 30 days prior to the proposal submission date. Spacecraft data that have not been obtained yet (i.e., future mission data) or those that have not been accepted for distribution in approved archives are not eligible for use in investigations. Regardless of the archive(s) used, if the data to be analyzed have issues that might represent an obstacle to analysis, the proposers must demonstrate clearly and satisfactorily how such potential difficulties will be overcome. Investigators funded by spacecraft missions who wish to apply must demonstrate clearly how the proposed research does not overlap and is not redundant with data

analysis, duties, or responsibilities already funded by their respective mission(s). Please see C.1, The Planetary Science Division Research Program Overview, for more information.

2.10.1 Facilities and Data Sources Available to Proposers

Proposers are advised to read C.1 Planetary Science Division Research Program Overview, and D.1 Astrophysics Research Program Overview, for information on facilities and data sources that are available to supported investigators. If their use is anticipated, this should be discussed and justified in the submitted proposals (especially note the provision for such discussion in the proposal section entitled Facilities and Equipment). Also note that, per the directions in Section 2.3 of the *NASA Guidebook for Proposers*, a letter of support may be required from any facility required for the proposed effort.

2.10.2 Geologic Maps

Proposers who plan investigations involving geologic mapping should consult Appendix C.1, Section 3.6, for guidance on submission and requirements for publication of U.S. Geological Survey (USGS) maps. The scientific goal of such a geologic map product should be clearly explained and justified.

2.11 NASA Postdoctoral Program Fellows

Grantees in the program are eligible to serve as mentors to NASA Postdoctoral Program (NPP) Fellows. The tenure of a Fellow must begin before the end of the award, but may extend beyond it. Proposals from potential Fellows must be submitted through the standard NPP process. This Program expects to select no more than two Fellows this year. More information about the NASA Postdoctoral Program may be found at <http://npp.usra.edu/>.

2.12 Data Management Plans

Proposals submitted to this program element must include a Data Management Plan (DMP, see Appendix C.1, Section 3.5). This must be placed in a special section, not to exceed two pages in length, immediately following the References and Citations section for the Scientific/Technical/Management portion of the proposal.

3. Summary of Key Information

Expected program budget for first year of new awards	~\$2M
Number of new awards pending adequate proposals of merit	See section 2.7
Maximum duration of awards	4 years; shorter-term proposals (1-3 years) are typical; fourth year must be explicitly and scientifically justified.
Due date for Step-1 proposals	See Tables 2 and 3 in the <i>ROSES Summary of Solicitation</i> .

Due date for Step-2 proposals	See Tables 2 and 3 in the <i>ROSES Summary of Solicitation</i> .
Planning date for start of investigation	6 months after proposal due date.
Page limit for the central Science/Technical/Management section of proposal	15 pp; see also Chapter 2 of the <i>NASA Guidebook for Proposers</i>
Relevance	This program is relevant to the Planetary Science and Astrophysics Divisions questions and goals in the NASA Science Plan. Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the <i>ROSES Summary of Solicitation</i> .
Detailed instructions for the preparation and submission of proposals	See the <i>NASA Guidebook for Proposers</i> at http://www.hq.nasa.gov/office/procurement/nraguidebook/ .
Submission medium	Electronic proposal submission is required; no hard copy is required or permitted. See Section IV of the <i>ROSES Summary of Solicitation</i> and Chapter 3 of the <i>NASA Guidebook for Proposers</i> .
Web site for submission of proposals via NSPIRES	http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposals via Grants.gov	http://grants.gov (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH16ZDA001N-HW
NASA points of contact concerning this program	<p>Mitch Schulte Planetary Science Division NASA Headquarters Washington, DC 20546 Telephone: (202) 358-2127 E-mail: mitchell.d.schulte@nasa.gov</p> <p>Mary Voytek Planetary Science Division NASA Headquarters Washington, DC 20546 Telephone: (202) 358-1577 E-mail: mary.voytek-1@nasa.gov</p> <p>and</p>

NASA points of contact
concerning this program,
continued

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