National Aeronautics and Space Administration

National Science Foundation

March 20, 1998

NRA-98-OES-03

RESEARCH ANNOUNCEMENT

INVESTIGATIONS OF ANTARCTIC ICE USING SATELLITE DATA

Letter of Intent due: April 20, 1998
Proposals due: May 20, 1998

Canadian Space Agency

Natural Resources Canada / Ressources naturelles Canada

CANADA CENTRE FOR REMOTE SENSING

OMB Approval No. 2700-0087

INVESTIGATIONS OF ANTARCTIC ICE USING SATELLITE DATA

Research Announcement
Soliciting Research Proposals
For Research Commencing
On or After
August 14, 1998

NRA-98-OES-03

Office of Earth Science
National Aeronautics and Space Administration
Washington, DC 20546

and

Office of Polar Programs
National Science Foundation
4201 Wilson Boulevard
Arlington, Va. 22230

INVESTIGATIONS OF ANTARCTIC ICE USING SATELLITE DATA

1.0 INTRODUCTION

The National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF) announce the solicitation of proposals for scientific investigations in support of Office of Earth Science program and the United States Antarctic Program (USAP) specific to investigations of Antarctic atmosphere/ice/ocean interactions that affect climate or the mass balance of the Antarctic ice sheet. This Interagency NASA/NSF Research Announcement (NRA) solicits proposals to investigate either of the above topics using data primarily from satellites, or using theoretical models to improve either data interpretation or understanding of important processes.

As part of a joint program with NASA, the Canadian RADARSAT Synthetic Aperture Radar (SAR) satellite completed, in September/October, 1997, the first high-resolution radar map of the entire Antarctic continent, including interferometric coverage of more than half the continent. Research applications of these data are strongly encouraged.

2.0 Background

National Atmospheric and Space Administration (NASA)

NASA's Polar Research Program has three main, long-term goals:

- improving the simulation of high-latitude processes in climate models;
- monitoring important polar observables, such as ice-sheet volume and sea-ice characteristics; and
- measuring and understanding the mass balance of the Greenland and Antarctic ice sheets.

Specific objectives include:

(i) identification of polar processes that have a significant impact on global climate and climate change
(ii) derivation, from satellite data, of long-term, reliable time series of sea-ice extent, concentration, motion, surface temperature, albedo, and atmospheric characteristics above the sea ice;
(iii) estimation, using these time series together with in situ measurements from data buoys, of fluxes of energy, salt, and water at the ocean/ice/atmosphere interfaces;
(iv) investigation of the impact of these fluxes on ocean density structure and high-latitude ocean circulation;
(v) measurement, using satellite and (for Greenland) aircraft data, of the mass balance of the Greenland and Antarctic ice sheets, and of some of the factors affecting it - snow accumulation, summer melt zones, and ice discharge down glaciers and ice streams;
(vi) improved understanding of the key processes that determine ice-sheet mass balance

Accomplishing these objectives requires development of improved techniques for estimating important geophysical parameters from satellite and in situ data, investigation of key processes and their mutual interaction, the use of models for data assimilation, and assessment of the sensitivity of the climate system to high-latitude processes and of those processes to climate.

The relevant satellite tools available to us include:

AVHRR (sea-ice, including albedo and temperature; clouds; ice-sheet morphology)
Landsat, SPOT and recently declassified "Corona" optical imagery (ice-sheet and glacier mapping and motion)

Laser Altimeter (ice-sheet surface topography and thickening/thinning rates; sea-ice surface roughness)
Passive Microwave (sea-ice; snow cover; onset and extent of surface melting on sea-ice and the ice-sheets)
Radar Altimeter (ice-sheet surface topography and thickening/thinning rates; sea-ice extent
SAR (sea ice, including motion; detailed ice-sheet mapping; glacier and ice-stream motion; ice-sheet surface characteristics)
Scatterometer (coarser resolution sea-ice, including motion; ice-sheet surface characteristics)
T**OVS** (atmospheric sounding; clouds)

All the relevant satellite sensors, apart from the Laser Altimeter, are currently flying, and will continue through the next decade. Moreover, some of the data sets listed above extend back to the 1970s, providing us already with long time series, and a major priority of the Polar Program has been to develop algorithms to convert these data into useful estimates of sea-ice and ice-sheet characteristics, and to develop data systems to apply these algorithms and to distribute user-friendly data to the research community: at the National Snow and Ice Data Center [NSIDC], and the Alaska SAR Facility [ASF]). Nevertheless, experience from past research suggests that full exploitation of remotely-sensed data often requires expertise in both remote sensing interpretation and polar processes.

For the most part, NASA polar research has focused attention on the Arctic, partly because some of the necessary data, such as SAR, aircraft remote sensing, and in-situ measurements, have been more readily obtained from the Arctic. However, it is clear that significant new satellite sources of Antarctic information are becoming available such as ERS tandem mission data and RADARSAT Antarctic Mapping Mission (RAMM), and this NRA invites proposals for Antarctic research using such data.

National Science Foundation (NSF)

The National Science Foundation funds and manages the U.S. Antarctic Program (USAP), which carries forward the Nation's goal of supporting the Antarctic Treaty, fostering cooperative research with other nations, protecting the Antarctic environment, among other activities. The research program is carried out by scientists selected from universities and other research institutions and has three goals: to understand the region and its ecosystems; to understand its effects on (and response to) global processes such as climate; and to use the region as a platform to study the upper atmosphere and space. Research is done in Antarctica which can only or which can best be done there.

NSF's Antarctic Glaciology program is concerned with the study of the history and dynamics of all naturally occurring forms of snow and ice, including floating ice, seasonal snow, glaciers, and continental and marine ice sheets. Program emphases include paleoenvironments from ice cores, ice dynamics, numerical modeling, glacial geology and remote sensing of the ice sheet. The Antarctic Oceans and Climate program at NSF focuses on the structure and processes of the ocean-atmosphere environment and their relationships with the global ocean, atmosphere and the marine biosphere. Research sponsored by the program is intended to improve understanding of the oceanic environment at high latitudes, including global exchange of heat, salt, water and trace elements; sea ice dynamics, and tropospheric chemistry and dynamics. Major program elements include physical and chemical oceanography and sea-ice dynamics.

Canadian Space Agency (CSA)

The CSA, as manager of the RADARSAT mission, has acquired and made available the Antarctic data set in support of this research announcement. One of the most important objectives of the RADARSAT programme is to advance our understanding of Antarctica using these data. More specifically the CSA goals are:

i) use the interferometric data sets to study the movement of ice sheets and glaciers
ii) use the interferometric data sets to study topographic features of scientific interest

iii) to support other scientific projects sponsored by NASA and NSF through this research announcement.
iv) to supply calibration data in support of scientific projects sponsored through this research announcement.

Canada Centre for Remote Sensing (CCRS)

The CCRS has a long history of leadership in research on the applications of earth observation data in general and SAR data in particular. In this research announcement its objectives are:

i) to advance the understanding of the technical capabilities of SAR interferometry in the Antarctic environment
ii) to develop and assess new applications of SAR data based on the interferometry in the Antarctic environment.

2.1 The mass balance of the Antarctic Ice Sheet

Changes in the volume of the Antarctic and Greenland ice sheets have an immediate effect on sea level, and it is expected that such changes will be one consequence of global warming. But we are unable to predict just how large the changes would be or how rapidly they would take place. Moreover, we do not even know the "sign" (i.e. positive/increasing or negative/decreasing) of these changes. Satellite altimetry offers the potential of measuring ice thickening/thinning rates over very large areas, and passive and active microwave imagery provides a great deal of information on surface characteristics of the ice sheets. Ongoing research includes the application of the passive microwave time series, extending from 1978 to the present, to monitor summer melt-zone extent and intensity, and to estimate snow-accumulation rates and 10-meter temperatures. Other relevant data include the recently declassified high-resolution data from the 1960's Corona program, that can be compared with more recent images to reveal ice-sheet changes.

Data from a series of satellite radar altimeters, starting with Seasat in 1978, have been interpreted to infer changes in the surface elevation of parts of the Antarctic and Greenland ice sheets, but analysis is complicated by problems associated with satellite orbits. Although these issues are being addressed, the radar altimeter does not make useful measurements over slopes greater than about 1:60, and there are problems with the interpretation of data over ice associated with the large radar footprint and with radar penetration into the surface snow. Consequently, the Geoscience Laser Altimeter System (GLAS), planned for launch in 2001 as part of the Earth Observing System program, has ice-sheet mapping as its prime objective. Meanwhile, investigators are encouraged to make use of the existing radar altimeter data.

During September/October, 1997 the Canadian Space Agency in partnership with NASA acquired high resolution radar data over the entire continent of Antarctica. This was accomplished by turning the normally north-looking RADARSAT through 180 degrees so that it looked southwards as it passed over Antarctica. The radar data are being processed into images which will be used to produce the first high resolution radar mosaic of the Antarctic. It is intended that these images will be used to support scientific investigations dealing ice dynamics and kinematics, surface properties, ice sheet variability and Antarctic geology and tectonics in the context of understanding the role of the Antarctic Ice Sheet in other global systems.

NASA has supported development of capabilities to apply interferometric SAR (INSAR) to measurement, at high spatial resolution, of surface topography and ice velocities on the Greenland and Antarctic ice sheets. Together with the RADARSAT mapping of Antarctica, this promises to revolutionize the study of ice sheets, offering the ability to measure most key ice-sheet parameters remotely, thus enabling large-area studies that would be far too costly by conventional means. Such work is relevant to understanding the processes responsible for any changes detected GLAS.

Ice-sheet priorities for the NRA include:

- New ideas for the application of the various existing satellite and in-situ data sets, towards achieving the major NASA/NSF goal of measuring and understanding the mass balance of the Antarctic ice sheet.

- Investigations of specific glaciological processes relevant to this goal, preferably using existing data sets, but with also the opportunity to request acquisition of "custom" data sets from RADARSAT SAR.

- Investigations, using theoretical models and available data, addressing the controls on surface accumulation and ablation, to improve our ability to assess likely changes in these parameters in an altered climate.

2.2 Atmosphere/sea-ice/ocean interactions

Sea-ice affects climate directly through its and its role as an insulating barrier between the high-latitude ocean and atmosphere, and indirectly through its impact on polar clouds and the formation of deep ocean water masses. The net effect of these various processes appears to be large. Recent model studies indicate that almost 40% of model-simulated global warming in a doubled CO_2 world is induced by sea-ice feedback. Although existing models poorly represent sea ice and its interaction with the ocean and atmosphere and reality will almost certainly be very different from these model simulations, this result highlights the need to improve the simulation of sea-ice related processes in climate models. Improvement will require better understanding and model simulation of:

- Sea-Ice Albedo Feedback
- Sea Ice as a Heat and Moisture Barrier between Ocean and Atmosphere
- Polar-Cloud Feedback
- Sea-Ice Impact on Ocean Water Circulation

Many climate simulations indicate a high-latitude amplification of greenhouse warming, with a tendency for this amplification to diminish as models take fuller account of ocean interactions and ice dynamics. However, there is still much to be learned, and the variability among model results is indicative of the sensitivity of the climate system to high-latitude processes. Long time series of parameters such as sea-ice extent and thickness, surface temperature, and over-ice energy fluxes provide checks on the models, in addition to supplying basic information for process studies. Ongoing NASA projects are attempting to compile some of these time series, and this NRA seeks to complement the existing studies.

Sea-ice related priorities for the NRA include:

- Identification and quantification of key processes and parameters, involving polar ice, affecting local and global climate. This presumably can be approached by assessing which of these processes/parameters are important to modeled climate, or by using existing time series to identify teleconnections between polar ice cover and climate variables.

  This work is of key importance. Currently, it is difficult to prioritize polar research because we do not know which process or parameter is important in the grand scheme of global climate. Although this difficulty is not unique to polar research it is understandable because of our remoteness from the polar regions.

- The impact of Antarctic sea ice on characteristics of the underlying ocean and overlying atmosphere, that are important to the Antarctic terrestrial ice sheet. Important questions include (but are not limited to):
  - Under what conditions could stratification of the ocean around Antarctica increase sufficiently to trap significantly more heat in deeper waters, which would then become available to increase melting from beneath the ice shelves?

- What is the response of snow accumulation over the ice sheet to changes in the extent, concentration, and seasonal cycle of the sea ice?

- The model assimilation of satellite data to provide improved time series of "observables" such as sea-ice extent, concentration, and type, and "derivables" such as thickness distribution, energy fluxes etc.

3.0 ELIGIBILITY

Participation in this program is open to all categories of organizations, domestic and foreign (data only), including educational institutions, industry, for-profit and not-for-profit organizations, and NASA centers and other U.S. Government agencies. Appendix B provides information for applicants about NSF Awards, the NSF Review Criteria and NSF Grant Administration. Appendix C provides guidance for international participation.

4.0 PROPOSAL SUBMISSION, SELECTION SCHEDULE AND AWARDS

Awards made through this competition are dependent upon responsiveness of the proposals to the announcement, the quality of the proposed research, and the availability of funds. Proposals will be selected on the basis of technical merit, relevancy to the research priorities outlined, program balance, and budget. In addition to the NASA evaluation factors described in Appendix A, other factors that will be taken into consideration by NSF in the evaluation and award process are described in Appendix B. "NSF will only make awards to those organizations that are eligible for NSF support (see Grant Proposal Guide-NSF 98-2) and will administer grants as described in Appendix B."

In FY-1998, it is expected that approximately $2.3 M will be available to support this NRA, with the possibility of increased funding thereafter. Most of the funds will be for support of research using satellite data, with a strong emphasis on interdisciplinary projects, and collaborations between experts in remote sensing and ice scientists are strongly encouraged. We plan to provide first-year funding starting in August 1998 and for a maximum of two additional years based on the availability of funds.

Although proposals submitted in response to this Interagency Research Announcement will be sent to NASA, both NASA and NSF will jointly manage the review and administration of the program. Final selection of awardees by the agencies will be determined by the review panel's recommendations and programmatic considerations. Each award will be supported by a single agency. Principal investigators recommended for funding may be requested to modify their budgets and work plans to comply with special requirements of the particular agency supporting their award. Additional documentation may be required prior to an award in order to comply with the Antarctic program and other agency requirements.

All prospective proposers are strongly encouraged to submit a letter of intent to propose in response to this announcement by the close of business on May 20, 1998. This letter to be sent to NASA will help to expedite NSF and NASA's planning for the peer review. The letter of intent may be submitted electronically through the Internet by completing the forms at URL: *http://www.mtpe.hq.nasa.gov/LOI/form.html***.** You are urged to use these electronic letter of intent forms unless you do not have access to the Internet. In that case, we will accept a FAX copy sent to 202-554-3024 with the following information:

- PI and CoI names and addresses, (including Zip + 4);
- NRA Identifier;
- Title of proposal;
- Telephone number;
- Fax number;
- Email address; and
- A brief summary of your proposal including any plans for aircraft usage (Please limit this summary to no more than 3000 characters).

All proposals from investigators from the U.S. and other countries will be received and evaluated by NASA and NSF. All proposals submitted in response to this announcement are due, at NASA Headquarters, by the close of business on May 20, 1998. Late proposals will not be considered for review and funding, unless it is judged to be in the interest of the U.S. Government. All proposals submitted in response to this announcement must have a completed cover-sheet-form and information on current and pending research support from all other sources (see Appendix C) attached. A complete proposal schedule is given below:

Letter of Intent to Propose due: April 20, 1998

Proposals due at NASA Headquarters: May 20, 1998

Peer Review by Mail: July 3, 1998

Meeting of Peer-Review Panels: July 22-23, 1998

Announcement of Final Selections: August 14, 1998

Additional information is provided in Appendices A-D of this Announcement. Appendix A contains the instructions needed for preparation of solicited proposals in response to this announcement. Appendix B provides information about NSF awards, the NSF review criteria, and NSF award administration. Appendix C provides guidance for international participation. Appendix D provides the list of required declarations and the proposal cover sheet.

5.0 Identifier: NRA 98-OES-03

Submit proposals to: Office of Earth Science
Polar Programs
Mail Code Y
400 Virginia Ave. SW, Suite 700
NASA Headquarters
Washington, DC 20024-3210

Proposals sent by commercial delivery service (e.g., Federal Express), US Postal Service Express, or hand carried should be addressed as follows:

Office of Earth Science
Polar Programs
Mail Code YS
400 Virginia Ave. SW, Suite 700
Washington, DC 20024-3210

Number of Copies Required: 15

Selecting Official: Director, Science Division
Office of Earth Science
NASA Headquarters

Points of Contact for Additional Information

: Dr. S Gogineni, Program Manager
Mail Code YS
NASA Headquarters
Washington, DC 20546
Tel.: (202) 358-0746 Fax: (202) 358-2770
sgoginen@hq.nasa.gov

: Dr. Julie M. Palais, Program Manager
Office of Polar Programs/National Science Foundation
4201 Wilson Boulevard
Arlington, Va. 22230
Tel.: (703) 306-1033 Fax: (703) 306-0139
jpalais@nsf.gov

Your interest and cooperation in participating in this opportunity are appreciated.

Original Signed By

Ghassem R. Asrar
Associate Administrator for
Office of Earth Science

Enclosures:

Appendix A. Instructions for Responding to NASA Research Announcements
Appendix B NSF Review Criteria, Awards and Grant Administration
Appendix C. Guidelines for International Proposals
Appendix D. Proposal Cover Sheet, Formats, Forms, And Required Declarations

Appendix A

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

(JANUARY 1997)

(a) General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR. Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) Transmittal Letter or Prefatory Material.

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information**. Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice

Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description**.

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach**. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel**. The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs.**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(9) **Security**. Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support**. For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) **Joint Proposals**.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals**. A proposal or modification received after the date or dates specified in an NRA may be considered if doing so is in the best interests of the Government.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) **Evaluation Factors**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) **Evaluation Techniques**. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award**.

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Cancellation of NRA**. NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

Appendix B

NSF Award Information

NSF Awards

The Foundation provides awards for research and education in the sciences and engineering. The awardee is wholly responsible for the conduct of such research and preparation of the results for publication. The Foundation, therefore, does not assume responsibility for the research findings or their interpretation.

The Foundation welcomes proposals from all qualified scientists and engineers and strongly encourages women, minorities, and persons with disabilities to compete fully in any of the research and education related programs described here. In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF projects. See the program announcement or contact the program coordinator at (703) 306-1636.

Privacy Act. The information requested on proposal forms is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used in connection with the selection of qualified proposals and may be disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees; to provide or obtain data regarding the application review process, award decisions, or the administration of awards; to government contractors, experts, volunteers, and researchers as necessary to complete assigned work; and to other government agencies in order to coordinate programs. See Systems of Records, NSF 50, Principal Investigators/Proposal File and Associated Records, and NSF-51, 60 Federal Register 4449 (January 23, 1995), Reviewer/Proposal File and Associated Records, 59 Federal Register 8031 (February 17, 1994).

Public Burden. Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of your receiving an award.

The public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Gail A. McHenry, Reports Clearance

Officer, Information Dissemination Branch, National Science Foundation, 4201 Wilson Boulevard, Suite 245, Arlington, VA 22230.

The National Science Foundation has TDD (Telephonic Device for the Deaf) capability, which enables individuals with hearing impairment to communicate with the Foundation about NSF programs, employment, or general information. To access NSF TDD, dial (703) 306-0090; for FIRS, 1-800-877-8339.

Appendix B (cont.)

NSF Review Criteria

NSF will consider in its evaluation and award process the following two criteria and the proposal's strengths and weaknesses with respect to these criteria:

Criteria 1. What is the intellectual merit of the proposed activity?

Potential considerations: How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, please comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to the necessary resources?

Criteria 2. What are the broader impacts of the proposed activity?

Potential considerations: How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g. gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

NSF Grant Administration

NSF grants awarded as a result of this announcement will be administered in accordance with the terms and conditions of the most recent NSF GC-1, "Grant General Condition", or the FDP-III, "Federal Demonstration Partnership General Terms and Conditions", depending on the grantee organization.

More comprehensive information on the administration of NSF grants is contained in the Grant Policy Manual (NSF 95-26, July 1995), for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, D.C. 20402. The telephone number at GPO is (202)-512-1800 for subscription information. The manual is also available on the Internet at www.nsf.gov.

Organizations applying to NSF for the first time, or which have not received an NSF award within the preceding two years, should refer to the NSF Grant Policy Manual, Section 500, for instructions on specific information that may be requested by NSF. First time NSF awardees will be required to submit organizational, management, and financial information, including a certification of civil rights compliance, before a grant can be made. One copy of the Grant Policy Manual will be provided free of charge to new grantees.

Upon completion of an NSF project, a Final Project Report (NSF Form 98A) form will be sent to the grantee. Applicants should review this form prior to proposal submission so that appropriate tracking mechanisms are included in the proposal plan to ensure that complete information will be available at the conclusion of the project.

OMB# 3145-0058

CFDA # 47.078

P.T. 34

K.W. 010200, 1005012, 1005020,
1008004, 1013009

Appendix C

Guidelines for International Proposals

NASA accepts proposals from entities located outside the U.S. in response to this NRA. Proposals from non-U.S. entities should not include a cost plan. Non-U.S. proposals, and U.S. Proposals that include non-U.S. participation, must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the non-U.S. participant is proposing. Such endorsement should indicate the following points: (1) The proposal merits careful consideration by NASA; and (2) If the proposal is selected, sufficient funds will be made available by the sponsoring foreign agency to undertake the activity as proposed.

Proposals, along with the requested number of copies and Letter of Endorsement must be forwarded to NASA in time to arrive before the deadline established for this NRA. In addition, one copy of each of these documents should be send to:

NASA Headquarters
Office of External Relations
Earth Science Division
Mail Code IY
Washington, DC 20546
USA

Any materials sent by courier or express mail (e.g., Federal Express) should be sent to:

NASA Headquarters
Office of External Relations
Earth Science Division
Mail Code IY
300 E Street, SW
Washington, DC 20024-3210

All proposals must be typewritten in English. All non-U.S. proposals will undergo the same evaluation and selection process as those originating in the U.S. Non-U.S. proposals and U.S. Proposals that include non-U.S. participation, must follow all other guidelines and requirements described in this NRA. Sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal without endorsement to the above address, if review and endorsement are not possible before the announced closing date. In such cases, however, NASA's Earth Science Division of the Office of External Relations should be advised when a decision on the endorsement is to be expected.

Successful and unsuccessful proposers will be contacted directly by the NASA Program Office coordinating the NRA. Copies of these letters will be sent to the sponsoring government agency.

APPENDIX C

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES REGARDING LOBBYING, DEBARMENT & SUSPENSION, AND DRUG-FREE WORKPLACE REQUIREMENTS

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must certify that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. DRUG-FREE WORKPLACE

The applicant **agrees** that it will or will continue to provide a drug-free workplace as required by the Drug-Free Workplace Act of 1988, P.L. 100-690, as amended.

3. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency.

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

(signature)

Appendix D

Proposal Cover Sheet, Formats, Forms, and Required Declarations

Proposal Cover Sheet
NASA Research Announcement 98-OES-03

Proposal No. _____ (Leave Blank for NASA Use)

Title: _____

Principal Investigator:

Name:_____

Department:_____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____

Country: _____ E-mail: _____

Telephone: _____ Fax: _____

Co-Investigators: Name Institution Telephone

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Budget:
1st Year: _____ 2nd Year: _____ 3rd Year: _____

Total: _____

Authorizing Official: _____ _____
(Name) (Institution)

Proposal Summary (1-page only)

NASA Research Announcement 98-OES-03

PRINCIPAL INVESTIGATOR
(Name, Address,
Telephone, Email)

Co-INVESTIGATORS:
(Name and Affiliation Only)

PROPOSAL TITLE:

PROPOSAL COST: Yr1 Yr2 Yr3

ABSTRACT: (Single-space, typed). Include: (a) Objectives and justification for work; (b) Accomplishments of prior year's work; (c) Outline of proposed work and methodology; (d) One or two relevant recent publications authored by the PI or Co-I. **DO NOT USE ADDITIONAL SHEETS**.

Current And Pending Research Support
From All Other Sources

All proposals must include this information. This list should include all current and pending research support from the following sources:

1. Any proposal for which the PI of this proposal is also the Principal Investigator.

2. Any proposal, regardless of the PI, which accounts for more than 20% of the time of the Principal Investigator of this proposal and other personnel essential to this proposal.

Please provide this information in the following format:

I. Principal Investigator

A. Current FY 98 Support

1. Source of Support and Principal Investigator
2. Award Amount and Period of Performance
3. Person-Months and Level of Effort
4. Project Title and Short Abstract (50 words or less)

B. Pending Proposals (Excluding this proposal but including other proposals).

1. Source of Support and Principal Investigator
2. Award Amount and Period of Performance
3. Person-Months and Level of Effort
4. Project Title and Short Abstract (50 words or less)

For both current and pending support provide information on:

II. Co-Investigators

As outlined above, provide information on all Current and Pending Support. Disclosure of current and pending research support is not required for collaborators.

III. Other agencies to which this proposal, or parts thereof, has been submitted.

Suggested Contents