RADARSAT-1

ADRO-2

Research Announcement

December 20, 1999

Canadian Space Agency | Agence spatiale canadienne

On behalf of the Canadian Space Agency and the National Aeronautics and Space Administration, we are pleased to announce the second Applications Development and Research Opportunity (ADRO 2) using data from RADARSAT-1. This will continue, and build on, the research carried out under the first ADRO program, which was announced in 1994. The success of the RADARSAT-1 mission is borne out by the fact that it has transitioned satellite synthetic aperture radar (SAR) technology to the point where it is now depended upon for a number of hazard and mapping-related applications. In so doing, the mission has also achieved a number of "firsts" for remote sensing, including complete mapping of the Earth's land surface by synthetic aperture radar (SAR). This culminated in 1997 in the ground-breaking survey of Antarctica. It is our belief that many further benefits can emerge from the mission and its archive of data, even as RADARSAT-1 approaches the end of its nominal lifetime.

We look forward to seeing your proposals and anticipate a productive joint research program.

Rolf Mamen
Director General,
Space Operations
Canadian Space Agency

Ghassem R. Asrar
Associate Administrator,
Office of Earth Science
National Aeronautics and Space
Administration

1.0 DESCRIPTION OF THE JOINT RESEARCH ANNOUNCEMENT

1.1 Introduction

The Canadian Space Agency (CSA) and the National Aeronautics and Space Administration (NASA), hereby announce a program to conduct research using data from the RADARSAT-1 satellite. This program is called the Application Development and Research Opportunity (ADRO-2) and it follows the successful ADRO-1 program.

1.2 Overview of this Document

This document contains two (2) separate Research Announcements. The first announcement is contained in Part I and is offered by CSA. It describes the objectives, eligibility, and procedures for submitting a proposal under this sub-program.

The second Announcement is described in Part II and is offered by NASA as NASA Research Announcement NRA-OES-99-10. The sub-programs can be viewed as separate opportunities and are each intended to be self-contained. Additional copies can be obtained from either http://radarsat.space.gc.ca or http://www.earth.nasa.gov/nra/index.html .

1.3 Sponsors and their Relationship

As the agency responsible for the RADARSAT-1 Project for the Canadian Government, CSA has overall responsibility for ensuring that the RADARSAT-1 Project is a success. As a partner in the RADARSAT-1 Project, the U.S. Government will receive data to support U.S. objectives in accordance with the International Memorandum of Understanding (MOU [1]). NASA will co-ordinate the U.S. sub program.

1.4 The RADARSAT-1 System

Both announcements will utilize data from the RADARSAT-1 system, therefore the description of the satellite system is applicable to both research opportunities. However, NASA relies upon having data processed at the Alaska SAR Facility, whereas CSA relies upon data being processed at the Canadian Data Processing Facility (CDPF). Proposers should be aware of the differences in the products and processing available from the two radar processing systems.

Details on the processing are available on the corresponding websites as follows:

a. CSA: http://radarsat.space.gc.ca . Users may also want to download a detailed

1 Memorandum of Understanding (MOU) between the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the Canadian Space Agency (CSA) concerning the RADARSAT project, dated February 27, 1991.

description of the CDPF products in the User Guide from http://www.rsi.ca/classroom/class.htm Please note that not all products that are described in the User's Guide will be provided under this Announcement.

b. ASF: http://www.asf.alaska.edu

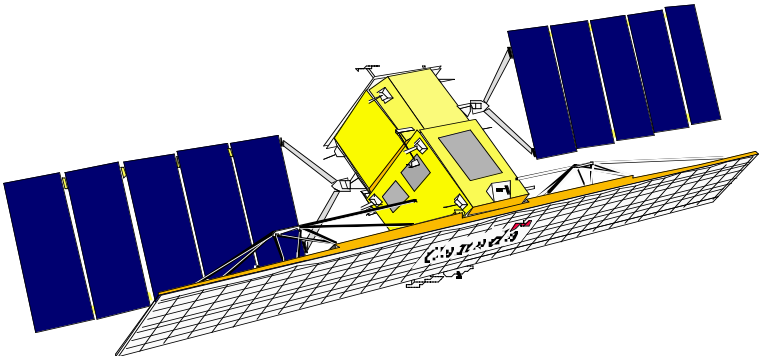
To learn more about the RADARSAT-1 system, many resources are available on Internet including http://www.rsi.ca/classroom/cl_rsat.htm .

Part I

Canadian Space Agency's

RADARSAT-1

Application Development
&
Research Opportunity – 2
(ADRO-2)
Announcement



Canadian Space Agency | Agence spatiale canadienne

Canada

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1 DESCRIPTION OF THE CSA ADRO-2 PROGRAM

1.1 Introduction and Overview

The Canadian Space Agency (CSA) and the National Aeronautics and Space Administration (NASA), hereby announce a program to conduct additional research and application development using data from Canada's RADARSAT-1 satellite. This program is referred to as the Application Development and Research Opportunity 2 (ADRO-2). CSA and NASA are referred to as the program Sponsors and ADRO-2 is a follow-on program to ADRO-1. Details on the results of ADRO-1 can be found at the following website: http://radarsat.space.gc.ca.

1.2 CSA's ADRO-2 General Objectives

This request for proposals is made available through the Earth Observation Application Development Program (EOADP) as part of CSA's Earth and Environment Program. CSA is requesting ADRO-2 proposals to conduct application development and demonstration investigations using RADARSAT-1 SAR data and is specifically seeking submissions which draw upon the extensive archives that have been collected since launch. Accordingly, ADRO-2 has the following general objectives:

a. to encourage the efficient use of RADARSAT-1's archived data sets to aid specific applications;

b. to demonstrate the ability of RADARSAT-1 data to be used effectively in support of disaster assessment or relief efforts;

c. to extend the ability of RADARSAT-1 data to be used in operational environments.

1.3 Eligibility

CSA's ADRO-2 program is open to all organizations operating in Canada. Partnership with non-Canadian organizations will be permitted; however, the Canadian organization must take the project lead.

A requirement of the CSA portion of ADRO-2 is the active participation of an end-user organization (i.e. commercial organization and/or operational user), since this is a program to support quality and specific projects that lead to market development and commercially viable RADARSAT-1 products and services for end-users. The nature of the participation is at the discretion of the proposer, and may or may not involve an exchange of funds amongst the project team. However, as a minimum, the end-user must be willing to commit to participate in the evaluation of the project results and where applicable, participate in any demonstration phase of the project.

1.4 Project Award

Under this program, CSA will provide successful project teams with RADARSAT-1 data from the archives and/or from new acquisitions. No funding support is included in the project award.

1.5 Solicitation and Submission Process

This call for proposals is open until 4.30 pm, EST, February 28, 2000. Organizations should submit their proposal in digital format by sending the proposal to ADRO-2@space.gc.ca.

1.5.1 Digital Copy Available

Additional copies of this document are available on-line at http://radarsat.space.gc.ca

1.5.2 Language

The proposal may be submitted in either English or French.

1.5.3 Digital Format

The proposal should be submitted electronically in either Word or Word Perfect format.

1.6 Background on Objectives of CSA's ADRO-2

Further to the general objectives listed in section 1.2 above, CSA requests that proposers consider the following information in preparation of their submissions.

1.6.1 Archive Applications

RADARSAT-1 was launched in November 1995 and has been routinely collecting data since it was declared operational in March of 1996. Consequently, the archives presently contain significant amounts of historical data that can be useful in determining changes in the Earth's surface. CSA is seeking applications that draw upon this vast wealth of information to demonstrate their utility. Proposers can find additional information on the data archives by utilizing the information located at http://radarsat.space.gc.ca.

Proposers should consider the following data sets as available sources of archived RADARSAT-1 data:

a. The Background Mission data sets have completely covered the Earth with ScanSAR data and has completed extensive coverage using Standard beams. Maps showing the regions covered are located on the CSA website listed above.

b. The Canadian Ice Centre has routinely covered the Canadian Arctic with ScanSAR data on an operational basis.

c. RSI has collected commercial data in many different beam modes from around the world.

d. NASA has routinely covered the Northern Arctic regions and extensive historical data is available.

e. Data collected under ADRO-1 can be made available. Proposers may want to consider extending the studies completed under this program.

f. CSA has been conducting a Disaster Watch program where RADARSAT-1 imagery was collected over regions where a disaster was occurring. Further details can be found on the CSA website listed above.

1.6.2 Disaster Monitoring

In preparing proposals that address disaster monitoring, it is important to recognize three steps in disaster monitoring. This includes analysis before the event, during the event, and after the event. Consequently, the use of archive data is very relevant to a disaster situation. The archive data listed above may prove to be a valuable source of data preceding the event, but not all geographic areas may be covered in the preferred beam mode. Proposers should explain in their submission why they believe a region is considered a high risk for a future disaster and how they believe RADARSAT-1 data can be of benefit in assessing the extent of the disaster and mitigation efforts. CSA is aware that to be effective in a disaster situation that the timeliness of the acquisition and data delivery is of prime importance. Consequently, any proposer who requires data on an emergency basis during an event should indicate this in their proposal. Proposers are encouraged to review the disaster information provided on the numerous web sites including http://radarsat.space.gc.ca and http://www.ceos.noaa.gov/findex.html

1.6.3 Operational Applications

RADARSAT-1 has proven to be a valuable resource in a variety of operational environments. The ability to provide consistent imagery despite local weather or lighting conditions has permitted users to rely on the provision of data to meet their operational requirements. CSA is seeking proposals that demonstrate the utility of the data to operational users, either through increasing utility or new applications. Proposers should explain what existing sources of information are used by end-users and how the inclusion of RADARSAT-1 data will complement the information process. Furthermore, CSA is seeking proposals that emphasize the value of the archive in an operational environment.

CSA recognizes that projects that will lead to realtime or operational use of RADARSAT-1 data may require repetitive coverage of the same area. However, it is the Sponsor's expectation that scene quantities will need to be imposed for all type of projects. Proposers requesting images for non-realtime or for operational or realtime demonstrations should include justification to support their request.

1.7 Responsibilities of the Proposers

The proposers will be responsible for the following:

a. Signature of the Agreement with CSA shown in Part I Appendix A;
b. Coordination of the project execution;
c. Ensuring the project has sufficient funding to complete the planned research;
d. Submission of two progress reports to CSA;
e. Publication of the results of the research project;
f. Submission, to the Sponsor, of project results and methodology used including material for promotional purposes.

1.8 Basic Assumptions and Limitations

1.8.1 Termination of program

CSA reserves the right to cancel all or part of its portion of its portion of the ADRO-2 program, at any time, without liability. It is our intention to continue with the entire program as described herein, however events such as failure of the satellite or cancellation of supporting funds would force termination of the program.

1.8.2 Competitive Award

The ADRO-2 program will provide data from the RADARSAT-1 system to projects selected on a competitive basis. Submission of a proposal does not guarantee its acceptance.

1.8.3 Data Suitability

CSA does not warrant the suitability of the data for any specific application. The proposers should be aware of imaging radar capabilities and limitations.

1.8.4 Data Quantities

Proposers should be aware that, although no precise data limitations are presently being specified, CSA wishes to support as many quality projects as possible from existing budgets. Consequently, all proposals should include an estimate of data requirements in a

form that clearly links data needs to proposal objectives. It will be particularly important to justify large data requests. Limitations on the number of scenes made available are expected and proposers are encouraged to keep the data requests to a minimum. The selected ADRO-2 projects are not intended to support operational requirements beyond a demonstration or proof-of-concept capability.

1.8.5 Promotion of Project Results

In accordance with the objectives of the ADRO-2 Program, CSA intends to use the results in promotion of RADARSAT-1 applications. Proposers must agree and undertake to publicize the results in scientific or technical journals and provide the Sponsor with material for promotional purposes.

It is the intention of the Sponsors to conduct a workshop or symposium, time to be confirmed, in order for the projects to present their results. It is expected that the symposium/workshop could be in either Montreal, Washington, or held in conjunction with a related Earth Observation symposium. The final location and timing will be specified at a later date.

1.9 Intellectual Property and Commercialization

All proposers should be aware that the Intellectual Property rights to the original RADARSAT-1 data vests with the Canadian Space Agency. All data sets will be marked with the following:

" 8 Canadian Space Agency/Agence spatiale canadienne, (Year of reception) ";

CSA encourages the commercialization of techniques to use RADARSAT-1 data, and hence, the intellectual property resulting from project efforts will vest with the developers, with rights granted to the Sponsors to use results for promotional purposes.

1.10 Schedule for the CSA ADRO-2 program

The target dates for the ADRO-2 program are listed below, however the Sponsors will confirm actual dates of each activity through program update notices.

4.30 pm, EST, January 15, 1999	Submission of Letter of Intent
4.30 pm, EST, February 28, 2000	Closing date for receipt of proposals
April 15, 2000	Announcement of selected proposals

April 30, 2000	Data Deliveries commence
April 1, 2001	Data Deliveries cease
Fall 2001	Project Results Due

2 PROJECT SELECTION AND IMPLEMENTATION

2.1 Selection Procedures

The Sponsors with the help of peer reviewers/panels comprising SAR application specialists will review proposals received in response to this call for proposals. These technical specialists will provide advice on the feasibility of data acquisition, etc., to assess potential contribution to Sponsor goals and other programmatic issues.

The purpose of the review will be to evaluate the application and technical merits of the proposed projects in relation to the objectives of this announcement of opportunity and in the context of the specific program. The review will include an assessment of the market development and commercialization of the anticipated results of the project.
Final decisions concerning the acceptance of individual proposals will be announced in writing by CSA.

2.2 Implementation of Successful Projects

Selected Project Leaders will be subsequently contacted to discuss the specific terms under which the project will be conducted and arrange for signature of an agreement between CSA and the selected Project Leader, his/her organization, and any end-user partner to be involved in the project. A sample of the Agreement is included. Failure to sign such an agreement will result in cancellation of project approval.

CSA will provide assistance in acquiring images from both the archive and new acquisitions to meet approved scene allocations per project.

3 GENERAL GUIDELINES FOR PROPOSAL PREPARATION

3.1 Purpose

This section outlines the *general* guidelines applicable to the preparation of proposals to the CSA portion of the ADRO-2 program. These guidelines should be adhered in order to facilitate comparative analysis of proposals and assist in their evaluation. Specific detailed requirements concerning the content of proposals for ADRO-2 appear in this document.

3.2 Address for Submission

All proposals should be submitted in digital format by email to:

ADRO-2@space.gc.ca

Requests for clarification or additional information should be addressed to either:

coord@space.gc.ca

or by mail or fax at the following address:

ADRO 2 Project
Earth & Environment Program
Canadian Space Agency
6767 Route de l'Aéroport
Saint-Hubert, Québec
Canada
J3Y 8Y9
Fax: 1-450-926-4888

3.3 General Conditions

a. Proposals submitted under the CSA ADRO-2 program may be submitted in English or French.

b. The CSA may desire to select only a portion of a proposer's investigation, in which case the proposer will be given the opportunity to accept or decline such partial acceptance. CSA may also ask a proposer to revise and re-submit a proposal, or may suggest possible teaming arrangements with other submissions, and will give proper notice and consideration in such cases.

c. Information of a proprietary nature contained in any proposal should be duly noted by the proposer, and will be used by CSA for evaluation purposes only. CSA will

ensure through signed Non-Disclosure Agreements (NDA's) with the evaluation team, that such information cannot be copied or otherwise retained by any person asked to participate in the review of the proposal but only at the request of the proposer. Should any proposer wish some information to be considered as confidential, he should affix the following "Notice" to the cover sheet of the proposal:

"Notice Information contained in pages(s)... of the proposal must be treated confidentially and utilized solely for the purposes of evaluation."

This caveat should also be clearly indicated (as a footnote) on the actual pages.

3.4 Proposal Content and Format

Applications to CSA's portion of ADRO-2 require completion of a two step process;

1) Submission of a letter of intent and,

2) Submission of a formal proposal.

The letter of intent will be used by CSA to prepare teams to evaluate the proposals, and consequently, is a prerequisite for a subsequent proposal to be accepted for assessment. Letters of intent are not considered by CSA as a binding commitment on the proposer to submit an actual proposal.

3.5 Letter of Intent

The letter of intent must include a completed copy of the cover sheet and an abstract providing a concise summary of the project objectives, methodology, anticipated results, and a schedule of the main activities. The abstract should be not more than two pages in length. This letter will assist CSA in preparing evaluation experts.

The letter of intent must be submitted by mail, Email or facsimile to one of the following addresses:

ADRO-2 Project
Earth & Environment Program
Canadian Space Agency
6767 Route de l'Aéroport
Saint-Hubert, Québec
Canada J3Y 8Y9
Email: ADRO-2@space.gc.ca
Fax: 1-450-926-4888

3.6 Proposal Requirements

The proposal should provide a complete description of the project and be approximately 10 pages and no more than 20 pages in length, excluding personnel résumés and bibliographies. Project Leaders should be aware that page limits will be strictly enforced. Proposals exceeding the 20-page limit may be rejected for this reason alone.

The following outline should be followed in the preparation and submission of proposals:

3.6.1 Proposal Cover Page

The proposal must have a completed cover page that provides the same information as the example provided herein.

3.6.2 Proposal Contents

a) Introduction

This section should provide a brief overview of the project, its objectives, and their relevance to the ADRO-2 program.

b) Technical Proposal and Data Requirements

The technical proposal shall include a listing and description of the tasks to be executed in order to complete the project and achieve the stated objectives. The overall methodology of the project should be explained in some detail.

The proposal must include estimates of the total amount of RADARSAT-1 and other data required, the form or media the RADARSAT data is to be delivered to the Project Leader, and the desired timetable for provision of the data. Data from any RADARSAT-1 mode will be made available. Users will be responsible for geo-referencing and geo-coding of the data. This information will be confirmed with the accepted Project Leader for each scene but is required with the proposal for evaluation purposes only.

In the event the proposal requires new data acquisitions, the proposal shall provide the precise geographic area(s) of interest, defining if possible, geographical co-ordinates of the area. For the area(s) of interest the proposal will indicate:

- the observation frequency required (i.e. daily, weekly, every x days, n times per year, seasonally etc);
- the duration of each observation period (in days, weeks or months);
- the duration of the total activity;
- which RADARSAT-1 incidence angles are preferred;

! Preference, if any, for ascending or descending passes;

In the event that ancillary data is crucial to the success of the proposed project, the proposal must present a plan to acquire these data showing clearly its adequacy and practicality.

The proposal should address what resources are available to carry out the work, including personnel, image analysis equipment, surface data acquisition or monitoring equipment, support facilities, etc.

Every proposal must indicate the manner and form in which the results will be presented, including a written undertaking to participate in an ADRO-2 symposium or workshop.

c) Project Organization

The proposal should summarize the approach and the project organization for the work described in the technical proposal, clearly indicating the Project Leader and affiliation.

d) Funding Requirements

CSA will provide RADARSAT-1 data only and no direct monetary funding will be provided to project teams.

However, proposals should demonstrate that they have anticipated funding sources that will be used to support project activities. Firm commitments of all resources required to carry out the work associated with the proposal must be provided in writing at the time of signature of the Research Agreement.

e) Project Schedule

CSA will contact the Project Leaders of accepted proposals to co-ordinate the acquisitions to meet the project objectives, however, a statement of the desired timeframe of the proposed acquisitions and delivery is required in the proposal.

The proposal must include a schedule for the achievement of all other tasks required to complete the project.

Part I A AGREEMENT FOR CSA ADRO-2 PROGRAM

I covenant and agree that the Data received from the RADARSAT-1 system shall be used only under the following terms and conditions:

1. I covenant and agree to respect the ownership and intellectual property rights of the Canadian Space Agency of all RADARSAT-1 data. I agree and undertake to clearly mark all recognizable RADARSAT-1 data, irrespective of form in which it is reproduced, in such a way that the Canadian Space Agency's copyright is knowledgeable to all, as follows:

   " 8 Canadian Space Agency/Agence spatiale canadienne (year of reception)";

2. The data are for my use for bona fide research and demonstration purposes only. No commercial benefit whatsoever is allowed from the data provided neither under the approved project nor from any products derived from these data sets.

3. The data shall not be reproduced or distributed to any other parties, except that it may be shared amongst the members of my research team (co-investigators) and with other researchers who have duly signed and executed an ADRO-2 research agreement. I am fully aware that I shall be responsible for compliance to these agreement terms by members of my research team, with whom I share these data.

4. I shall publish in the open scientific literature and provide the Sponsor with material for promotional purposes from the results of the research accomplished under this program.

5. I agree and undertake to provide a copy of such results, including derived data sets, algorithms, models, and documentation, to the Sponsor for archive and potential distribution.

I covenant and undertake that if these conditions are violated, the Sponsor may take the appropriate action including, but not limited to, the termination of this Agreement <u>and barring from future Research Agreements with the Sponsor.</u>

Project Leader/Principal Investigator: _____

Date: _____

Signature: _____

Project Title: _____

Part I B LETTER OF INTENT FOR CSA ADRO-2 PROGRAM

Please complete the following and attach to your two-page abstract.

Title of Project

_____

Project Leader/Principal Investigator: _____
Affiliation:_____
Division/ Department: _____
Mailing Address:_____
_____
_____
_____

Phone:_____ Country code: _____ City code: _____ Local Number: _____
Fax: _____ Country code: _____ City code: _____ Local Number: _____
E-Mail: _____

List of Partners/Co-Investigators and their affiliation:

_____
_____
_____
_____
_____
_____

Anticipated Funding Source _____

Attached: Abstract of intended proposal; Two page maximum

I acknowledge and agree that this Letter of Intent is not to be considered as a binding commitment to submit a proposal.

Signature and Name of Project Leader/Principal Investigator:

_____

Part I C PROPOSAL COVER PAGE FOR CSA ADRO-2 PROGRAM

Title of Project:

_____

Project Leader/Principal Investigator: _____
Affiliation: _____
Division/ Department: _____
Mailing Address:

_____
_____
_____
_____

Phone: Country code: _____ City code: _____ Local Number: _____
Fax: Country code: _____ City code: _____ Local Number: _____
E-Mail:

_____

List of Industry Partners/Co-Investigators and Affiliation:

_____
_____
_____
_____
_____

Signature and Printed Name of Project Leader/Principal Investigator:

_____

Signature and title of representatives or individuals duly authorized to legally bind the organization:

_____
_____
_____
_____

Signature of Co-Investigators and Industry Partners:

Name (Please Print) Signature

_____
_____

Part II

National Aeronautics and
Space Administration

December 20, 1999

NRA-99-OES-10

RESEARCH ANNOUNCEMENT

INVESTIGATIONS USING RADARSAT-1 DATA AND DERIVED PRODUCTS, AND OTHER ARCHIVED DATA FROM THE ALASKA SAR FACILITY (ASF)

Proposals Due February 28, 2000

OMB Approval No. 2700-0087

INVESTIGATIONS USING RADARSAT-1 DATA AND DERIVED PRODUCTS, AND OTHER ARCHIVED DATA FROM THE ALASKA SAR FACILITY (ASF)

NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
February 28, 2000

NRA 99-OES-10
Issued December 20, 1999

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

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INVESTIGATIONS USING RADARSAT-1 DATA AND DERIVED PRODUCTS, AND OTHER ARCHIVED DATA FROM THE ALASKA SAR FACILITY (ASF)

1 DESCRIPTION OF THE OPPORTUNITY

The National Aeronautics and Space Administration (NASA), together with the Canadian Space Agency (CSA), announce a program to conduct scientific investigations using Synthetic Aperture Radar (SAR) data and derived products. The primary sensor of interest is the SAR on board RADARSAT-1, which has operated since 1995, but the NASA opportunity extends to archived data from other SAR sensors, including the European Space Agency's ERS-1 and ERS-2 satellites, and the Japanese Earth Resources Satellite, JERS-1. The prime objective of the NASA Research Announcement (NRA) is to solicit proposals for applications of SAR products to land, oceans and ice research, and particularly those associated with the NASA's Earth Science Enterprise (http://www.earth.nasa.gov). Proposals that make use of SAR data along-side complementary data-sets, such as from QuikScat (NRA-99-OES-04), are also encouraged.

This program follows and extends an earlier collaborative NASA-CSA program entitled the RADARSAT-1 "Application Development and Research Opportunity", released in December 1994 (referred to here as "ADRO 1"). A number of exciting and novel applications of RADARSAT-1 data emerged from the ADRO 1 program, and it is the intention of NASA and CSA (hereafter called the "sponsors") to build on this success through this further announcement of opportunity, hereafter called "ADRO 2". Proposers who were funded under ADRO 1 must submit new proposals under this NRA in order to continue their research. The main focus of this NRA will be to support analysis of archived RADARSAT-1 data and products. Under the terms of the US-Canada Memorandum of Understanding [2] (MOU), the US can request specific RADARSAT-1 coverage until November 4, 2000. No new acquisitions from RADARSAT-1 are currently available to US investigators after that date.

2 THE NASA EARTH SCIENCE ENTERPRISE

NASA's Earth Science Enterprise seeks to develop an understanding of the total Earth system and the effects of natural and human-induced changes on the global environment. NASA is particularly focused on questions to which remote sensing data are essential for progress. Considering the current state of Earth science and the context of national and international research efforts, NASA has identified the following priority research themes for the coming decade:

- Ecosystems & Global Carbon Cycle: How do changes in terrestrial and marine ecosystems affect primary productivity and the global carbon budget?

2 Memorandum of Understanding (MOU) between the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the Canadian Space Agency (CSA) concerning the RADARSAT project, dated February 27, 1991.

- Global Water & Energy Cycle: In what way are atmospheric and hydrological processes that produce severe weather, cause floods, and control water resources related to climate changes?
- Climate Variability & Change: Are the changes we observe in the Earth climate associated with mechanisms we can understand, model, and predict?
- Solid Earth & Natural Hazards: Can we understand the dynamics of the Earth interior, and use this knowledge to prepare for natural hazards such as volcanoes and earthquakes?
- Atmospheric Chemistry: Is stratospheric ozone recovering as a result of the Montreal Protocol? Can long-distance transport cause significant global tropospheric pollution?

NASA Research Announcements (NRAs) from the Earth Science Enterprise, as well as observing mission selections, are designed and issued in this broader research context. SAR data has an important role to play in contributing to the first four of these research themes. Prospective investigators are invited to show clearly the relevance of the proposed project to one or more of these research themes and specifically to science questions that reside within them. The use of complementary data-sets are encouraged that assist the effective use of SAR data in addressing these science questions.

3 PROJECT SCOPE

The following categories of proposals are solicited:

a) Highest priority will be given to research that addresses important Earth system science questions, as defined through NASA's Earth Science Enterprise (ESE) program (http://www.earth.nasa.gov/) and summarized above. Proposals in this category will be expected to have specific and detailed scientific objectives by which the progress of the project may be evaluated.

b) Proposals are also invited that enhance the usefulness of SAR data for the general research community, through the development of new SAR products or the evaluation of existing SAR products. In this case the proposal should form part of a clear plan in which the derived products or techniques, or the results of evaluations, will be made available to the research community at the end of the project. All algorithms developed will be subject to the terms and conditions of the EOS Data Policy (NASA, 1993). Fundamental microwave research and entirely speculative algorithm research will not be supported.

c) Applications Demonstration programs, in which research is directed towards assisting applied (operational) problems such as oil spill detection, will be considered for provision of data only. These projects should last a finite length of time, and should specify a well-defined data-set to meet the project objectives. All Principal Investigators accepted under this area will be expected to publish the results of their research in the open literature. NASA is supportive of operational applications development and more information is provided at http://www.crsp.ssc.nasa.gov.

Projects are also encouraged that have a bearing on the design of future programs and research.

However, this is a secondary objective and should not form the basis for a proposal on its own. NASA will not provide financial support to projects more appropriately supported by other agencies.

In summary, all proposals submitted in response to this Announcement must be for research using SAR data. You may propose either:

a) to obtain financial support and access to data, or
b) to obtain access to data with the financial support for their use being provided from another source.

4 SCIENCE RESEARCH TOPICS

This section describes some of the research areas that may benefit from SAR data. The list of topics and descriptions of the disciplines serve as guidelines only and proposers are encouraged to suggest additional research topics. Proposers should note that, while applications of SAR data are emphasized in this narrative, synergy with other sensors is encouraged.

Polar Oceans

Interactions between sea-ice, ocean and atmosphere at high latitudes strongly affect the Earth's climate system. These effects include absorption and emission of radiant energy, poleward flux of heat, and modification of ocean density structure that modulates thermohaline circulation. Sea-ice growth, movement, and decay affect key elements of the polar ocean system. The surface heat and brine fluxes associated with sea-ice growth contribute significantly to convection of the ocean and thermohaline circulation. Snow covered sea-ice reflects most of the incident solar energy back into space, while freshwater fluxes associated with melting ice serve as stabilizing elements in the circulation of North Atlantic waters. Processes along the ice margin and coastlines participate in water-mass formation, upwelling, convection, sediment transport, and other phenomena. Understanding and modeling these phenomena require information on sea-ice extent, thickness, motion, type, and concentration. This must be supplemented by data on cloud cover, radiative fluxes, surface winds and temperatures.

Coverage of the Arctic Ocean by RADARSAT-1 has been extensive and has been coordinated through the so-called "Arctic Snapshot" data acquisition program, which is reviewed in Section 6.2. Furthermore, extensive and novel geophysical products from across the Arctic Ocean have been generated by the RADARSAT Geophysical Processor System (RGPS), developed by NASA. Important activities for this program include an evaluation of the quality of these products and demonstration of their application to key science questions. Combination of these products with models and/or complementary products from other sensors such as SSM/I and QuikScat is encouraged. Additional analysis of basic SAR data from the Arctic Snapshot is also encouraged.

Ice Sheets and Glaciers

The immense ice sheets of Antarctica and Greenland exert important radiative and thermal influences on both regional and global climate. They are vast storehouses of freshwater with enormous potential for influencing global sea level. Model simulations showing significant high-latitude enhancement of any climate change suggest that Greenland and Antarctica might provide early warning of global climate change. Yet, recent results from the NASA-sponsored Program for Arctic Regional Climate Assessment (PARCA) program and elsewhere are starting to demonstrate the complexity of the behavior of the ice sheets in terms of regional differences in height change and dynamics, and time-scales of response to external forcing.

SAR data show ice-sheet extent, detect flow features, delineate melt regimes and can be used to locate dynamically important regions. RADARSAT-1 has already been used to great effect in improving our knowledge of these major ice masses. A collaboration between NASA and CSA resulted in the successful first Antarctic Mapping Mission (AMM-1), which provided an image snapshot of the continent compiled over a period of about 18 days during late 1997 (http://polestar.mps.ohio-state.edu/ramp.html). This is reviewed further in Section 6.2. In Greenland, SAR data have been used to map surface melt zones and have also been used to investigate the dynamics of key glacier systems, through the use of interferometric techniques, augmenting both field studies and airborne campaigns carried out through the PARCA program (http://cires.colorado.edu/parca.html). An additional invaluable data-set for glaciological research is provided by the ERS tandem mission from 1995-96, which achieved interferometric coverage of much of Antarctica north of 79°S.

For all proposals involving ice sheets, the over-arching objective is to improve our knowledge of the dynamics and mass balance conditions of key ice catchments or the ice sheet as a whole. For projects that are focussed on Greenland, it is expected that projects will be clearly linked into activities that have been supported through PARCA. For projects that are focussed on Antarctica, it is expected that there will be use of (interferometric) ERS tandem data and/or RADARSAT-1 data from AMM-1. Complementary use of other data-sets, such as SSM/I and QuikScat, is encouraged, within the context of improving our understanding of key components of the mass balance equation or fluxes. A by-product of projects focussed on Antarctica should be to assist in future planning of regional (airborne) campaigns.

The two great ice sheets contain the vast majority of glacial ice, but smaller glaciers and ice caps are more widely distributed and act as important indicators of regional climate. Glacial systems contain memories of recent climate, but have a complex response to regional climate, including different lag times. In general, glaciers appear to be retreating and may have contributed to about one-third of the observed increase in sea level this century. Because of cloud coverage, SAR offers a convenient means of providing insight into the behavior of regional glacier systems and ice caps to complement studies of the major ice masses and to provide more widespread coverage of these natural integrators of climate. Projects that can demonstrate the use of SAR data in improving our knowledge of regional climate and/or hydrological processes through glacier system studies are also encouraged.

Geology

SAR studies in geology and geomorphology are useful for mapping and monitoring studies, including

the determination of surface elevation, the distribution of surface materials, the structure of geologic units, and the long-term record of climate change. On the shorter time scale, SAR provides information on processes such as volcanism, tectonics and erosion. SAR can be used to generate high-resolution digital elevation models for a wide range of hydrologic, geologic, and ecological applications. High resolution (~30 m/pixel) digital terrain data, potentially available from interferometric analysis of SAR data, may be the best source of information for determination of slopes, volumes and the absolute relief of many areas of the world. Interferometric analysis also yields information on short-term changes, such as terrain displacement following an earthquake. For studies of larger time-scale changes, SAR images have been used to map glacial moraines and raised beaches over large distances in areas that are difficult to reach.

Monitoring studies center on the ability of remote sensing techniques, including radar, to study centimeter-scale surface changes at high spatial resolution over hundreds of square kilometers. Through repetitive coverage of a region, earthquake deformation, the changes in a volcano prior to an eruption, the distribution of subsidence due to landslides, and groundwater withdrawal can all be monitored.

Oceanography

SAR data have been applied to measurements of numerous oceanic processes occurring at or near the sea surface. Imagery is being used to map the gravity wave field, internal waves, warm-core eddies, surface slicks, currents and near-surface winds. Recent emphasis has been placed on utilizing the relatively high spatial resolution of SAR for coastal oceanography that complements lower resolution open ocean satellite instruments such as SSM/I and scatterometers. Emerging topics in this area include measuring the coastal wave field, hurricane winds and rain, surface slicks, freshwater signatures, vessel detection and coastal winds. Measuring surface wind fields and marine boundary layer impacts at scales of 0.1 to 5 km promises to expand our information on near surface fluxes and ocean boundary layer stability, storm generation and propagation, oceanic precipitation, and to improve forecast capability in coastal regions and the open ocean. Ocean biologists may benefit from some possible combination of surface temperature, ocean color, current and SAR data relating slicks and eddies to the detection of near-shore primary productivity. Many ocean forecast and monitoring activities can potentially utilize SAR data for local and regional surface and subsurface currents, atmospheric forcing and freshwater input; conditions leading to toxic algae blooms; drift pattern of spilled or natural slicks; ship monitoring in fisheries and other zones of interest.

Biology and Biogeochemistry of Ecosystems and the Global Carbon Cycle

The sensitivity of radar to vegetation structure and surface moisture, as well as its ability to image the surface when clouds are present, make it a valuable data source. Not only does it provide remote sensing information for the study of forest ecosystems, global land cover change, and terrestrial carbon storage that is unique, it also provides information that is complementary to that from optical sensors. NASA is particularly interested in new studies to utilize SAR data for:

1) characterizing forest cover, particularly in areas of frequent cloud cover, both as a primary source of information as well as a secondary source for filling in regional and global data sets when optical remote sensing data are insufficient;
2) documenting the extent of global wetlands and, insofar as possible, the temporal dynamics of seasonal inundation, and
3) exploring the ability to quantify changes in above-ground biomass of vegetation experiencing re-growth following a disturbance or change in land cover or use.

There is a growing need by the science and policy communities for timely and reproducible data sets on forest extent, rates of change, and biophysical characteristics (see http://www.gofc.org/gofc). SAR is one of several types of remote sensing technologies that can provide such information for forest ecosystems. Furthermore, SAR can be used to improve models of the processes and patterns of carbon storage and flux from forest ecosystems as a function of seasonal pattern (e.g. freeze/thaw status and phenology) and fire extent and history. Also of importance, particularly in mid-latitude and tropical areas, is mapping of deforestation extent and re-growth. SAR data also offer potential for forestry applications such as: reconnaissance mapping; mapping burned and/or deforested areas; and environmental decision-making.

Quantifying the rates, patterns, and degree to which landscapes respond to both anthropogenic and natural disturbance will address a major uncertainty in the terrestrial carbon budget. Observations to track both the occurrence of, and recovery from, major disturbances (e.g. fire, insect infestations, deforestation) are critical to understanding the overall rates of exchange of carbon between the terrestrial surface and the atmosphere. Both lidar and radar remote sensing approaches have potential to provide valuable information about above-ground biomass. The sensitivity of the SAR to above-ground biomass, which is well-documented for low to intermediate biomass levels in forests, can be exploited to follow at least the early stages of carbon sequestration in re-growing forest vegetation.

Permanent and seasonal wetlands and permafrost areas play a major role in global biogeochemical cycling as sites of atmospheric trace exchange; carbon dioxide fluxes and methane emissions are of particular interest to the NASA ESE program. SAR-derived estimates of the areal extent of wetlands, level of surface inundation, and vegetation type and amount can be important in predicting trace gas source and sink strengths. The predominance of wetlands in boreal forest and tundra ecosystems makes the high latitudes particularly important source areas for trace gases. Wetlands in tropical forest ecosystems are also important ecosystems for trace gas exchange, and radar's unique ability to detect surface inundation under forest canopies can be exploited in this regard.

Agriculture and land cover change

Agricultural studies using ERS-1 and RADARSAT-1 data demonstrate the utility of SAR data for crop classification, biomass estimation and crop monitoring (based on time series of data with appropriate ancillary information). Distinctive agricultural practices and schedules can be exploited to assist in land cover classification using multi-temporal SAR data. Change detection can also be used to investigate systematic change in a landscape. Events of interest can include, but are not necessarily limited to: desertification, deforestation and re-growth, urbanization, land degradation, and other natural and human-induced disturbances of land cover.

Hydrological applications

The terrestrial hydrologic system's interaction with the climate system occurs primarily with the thin reservoir of soil that stores and distributes precipitation, and so soil moisture observations are critical for understanding land-atmosphere interactions. The processes of wetting and drying of the soil also significantly influence the amount of radiant heat absorbed, and the partitioning of the incoming energy into outgoing latent and sensible heat fluxes. Soil moisture is an important state variable in the climate system; it determines the partitioning of net surface radiation into sensible and latent heat fluxes and the partitioning of rainfall, snow melt or irrigation into infiltration and runoff. Unfortunately, in estimating soil moisture from SAR data, the penetrating depth and the effects of topography, soil heterogeneity and vegetation seriously complicate the analysis and use in models.

Lakes, rivers, and areas of standing water can be readily and accurately detected with SAR data, even in situations in which the water is obscured by vegetation as long as surface roughness, due to wind, is limited. This capability is useful in monitoring flood and drought conditions for large rivers and lakes. It can also be used to map standing water in wetlands, especially in remote or inaccessible areas. This capability could be exploited in prediction and monitoring of flood emergencies and in estimating runoff.

Snow cover represents an important source of short to medium-term storage for fresh water. Key studies of snow cover include: mapping seasonally snow-covered areas, estimating free liquid water content, and refining and validating models for observing snow fields from space. These studies range from drainage basins to regional scales and would include the snow line on glaciers and the provision of products for runoff forecasting and climatic investigations. However, at this time, it is not clear that single-frequency, single polarization SAR data provide sufficient information to recover snow properties, although significant progress in determining snow-water equivalence appears to have been made in ADRO 1 projects.

5 TECHNIQUES

The range and quality of techniques available for analyzing SAR data have grown considerably in the last ten to fifteen years, and these include techniques related to spatial texture, multi-temporal data signature analysis, feature tracking and filtering. Perhaps the most impressive technique to emerge from SAR data analysis in recent years is that of interferometry. The technique can be used with astonishing precision to measure changes in the positions of the surface scattering elements, enabling detection of such events as co-seismic displacement and volcano "swelling", and also to measure glacier motion, changes in coastlines and ground subsidence due to water or oil extraction. The coherence associated with SAR interferometry also provides information for the detection of land cover change and other ground disturbance. The RADARSAT-1 orbit repeat of 24 days is longer than optimal for interferometric applications in many areas, but may prove adequate for polar ice, arid-lands, geology, and some wintertime phenomena. Interferometric data from the ERS tandem mission are also available from the ASF through this NRA. Further information and links are available at http://www.asf.alaska.edu/user_serv/sar_faq.html#interferom.

6 PROJECT RESOURCES

Distribution of SAR data products will be the responsibility of the Alaska SAR Facility (ASF) Distributed Active Archive Center (DAAC), a node of the Earth Observing System Data and Information System (EOSDIS). Web site information is provided to assist proposers. For those without direct access to web information, please contact the ASF User Services for further information, tel. 907-474-6166, fax 907-474-2665, email uso@asf.alaska.edu.

6.1 RADARSAT-1 Data Availability

RADARSAT-1 is a joint program between the Canadian Space Agency (CSA) and NASA, and the satellite was launched in November 1995. In accordance with the US-Canada Memorandum of Understanding (MOU) the US can request specific RADARSAT-1 coverage until November 2000. Mission control is the responsibility of the CSA and ASF serves as the interface to the CSA for data requests as part of this NRA. All NASA-supported researchers will receive their data from the ASF.

The C-band (5.3 GHz) SAR is the only sensor on the satellite, and has provided imaging in several different modes over an accessibility swath of 500 km, covering a range of incidence angles of 20 to 50 degrees. A user can select products from a variety of imaging modes ranging from the full 500 km swath to a standard resolution beam, which is approximately 100 km wide. RADARSAT-1 has operated in a sun-synchronous polar orbit at an altitude of 798 km and inclination of 98.6 degrees and the system has collected up to 28 minutes of SAR data each orbit. The 24 day repeat cycle has provided sub-cycles of 7 days and 3 days, and these can be used to investigate geophysical phenomena at a range of temporal sampling rates. RADARSAT-1 is a north-looking satellite, which means that there has been a gap over Antarctica near the South Pole. However, during 1997, the satellite was rotated to allow for complete coverage of the southern polar region. The RADARSAT-1 platform has two on-board tape recorders that have been used to obtain data in areas not covered by a receiving station. More complete details of RADARSAT-1, including

definitions of the modes of operation and their calibration status, are provided in http://www.asf.alaska.edu/radarsat/radarsat_toc.html.

New acquisitions with RADARSAT-1 are available to NASA-approved investigators until November 4, 2000, at which time the existing MOU between NASA, CSA and NOAA expires. Thus, investigators should plan for new acquisitions only up to November 4, 2000. After that time, investigators should plan to use only acquired and archived data, and derived RADARSAT-1 products. However, prospective investigators should retain some flexibility in their plans to enable them to take advantage of any possible extension to the MOU.

Most RADARSAT-1 SAR standard beam products at ASF are now calibrated, as is ScanSAR Wide B data and the left-looking beams used to map Antarctica. Additional calibration will be completed during 1999 and proposers should review the ASF web site http://www.asf.alaska.edu/user_serv/rsat1_table.html for an updated schedule.

RADARSAT-1 products are subject to anomalies and these should be checked prior to submitting a proposal for applications of RADARSAT-1 data. For details, see http://www.asf.alaska.edu/user_serv/anomalies.html.

6.2 RADARSAT-1 campaign data-sets

Campaign data-sets are summarized at http://www.asf.alaska.edu/user_serv/project_data.html.

The Arctic Snapshot

RADARSAT-1 has provided the first routine imaging of a large portion of the Arctic and adjacent ice-covered seas by SAR, through the so-called Arctic Snapshot. The Arctic Snapshot has provided coverage of much of the western Arctic every 3 days since in October 1996. These data form the basis for operation of the RADARSAT-1 Geophysical Processor System (RGPS), which is designed to provide experimental ice age and thickness histogram products, as well as ice drift and deformation products (http://www-radar.jpl.nasa.gov/rgps). The combination of wide coverage SAR data, good and consistent temporal sampling and a processor that provides geophysical products makes this a powerful data set, providing opportunities for scientists to improve models of the Arctic and to investigate possibilities for synergy with other wide-coverage data sets, such as passive microwave and optical/infra-red data.

The ASF has been collecting RADARSAT-1 ScanSAR Wide B data over the Arctic Ocean and some sub-Arctic oceanic regions since October 1996. The target coverage has been complete coverage every 3 days over areas covered by the ASF station mask and coverage every 6 days in other Arctic oceanic regions. Actual coverage statistics are provided at http://www.asf.alaska.edu/rgps/snapshot.html.

The Antarctic Mapping Mission

The Antarctic Mapping Mission (http://polestar.mps.ohio-state.edu/ramp.html) was a joint venture

between CSA and NASA and involved the collection of data from the Antarctic continent over a period of 31 days in September and October 1997. The resulting mosaic has been compiled under the coordination of the Byrd Polar Research Institute at Ohio State University, and is a factor of about forty times better in terms of spatial resolution than a previous image mosaic compiled using AVHRR data (which, furthermore, took some thirteen years to complete due to cloud contamination). This product provides information at a pixel size of 25 meters over the entire continent, representing the first true "snapshot" of the state of the ice sheet and providing a valuable baseline for investigating future change. A second, Antarctic mapping mission is planned for RADARSAT-1.

6.3 Derived RADARSAT-1 Products: The RADARSAT Geophysical Processor System

The Arctic Snapshot provides data for the RADARSAT Geophysical Processor System (RGPS), which generates geophysical sea-ice products. The RGPS ingests image data from the SAR processor and produces geophysical data on a moving Lagrangian grid covering the Arctic Ocean, with an initial grid spacing of 10 km. These products include: ice motion and deformation; estimated ice-age and ice-thickness distributions; backscatter distribution; and surface meteorological data derived in part from the International Arctic Buoy Program. The meteorological data include 2-meter air temperatures, 10-meter wind vectors, surface temperature, and pressure, and are provided from data derived in part from the International Arctic Buoy Program. The output files from this system are available for research applications from ASF and more detail is available at the RGPS web site, http://www-radar.jpl.nasa.gov/rgps and at: http://www.asf.alaska.edu/user_serv/rgps_table.html.

6.4 Other SAR Data

NRA proposers are encouraged to make use of any archived SAR data available at the ASF. However, new data acquisitions from SAR sensors other than RADARSAT-1 are not available.

ERS-1 and ERS-2

NASA and the European Space Agency have cooperated in the European Remote Sensing Satellites ERS-1 and ERS-2 program under an MOU [3]. All NASA-supported researchers will receive their data from the ASF.

ERS-1 was successfully launched in 1991 and ceased to be used operationally in 1996, but was followed in 1995 (with some overlap) by ERS-2, which continues to be operational. The Active Microwave Instrument (AMI), which is the same design on both ERS-1 and ERS-2, operates at C-band and combines the functions of a SAR and a wind Scatterometer. The SAR mode can be operated for a maximum of 12 minutes per orbit. It is not possible to operate the Scatterometer and

3 Memorandum of Understanding between the United States National Aeronautics and Space Administration and the European Space Agency concerning the acquisition of ERS-1 SAR data at Fairbanks, dated January 14, 1986.

the SAR simultaneously.For a short period, the ERS-1 and ERS-2 operated in tandem and generated data for use in repeat pass SAR interferometry.

ERS-1 and ERS-2 SAR data have been acquired when the satellite has been within range of the ASF ground receiving station (approximately 3,000 km). In general, data have been collected in segments of not less than 2 minutes duration, covering approximately 800 km along the orbit track. Details are provided at:
http://www.asf.alaska.edu/source_documents/ers1_source.html
http://www.asf.alaska.edu/source_documents/ers2_source.html.

In addition, ERS tandem data (data collected by ERS-1 and ERS-2 of the same location, separated by a day), have been collected and archived at the ASF. These data support interferometric applications of SAR data where a rapid revisit is required to maintain coherence between passes.

JERS-1

NASA and the National Space Development Agency of Japan (NASDA) have cooperated in the Japanese Earth Resources Satellite-1 (JERS-1) program under an MOU [4]. All NASA-supported researchers will receive their data from the ASF.

The JERS-1 satellite was launched in 1992, and ceased operations in 1998. The payload includes both a SAR and an optical sensor, but only SAR data from JERS-1 are available through this NRA. The SAR is an L-Band sensor which was designed primarily for land applications including: resource exploitation; land surveying; forestry; environmental protection; disaster prevention and coastal monitoring (NASDA, 1990). JERS-1 carried onboard data recorders, and so was able to collect data from well outside the ASF station mask. A more complete description can be found at: http://www.asf.alaska.edu/source_documents/jers1_source.html.

NASDA, NASA, and the Joint Research Center in Europe are cooperating in creating global mosaics of JERS-1 SAR data for tropical and boreal forests (the Global Rain Forest Mapping (GRFM) and Global Boreal Forest Mapping (GBFM) Projects, respectively). For the Amazon, peak wet season and peak dry season coverage has been collected. Some of these data are now available, and the rest will soon become available, through EORC in Japan (see http://www.asf.alaska.edu/user_serv/project_data.html for information on what data are currently available).

6.5 Ancillary Data-Sets

RADARSAT-1's effectiveness as both a regional and high-resolution imaging sensor is enhanced further when combined with data sets compiled from other sensors by the EOS data centers. As an example, the National Snow and Ice Data Center (NSIDC) offers gridded, calibrated passive microwave and visible/near-IR/thermal-IR data sets covering both poles and spanning most of the

4 Memorandum of Understanding between the United States National Aeronautics and Space Administration and the National Space Development Agency of Japan concerning the direct reception of JERS-1 data at the Fairbanks Station, dated January 28, 1988.

last 20 years (http://www-nsidc.colorado.edu). NSIDC also distributes digital elevation model information for both Greenland and Antarctica, sea-ice and land-ice velocity data, and a variety of climate-related data sets. These data can be combined with the active radar to provide additional insight into firn character, sea-ice type, mass fluxes, and simply to track the changes that have occurred in the cryosphere in the recent past. Other EOS data centers provide ancillary products for other disciplines and prospective PIs are encouraged to investigate these resources (see http://spsosun.gsfc.nasa.gov/Newer_Index.html).

6.6 Software Tools

NASA has provided support for the development of software tools that can assist users in the analysis of SAR data. These cover a range of functionality and are designed to support all formats of data provided by the Alaska SAR facility. They are described at http://www.asf.alaska.edu/step/intro.

6.7 Intellectual Property and Commercialization

All proposers should be aware that the intellectual property rights to the original RADARSAT-1 data vests with the Canadian Space Agency. All data sets will be marked with the following bilingual copyright notice:

"© Canadian Space Agency, Agence spatiale canadienne (Year of reception)"

The Sponsors encourage the commercialization of techniques to use RADARSAT-1 data, and hence, the intellectual property resulting from project efforts will vest with the developers, with rights granted to the Sponsors to use the results for promotional purposes.

The intellectual property rights to the original ERS-1 and ERS-2 data vests with the European Space Agency. All data sets will be marked with the following:

" © ESA, (Year of reception). "

In addition, the proposer must mark all ERS SAR data and analyzed information received under the IMOU as follows:

" © ERS-(Number) "

The intellectual property rights to the original JERS-1 data vests with the National Space Development Agency of Japan. All data sets will be marked with the following:

" © NASDA, (Year of reception). "

In addition, the proposer must mark all JERS SAR data and analysed information received under the IMOU as follows:

" © JERS-1 "

Please refer to ASF for further information regarding copyright of data.

7 GUIDANCE FOR PROPOSERS

General instructions for submission of a proposal in response to this NRA are given in Part II, Appendix A. Part II, Appendix B provides certifications and proposal cover sheet template required for this NRA. Part II, Appendix C contains instructions for preparing a budget summary.

In addition to the requirements of Part II, Appendix A, proposals should include the following information.

- A work plan, indicating the specific tasks that are planned for each year of the proposed project, should be included as part of the text.

- All proposals should include a list of other support for the principal investigator and any co-investigators. Where the proposers have other support from NASA's Office of Earth Science, a clear statement of the relationship between this proposals and their other NASA funding should be provided.

- Vitae for each investigator should be limited to no more than three pages, including a selected list of publications.

- To facilitate recycling, proposals should be prepared on white paper using no binding material other than clips or staples. No plastic cover sheets should be used. If color figures are used, proposers should ensure that all proposal copies contain color copies of the figures.

- Proposals should be self-contained. Preprints or reprints of publications and reports should not be attached. Reviewers will be instructed that they should ignore any such attachments when evaluating a proposal.

- If use of NASA supercomputer resources is anticipated, an estimate of computational requirements on a NASA system should be included as part of the budget submission.

- Proposers should include in their plans attendance at a three-day ADRO program review during the final year of the program. For budget purposes, assume that this meeting will take place at an East Coast location.

- Every proposal must include a publications plan, and information on any other proposed means of publicizing results. Published results must include information on the methodology used to obtain results and copies of publications must be provided to NASA.

- Proposers should undertake to provide material to NASA for promotional purposes, in appropriate digital format. In accordance with the objectives of the ADRO 2 Program, the Sponsors intend to use the results in promotion of RADARSAT-1 applications.

- Detailed information on data requirements is required, as outlined in Section 7.3.

Proposers are requested to be reasonably concise when writing a proposal. The expository text, exclusive of references, vitae, budget information, and certifications, should not exceed 15 pages of single-spaced pica 12 type. Reviewers will be informed that they need not consider any material in excess of this length limit. Proposals should be self-contained and should not make unnecessary reference to other materials. In particular, readers should not be directed towards websites on the Internet.

7.1 Available funding

Approximately $2 million per year will be reserved to support approved investigations. It is anticipated that most NASA awards will fall in a funding range of $50,000-$150,000. For an accepted proposal, funding will be approved initially for two years, contingent on submission of an acceptable progress report after the first year. Proposers should, however, submit a proposal for a three-year program of funding, with the third year being optional. The work plan should distinguish clearly between activities supported within the first two years of the project and activities supported in the third year. NASA reserves the right to cancel this NRA if adequate funds are not appropriated.

7.2 Eligibility

Participation in this program is open to all categories of organizations, including educational institutions, industry, non-profit institutions, NASA centers, other government agencies. Proposals from non-US institutions are welcomed and Appendix D provides further information on the conditions under which NASA will support foreign participation in this NRA. However, Canadian investigators should direct proposals for data to the Canadian Space Agency. Financial support is available for US institutions only. Non-US institutions will be eligible for data only and non-US proposers should note that certain restrictions on data eligibility apply, as described in Section 7.3.

7.3 Data Requirements

Although the majority of SAR data acquired by NASA are focussed on the polar regions, data have been, and can be, acquired from a wide variety of locations, presenting opportunities for research in a wide range of disciplines. However, proposals that require data reception from foreign ground stations will be required to include the costs of acquiring these data within their proposals, and these costs will be traded against scientific value during the evaluation of proposals. All the information required to assist proposers in costing and specifying their data requirements will be available at the Alaska SAR facility web site, http://www.asf.alaska.edu/user_serv/rsat1_costs_table.html. In accordance with the relevant MOU and Data Policies, SAR data access is restricted to approved investigators, and all data recipients will be required to agree to this restriction. All selected proposals will receive the data needed for their research, but NASA reserves the right to negotiate data requirements prior to proposal selection. Proposers are strongly encouraged to review their data requirements with ASF before proposal submission.

It should be noted that, because of costs associated with acquisition of data from foreign ground stations and limitations on the use of the on-board recorder, non-US institutions will be eligible to apply only for data (and derived products) archived at the ASF and/or data which may be acquired from within the ASF station mask. Information on investigating the archived SAR data holdings at ASF can be obtained from the web site http://www.asf.alaska.edu/.

To facilitate a complete evaluation, all proposals should include the following:

For all data products and derived products acquired through ASF:

a) Media required for data products;
b) Estimates of the total quantities of data required for the project (distinguishing between distinct data products);
c) A justification for the total quantity, referencing the scientific objectives. This is particularly important for products from foreign ground stations;
d) A time schedule of data delivery requirements for the project, making clear linkages between requirements for data and project milestones;
e) Specification of the geographic area(s) of interest

For data that represent new RADARSAT-1 acquisitions [5] :

a) List of imaging parameters for RADARSAT-1 data including imaging mode; preference, if any, for ascending or descending passes; incidence angle (if applicable), etc.
b) Specification of the ground station(s) having acquisition mask(s) that include the proposed geographic location of interest.
c) An estimated cost of the data, based on cost information available at the ASF web site. Data costs should not be included with other project costs but should be estimated and quoted separately from the project total costs.

Proposers should note that the total data requirements should be matched to the scientific objectives and in cases where the reviewers deem that the data requirements are excessive, proposers will be contacted to negotiate data requirements. In some cases, this may involve the coordination of data requirements with other proposers to ensure an efficient program-wide strategy for the collection and processing of data. RADARSAT-1 has on-board data recorders that allow data for ADRO 2 to be collected from nearly any location in the world. Proposers should note, however, that during routine mission operations, access to the tape recorders has operational restrictions that affect the availability of data. Proposers are reminded that new data acquisitions are available to NASA approved investigators under the terms of the existing NASA-NOAA-CSA MOU only until November 4, 2000. It is possible that the MOU will be extended beyond this date, but investigators should not rely on this in preparing their proposals.

Note that not all data are available in calibrated form. Proposers should investigate the status of the products prior to proposal preparation and should be careful to select their scientific objectives so that they can be supported by the available data products. NASA does not warrant the suitability

5 The proposer is invited to contact ASF User Services Office for assistance.

of the data for any specific application. The proposers should be aware of imaging radar capabilities and limitations. In the event that ancillary data are crucial to the success of the proposed project, the proposal must present a plan to acquire these data showing clearly its adequacy and practicality.

Successful proposers will be required to sign a data agreement that will place conditions on use of RADARSAT-1 data. See http://www.asf.alaska.edu/user_serv/data_policy.html for details. These conditions include the following:

- The data are for the researcher's use for bona fide research purposes only.
- The data will not be reproduced or distributed to any other parties, as consistent with the MOU.
- Users will publish in the open literature results of research accomplished with the requested data, including derived data sets, and the algorithms and models used.
- The users will provide, if requested, a copy of such results including derived data sets, algorithms, models, and documentation to ASF for archival and distribution.

Once proposals have been selected, successful proposers are expected to ensure that ASF is fully aware, in advance, of any changes to the proposed data requirements plan, including schedule, types of products and quantities. The approved data plan will be taken from the successful proposal and implemented at ASF. Any changes that involve increased quantities of data and/or increased cost of data will require approval by Code YS, NASA Headquarters, but will be requested by the proposer through ASF.

8 PROPOSAL SUBMISSION, REVIEW AND SCHEDULE

Review of submitted proposals will be competitive. Proposals will be subject to both mail peer review and to the deliberations of a review panel. The responsible program manager reserves the right to negotiate revised budgets or work plans in light of the results of the review process.

Following peer review and evaluation of the proposals received, a selection of the projects to be supported will be made by the Director of the Research Division, Office of Earth Science. Highest priority will be given to projects that directly support the objectives of NASA's Earth Science Enterprise (see Section 3). Proposal reviews will be conducted during spring 2000, with selection anticipated during May, 2000, and funding approval shortly thereafter. Proposals found to be unacceptable scientifically or programmatically will be rejected. To allow adequate time for review and selection, proposals must be submitted by February 28, 2000.

The target dates for the ADRO-2 program are listed below.

4.30 pm, EST, January 20, 2000	Submission of Letter of Intent
4.30 pm, EST, February 28, 2000	Closing date for receipt of proposals
May 15, 2000	Announcement of selected proposals

Information for submission of proposals is provided as follows:

Identifier	NRA-99-OES-10
Submit proposals to:	RADARSAT-1 ADRO 2 Code YS 400, Virginia Av., SW Suite 700 Washington, D.C. 20024 Phone (202) 554 2775
Number of copies required:	10
NASA Selecting Official	Director, Research Division, Office of Earth Science
Obtain additional information about this NRA from:	Dr. Kim C. Partington Code YS, NASA Headquarters Washington, DC 20546 Tel 202-358-0746 fax 202-358-2770 email kparting@hq.nasa.gov
Obtain additional information concerning technical aspects of the SAR missions and data, orbits, coverage, and procedures for requesting and obtaining data from:	Dr. Verne Kaupp Alaska SAR Facility Geophysical Institute University of Alaska Fairbanks Fairbanks, AK 99775-0800 Tel 907-474-7263 fax 907-474-6441 vkaupp@sparc1k.images.alaska.edu

Please use identifier number NRA-99-OES-10 when making an inquiry regarding this Announcement.

Proposals submitted to NASA Headquarters will cause a delay in receipt of your proposal. Therefore, please adhere to Section 8 "Proposal Submission, Review and Schedule" instructions noted above.

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

Ghassem R. Asrar
Associate Administrator
Office of Earth Science

PART II, APPENDIX A
INSTRUCTIONS FOR RESPONDING
TO NASA RESEARCH ANNOUNCEMENTS

(SEPTEMBER 1999)

(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 (U.S. Proposals Only).

(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 andsupplies; 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).

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S.-manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(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.** Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

(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) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included (unless otherwise noted in the NRA). Proposals from foreign entities and proposals from U.S. entities that include foreign 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 that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) When a "Notice of Intent" to propose is required, prospective foreign proposers should write directly to the NASA official designated in the NRA and send a copy of this letter to NASA's Office of External Relations at the address in paragraph (l)(3) of this provision.

(3) In addition to sending the requested number of copies of the proposal to the designated address, one copy of the proposal, along with the Letter of Endorsement from the sponsoring non-U.S. government agency or funding/sponsoring institution must be forwarded to:

National Aeronautics and Space Administration

Code IY

Office of External Relations

(NRA Number)

Washington, DC 20546-0001

USA

(4) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement to the above address if endorsement is not possible before the announced closing date. In such cases, NASA's Office of External Relations should be advised when a decision on endorsement can be expected.

(5) Successful and unsuccessful non-U.S. proposers will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the sponsoring government agency or funding institution. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsoring agency or funding institution for the proposed participation on a no-exchange-of-fundsbasis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(6) Depending on the nature and extent of the proposed cooperation, this arrangement may entail:

(i) A letter of notification by NASA;

(ii) An exchange of letters between NASA and the sponsoring foreign governmental agency; or

(iii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(m) **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.

(End of provision)

PART II, APPENDIX B
PROPOSAL COVER SHEET AND CERTIFICATIONS

Proposal Cover Sheet

NASA Research Announcement NRA-99-OES-10

Proposal No. _____ (Leave Blank for NASA Use)

Title: _____

Principal Investigator::_____

Department:_____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____

Country: _____ E-mail: _____

Telephone: _____ Fax: _____

Co-Investigators:

Name	Institution & Email Address	Address & Telephone
_____	_____	_____
_____	_____	_____
_____	_____	_____

Budget:
1st Year: _____ 2nd Year: _____Total: _____

Certification of Compliance with Applicable Executive Orders and U.S. Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i*) Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs*, *and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Title of Authorizing Institutional Official: _____

Signature: _____ Date: _____

Name of Proposing Institution: _____

Telephone: _____ E-mail:_____ Facsimile: _____

Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

NASA FORM 1206

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES REGARDING LOBBYING AND DEBARMENT & SUSPENSION

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. 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.

PART II, APPENDIX C: BUDGET SUMMARY

For period from _____ to _____

• Provide a complete Budget Summary for year one and separate estimates for each subsequent year.
• Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
• Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See *Instructions For Budget Summary* on following page for details.

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs:			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Facilities and Administrative Costs	_____	_____	_____
4. Other Applicable Costs:	_____	_____	_____
5. SUBTOTAL--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing (if any)	_____	_____	_____
7. Carryover Funds (if any)			
a. Anticipated amount: _____			
b. Amount used to reduce budget	_____	_____	_____
8. Total Estimated Costs	_____	_____	XXXXXXX
9. APPROVED BUDGET	XXXXXX	XXXXXXX	_____

INSTRUCTIONS FOR BUDGET SUMMARY

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:

a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.

b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).

c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.

d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.

e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.

f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.

3. Facilities and Administrative (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).

8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

PART II, APPENDIX D: Guidelines for Foreign Proposals and Proposals Including Foreign Participation

(a) NASA welcomes proposals from outside the U.S. However, investigators working outside the U.S. are not eligible for funding from NASA. Proposals from non-U.S. entities should not include a cost plan. Proposals from outside the U.S. 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. The letter of endorsement should indicate that the proposal merits careful consideration by NASA; and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed. Sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal without endorsement, if review and endorsement are not possible before the announced closing date. In such cases, however, the NASA sponsoring office should be advised when a decision on the endorsement is to be expected.

(b) Successful and unsuccessful proposers will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the sponsoring government agency. Should a non-U.S. proposal or a U.S. proposal with non-U.S. participation be selected, NASA's Office of External Relations will arrange with the non-U.S. sponsoring agency for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

1. An exchange of letters between NASA and the sponsoring governmental agency; or
2. A formal Agency-to Agency Memorandum of Understanding (MOU).

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