DRAFT Proposal for a National Spatial Data Infrastructure Standards Project

Project Title: FGDC Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata

Date of Proposal: October 21, 1998

Type of Standard: Data Usability Standard – user-defined extensions to FGDC Content Standard for Digital Spatial Metadata

Submitting Organization: National Aeronautics and Space Administration (NASA)

Point of Contact: Benjamin Kobler, NASA Goddard Space Flight Center, Mail Code 423, Greenbelt, MD 20771. Phone: 301-614-5231. Electronic mail: ben.kobler@gsfc.nasa.gov.

OBJECTIVES: The purpose of this proposal is to provide extensions to the *Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata* (also referred to hereafter as the *Metadata Content Standard*) for metadata describing geospatial data obtained from remote sensing. Efforts will be made to make these extensions consistent with the ISO

SCOPE: These extensions will define content standards for metadata not defined in the *Metadata Content Standard* that are needed for describing data obtained from remote sensing. They will include metadata describing the observing geometry, the sensor, and the method and process of deriving geospatial information from raw telemetry. In addition, metadata to describe granules, the individual files or images that collectively make up a data product, will be defined.

JUSTIFICATION: Proper use of remote sensing data requires an understanding of how those data were obtained. While ground-based data are often compiled from existing data sources without change of form or are obtained by direct *in situ* measurement, deriving geospatial data from the measurements made by remote sensing instruments is often much less direct. To do so may require knowledge of the observing geometry, the instrument behavior, and the processing methods and history. In addition, remote sensing measurements produce large volumes of data, and users typically do not access the entire data set, only selected files or frames.

Information about the viewing geometry and the properties and behavior of the instrument in the FGDC *Metadata Content Standard* is limited to the description of the number of points along the raster axes. The draft ISO metadata standard also includes solar elevation and azimuth angles and the angle of an image to the vertical. However, many user needs a more detailed viewing geometry: satellite orbit or aircraft flight path, platform orientation, and orientation of

including its dependence on wavelength and time, is usually required. A standard description of such metadata should be defined.

Processing of remote sensing data passes through several stages. The instrument calibration must be applied to the readings communicated by the raw telemetry and the resulting physical measurements located geographically. In some cases, what the instruments measure is not the final product; for example, radiation measurements may be used to infer temperatures. Maps and grids may be generated from data at individual points. Information on the algorithms used to for these steps should accompany the data. In addition, information about the processing itself, such as what stage a given processing represents, or which version of processing is represented, is needed. The FGDC *Metadata Content Standard* allows for this information an entry for lineage, which the draft ISO standard has expanded this item to an entire section on lineage information, but in both cases the content is unspecified free text. These extensions will define the specific items that are needed in remote sensing metadata.

The dataset containing results from a remote sensing mission is large and heterogeneous. Necessary descriptive metadata may not apply to the entire dataset, but only to individual pictures or files. While the FGDC *Metadata Content Standard* has no specific provision for such granularity, the informative Appendix F to the ISO draft provides but does not define granule-

BENEFITS: Adoption of these extensions will broaden the applicability of the *Metadata Content Standard* to include metadata needed to describe geospatial data derived from remote sensing. Making this standard directly relevant to the remote sensing community will encourage its use. There will be less chance that future producers of remote sensing data will see the *Metadata Content Standard* as inapplicable to their needs and develop separate standards.

APPROACH: Data standardization and modeling are major research issues within the Earth Observing System Data and Information System (EOSDIS) development process. Results of this research, combined with comments from scientists around the world, from the EOSDIS Data Model Working Group, and from Earth Science Data and Information System (ESDIS) staff, have been developed into metadata for the EOSDIS Core System (ECS). These metadata are described in the *Proposed ECS Core Metadata Standard*. This document defines metadata in several areas in the scope of the extensions to be developed and will be used as a basis of the extensions covering those areas. The *Moderate-Resolution Imaging Radiometer (MODIS) Level 1A Earth Location: Algorithm Theoretical Basis Document* has a detailed discussion of the information and process required to derive positions in geographical coordinates given spacecraft and instrument position and orientation. That discussion will serve as the basis for the definition of viewing geometry metadata. As the proposed extensions are to be developed following FGDC prescriptions, development and adoption is to proceed through the FGDC Standards Working

RELATED STANDARDS: This standard is intended as extended elements of the *FGDC Content Standard for Digital Geospatial Metadata*. It will follow the prescriptions of Appendix D of that Standard, which specifies the requirements for extended elements.
ISO/ Technical Committee 211, Working Group 3 is developing an international standard for metadata; the current draft is ISO/CD 15046-15. When development of that standard is complete, it is likely to be considered for adoption by FGDC, superseding those parts of the current standard where there is overlap. The ISO standard also has a recommended extension methodology, in Appendix E. The information there will be used to guide the process of development of these extensions to the metadata standard. Extensions to the current FGDC standard covering areas in the ISO standard not in the FGDC standard will be constructed to be compatible with the ISO standard.

As noted in the section on approach, the *ECS Core Metadata Standard*, which covers many of the areas in the scope of these extensions, will be used where relevant as a basis for the FGDC codification.

SCHEDULE: Submission of proposal to FGDC/SWG: November 1998

POTENTIAL PARTICIPANTS: Through the Mission to Planet Earth, NASA already involves many diverse groups in the remote sensing community. The continuing standards work for ESDIS has provided considerable insight into the requirements of these groups. Other federal agencies that produce large quantities of remote sensing data, such as the National Oceanic and Atmospheric Administration, the National Imagery and Mapping Agency, and the U. S. Geological Survey, may also participate in development of the standard. Contributions will be solicited from the academic remote sensing community.

TARGET AUTHORIZATION BODY: The proposed extensions are not specifically targeted for consideration by any authorizing agency other than FGDC. However, as efforts to bring the FGDC standard into consistency with the ISO standard proceed, efforts may be made to gain ISO endorsement as well.