

## DRAFT

To : QA Advisory Group (QAAG)  
From : Bob Lutz / ESDIS Science Office  
Re : Fourth draft of QA Plan  
Date : June 20 1995

This mailing concerns the latest effort in regards to the specification of QA procedures and methodology for EOS products. As has been indicated within a previous E-mail, this issue has transitioned over to the ESDIS Science Office (H. K. Ramapriyan) with myself continuing to serve as the focal point of contact. Please find enclosed the fourth version of the QA Plan. We have tried to incorporate the suggestions (and to placate the objections) that were raised during reviews of the third draft (October 1994). It should be noted that there are several important differences between this and the third draft, which are summarized below.

- 1) Through discussions with the Chairman of the Data Quality Control Panel (Mike Freilich) and the EOS Validation Scientist (Dave Starr), a working definition of what constitutes QA is proposed. Using this definition, Step 4 (User QA) is dropped from the previous plan and Steps 2 (DAAC QA) and 3 (SCF QA) are now strongly limited. We realize that this definition may not please everyone, but we hope that all can "live" with it (Please see Sections 1.0 and 2.0 for a further discussion of this issue).
- 2) This draft also discusses a procedure to include suggestions and comments from other groups who may be generating QA within EOS and/or who would be interested in the subject of quality assurance. The interdisciplinary science (IDS) teams may generate QA data within their processing of higher level EOS products. In addition, these teams may have preferred formats and content of the QA that they would like to receive with the standard EOS products. These desires, if identified early enough, may be able to be accommodated within the operational QA software of the instrument science teams (ITs). Another group, the general science community, may also be concerned about quality assurance, such as the content and the organization of the archived QA metadata. Early comments from this group will enhance the potential long-term usefulness of the archived QA data.

- 3) We are now proposing a schedule for the writing of the IT QA Plans that would generally coincide with the needs of QA information for the IT software deliveries and the ECS system releases. The development of these plans would be a three step iterative process: a preliminary scoping of roles and responsibilities of the SCFs and the DAACs in terms of QA procedures for the Beta delivery, an informal (draft) QA Plan generated before Version 1 and a formal deliverable QA Plan due before Version 2. Schedules are also presented on how input from the IDS teams (through questionnaires) and the science community (through a panel chosen from interested participants), could be incorporated into the development of the general QA methodology.
- 4) The fourth draft, contained here, has a straw man QA Plan within it, that may or may not be used by the ITs. This office will work with the ITs to finalize this plan. In addition it is planned at this time, that the Ad Hoc Working Group of Consumers (AHWGC) will coordinate the solicitation of information from the IDS teams.
- Again this office needs your feedback on the general QA approach, the proposed schedule contained in Section 5 of the QA Plan and to sections that especially pertain to your specific area of interest; (ITs and DAACs - Sections 2 and 3, IDS teams - Section 3, and the User Community - Section 4). Please send your comments to Bob Lutz, [rlutz@ltpmail.gsfc.nasa.gov](mailto:rlutz@ltpmail.gsfc.nasa.gov) (301-286-7339) by July 15 if possible. If the overall reaction from the group is positive, we will proceed as outlined here.

Thank you for your continued involvement.

Bob Lutz

# DRAFT

## Quality Assurance Procedures For EOS Products—Concepts, Implementation and Archival

### 1.0 Introduction

Quality control procedures of EOS products and the archival of quality control data within the product metadata are important aspects of EOS and EOSDIS. The EOS Data Quality Panel is presently proposing that quality control consist of four entities : calibration, monitoring, quality assurance and validation. This document describes the concepts and suggested implementation of quality assurance procedures for EOS products, as well as recommended archival guidelines. Quality assurance may be defined as a process whose objective is to identify and flag data products, at the granule or smaller level, which obviously and significantly do not conform to the expected accuracies for the particular product type (proposed definition by the EOS Data Quality Panel). Within an operational context, our office is recommending that in addition to the above definition, that quality assurance be also (and non-technically) defined as any quality control process that could be done (either by the software processing algorithms, DAACs or the SCFs) within the operational time-window of producing EOS products (i.e. : before archival at the DAACs).

A distinct separation between quality assurance and validation borders almost on a "religious argument", with many researchers firmly believing in their positions and total agreement will not be possible within the EOS community on the subject of this division. Some common agreement does prevail though. QA does not entail calibration aspects of quality control, which instrument control personnel will use to monitor the health of the instrument and to analyze instrument errors as they occur (defined as calibration). QA does include automated flagging within the science algorithm software and in addition "may" involve human or automated interpretation at the DAACs and/or the SCFs of these generated flags. Our office recommends that the latter part of the previous sentence only pertain to procedures that may be done within the real-time window. Validation is defined as all other quality control processes; including long-term analyses

(time series analysis, regional data analyses, detailed quality control flag analysis, etc.) by the DAACs, SCFs and scientific researchers who are utilizing the data within their studies.

## 1.1 Scope

The overall purpose of this document is to develop a coordinated approach in the application of quality assurance methodology within the generation of EOS products, as well as to develop a rational method for archiving the statistics. It is realized that quality assurance products may be used by several "types" of users :

- 1) The instrument science teams (ITs) will use QA data for the monitoring of the "health" of their data products. It is conjectured that some of this data may be "internal" and not stored within the metadata of the product.
- 2) Data dependent ITs will need supplemental QA information from the other ITs (data providers) in order to process their own products. It is envisioned that some of this incoming QA will be operational; in other words QA that is generated by the data provider to monitor their (data producers') own product generation, but will not be stored within the product or the metadata of the product.
- 3) Interdisciplinary science (IDS) teams who are generating higher level EOS products within the operational program. This class of scientists are defined as the funded researchers within the EOS program who will be responsible for generating level 3 or 4 products. It is envisioned that these scientists may need more extensive QA than the next class of users (the general science community), but less QA than the ITs generating the operational standard products.
- 4) The overall science community, which would represent scientists who would use EOS data for general research purposes, not for the generation of EOS products. Their needs for QA may be quite different than the above groups, in that QA may be principally used to "screen" data for its potential usefulness. It should be noted that there is a strong possibility of "overkill" in the archiving of QA within the metadata and the data products, (i.e. : the saving of data that is neither wanted - or eventually used - by the general science community). This group may provide recommendations pertaining to the characteristics of the archived QA (i.e. : resolution and which QA statistics ).

To ascertain the requirements of each of these categories of users, as well as to surface any potential conflicts and inconsistencies, this document outlines an approach for gathering the information needed for such an analysis.

## 1.2 Background

Generally, before the EOS/EOSDIS era (i.e., before 1990), detailed QA procedures had been incorporated into the operational processing algorithms after the launch of the satellite. This methodology was at many times ad hoc and incomplete. From a user's point of view, the organization and the content of such QA statistics within the archived data product, also left a lot to be desired. In addition, with the requirement that EOS products conform to an HDF standard, the appendage of QA (flags and generated statistics) into the product metadata, as well as into the product itself, may not be a trivial task, unless some forethought is given to the procedure and the space (within the file) necessary for the process. It is hoped that by defining a quality assurance approach early in the development of EOS and defining the needs of the general user community within this area, many such problems and shortcomings might be avoided.

## 1.3 Overview, strategy and document organization

This plan is divided into five sections.

- Section 1 is the introductory section, presenting the need for the development of a QA methodology.
- Section 2 discusses a three step methodology in which the ITs, in conjunction with their associated DAACs, will ensure quality assurance of EOS standard data products.
- Section 3 describes two straw man methods to solicit information about the QA process. The first method is a QA Plan, which the ITs and their DAACs, would describe the operational methodology and the content of QA for their EOS standard products. This plan contains general and detailed sections that outline their intended QA procedures. Within the detailed section there is an opportunity for them to describe their projected QA requirements from other ITs, in terms of incoming EOS standard data products to their data stream. The delivery of these plans would be a three step iterative process; corresponding for the need of QA information for the Beta (General QA Procedures), Version 1 (Draft QA Plans) and Version 2 (Final QA Plans) software deliveries. A workshop would be convened after the submission of the Draft QA Plans (i.e. : before Version 1 delivery). The final QA plans would be submitted to the ESDIS Science Office for coordination and review purposes. The second suggested method is a questionnaire that would be submitted to the IDS teams for a definition of their QA requirements from the science teams. This questionnaire is a shortened version of the QA Plans, which the ITs have been

requested to complete. This questionnaire outlines their (IDS teams) intended QA procedures (for an understanding of their QA methodology), as well as their desired QA data needs from the ITs generating the EOS operational products. The Ad Hoc Working Group on Consumers (AHWGC) may work with this office in the gathering of this data.

In summary, completion of these plans and questionnaires would allow :

- A clarification of the respective roles of the DAACs and the ITs with regard to QA. This would enable both entities to plan better in their development and resource allocation.
  - The opportunity for the ITs and the DAACs to modify their individual QA plans after surveying what other ITs are planning in this area (i.e., allow ITs to learn from one another).
  - The ability for data-dependent EOS ITs (i.e. : ITs receiving EOS standard products from another IT) to review how the received EOS-QA could be used in their processing algorithms.
  - The opportunity for IDS teams to analyze and comment on the QA statistics that are intended to be generated and stored by the ITs and the possibility that these suggestions could be incorporated by the ITs within their processing streams.
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- Section 4 presents a discussion of the development of a common methodology for the incorporation of QA results into the metadata and data. This section will be highlighted for review by the general science community. While it is realized that this community can not lever QA requirements on the developers of the products, it is felt that this group should have "input" into topics such as :
    - the content of the subset of the operational QA that are archived
    - the organization of the QA data within the metadata and the specification of "searchable" QA keywords.

A successful completion of this activity would :

- Enable the ECS contractor to plan ahead in the design of the QA metadata within the HDF data structure.
- An opportunity for the user community to comment on the types of QA that may be generated for a product before the QA is actually implemented.

- Section 5 presents a schedule for the development of the QA methodology. This schedule involves the ITs, the DAACs, the IDS teams and the user community.

## **2.0 Definition of the Quality Assurance Procedure (within the processing of standard EOS products )**

Quality assurance of EOS products may consist of one or more of three possible steps:

- 1) Automated QA within the processing algorithm software.
- 2) QA performed by DAAC personnel, in consultation with the ITs, after the product is generated, but before it is archived
- 3) QA done by the SCFs on either complete or portions of the products, before archival.

All QA would be done within the operational time frame window (i.e. : in real time and before a product is archived at the DAAC). It is believed that this time period may be different from one product to another. The science teams and the DAACs would specify these operational times. It is recognized that some ITs are co-located with their DAACs, so that Steps 2 and 3 may be combined. For the purposes of a common methodology of incorporating the QA data within the metadata though, it is desirable to keep the Steps separate. Furthermore, it is realized that some ITs may consider QA to be only the first step. Therefore, their QA Plan would only consist of the first step. Please keep in mind, that this office is only presenting the above as guidelines, not rules.

The QA process should be regarded as evolutionary in nature, in that the roles and responsibilities of the ITs and the DAACs may change as the algorithms become more robust and the system stabilizes. In addition, it should be realized that simply because a data product passes through a certain step in the QA process, this does not guarantee a stamp of approval by the processing entity. It indicates only that the data has passed through some certain pre-defined test. For example, if a product passes through the automated QA contained within Step 1 successfully, this will not imply that the IT has "certified" its accuracy or correctness. It will mean only that the data has passed through a certain filter (for example boundary checking).

### **2.1 Possible Implementation of QA Methodology Within Each Processing Step**

The quality assurance procedure is defined as a consisting of three steps, as outlined above. All data products will be expected to pass through some form of Step 1 QA, with the possibility that portions (or all) of the data products would be analyzed in Steps 2 and 3. As an overall concept, it is recommended that each QA step build upon what has preceded, examining a subset of the previous QA information. For example, DAAC QA (Step 2) may emphasize

monitoring of the automated QA statistics (Step 1), and calling any questions to the IT's attention. SCF QA (Step 3) may include analysis of automated and DAAC QA.

It should be noted that the following are only suggested scenarios.

- **2.1.1 Step 1: QA within the IT algorithm processing software.**

**Implementation of QA analysis:** Within the IT algorithm processing software, initial QA can be "built in" during the routine processing/generation of the data. The QA defined here should be written by IT personnel, incorporated within the science processing algorithms, and performed at the DAAC that is processing the data. This QA would be completely automated and be performed on the data as they are being processed.

**QA analysis:** QA performed at this step should catch large-scale algorithm or processing errors of the data products. As a minimum, the QA activities that should be performed within this step are the identification and flagging of missing data, and boundary checking. Simple statistical data may be generated at this step. For example in the case of image-type data, the mean and standard deviation of scan lines or scenes may be calculated. Ancillary QA products (secondary products) may also be derived at this step, such as standardized graphs and plots. It has also been suggested that QA flags could be organized along the lines of constraint thresholding, where thresholds would be determined for physical, algorithmic, and climatological constraints.

**Storage/archival of QA analysis:** QA statistics/flags may be incorporated within the metadata (granular), within the product, and as an external product. The latter two categories would most likely contain QA parameters on a sub-granular or datum basis. Storage of QA by a datum basis could consume significant archive resources. It has been suggested that, in order to save computer storage space, some ITs may opt to simply incorporate a flag within the metadata indicating that this specific data has been quality checked at this step. A user would then have to request the QA processing software/algorithms if interested in obtaining the actual QA statistics.

- **2.1.2 Step 2 : QA done at and by DAAC personnel after the EOS products are generated, but before archival.**

**Implementation of QA analysis:** QA flags or the generated products themselves may be "pulled" by the DAACs via the subscription service, (an event that triggers a specific response - in this case a data transfer from the algorithm processing stream to the requestor at the DAAC), for QA analysis at the DAAC. In general, the DAACs' QA role would be to ensure that the data are generated within the quality specifications defined by the ITs. An

additional role of the DAAC is to ensure the integrity of the data—i.e., that data are not corrupted in the transfer, archival, or retrieval process. Specifically, the role of the DAAC may involve the monitoring of QA statistics generated within the software mentioned in Step 1. As has been envisioned by a DAAC reviewer, an IST (Instrument Support Terminal)-like workstation may be set up that allows the DAAC operator to monitor the automated QA stream with dynamic graphical (plots or image-based) outputs. These secondary products may or may not be saved at the DAAC. In addition, the ECS contractor has suggested that a DAAC Quality Assurance Monitor (QAM) be assigned to each DAAC. At the present time, the specific duties for this position has not been defined, but would depend on the agreed upon roles of the SCFs and the DAACs in the QA process.

**QA analysis:** Criteria of “good” versus “bad” QA statistics would be defined by the ITs, with the DAACs alerting the ITs when the data indicate that there are problems in the data products. Large-scale error checking may also be done at this step. Through selective subsampling (for example, every eighth data point) or averaging, a “sanity check” can be done on the data product. In addition, the QA defined in this step may take the form of qualitatively comparing “yesterday’s” (or the first complete set of older) data, with “today’s” data. These QA procedures may take the form of analysis of visual or imaged data. This type of QA would involve consultation with the ITs (maybe an IT representative located at the DAAC), and it is envisioned that this type of QA would likely involve a mixture of a person and automation.

**Storage/archival of QA analysis:** Flags developed at this step may be decided to be consistent at all DAACs for the same level products (and maybe for all products). This would eliminate the need for the user to understand (for example) hundreds of quality flags for hundreds of EOS data products and parameters. If this is not possible, it is hoped that individual ITs could develop consistent flags within the generation of their own science team data production. If this is not done, an on-line quality flag dictionary should be developed, so that users could easily interpret these flags.

The responsibilities of QA functions that may be done at the DAAC (Step 2) versus those performed by personnel at the SCFs (Step 3), need to be defined by the ITs and their respective DAACs. These roles will be discussed within the QA plans generated by the ITs.

- **2.2.3 Step 3: QA done at the SCFs by the ITs.**

**Implementation of QA analysis:** QA flags or the generated products themselves may be “pulled” by the SCFs via the subscription service for QA analysis at the SCF. This would require a transfer of some of the data

processed at the DAACs to the ITs. Within the QA Plan, network transfer rates are requested.

**QA analysis:** Techniques such as visual analysis, subsampling or other statistical techniques may be used here.

**Storage/archival of QA analysis:** Where human analysis is performed, descriptive text may be generated (for example through visual analysis of the data). This descriptive text may not be stored within the HDF file, but elsewhere in an adjacent file that would be associated with the data product. With appropriate flagging within the product metadata, the user would be made aware of the existence of this additional information. The SCF would send these QA flags or statistics to the DAAC, via the ingest service, (a service request that directs the system to ingest data from an external data provider),

### **3.0 A Straw man IT QA Plan and IDS Questionnaire**

A straw man QA plan and a questionnaire are presented in this section. The first plan presented is to be completed by the ITs, in consultation with their DAACs. These plans will cover the QA procedures for the production of the EOS standard products. The second element is a suggested questionnaire, to be completed by the IDS teams outlining their QA methodology and needs. Both are generic in nature, with the intention here being that plans that are organized in the same format will be easier to compare.

- **IT Plan :**

The first part of the plan is general and would likely be the same for all products generated by that IT. It includes a general description of QA roles of the ITs and their DAACs. The latter part of the QA Plan is detailed and will probably vary from one product to another. The final section of this plan provides the opportunity for the ITs to indicate the QA statistics that they would desire from the other ITs. It is envisioned that the plans will be evolutionary in nature, with changing roles of processing entities as the system becomes more stable. It is hoped that this concept could be woven into the plan. The finalization and completion of these plans would be coordinated and submitted to the ESDIS Project Science Office. There would be three stages of completion of these plans, corresponding to the software deliveries of the ITs.

- **IDS team questionnaires :**

These questionnaires are an abbreviated form of the IT QA plans. The finalization and completion of these questionnaires will most likely be coordinated by the Ad Hoc Working Group for Consumers.

### 3.1 - QA Plan for ITs and DAACs

- **General :**

- 1) The definition of the pre launch QA process on simulated data.
- 2) General description of the responsibilities of the ITs and the DAACs within the complete procedure of the QA process. This high-level view of the QA process should also attempt to address the evolutionary nature of the QA process (i.e., how the roles of the ITs and the DAACs may change in time as the system stabilizes and the algorithms become more robust). A brief operational scenario would also be very beneficial within this section. Please note that within Section 2, various scenarios of possible QA procedures are outlined.
- 3) The percentage of each data product that will be transferred between the DAAC and the SCF for QA purposes. An overall transfer rate ( i.e. : for all products) between the SCF and their DAAC(s) would be an alternate specification.

- **Specific :**

A) For each step in the envisioned QA process (this may be different for each product):

- 1) The overall methodology of the QA process (i.e., statistical, visual....).
- 2) The expected percentage of the data product that would be examined within this step.
- 3) All of the parameters/results generated from the QA process and how they should be interpreted. (i.e., types of flags, variables calculated, resolution of the QA parameter, etc. ....).
- 4) The parameters/results from 3 that are expected to be stored in the metadata.
- 5) The parameters/results from 3 that are expected to be stored in the product.
- 6) The parameters/results from 3 that are expected to be stored in a separate QA product.
- 7) The response to the QA process
- 8) The expected time frame for the QA process.
- 9) The resources needed/expected for the QA process. This would include computational, financial, and people-power requirements.

Also, a prioritization of the QA process if funding is limited.

B) Desired QA from other ITs generating EOS products (i.e. : data incoming from other ITs in the operational time window)

- 1) Name of IT and Product

- a) Desired QA statistics
- b) Desired resolution of QA statistics (i.e. : by data point, granule ...)

### 3.2 - QA questionnaire for IDS teams:

Please note : The purpose of the first three items are only to place in context the final (number 4) question.

- 1) General description of the QA procedure for generated products.  
Description of activities (if any envisioned) to be done by DAAC personnel.
- 2) The parameters/results generated from the QA process (i.e., types of flags, variables calculated, etc. ....).
- 3) The parameters/results from 2 that are expected to be stored in the metadata or the product.
- 4) Desired QA from the ITs generating the standard EOS products (i.e. : QA data incoming from the ITs)
  - Name of IT and Product
  - Desired QA statistics
  - Desired resolution of QA statistics (i.e. : by data point, granule ..)

In addition, to the above, it has been suggested the following questions be asked, so that the ITs may be able to respond more effectively to the IDS teams needs :

- What kind of investigation is the IDS team planning to perform with this data?
- What specific geophysical quantities and at what level of data processing (e.g., Level 2 or Level 3) are required for the investigation?
- What are the specific data quality issues that matter most to this application [e.g., absolute radiometric calibration, band-to-band relative radiometric calibration, absolute geometric calibration relative to Earth, camera-to-camera relative geometric calibration (co-registration), etc.]?

## 4.0 QA Archival

### 4.1 QA organization and content :

QA information may be stored within the metadata (granule or larger characteristics), as part of the product or alternately as a separate QA product. The latter two categories would most likely contain sub-granule statistics.

Within the metadata, it is recommended that a common approach be developed for the inclusion of QA results. This would provide users with a consistent format in their understanding and interpretation of project wide QA. At present, a sub-group of the Data Modeling Working Group (DMWG), is preparing a straw man design of a QA metadata model. This QA metadata model will be presented for critique at the Critical Design Review during the summer of 1995. The sub-section that follows, presents the latest version of this model as of June 20. It is recommended that the final methodology of how to include QA into the metadata be adaptive enough to accommodate a changing QA data stream, because it is anticipated that QA procedures (statistics, flags, etc.) will change during the life of the project.

Sub-granule QA information may be stored in the data product or as a separate QA product (i.e.: external to the product). This QA data may be on a data by data point format, a subset of the original resolution of the data product, or some form of mask array. This type of QA data would most likely be "created" within the algorithm processing software.

### 4.2 QA Metadata

Quality control information may be inserted into the core metadata at two levels; at the collection level (e.g.: dataset, many granules) and at the granule level. At the collection level it is more aptly called 'validation', since the quality control information is applied once the data set has been formed and after the granule has been generated. Therefore, quality assurance information will only be contained in the granule level core metadata.

At the granule level, the following QA attributes or measures are proposed :

- **General QA flags/comments**
- **Generic percentage measures**
- **Pointers**
- **Product specific measures**

These selected QA attributes would be searchable keywords within the core metadata. In general, the majority of these parameters would usually be

produced by the PGEs. A more thorough description of each measure now follows.

- **General QA flag and comment**

a) General QA flag :

To indicate the overall quality assurance level of the granule, there would be a set of three general QA flags.

Category	Description
Automatic	QA performed by PGE or other software element.
Operational	Somewhat routine, manual or semi-automated analysis, often at the DAACs
Science	Results of expert analysis, usually based at the SCF.

It is proposed that the domain of each QA Flag consist of the following :

Passed, failed, being investigated, not being investigated, or N/A.

The criteria of what constitutes "Passed and Failed" would be determined by the ITs for each product.

An example of a Generic QA Flag : Automatic [passed]; Operational [N/A]; Science [not being investigated].

Subsequent changes or additions to this QA flag after the granule is archived, would have to be made in the data server in response to update requests from Science or Operational personnel.

b) Comment field

Along with the flagging system, a text comment field would be available for the evaluator (usually the SFC) to explain the decision that was made in determining the flag value.

- **Generic percentage measures**

A set of generic numerically based flags would be associated with each granule. It is realized that these proposed measures may not be applicable for every product, but are hopefully generic to be useful across a large number of collections. In addition, it should be noted that these measures may be duplicated to apply to each of the several layer/bands/etc. within the granule (for example the granule may consist of 36 channels of data). The following measures are proposed :

a) % of missing data

b) % out of bounds data (bounds defined at the collection level in a text comment)

c) % of interpolated data

- **Pointers**

QA data may also exist as part of the product granule or as a separate 'QA' granule. Simple flags indicating the presence/absence of these are included within this parameter as well as pointers to the location of these measures. The pointers may take the form of data object names (if within the product granule) or URs (reference to external 'QA' granule').

- **Product specific measures**

To indicate specific product QA information, specific measures/attributes would be established. These might be set automatically (e.g. % cloud cover = 56) by the algorithm software, operationally (routine surface temperature validation = OK) by DAAC personnel or scientifically (geolocation assessment = poor) by SCF scientists. As with text flags, post-production updates would be made in the data server in response to update requests from Science or Operational personnel. In addition, it may be possible to group many of the EOS standard products into common "data types" (i.e. : image data, point source data, etc.). It is envisioned that with each data type, certain common QA parameters would be defined. This final concept has not yet been analyzed in any great detail.

## 5.0 Proposed Schedules

### 5.1 Introduction

Proposed schedules are presented for the ITs, the IDS teams and the user community. The schedules are basically a two step iterative process. During the first stage of the process, data is gathered (through QA Plans and questionnaires) independently from each group, outlining their QA procedures and QA needs. This office will compile the collected data and then arrange for distribution of the material to the various groups. Shortly thereafter, a workshop will be convened where representatives from all groups will participate in the formulation of a QA approach. The second stage will (hopefully) see each group modifying their own individual plans to accommodate the wishes of others. A well thought out (and well represented) QA approach for EOS should be the result of this process.

### 5.2 Proposed Schedule for the ITs

#### Introduction

It is realized that the development of QA methodology for the ITs will be an evolutionary process, as the algorithms mature and lessons are learned from the implementation of earlier versions of the software. We are therefore recommending a three stage iteration of these plans; requesting the science teams provide at first a general description of their QA methodology, then a draft of their QA approach, and then a formal QA Plan.

- **QA Procedural Plan for Beta Delivery**

At the present time, the ECS contractor (Hughes) has only a generic plan of how QA will be take place (in an operational sense) between the SCFs and their DAACs. Through discussions with Hughes personnel, it has been expressed that it would be beneficial for the development of the system, if some preliminary QA information, (such as the outlining of general roles and responsibilities of the DAACs and the SCFs and a realistic estimate of data rate flows between the DAACs and the SCFs), could be provided as soon as possible. It is realized though that at this time, some of the ITs may not be ready to provide such "realistic" scenarios and estimates. We request then that they would provide their "best guess" at this time, and note within their documentation where uncertainties may exist.

#### Proposed schedule :

**The general part of the straw man QA Plan would be completed by the ITs and the DAACs - 9/95**

## **Possible inclusion of above information into ECS RI-1 release - 9/95**

- **QA Plan for Version 1**

The Version 1 software delivery to the DAACs is now scheduled for around 1/97. Quoting a statement from the science team working agreements "Programs shall demonstrate all major functional capabilities and a complete operator interface, including the generation of all needed messages using standard error and message services." We realize that within this version the ITs may not be able to provide details to specific content of their QA products, but it is anticipated that they will be able to indicate "in general" what QA elements they will include in their algorithm processing package. Also, it is envisioned that they should be able to incorporate within their software, the "hooks" needed to capture and process incoming QA streams from other science teams. It is our belief that it would be of great benefit to the ITs if they knew before Version 1, what the other ITs were doing in terms of QA (type and content), so that these "hooks" could be more realistically simulated. In addition, if possible suggested QA requirements indicated by the IDS teams may be able to be accommodated within their software at this time (i.e.: within Version 1). Additional input from the science community may also be useful to the preliminary scoping of what portion of the operational QA will be archived.

We therefore are recommending that Draft QA plans be generated by the ITs between the Beta and Version 1 releases, with enough time left after the generation of such plans, for a workshop to be convened for an exchange of information. This workshop may be in conjunction with other common subject areas. After the workshop, revised draft QA Plans may be generated.

### **Proposed schedule :**

**Format and content of "generic" IT QA Plans defined and circulated to ITs- 1/96**

**Draft IT QA Plans submitted to ESDIS Science Office - 6/96**

**Draft IT QA Plans, IDS Questionnaires, User QA Panel comments circulated among all groups - 7/96**

**Workshop Convened to review the QA Approach - 9/96**

**Revised Draft QA Plans - 12/96**

- **QA Plan for Version 2**

Version 2 is defined as "This version shall be a launch ready, complete, verified and operational software system". The approximate date of this release is 9/97. The revised Draft QA Plans would be circulated amongst the user community panel and the IDS teams for comment during the early part of 1997. In addition, it is anticipated that data dependent ITs will need to

know several months in advance of this date (i.e. : before 9/97), detailed QA characteristics from the other ITs. With the feedback from the Draft QA plans as well as lessons learned from the implementation of Version 1, final QA Plans would be generated. These would be formal deliverables on the part of the ITs. A review would be done of these Plans to check for inconsistencies and incompatibilities among the IT Plans and also the IDS team questionnaires and comments. These final Plans would then be circulated amongst the ITs for their use in Version 2 software development.

We recommend Final QA plans be submitted to the ESDIS Science Office between the Version 1 and Version 2 time frame, again with enough time allotted so that feedback could be incorporated within the Version 2 software.

**Proposed schedule :**

**Final QA Plans submitted and circulated for review- 4/97**

**Final QA Plans reviewed and inconsistencies resolved - 6/97**

### **5.3 Proposed Schedule for the IDS Teams**

#### **Introduction**

The IDS teams would be notified, through their respective land, ocean and atmosphere panel chairmen that there is a desire within the project for their input to QA Procedures within EOS. A QA questionnaire would be developed through input from the IDS teams and may be coordinated by the AdHoc Working Group on Consumers (AHWGC). A straw man questionnaire is provided in the fourth draft.

**Proposed schedule :**

**Notification of IDS teams for their planned involvement - 6/95**

**Finalization of the form of IDS team QA Questionnaire - 12/95**

**IDS team QA Questionnaires Completed - 6/96**

**Draft QA Plans, IDS team Questionnaires, User QA Panel comments circulated amongst all groups - 7/96**

**IDS team representatives at Workshop - 9/96**

**Revised IT Draft QA Plans circulated to IDS investigators for comment - 12/96**

**IDS team QA Comments Due - 2/97**

### **5.4 Proposed Schedule for the Involvement of the User community :**

#### **Introduction**

A panel should be formed of researchers which would be typical of the user science community. A possible source of these "type" of users may be members of the DAAC User Working Groups (UWGs), who are knowledgeable of EOS, yet most are not aligned with any specific instrument or product. They may also be able to recommend graduate students for involvement in this panel, as many of the members of the UWGs are associated with universities. After the panel is formed, a questionnaire would be formulated, soliciting them for their comments on the proposed content of the archived QA metadata. In addition, within the workshop, the user community would be provided the forum to comment on the proposed content of the sub-granule QA information found within the products and external to the products.

Some of the suggestions regarding the content and organization of the QA within the metadata and the products may impact developments within the ECS contractor's Release A. The proposed schedule would allow enough time for these comments to be incorporated into this release.

**Proposed Schedule :**

**User QA Panel formed - 12/95**  
**Questionnaire prepared and given to User QA Panel -1/96**  
**Questionnaires returned (User QA Panel comments)- 6/96**  
**Draft IT QA Plans, IDS team Questionnaires, User QA Panel comments circulated amongst all groups - 7/96**  
**Possible input of User QA Panel to ECS Release A - 9/96**  
**Representatives of Panel to attend Workshop - 9/96**  
**Revised Drafts of IT QA Plans provided - 12/96**  
**Comments Due regarding IT Drafts - 2/97**