Extensions for Terrain Corrected Geolocation and Like <example file> option

Proposed by Albert Cheng, Larry Knox

1 Purpose

This document describes the geolocation processing requirements for nagg and the design changes to nagg for extending it to process related terrain corrected geolocation as an alternative to the standard corresponding geolocation product as listed in the JPSS Common Data Format Control Book – Volume I. Section 2 describes the motivation for this extension. Section 3 lists the nagg requirements for providing the extended capability. The requirements for the Like <example file> extensions are specified in a previous document, Nagg: Possible Extensions to the Like (-l/--like) Option. Section 4 describes the implementation design. Section 5 shows the verification requirements and implementation. Section 6 lists the documentation needed to accompany the implementation. Section 7 is a summary of time estimates for implementation.

2 Motivation for changes to geolocation requirements

A user was seeking a way to package VIIRS medium resolution products with their related terrain-corrected GEO products. He found a workaround which exploited a bug in nagg's product checking when the –g no option is in use. This bug allowed him to package VIIRS moderate resolution products (SMV01-16 and IICMO) with the related terrain-corrected GEO product GMTCO and later to repackage the same products with the standard GEO product GMODO. In order to preserve these capabilities while fixing the bug, additional requirements must be met.

In Table A-2 of JPSS Common Data Format Control Book – External Volume I there is a column with the heading "Related Geo Terrain Corrected Product*". The corresponding footnote for this column states "This column is provided to indicate which terrain corrected GEO corresponds to a particular SDR. SDR Geolocations delivered with SDRs are not the terrain corrected geolocations. However, users who would like the terrain corrected versions of a Geolocation may order a corresponding granule of any EDR listed in this column."

Table 2.1.1, which follows, shows in column A in the first row of each section the DPIDs for data products that have entries in the "Related Geo Terrain Corrected Product*" column of the Control Book's Table A-2. The DPIDs for the corresponding GEO product is in column B of Table 2.1.1, and the DPIDs for the Related Terrain Corrected GEO products are in column C. The NPP data products that have the Terrain Corrected GEO product in column C are listed in column D. The Control book footnote indicates that it may be useful to package the GEO product in column C with data products in column A for each row.

nagg will package as compatible products any number of data products that are in the same row from columns A and D of table 2.1.1, with or without one of the GEO products from the same row in column B or column C.

2.1.1 Table of NPP products with Related Terrain Corrected or Not Terrain Corrected GEO products

	A	B	C	D
	Product DPID	Not Terrain Corrected GEO DPID	Related Terrain Corrected GEO DPIDs	Data product DPIDS corresponding to GEO product in column C
I	SATMR	GATRO	GCRIO	ICALI ICALM ICCCR ICISE ICMSE ICSTT ICTLI ICTLM REDRO REDRS
II	SVI01-SVMI05	GIMGO	GITCO	VSCMO VIVIO VSCMS VIVIS
III	SVM01-SVM16*, IICMO	GMODO	GMTCO	VISTO VLSTO VOCCO VISAO VSCDO VSICO VSSTO VSTYO VSUMO VISTS VLSTS VOCCS VISAS VSCDS VSICS VSSTS VSTPS VSUMS

* The related products to obtain terrain corrected GEO for SVM01-SVM016 in Table A-2 include AOT EDR which has Terrain Corrected GEO product GAERO. The NPP data products with DPIDs VAOOO and VAOOS have GEO product GAERO. These may also be compatible with products SVM01-SVM16 and IICMO, but this has not been confirmed. nagg will continue to treat them as incompatible until a use case is presented to do otherwise.

3 Requirements Specification

Requirements for the Like option extensions are listed in the document Nagg: Possible Extensions to the Like (-l/--like) Option. This section contains the requirements for geolocation processing that are already implemented, new requirements for geolocation processing with extended compatibility for products with related terrain corrected geolocation in addition to their corresponding geolocation, and a table of expected behaviors for possible combinations of Like and geolocation options.

3.1 Original requirements for nagg handling of geolocation products

3.1.1 Each NPP data product has exactly 1 corresponding geolocation (GEO) product.

3.1.2 Data products with the same GEO product are compatible, may be processed together and packaged in the same file.

3.1.3 Data products with different GEO products are incompatible, cannot be processed together, and cannot be packaged in the same file.

3.1.4 nagg will require and process corresponding GEO product granules with data product granules unless directed otherwise.

3.1.5 nagg will find GEO product granules that are in the same file as the data product granules, or that are in the file named in the data product file's /N_GEO_Ref attribute and located in the same directory as the product file.

3.1.6 GEO products have no corresponding GEO product.

3.1.7 GEO products can be aggregated without a data product.

3.1.8 Data products can be aggregated without a corresponding GEO product if so directed.

3.1.9 Only one GEO product may be specified on the command line.

3.2 Additional nagg requirements for handling related terrain corrected geolocation products

3.2.1 nagg will use the broadened compatibility definition for those NPP products with DPIDs listed in the table.

3.2.2 nagg will package granules of any product in the table with either the Not Terrain Corrected GEO product or the Related Terrain Corrected GEO product.

3.2.3 The default corresponding GEO product for the NPP data products is not changed by this broadened definition of compatibility.

3.2.4 nagg will package only one GEO product per file and per nagg invocation.

3.2.5 nagg will provide a command line option or combination of options to specify which Terrain Corrected or Not Terrain Corrected Geolocation product will be packaged with the specified data products.

3.2.6 nagg will process either Not Terrain Corrected or Terrain Corrected GEO product granules for data products related by extended compatibility.

3.2.7 nagg will not process both Not Terrain Corrected and Terrain Corrected GEO product granules for data products related by extended compatibility and processed by a single nagg operation.

3.2.8 If compatible products having different default corresponding GEO products are to be packaged and no GEO product is specified, the Terrain Corrected GEO product will be processed.

3.3 Required behavior of revised GEO and revised Like option combinations

Effects of interaction of GEO changes and Like option changes. Red table entries are either the result of newly available command option combinations or an outcome that is different from the current version for the combination. Black table entries are unchanged from the current version but are included for completeness.

		A	B	C	D	E
	-t or –l options: **GEO options:**	**-t <product list>**	**-l <example file> (with data product(s) and internal GEO or reference)**	**-l <example file> (with data product(s) but no internal GEO or reference**	**-l <example file> (with no dataproduct(s))**	**No –t, no -l**
1	**-g no**	a)	a) (-g no overrides example file)	a) (-g no same as example file)	***ERROR*** No product specified	b)
2	**-g yes**	c)	No effect –g yes matches example file	c) (-g yes overrides the example file)	***Error*** -g yes requires corresponding GEO product. Example file is GEO only	b)
3	**-g strict**	d)	d)	d)	-g strict conflicts with example file that indicates –g	b)

					<geoproduct> aggregation. Error or ignore?	
4	**-g <GEO product>**	e)	e) (-g <GEO product overrides example file)	e) (-g <GEO product overrides example file)	GEO only aggregation. <GEO product> overrides the GEO product in the example file	GEO only aggrega-tion
5	**absent**	Defaults to –g yes	According to example file	According to example file	According to example file	b)

a. Granules of products in list processed; no GEO granules processed.
b. ***ERROR*** parse_options(): no product name given
c. The default corresponding GEO product granules will be found in the input files or in files named in the input files N_GEO_Ref attribute. nagg will return an error if no GEO granules are found or if any products to be processed including the GEO product are not compatible.
d. Same as 2) except if GEO is not in data input files, filenames must exactly match the N_GEO_Ref attribute value.
e. The specified GEO product will be found in input files. nagg will return an error if no GEO granules are found. This needs more investigation.

4 Implementation Design

Extending compatibility for the three pairs of products and related terrain corrected geo products and adding the proposed extensions to the Like option will be implemented with the following changes to nagg:

4.1 nagg command option changes

The command options –t <data products> and –g <geo product> will now be allowed together when invoking the nagg command. The command options –l <example file> and –g <geo product> will now be allowed together when invoking the nagg command. This will satisfy requirement 3.2.5. Time – 2 hrs

4.2 Check GEO product for compatibility with the data products

This is not currently done (the GEO product is currently determined from the data product file). The data products in the –t list are checked for compatibility, but if "-g no" is also in the command args this check is incorrectly skipped. This will satisfy requirement 3.2.1 and fix the bug with "-g no" for requirement 3.1.3. Time – 8 hrs

4.3 Allow extended compatibility for the three GEO products with related terrain corrected GEO products

The data products corresponding to either of the GEO product pair will be considered compatible with either GEO product and with all other data products

corresponding to either GEO product. All data products will still have 1 corresponding GEO product, but for the six GEO products in a pair with another GEO product related by terrain correction, the data products will have extended compatibility. This will satisfy requirement 3.2.1. Time – 8 hrs

4.4 Allow packaging with either terrain corrected or not terrain corrected GEO product for data products corresponding to those GEO products related by terrain correction

nagg will package data products meeting the criteria in 4.3 with either of the two GEO products as specified by –g <geo product>. This will satisfy requirement 3.2.6. Time – 2 hrs

4.5 Add GEO product default and restrictions for processing extended compatibility data products

Use terrain corrected GEO product for lists of data products corresponding to two related GEO products unless the not terrain corrected product is specified by –g <geo product>. This will satisfy requirements 3.2.2, 3.2.4, 3.2.7 and 3.2.8. Time 6 hrs

4.6 –g no or –g <geo product> to override example file

This will satisfy requirements 3.3.1.B and 3.3.5.B. Time – 2 hrs

4.7 Example file with no geolocation group or reference.

1. Check example file for GEO group or reference.
2. set geofiles_arg = GEOFILE_NO.
3. reset geofiles_arg according to any –g parameters on the command line

This will satisfy requirements 3.3.*.C. Time – 2 hrs

4.8 Example file with geolocation group but no product group.

1. Get GEOFILE_GEOPRODUCT from example file.
2. set geofiles_arg = GEOFILE_GEOPRODUCT
3. reset geofiles_arg according to any –g parameters on the command line

This will satisfy requirements 3.3.*.D. Time – 2 hrs

4.9 Implementation time estimate

The total time estimate for implementation is 32 hrs and for testing is 44 hrs. Documentation time estimate is listed in a later section.

5 Verification Requirements and Implementation

Setup tests to verify that the nagg tool is meeting all the requirements specified in the Requirement Specification section. A number of these tests already exist and are run by make check. Tests for the new requirements will need to be added. In some cases a test can be devised to cover multiple requirements.

5.1 Verify that nagg meets original requirements for handling geolocation products

5.1.1 Test Requirement 3.1.1: nagg has a corresponding geolocation product for each data product

Test that get_gpid_by_id(const char *prod_id) returns a 5 digit product id for each entry in nagg's product_table.

5.1.2 Test requirement 3.1.2: data products with the same GEO prduct ID may be processed together and packaged in the same file.

5.1.2.1 Test multiple data products with the same GEO product and unpackaged output.

5.1.2.2 Test multiple data products with the same GEO product and packaged output.

5.1.3 Test requirement 3.1.3: data products with different GEO products are incompatible, cannot be processed together, and cannot be packaged in the same file

Test multiple data products with different GEO products that are not related by terrain correction.

5.1.4 Test requirement 3.1.4

5.1.4.1 Test that nagg will fail to process data product granules when corresponding GEO product granules are not available.

5.1.4.2 Test that nagg processes corresponding GEO product granules along with data product granules (this should be tested by 5.1.5).

5.1.5 Test requirement 3.1.5

5.1.5.1 Test that nagg processes corresponding GEO product granules along with data product granules when GEO product granules are in separate files named in N_GEO_Ref attribute.

5.1.5.2 Test that nagg processes corresponding GEO product granules along with data product granules when GEO product granules are in another product group in the data product file.

5.1.6 Test requirement 3.1.6

Test that get_gpid_by_id(const char *prod_id) returns null for each entry in nagg's geolocation_table.

5.1.7 Test requirement 3.1.7

Test that a geo product can be aggregated with no data product using the -g <geoproduct> option.

5.1.8 Test requirement 3.1.8

Test that several compatible data products can be aggregated without corresponding GEO product granules using "-g no" option.

5.1.9 Test requirement 3.1.9

Test that -g <geoproduct1,geoproduct2> returns error.

5.2 Verify that nagg meets extended requirements for handling geolocation products with data products having related terrain corrected GEO products

5.2.1 Test requirement 3.2.1

Test that all data products corresponding to either of the paired GEO products can be packaged as compatible products.

5.2.2 Test requirement 3.2.2

Test that data products corresponding to each of the six GEO products with extended compatibility for terrain corrected or not terrain corrected geolocation can be packaged with the other GEO product.

5.2.3 Test requirement 3.2.3

Verified by 5.1.1

5.2.4 Test requirement 3.2.4

Test that compatible data products from both terrain corrected and not terrain corrected groups produce output files with only one GEO product in all output files. This testing should be combined with 5.2.6 and 5.2.8.

5.2.5 Test requirement 3.2.5

Test that a combination of compatible products with both terrain corrected and not terrain corrected GEO products can be packaged with either the terrain corrected or the not terrain corrected GEO product using the -g <geoproduct> option. Check that only one geolocation product is produced in all output files.

5.2.6 Test requirement 3.2.6

Test that a nagg operation producing unpackaged output with compatible products from both terrain corrected and not terrain corrected groups produces only terrain corrected geolocation groups in all output files. This is a variant of 5.2.5 with unpackaged output.

5.2.7 Test requirement 3.2.7

Test that a combination of compatible products with both terrain corrected and not terrain corrected GEO products and no -g <geoproduct> specification will be packaged with the terrain corrected GEO product for product lists beginning with products from either group. Check that only one geolocation product is produced in all output files.

5.3 Verify nagg behavior for Like and GEO option combinations

5.3.1.A Test requirement 3.3.1.A

Test that nagg –t <products> -g no output has no geolocation granules

5.3.1.B Test requirement 3.3.1.B

Test that nagg –l <example file> -g no has no geolocation granules when example file has internal geolocation granules or N_GEO_Ref attribute for geolocation file.

5.3.1.C Test requirement 3.3.1.C

Test that –l <example file> –g no produces output files with no geolocation granules when <example file> has no geolocation granules or attributes. Since –g no is redundant when <example file> has no geolocation granules or attributes, this test probably does not need to be run by make check.

5.3.1.D Test requirement 3.3.1.D

Test that –l <example file> -g no returns error when example file has only GEO product.

5.3.1.E Test requirement 3.3.1.E

Test that nagg command with no –t or –l options and –g no returns error.

5.3.2.A Test requirement 3.3.2.A

Test that output files have GEO product in addition to products in –t list.

5.3.2.B Test requirement 3.3.2.B

Test that output files have GEO product in addition to products in –t list.

5.3.2.C Test requirement 3.3.2.C

1. Input files with internal GEO or reference to GEO file in N_GEO_Ref:
   Test that output files have GEO product in addition to products in –t list.
2. Input files without internal GEO or reference to GEO file in N_GEO_Ref:
   Test that result is error for missing GEO.

5.3.2.D Test requirement 3.3.2.D

Test that –g yes with a GEO only example file produces the correct error message.

5.3.2.E Test requirement 3.3.2.E

Test that nagg command with no –t or –l options and –g no returns error.

5.3.3.A Test requirement 3.3.3.A

1. Input files with corresponding GEO files that exactly match N_GEO_Ref:
   Test that output files have GEO product in addition to products in –t list.
2. Input files with corresponding GEO files that do not exactly match N_GEO_Ref:
   Test that result is missing GEO error.

5.3.3.B Test requirement 3.3.3.B

1. Input files with corresponding GEO files that exactly match N_GEO_Ref:
   Test that output files have GEO product in addition to products in –t list.

2. Input files with corresponding GEO files that do not exactly match N_GEO_Ref:
   Test that result is missing GEO error.

5.3.3.C Test requirement 3.3.3.C

1. Input files with corresponding GEO files that exactly match N_GEO_Ref:
   Test that output files have GEO product in addition to products in –t list.
2. Input files with corresponding GEO files that do not exactly match N_GEO_Ref:
   Test that result is missing GEO error.

5.3.3.D Test requirement 3.3.3.D

Test that –g strict with GEO only example file produces error or is ignored, whichever outcome is chosen.

5.3.3.E Test requirement 3.3.3.E

Test that nagg command with no –t or –l options and –g no returns error.

5.3.4.A Test requirement 3.3.4.A

Test that nagg –g <GEO product> aggregates <GEO product> granules.

5.3.4.B Test requirement 3.3.4.B

Test that nagg –g <GEO product> aggregates <GEO product> granules.

5.3.4.C Test requirement 3.3.4.C

Test that nagg –g <GEO product> aggregates <GEO product> granules.

5.3.4.D Test requirement 3.3.4.D

Test that nagg –g <GEO product> aggregates <GEO product> granules.

5.3.4.E Test requirement 3.3.4.E

Test that nagg –g <GEO product> aggregates <GEO product> granules.

5.3.5.A Test requirement 3.3.5.A

Test that output files have GEO product in addition to products in –t list.

5.3.5.B Test requirement 3.3.5.B

Test that output files have GEO product in addition to products in –t list.

5.3.5.C Test requirement 3.3.5.C

Test that output files have only products in –t list (no GEO).

5.3.5.D Test requirement 3.3.5.D

Test that output files have only GEO product in example file.

5.3.5.E Test requirement 3.3.6.E

Test that nagg command with no –t or –l options and –g no returns error.

6 Documentation Requirements

The nagg Reference Manual and the nagg User Examples documents will need to be updated when these extensions are implemented.

Total time for updating documentation is 40 hours.

7 Summary

Estimated time for implementing, testing and documenting changes to nagg for extended compatibility:

Implementation	32 hours
Testing	44 hours
Documentation	40 hours
Total	116 hours

Revision History

Date	Revisions
2013-1-4	Rev 1: Implementation design matched to requirements.
2013-1-7	Rev 2: Test design matched to requirements.
2013-1-10	Rev 3: Text revisions and summary added.