The HDF-EOS Library: Interfaces and Examples

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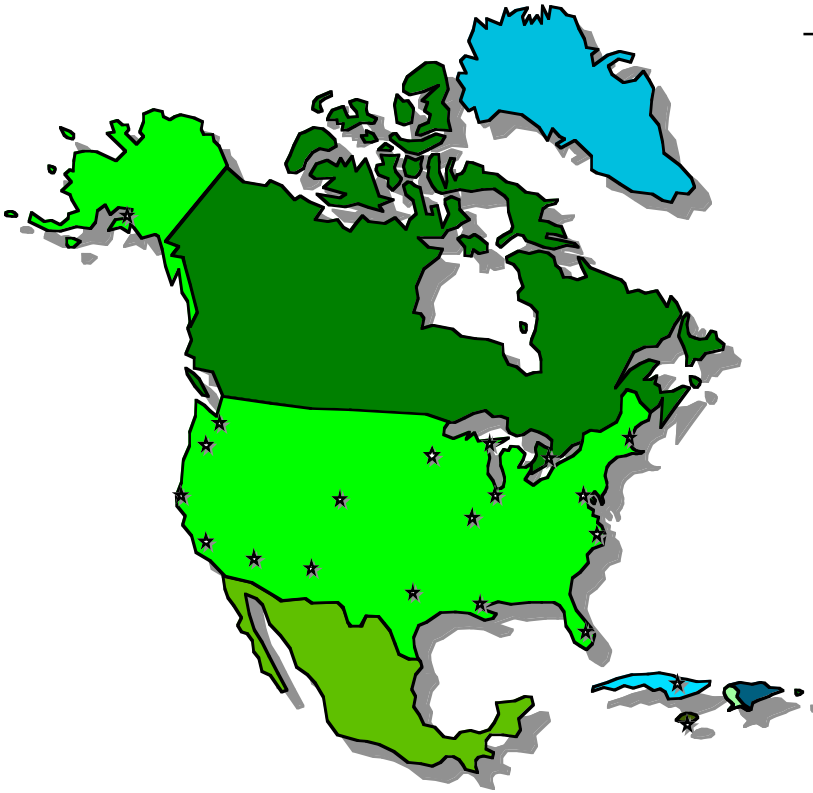
Point Data



Lat	Lon	Temp(C)	Dewpt(C)	Press(Mb)
61.12	-149.48	15.00	5.00	1020.60
45.31	-122.41	17.00	5.00	1022.30
38.50	-77.00	24.00	7.00	1025.70
38.39	-90.15	27.00	11.00	1026.70
30.00	-90.05	22.00	7.00	1025.40
37.45	-122.26	25.00	10.00	1026.70
18.00	-76.45	27.00	4.00	1027.10
43.40	-79.23	30.00	14.00	1027.80
34.03	-118.14	25.00	4.00	1026.40
32.45	-96.48	32.00	8.00	1029.10
33.30	-112.00	30.00	10.00	1028.40
42.15	-71.07	28.00	7.00	1029.10
35.05	-106.40	30.00	9.00	1029.80
34.12	-77.56	28.00	9.00	1029.80
46.32	-87.25	30.00	8.00	1029.80
47.36	-122.20	32.00	15.00	1031.50
39.44	-104.59	31.00	16.00	1030.80
21.25	-78.00	28.00	7.00	1030.10
44.58	-93.15	32.00	13.00	1029.10
41.49	-87.37	28.00	9.00	1029.50
25.45	-80.11	19.00	3.00	1021.00

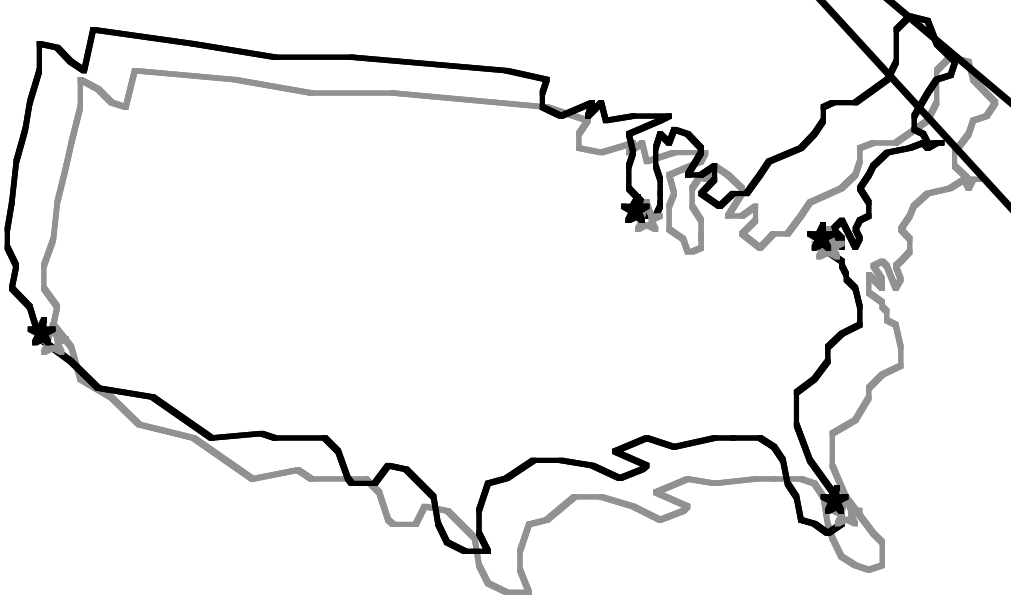
The HDF-EOS Point Interface

Category	Routine Name		Description
	C	FORTRAN	
Access	PTopen	ptopen	creates a new file or opens an existing one
	PTcreate	ptcreate	creates a new point data set and returns a handle
	PTattach	ptattach	attaches to an existing point data set
	PTdetach	ptdetach	releases a point data set and frees memory
	PTclose	ptclose	closes the HDF-EOS file and deactivates the point interface
Definition	PTdeflevel	ptdeflev	defines a level within the point data set
Basic I/O	PTwritelevel	ptwrlev	writes (appends) full records to a level
	PTreadlevel	ptrdlev	reads data from the specified fields and records of a level
	PTupdatelevel	ptuplev	updates the specified fields and records of a level
	PTwriteattr	ptwrattr	creates or updates an attribute of the point data set
	PTreadattr	ptrdattr	reads existing attribute of point data set
Index I/O	PTwritebackptr	ptwrbptr	establishes the backward pointer linkage between two levels
	PTreadbackptr	ptrdbptr	reads the back pointer information from a level
	PTupdatebackptr	ptupbptr	updates (corrects) back pointer
Inquiry	PTnlevels	ptnlevs	returns the number of levels in a point data set
	PTnrecs	ptnrecs	returns the number of records in a level
	PTlevelinfo	ptnlevinfo	returns information about the fields in a given level
	PTsizeof	ptsizeof	returns information about specified fields in a point
Subset	PTdefboxregion	ptdefboxreg	define region of interest by latitude/longitude
	PTextractregion	ptextrreg	read a region of interest from a field

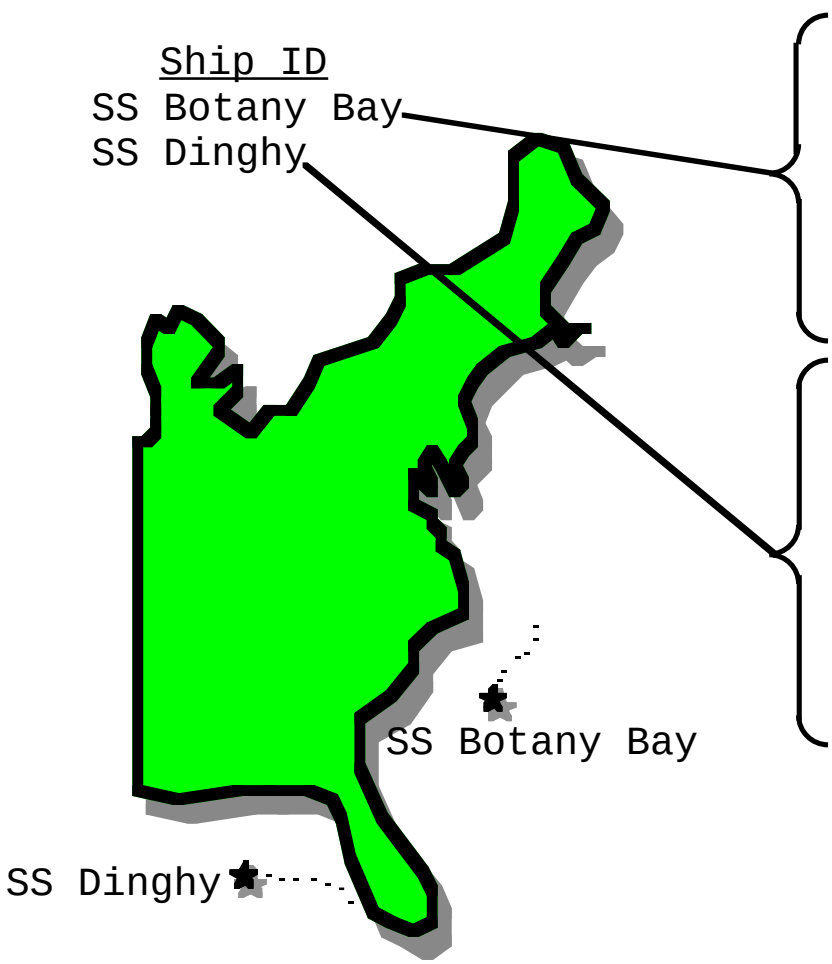
Point Data Example: Fixed Reporting Stations

Station	Lat	Lon
Chicago	41.49	-87.37
Los Angeles	34.03	-118.14
Washington	38.50	-77.00
Miami	25.45	-80.11

Time	Temp(C)
0800	-3
0900	-2
1000	-1
0800	20
0900	21
1000	22
1100	24
1000	6
1100	8
1200	9
1300	11
1400	12
0600	15
0700	16

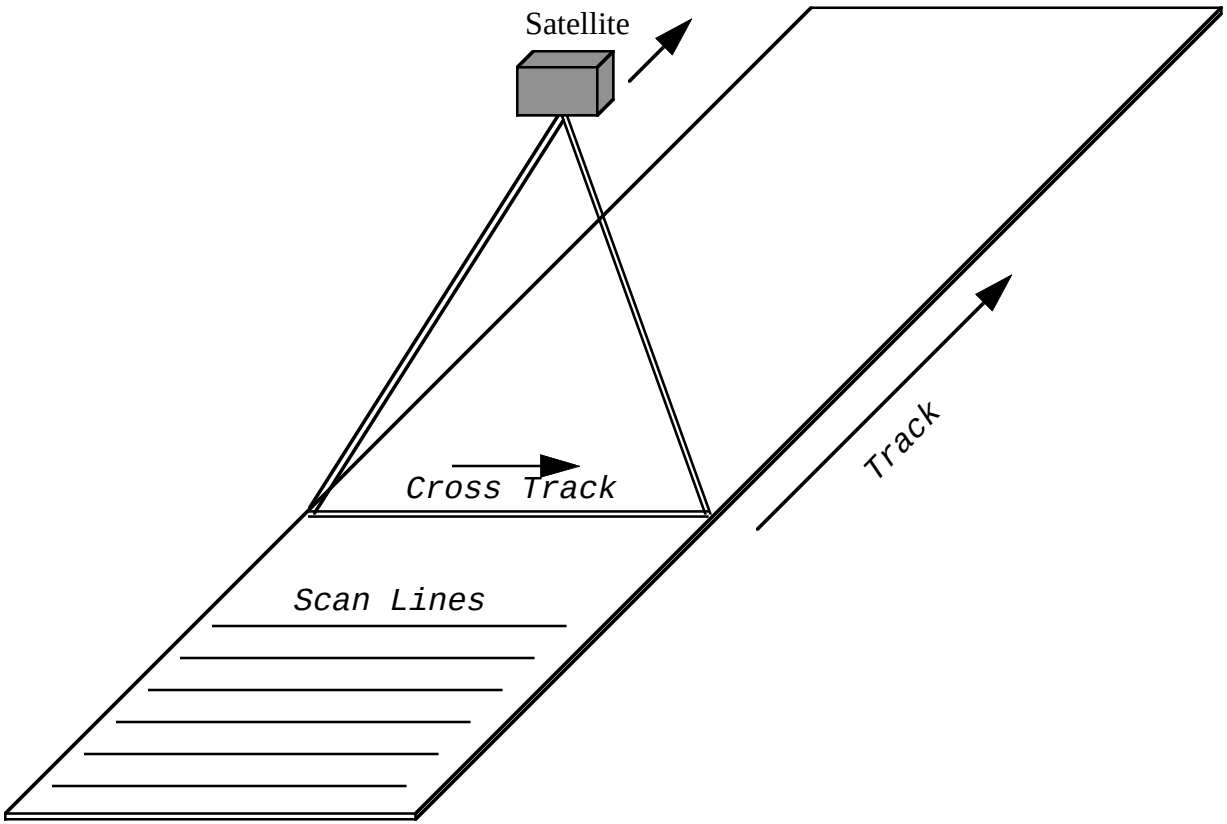


Point Data Example 2: Mobile Reporting Stations



Lat	Lon	Temp(C)	Salinity(PPM)
34.12	-74.56	18	146
33.24	-74.62	18	158
32.45	-75.65	19	151
32.03	-76.02	19	160
30.94	-76.48	20	162
30.04	-76.89	20	165
29.88	-76.94	21	159
25.51	-84.67	26	167
25.97	-85.06	26	173
26.22	-85.65	25	168
26.53	-86.14	26	162
26.58	-86.74	27	144
26.62	-87.45	27	156
26.87	-87.97	25	160
27.09	-88.68	25	166

Swath Data



The HDF-EOS Swath Interface

Category	Routine Name		Description
	C	FORTRAN	
Access	SWopen	swopen	opens or creates HDF file in order to create, read, or write a swath
	SWcreate	swcreate	creates a swath within the file
	SWattach	swattach	attaches to an existing swath within the file
	SWdetach	swdetach	detaches from swath interface
	SWclose	swclose	closes file
Definition	SWdefdim	swdefdim	defines a new dimension within the swath
	SWdefdimmap	swdefmap	defines the mapping between the geolocation and data dimensions
	SWdefidxmap	swdefimap	defines a non-regular mapping between the geolocation and data dimension
	SWdefgeofield	swdefgfld	defines a new geolocation field within the swath
	SWdefdatafield	swdefdfld	defines a new data field within the swath
	SWwritegeometa	swwrgmeta	writes field metadata for an existing swath geolocation field
	SWwritedatameta	swwrdmeta	writes field metadata for an existing swath data field
Basic I/O	SWwritefield	swwrfld	writes data to a swath field
	SWreadfield	swrdfld	reads data from a swath field.
	SWwriteattr	swwrattr	writes/updates attribute in a swath
	SWreadattr	swrdattr	reads attribute from a swath
	SWsetfillvalue	swsetfill	sets fill value for the specified field
	SWgetfillvalue	swgetfill	retrieves fill value for the specified field

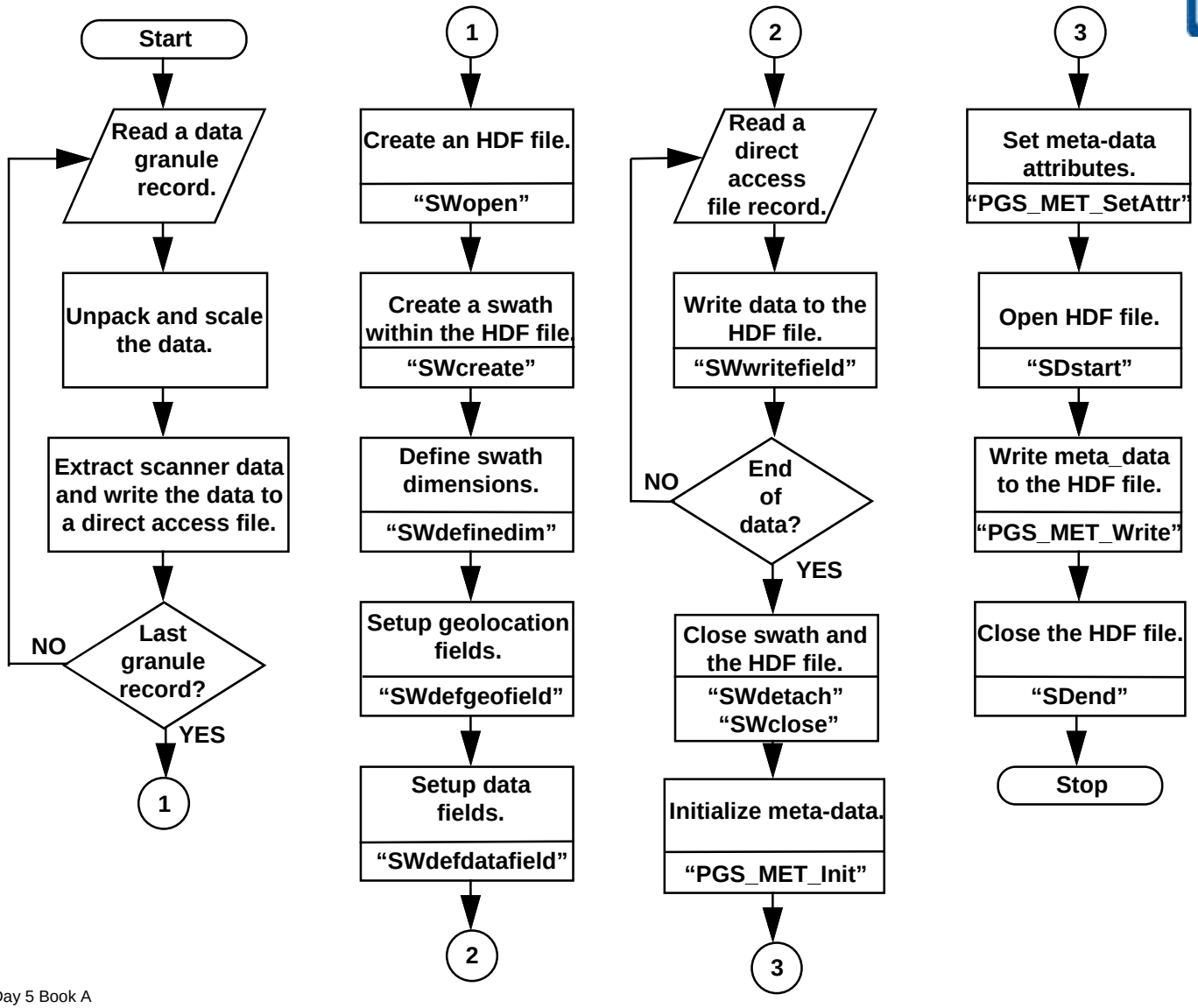
The HDF-EOS Swath Interface (cont.)

Category	Routine Name		Description
	C	FORTRAN	
Inquiry	SWinqdims	swinqdims	retrieves information about dimensions defined in swath
	SWinqmaps	swinqmaps	retrieves information about the geolocation relations defined
	SWinqidxmaps	swinqimaps	retrieves information about the indexed geolocation/data mappings defined
	SWinqgeofields	swinqgflds	retrieves information about the geolocation fields defined
	SWinqdatafields	swinqdflds	retrieve information about the data fields defined
	SWnentries	swnentries	returns number of entries and descriptive string buffer size for a specified entity
	SWdiminfo	swdiminfo	retrieve size of specified dimension
	SWmapinfo	swmapinfo	retrieve offset and increment of specified geolocation mapping
	SWidxmapinfo	swimapinfo	retrieve offset and increment of specified geolocation mapping
	SWfieldinfo	swfldinfo	retrieve information about a specific geolocation or data field in the swath
Subset	SWdefboxregion	swdefboxregion	define region of interest by latitude/longitude
	SWdefboxregionext	swdefboxregext	define region of interest by latitude/longitude with external geolocation
	SWextractregion	swextrreg	read a region of interest from a field

Swath Example: ERBE S-8 V0 Data Migration

- Obtain a data granule from the Langley DAAC
- Extract Scanner, Satellite Parameter, and Flag Word data and write to a new direct access file
- Create HDF-EOS file, define dimensions and data fields
- Read data from direct access file and store in swath
- Collect metadata and add it to the HDF-EOS file

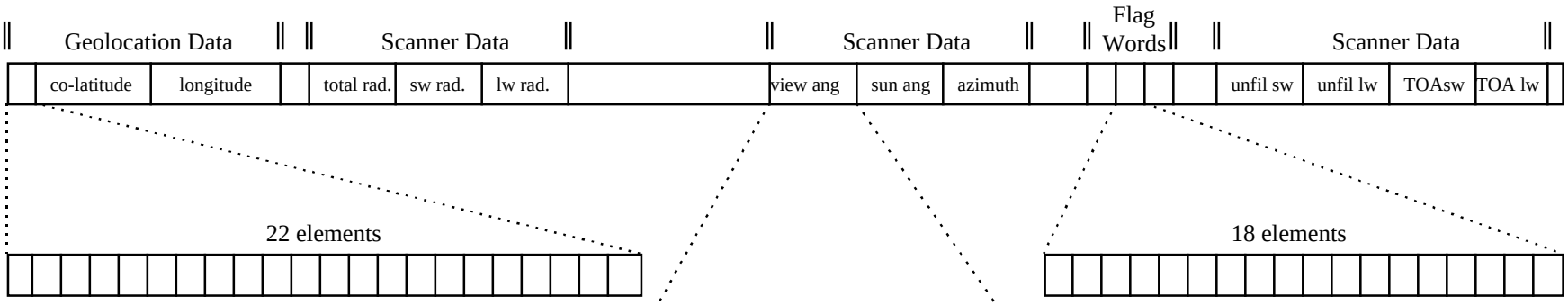
Program Flow Chart



S-8 Input Tape Format

Unpacked and unscaled PAT record.

3630 data elements



22 elements

Spacecraft parameter data block.

(e.g. time, position, velocity, orbit number, etc.)

Each record contains data for a 16 second time period. There are a maximum of 5400 records per granule (less due to dropouts).

18 elements

Flag word block

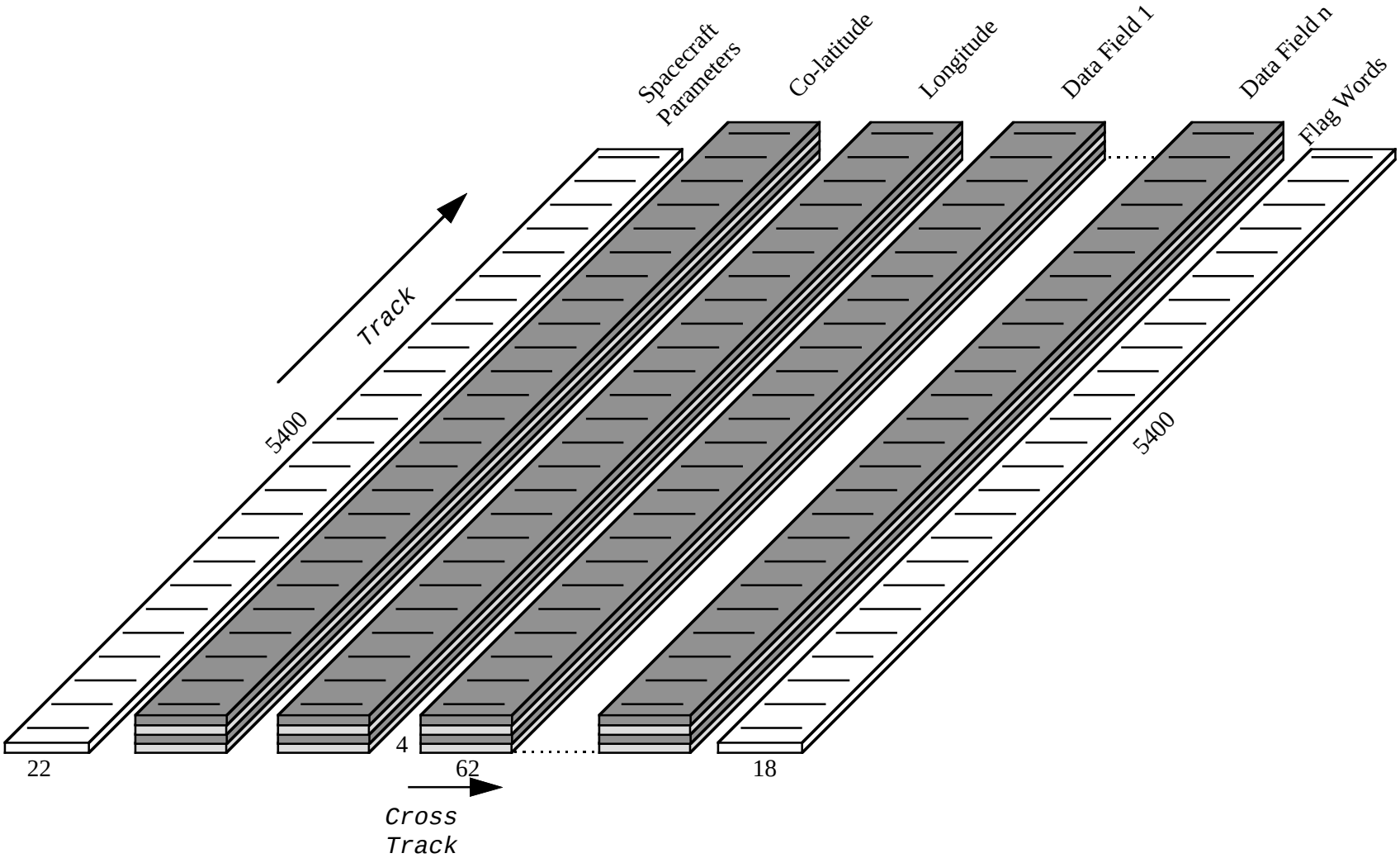
Eighteen 16-bit values, represented as decimal numbers, contain a single bit of information for each of the 248 measurements for each scanner channel.

248 elements

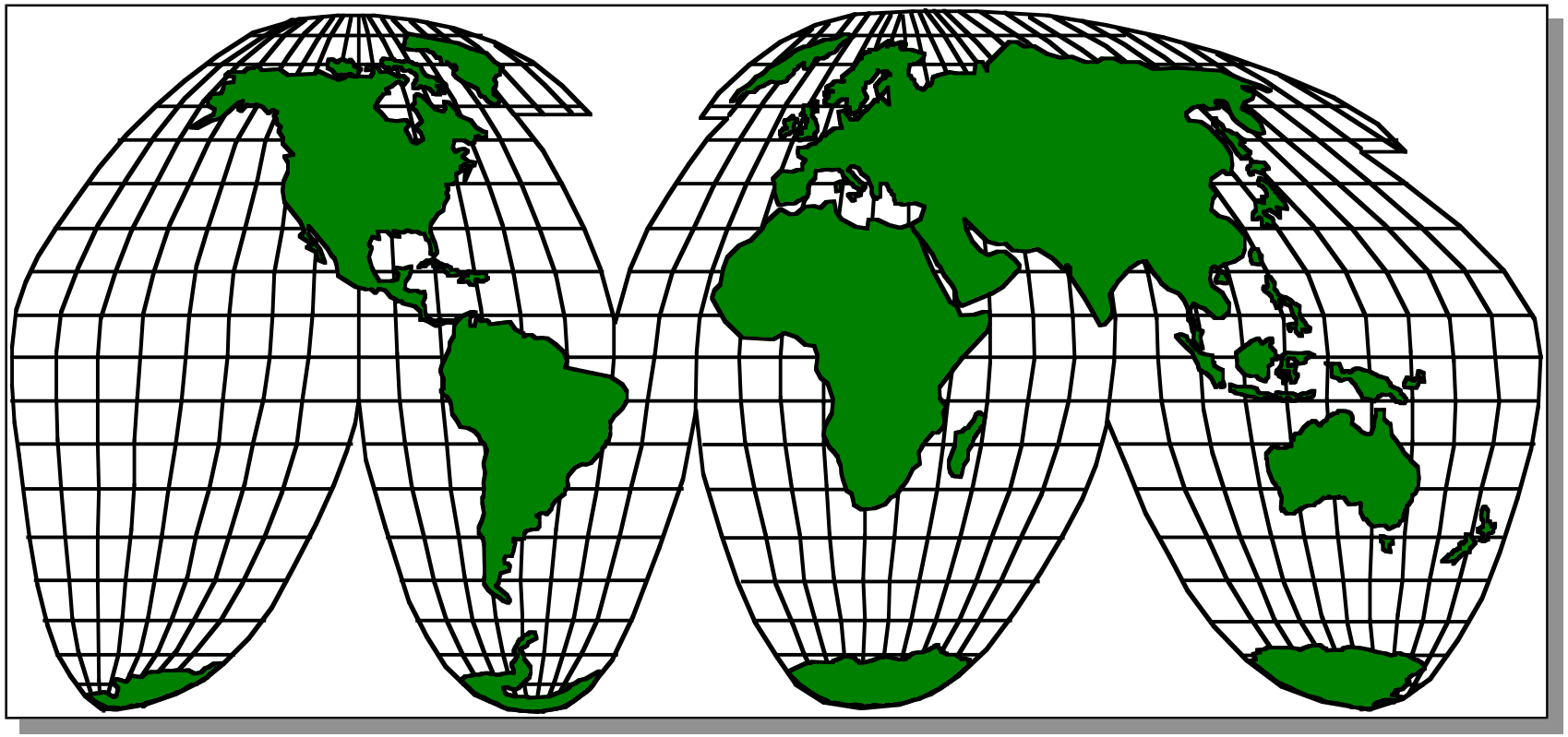
Scanner Data Block (typical)

The same structure is used for the co-latitude and longitude block so there is a corresponding geolocation element for each data element.

S-8 in HDF-EOS Swath



Grid Data



The HDF-EOS Grid Interface

Category	Routine Name		Description
	C	FORTRAN	
Access	GDopen	gdopen	creates a new file or opens an existing one
	GDcreate	gdcreate	creates a new grid in the file
	GDattach	gdattach	attaches to a grid
	GDdetach	gddetach	detaches from grid interface
	GDclose	gdclose	closes file
Definition	GDdefdim	gddefdim	defines dimensions for a swath
	GDdefproj	gddefproj	Defines projection of grid
	GDdefpixreg	gddefpixreg	defines pixel registration within grid cell
	GDdeffield	gddeffld	defines data fields to be stored in a grid
	GDwritefiledmeta	gdwrmeta	writes metadata for field already existing in file
Basic I/O	GDwritefield	gdwrfld	writes data to a grid field.
	GDreadfield	gdrdfld	reads data from a grid field
	GDwriteattr	gdwrattr	writes/updates attribute in a grid.
	GDreadattr	gdrdattr	reads attribute from a grid
	GDsetfillvalue	gdsetfill	sets fill value for the specified field
	GDgetfillvalue	gdgetfill	retrieves fill value for the specified field

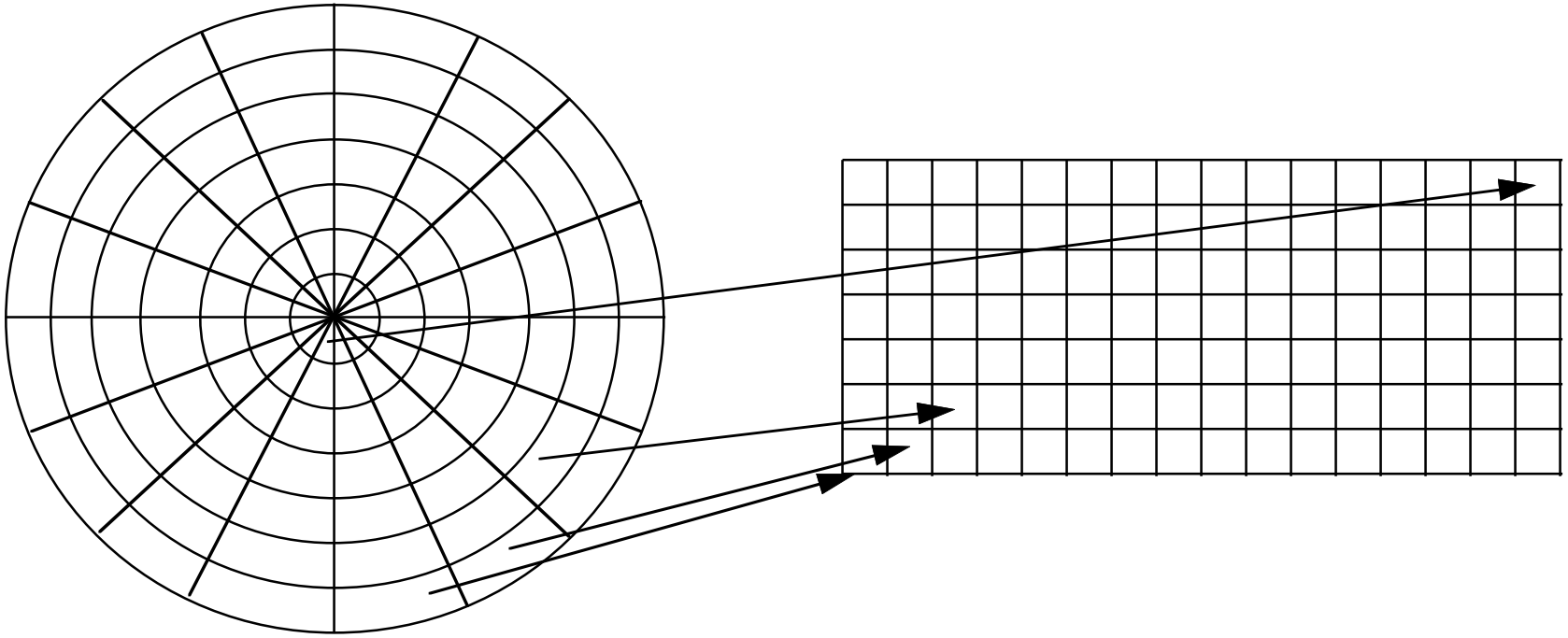
The HDF-EOS Grid Interface (cont.)

Category	Routine Name		Description
	C	FORTRAN	
Inquiry	GDinqdims	gdinqdims	retrieves information about dimensions defined in grid
	GDinqfields	gdinqdflds	retrieves information about the data fields defined in grid
	GDnentries	gdnentries	returns number of entries and descriptive string buffer size for a specified entity
	GDgridinfo	gdgridinfo	returns dimensions of grid and X-Y coordinates of corners
	GDprojinfo	gdprojinfo	returns all GCTP projection information
	GDdiminfo	gddiminfo	retrieves size of specified dimension.
	GDfieldinfo	gdfldinfo	retrieves information about a specific geolocation or data field in the grid
Subset	GDdefboxregion	gddefboxreg	define region of interest by latitude/longitude
	GDextractregion	gdextrreg	read a region of interest from a field

Grid Example: NMC Data (ADPP)

- **Obtain data through ingest.**
- **Extract and Decode metadata parameters and check for valid values of key parameters.**
- **Unpack science data into floating point.**
- **Gather metadata and write to HDF file**
- **Write science data to three dimensional HDF grid structures .**

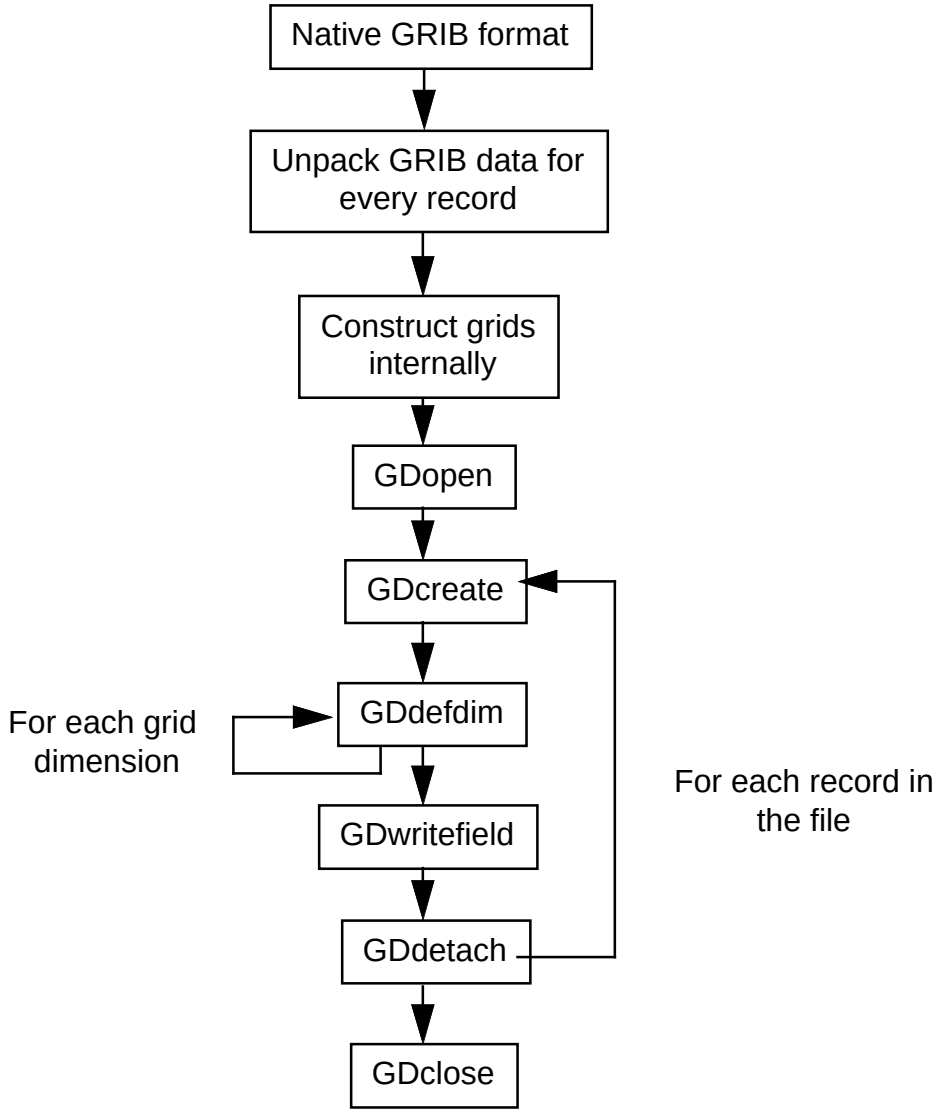
Schematic View of NMC Grid



Grid in Projection Plane

Grid In Storage Plane

Program Flow Chart



Conclusions

- HDF-EOS represents a convenient way to support instrument independent services on data products
- HDF-EOS libraries are currently available as prototypes
- A beta version (with User's Guide) will be released at the end of April
- Version 1 of HDF-EOS will be released June 21
- V0 Migration has used the prototype code for some examples