

### 3.45 Sensor Data Records File (SDR)

**Created By :** SDRP

**Used By :** EDRP, GRID

**Format :** Binary, direct access

**Description :** This file contains earth-located sets of brightness temperatures which have been surface tagged, calibrated, Doppler corrected, cross polarization and spill-over corrected or APC corrected according to Earth surface type, averaged along scan and along the ground track, formatted and written to a file for subsequent use by EDRP. The SDR file contains the imager, environmental, lower, and upper sounding scene data.

#### 3.45.1 Data Elements

##### 3.45.1.1 Revolution Header

Data Element	Description	Validity Check	Unit of Measure	Precision	Limit/Range	Accuracy	Data Type
File Info Word	File information for internal use [First 2 Bytes contain Software Rev #: 42 for Rev 4B (for example) 3 <sup>rd</sup> Byte contains Endian type-1=Big/0=Little 4 <sup>th</sup> Byte contains <b>File ID of 1</b> -for SDR]	N/A	None	1	0 to 2147483647	N/A	Integer
Revolution number	Revolution number (full)	N/A	None	1	0 to 2147483647	1 orbit	Integer
Year	Starting Year	N/A	Year	1	0 to 9999	1 year	Integer
Julian Day	Starting Julian day	N/A	Days	1	1 to 366	1 day	Integer
Hour	Starting hour	N/A	Hours	1	0 to 23	1 hour	Integer
Minute	Starting minute	N/A	Minutes	1	0 to 59	1 minute	Integer
Satellite ID	Satellite ID 1=First Sensor=S/N #2 2=unassigned 3=unassigned	N/A	None	1	1 to 3	N/A	Integer
Number of SDR Records	Number of scan headers in file	N/A	N/A	1	1 to 32767	N/A	Integer
Constants File ID	3 Characters to identify the constants file used in processing	N/A	N/A	N/A	0-255	N/A	Integer (ASCII Code)
Constants File Checksum	Code unique to the contents of the constants file-any file changes whatsoever will modify the value	N/A	N/A	1	65535	N/A	Integer
Processing Status Flags	0 or 1 indicator for various processing options bit 0::warm load bias bit 1::residual Doppler bit 2::scan non-uniform bit 3::cross pol / APC bit 4::resampling bit 5::cal re-averaging	N/A	N/A	N/A	0 to 1	N/A	bit

	bit 6::Moon intrusion bit 7::spike removal						
Processing Status Flags 2	indicator for various processing options bits0-2::Sun intrusion bits3-14::spare bit 15::Environmental Channel 12-16 resolution (0=1/10 <sup>th</sup> degree & 1 =1/100 <sup>th</sup> degree).	N/A	N/A	N/A	0 to 5 [6] for sun intrusion	N/A	Bit(s)
Spare & Spare1	Spare fields for future growth	N/A	N/A	N/A	N/A	N/A	Integer

### 3.45.1.2 Scan Header

Data Element	Description	Validity Check	Unit of Measure	Precision	Limit/Range	Accuracy	Data Type
SDR sync word	Sync word set to 0F0F0F hex	N/A	None	1	0F0F0F hex	N/A	Integer
Year	Scan Year	N/A	Year	1	0 to 9999	1 year	Integer
Julian Day	Scan Julian day	N/A	Days	1	1 to 366	1 day	Integer
Hour	Scan hour	N/A	Hours	1	0 to 23	1 hour	Integer
Minute	Scan minute	N/A	Minutes	1	0 to 59	1 minute	Integer
Scan number	Scan number of first in 24 scan buffer	N/A	None	1	1 to 2147483647	N/A	Integer
Img scans	#Imager scans	N/A	None	1	0 to 28	N/A	Integer
Env scans	#Environmental scans	N/A	None	1	0 to 24	N/A	Integer
LAS scans	#LAS scans	N/A	None	1	0 to 8	N/A	Integer
UAS scans	#UAS scans	N/A	None	1	0 to 4	N/A	Integer
Imager scan times	Milliseconds since midnight for 0..28 scans	N/A	msec	1	0 to 86400000	1 msec	Integer
Imager scene counts	Count of scenes for each imager scan	N/A	None	1	0 to 180	N/A	Integer
Environmental scan times	Milliseconds since midnight for 0..24 scans	N/A	msec	1	0 to 86400000	1 msec	Integer
Environmental scene counts	Count of scenes for each environmental scan	N/A	None	1	0 to 90	N/A	Integer
LAS scan times	Milliseconds since midnight for 0..8 scans	N/A	msec	1	0 to 86400000	1 msec	Integer
LAS scene counts	Count of scenes for each LAS scan	N/A	None	1	0 to 60	N/A	Integer
UAS scans	Milliseconds since midnight for 0..4 scans	N/A	msec	1	0 to 86400000	1 msec	Integer
UAS scene counts	Count of scenes for each UAS scan	N/A	None	1	0 to 30	N/A	Integer
Spare	Spare fields for future growth	N/A	N/A	N/A	N/A	N/A	Integer

### 3.45.1.3 Imager Scene Data

Data Element	Description	Validity Check	Unit of Measure	Precision	Limit/Range	Accuracy	Data Type
Latitude	Scene latitude (+ north)	N/A	degrees *100	1	-9000 to 9000	100th deg	Integer
Longitude	Scene longitude (+ east)	N/A	degrees *100	1	-18000 to 18000	100th deg	Integer

Scene count	Imager scene #	N/A	None	1	1 to 180	N/A	Integer
Surface tag	Static surface tag -1 = Unknown 0 = Land 1 = Spare 2 = Near coast 3 = Ice 4 = Possible ice 5 = Ocean 6 = Coast 7 = Spare	N/A	None	1	-1 to 7	N/A	Integer
Rain flag	Rain flag -1 = indeterminate 0 = no rain 1 = rain	N/A	None	1	-1 to 1	N/A	Integer
Channel brightness temperatures	Channel 8-11, 17,18 brightness temperatures	N/A	Celsius *100	1	-19500 to 6000	100th deg	Integer

### 3.45.1.4 Environmental Scene Data

Data Element	Description	Validity Check	Unit of Measure	Precision	Limit/Range	Accuracy	Data Type
Latitude	Scene latitude (+ north)	N/A	degrees*100	1	-9000 to 9000	100th deg	Integer
Longitude	Scene longitude (+ east)	N/A	degrees*100	1	-18000 to 18000	100th deg	Integer
Scene count	Environmental scene #	N/A	None	1	1 to 90	N/A	Integer
Sea ice flag	Sea ice flag 0 = No ice 3 = Ice 5 = Ocean 6 = Coast	N/A	None	1	0, 3, 5, 6	N/A	Integer
Surface tag	Static surface tag -1 = Unknown 0 = Land 1 = Spare 2 = Near coast 3 = Ice 4 = Possible ice 5 = Ocean 6 = Coast 7 = Spare	N/A	None	1	-1 to 7	N/A	Integer
Channel brightness temperatures (5x5,5x4)	Channel 12-16, 15-18 (5x5), 17-18 (5x4) brightness temperatures	N/A	Celsius*100 <i>if processing status word 2 bit 15(16<sup>th</sup> bit) =1</i>  Celsius*10 <i>if processing status word 2 bit 15(16<sup>th</sup> bit) =0</i>	1	-19500 to 6000 <i>if processing status word 2 bit 15(16<sup>th</sup> bit) =1</i>  -1950 to 600 <i>if processing status word 2 bit 15(16<sup>th</sup> bit) =0</i>	100th deg <i>if processing status word 2 bit 15(16<sup>th</sup> bit) =1</i>  10 <sup>th</sup> deg <i>if processing status word 2 bit 15(16<sup>th</sup> bit) =0</i>	Integer
Rain flag 1	Rain flag 1 -1 = indeterminate 0 = no rain 1 = rain	N/A	None	1	-1 to 1	N/A	Integer
Rain flag 2	Rain flag 2 -1 = indeterminate 0 = no rain	N/A	None	1	-1 to 1	N/A	Integer

	1 = rain						
EDR bit flags	Algorithm bit flag (currently not set /used)	N/A	None	1	N/A	N/A	Integer

### 3.45.1.5 Lower Air Sounding Scene Data

Data Element	Description	Validity Check	Unit of Measure	Precision	Limit/Range	Accuracy	Data Type
Latitude	Scene latitude (+ north)	N/A	degrees *100	1	-9000 to 9000	100th deg	Integer
Longitude	Scene longitude (+ east)	N/A	degrees *100	1	-18000 to 18000	100th deg	Integer
Channel brightness temperatures	Channel 1-7, 8-11,18 (5x5) , 24 (3x3) brightness temperatures	N/A	Celsius *100	1	-19500 to 6000	100th deg	Integer
1000 mb height	Height of 1000 mb pressure level -999 = Undetermined	N/A	meters	1	-999, -500 to 500	1 meter	Integer
Surface tag	Static surface tag -1 = Unknown 0 = Land 1 = Spare 2 = Near coast 3 = Ice 4 = Possible ice 5 = Ocean 6 = Coast 7 = Spare	N/A	None	1	-1 to 7	N/A	Integer
Lower temperature quality flag	Sum of #valid scenes when computing 3x3 averages for channels 1-7, 24. (3 scans per channel x 8 channels = 24 possible valid scenes)	N/A	Total #valid scenes used in the averaging.	1	0 to 24	N/A	Integer
Lower humidity quality flag	Sum of #valid scans and scenes when computing 3x3 averages for channels 1-4 (3 scans per channel x 4 channels = 12 possible valid scans), and 5x5 averages for channels 8-11,18 (25 scenes x 5 channels = 125 possible valid scenes).  (12 + 125 possible valid scenes = 137)	N/A	Total #valid scenes used in the averaging.	1	0 to 137	N/A	Integer
Terrain height	Terrain height -32768 = Undetermined	N/A	meters	1	-32768, -400 to 7000	1 meter	Integer
Scene number	LAS Scene number	N/A	None	1	1 to 60	N/A	Integer

### 3.45.1.6 Upper Air Sounding Scene Data

Data Element	Description	Validity Check	Unit of Measure	Precision	Limit/Range	Accuracy	Data Type
Latitude	Scene latitude (+ north)	N/A	degrees *100	1	-9000 to 9000	100th deg	Integer
Longitude	Scene longitude (+ east)	N/A	degrees *100	1	-18000 to	100th deg	Integer

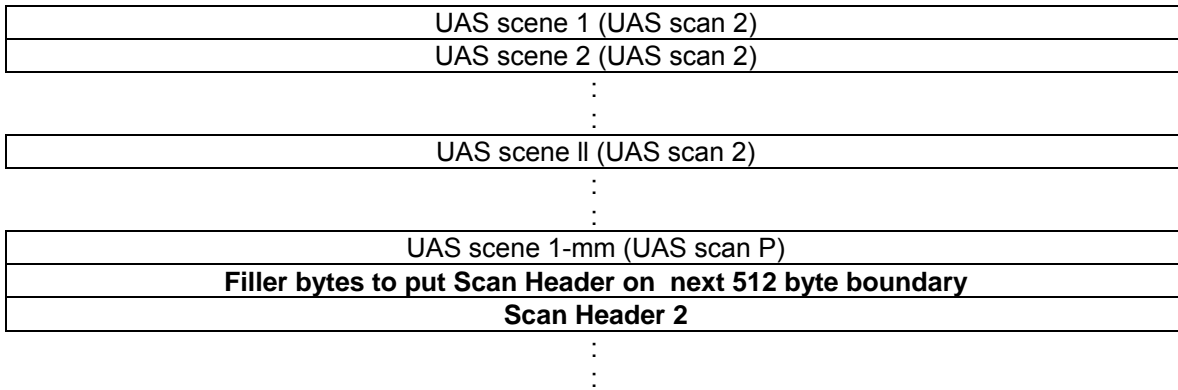
					18000		
Channel brightness temperatures	Channel 19-24 (6X6) brightness temperatures	N/A	Celsius *100	1	-19500 to 6000	100th deg	Integer
Scene number	UAS Scene number	N/A	None	1	1 to 30	N/A	Integer
Temperature quality flag	Sum of #valid scans / scenes when computing 6x6 averages for channels 19-23 (6 scans x 5 channels = 30 possible valid scans), and 6x6 average for channel 24 (6 scans x 2 scenes x 1 channels = 12 possible valid scenes).  (30 + 12 possible valid scans = 42)	N/A	Total #valid scenes used in the averaging.	1	0 to 42	N/A	Integer
Geomagnetic Field	Squared geomagnetic field strength	N/A	$\mu\text{Tesla}^2$	1	48400 to 450000	$\mu\text{Tesla}^2$	Integer
B dot K	Squared dot product of geomagnetic field with propagation vector	N/A	$\mu\text{Tesla}^2$	1	0 to 450000	$\mu\text{Tesla}^2$	Integer

### 3.45.2 File Format

This file contains 7 distinct types of records: 1) Revolution Header, 2) Scan Header, 3) Imager Scene, 4) Environmental Scene (odd), 5) Environmental Scene (even), 6) Lower Air Sounding Scene, and 7) Upper Air Sounding Scene. The records are physically structured in the file in the following manner:

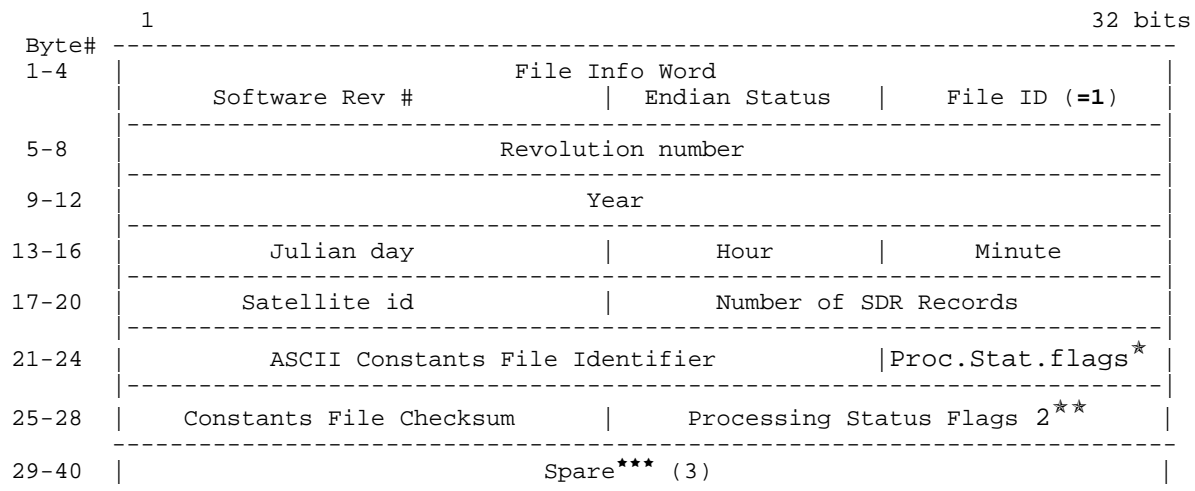
Revolution Header Record
<b>Filler bytes to put scan header on next 512 byte boundary</b>
<b>Scan Header 1</b>
Imager scene 1 (imager scan 1)
Imager scene 2 (imager scan 1)
Imager scene 3 (imager scan 1)
:
:
Imager scene aa (imager scan 1)
Imager scene 1 (imager scan 2)
Imager scene 2 (imager scan 2)
:
:
Imager scene bb (imager scan 2)
:
:
Imager scene 1 (imager scan M)
Imager scene 2 (imager scan M)
Imager scene cc (imager scan M)

Environmental scene record 1 (environmental <b>odd</b> scan 1)
Environmental scene record 2 (environmental <b>odd</b> scan 1)
Environmental scene record 3 (environmental <b>odd</b> scan 1)
⋮
Environmental scene record dd (environmental <b>odd</b> scan 1)
Environmental scene record 1 (environmental <b>even</b> scan 2)
Environmental scene record 2 (environmental <b>even</b> scan 2)
Environmental scene record 3 (environmental <b>even</b> scan 2)
⋮
Environmental scene record ee (environmental <b>even</b> scan 2)
Environmental scene record 1 (environmental <b>odd</b> scan 3)
Environmental scene record 2 (environmental <b>odd</b> scan 3)
Environmental scene record 3 (environmental <b>odd</b> scan 3)
⋮
Environmental scene record ff (environmental <b>odd</b> scan 3)
Environmental scene record 1 (environmental <b>even</b> scan 4)
Environmental scene record 2 (environmental <b>even</b> scan 4)
Environmental scene record 3 (environmental <b>even</b> scan 4)
⋮
Environmental scene record gg (environmental <b>even</b> scan 4)
⋮
Environmental scene record 1 (environmental <b>odd</b> scan N)
⋮
Environmental scene record 1 (environmental <b>even</b> scan N+1)
⋮
LAS scene 1 (LAS scan 1)
LAS scene 2 (LAS scan 1)
⋮
LAS scene hh (LAS scan 1)
LAS scene 1 (LAS scan 2)
LAS scene 2 (LAS scan 2)
LAS scene 3 (LAS scan 2)
⋮
LAS scene ii (LAS scan 2)
⋮
LAS scene 1-ji (LAS scan O)
UAS scene 1 (UAS scan 1)
UAS scene 2 (UAS scan 1)
UAS scene 3 (UAS scan 1)
⋮
UAS scene kk (UAS scan 1)



The Revolution Header specifies the number of Scan Headers in the file. Each Scan Header specifies a number of imager, environmental, LAS, and UAS scans, and the number of scenes in each scan. The format of the odd and even environmental scenes are different, depending on whether the environmental scan is odd or even.

### 3.45.2.1 Revolution Header



\* Processing Status Flags, also described as the processing option flags, describe the processing state for key algorithms used to generate the SDRs. On the SUN machine those options are ordered as follows: The first bit (bit 0) represents warm load bias processing status (0=off/1=on). The second bit (bit 1) represents the residual Doppler processing status (0=off/1=on). The third bit (bit 2) represents the scan non-uniformity processing status (0=off/1=on). The fourth bit (bit 3) represents the cross polarization & spillover correction if the value is (0), but if the value is (1) it represents the antenna pattern correction (1). The fifth bit (bit 4) represents the Backus-Gilbert re-sampling of channels 12-14 to the channel 15-16 grid (0=off/1=on). The sixth bit (bit 5) represents the calibration data averaging [re-averaging if one considers the initial averaging done by the flight software aboard the sensor] (0=off/1=on). The seventh bit (bit 6) represents the Moon Intrusion repair (0=off/1=on). The eighth bit (bit 7) represents the calibration data spike repair (0=off/1=on).

\*\* Processing Status Flags 2 is a continuation of the above processing status flags. The Sun Intrusion processing status is defined in the first through third bits (bits 0-2). The combination of the three bits is used to define the processing option which may be 0 through 5. The 16<sup>th</sup> bit (bit 15) represents the output resolution of environmental channels 12-16-'0' indicates the old format of 1/10<sup>th</sup> degree and '1' indicates the new format as of Rev 6.0 of 1/100<sup>th</sup> degree. The 4<sup>th</sup> through 15<sup>th</sup> bits (bits 3-14) are spares.

\*\*\* Because the SDR scan header is packed starting at the beginning of a 512-byte block, the SDR revolution header is actually 512 bytes in size despite not being depicted as such. This means that there is enough room for an additional 472 bytes of data in the revolution header without changing the overall SDR file format.

### 3.45.2.2 Scan Header

Note: Scan Headers are written to the SDR file on 512 byte boundaries. Thus, after the UAS scenes have been written for the previous Scan Header, the next Scan Header will begin on the first byte after a byte number that is divisible by 512. For example, to find the byte number of the next scan header from the end of the previous scan's UAS scene data, the following formula can be used:

The next Scan Header will start at the first byte #  $(512 * n) + 1$  that occurs at or after the current write position.

Byte#	1	32-bits
1-4	SDR Sync word	
5-8	Year	
9-12	Julian day	Hour   Minute
13-16	Scan number	
17-20	#imager scans	#enviro scans   #LAS scans   #UAS scans
21-24	Imager start scan time (scan 1)	
25-28	Imager start scan time (scan 2)	
	:	
	:	
129-132	Imager start scan time (scan 28)	
133-136	scan 1 #I.S.	scan 2 #I.S.   scan 3 #I.S.   scan 4 #I.S.
137-140	scan 5 #I.S.	scan 6 #I.S.   scan 7 #I.S.   scan 8 #I.S.
141-144	scan 9 #I.S.	scan 10 #I.S.   scan 11 #I.S.   scan 12 #I.S.
145-148	scan 13 #I.S.	scan 14 #I.S.   scan 15 #I.S.   scan 16 #I.S.
149-152	scan 17 #I.S.	scan 18 #I.S.   scan 19 #I.S.   scan 20 #I.S.
153-156	scan 21 #I.S.	scan 22 #I.S.   scan 23 #I.S.   scan 24 #I.S.
157-160	scan 25 #I.S.	scan 26 #I.S.   scan 27 #I.S.   scan 28 #I.S.
161-164	Environmental start scan time (scan 1)	
165-168	Environmental start scan time (scan 2)	
	:	
	:	
253-256	Environmental start scan time (scan 24)	
257-260	scan 1 #E.S.	scan 2 #E.S.   scan 3 #E.S.   scan 4 #E.S.
261-264	scan 5 #E.S.	scan 6 #E.S.   scan 7 #E.S.   scan 8 #E.S.
265-268	scan 9 #E.S.	scan 10 #E.S.   scan 11 #E.S.   scan 12 #E.S.
269-272	scan 13 #E.S.	scan 14 #E.S.   scan 15 #E.S.   scan 16 #E.S.
273-276	scan 17 #E.S.	scan 18 #E.S.   scan 19 #E.S.   scan 20 #E.S.
277-280	scan 21 #E.S.	scan 22 #E.S.   scan 23 #E.S.   scan 24 #E.S.
281-284	LAS start scan time (scan 1)	
285-288	LAS start scan time (scan 2)	



289-292	LAS start scan time (scan 3)			
293-296	LAS start scan time (scan 4)			
297-300	LAS start scan time (scan 5)			
301-304	LAS start scan time (scan 6)			
305-308	LAS start scan time (scan 7)			
309-312	LAS start scan time (scan 8)			
313-316	scan 1 #LAS.S.	scan 2 #LAS.S.	scan 3 #LAS.S.	scan 4 #LAS.S.
317-320	scan 5 #LAS.S.	scan 6 #LAS.S.	scan 7 #LAS.S.	scan 8 #LAS.S.
321-324	UAS start scan time (scan 1)			
325-328	UAS start scan time (scan 2)			
329-332	UAS start scan time (scan 3)			
333-336	UAS start scan time (scan 4)			
337-340	scan 1 #UAS.S.	scan 2 #UAS.S.	scan 3 #UAS.S.	scan 4 #UAS.S.
341-360	Spare (5)			

### 3.45.2.3 Imager Scene

1	32-bits		
Byte#			
1-4	Latitude	Longitude	
5-8	Scene Number	Surface Tag	Rain Flag
9-12	Channel 8 1x1	Channel 9 1x1	
13-16	Channel 10 1x1	Channel 11 1x1	
17-20	Channel 17 1x1	Channel 18 1x1	

Repeat up to 180 scenes per scan

### 3.45.2.4 Environmental Scene (odd scans)

1	32-bits		
Byte#			
1-4	Latitude	Longitude	
5-8	Scene count	Sea ice flag	Surface tag
9-12	Channel 12 1x2	Channel 13 1x2	
13-16	Channel 14 1x2	Channel 15 1x2	
17-20	Channel 16 1x2	Channel 15 5x5	
21-24	Channel 16 5x5	Channel 17 5x5	
25-28	Channel 18 5x5	Channel 17 5x4	
29-32	Channel 18 5x4	rain flag 1	rain flag 2
33-36	EDR bit flags		

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Repeat up to 90 scenes per scan

### 3.45.2.5 Environmental Scene (even scans)

Even numbered scans will have a shorter record size than the odd numbered scans for the environmental scenes.

Byte#	32-bits		
1-4	Latitude	Longitude	
5-8	Scene count	Sea ice flag	Surface tag
9-12	Channel 12 1x2	Channel 13 1x2	
13-16	Channel 14 1x2	Channel 15 1x2	
17-18	Channel 16 1x2		

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Repeat up to 90 scenes per scan

### 3.45.2.6 Lower Air Sounding Scene

Byte#	32-bits		
1-4	Latitude	Longitude	
5-8	Channel 1 3x3	Channel 2 3x3	
9-12	Channel 3 3x3	Channel 4 3x3	
13-16	Channel 5 3x3	Channel 6 3x3	
17-20	Channel 7 3x3	Channel 8 5x5	
21-24	Channel 9 5x5	Channel 10 5x5	
25-28	Channel 11 5x5	Channel 18 5x5	
29-32	Channel 24 3x3	1000 mb height	
33-36	Surface tag	LAS TQ flag	LAS HQ flag
37-40	Terrain height	Scene number	

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Repeat up to 60 scenes per 3 scans

### 3.45.2.7 Upper Air Sounding Scene

1-4	Latitude	Longitude	
5-8	Channel 19 6x6	Channel 20 6x6	
9-12	Channel 21 6x6	Channel 22 6x6	
13-16	Channel 23 6x6	Channel 24 6x6	
17-20	Scene count	UAS TQ flag	
21-24	Squared Geomagnetic field strength		

25-28 |-----|  
B dot K squared
Repeat up to 30 scenes per 6 scans