



NISAR L&S Band Level-1 & Level-2 QA Data Product Format Document

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JULY 2024



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Document Control & Data Sheet

1.	Document No. & Date :	ISRO-SAC-PR-NISAR-2024-070
2.	Title :	NISAR L&S Band Level-1 & Level-2 QA Data Product Format Document
3.	Type of Report :	Technical
5.	No. of Pages:	73
6.	Authors :	NISAR DP Team
7.	Originating Unit :	SAR Data Processing Division, Microwave Data Processing Group, Signal & Image Processing Area
8.	Abstract :	This document provides details of the NISAR L&S Band Level-1 and Level-2 QA data product format.
9.	Keywords :	NISAR, SAR, HDF-5, Quality Assurance, Data Products, CSV, KML
10.	Security Classification :	Unrestricted
11.	Distribution:	Through NISAR Bhoonidhi portal

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DOCUMENT CHANGE HISTORY

S. No.	Version No.	Release Date	A/M/D	Remarks
1.	SAC/SIPA/MDPG/SDPD/NISAR/SAR/QA-FORMAT/JULY/2024/V1.0, 09-07-2024	09/07/2024		Initial Draft
2.	SAC/SIPA/MDPG/SDPD/NISAR/SAR/QA-FORMAT/AUG/2024/V1.0, 16-08-2024	16/08/2024	M	Table-4,6,8,10,12,14,16,18 has been modified.
3.	SAC/SIPA/MDPG/SDPD/NISAR/SAR/QA-FORMAT/JAN/2025/V1.0, 21-01-2025	21/01/2025	M	Table-9,11,13,15,17 has been modified.
4.	SAC/SIPA/MDPG/SDPD/NISAR/SAR/QA-FORMAT/AUG/2025/V1.0, 01-08-2025	01/08/2025	M	Table-2,3,4,5,6,7,8,9,11,13,15,17 have been modified. Figure 2,5,6,7,8,11,12,13,14,17,18, 19,20,26,32,38,44 have been modified. Appendix-1 has been updated.

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1. INTRODUCTION

NASA-ISRO SAR (NISAR) is a joint L & S Band SAR mission in which S-Band SAR instrument is developed by ISRO while NASA has developed L-Band SAR instrument. It is the first earth bound Dual frequency SAR mission with parabolic reflector-based antenna. It is capable of acquiring wide swath high-resolution SAR images in Stripmap mode with the help of a novel concept called as SweepSAR imaging. Conflicting requirements of high resolution and wide swath imaging results in blind range gaps in receive data window. Blind Range Gaps are distributed in the image with the help of PRI staggering. NISAR is capable of acquiring datasets in L-only, S-only and in Joint Mode (L+S) with various bandwidth and polarization combinations.

2. DATA PRODUCTS

NISAR will operate in L and S band with Single, Dual, Circular, QQP and Quad Polarization combinations. NISAR Data Products Generation System (DPGS) will have following three main levels of processing and corresponding product types from Level-0 to Level-2. However, higher level of science/information products (Level-3/4) are also planned to be generated operationally [1].

- I. Level-0: Raw signal product
- II. Level-1: Geo-Tagged product
- III. Level-2: Terrain Geo-Referenced product

The details of eight science data products (SDP) corresponding to Level 1 and Level 2 are shown in Table 1 below.

Product	Level	Scope	Description
Range Doppler Single Look Complex (RSLC)	L1	Global	The L1 RSLC product contains focused SAR images in range-Doppler coordinates. Standard product used to generate all higher-level products.
Geocoded Single Look Complex (GSLC)	L2	Global and all channels.	Single Look Complex SAR image on geocoded map coordinate system.
Geocoded Polarimetric Covariance (GCOV)	L2	Global and all channels. Single/Dual/Quad pol.	Geocoded, multi-looked polarimetric covariance matrix.
Range Doppler Interferogram (RIFG)	L1	Antarctica, Greenland and selected mountain glaciers. Nearest pair in time and co-pol channels only.	Multi-looked, ellipsoid and topography flattened wrapped interferogram in Range Doppler coordinates.
Range Doppler Unwrapped Interferogram (RUNW)	L1	Antarctica, Greenland and selected mountain glaciers. Nearest pair in time and co-pol channels	Multi-looked, ellipsoid and topography flattened unwrapped interferogram in Range Doppler coordinates.
Geocoded Unwrapped Interferogram (GUNW)	L2	Global. Nearest pair in time and co-pol channels only.	Geocoded, Multi-looked, ellipsoid and topography flattened unwrapped interferogram.
Range Doppler Pixel Offset (ROFF)	L1	Antarctica, Greenland and selected mountain glaciers. Nearest pair in time and co-pol channels only.	Unfiltered and unculted layers of pixel offsets in Range Doppler coordinates with different resolutions obtained from incoherent cross correlation

Geocoded Pixel Offset (GOFF) Data Product	L2	Antarctica, Greenland and selected mountain glaciers. Nearest pair in time co-pol channels only	Unfiltered and unculled layers of pixel offsets with different resolutions obtained from incoherent cross correlation and geocoded on map coordinate system.
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3. QA DATA PRODUCTS

The DPGS will generate all SDP products along with Quality Assurance (QA) products operationally and they will be archived and disseminated from NRSC. The QA products are generated in the form of a zip file comprising of seven files as mentioned in Table 2. The same detail is represented in the form of a picture in Fig. 1.

Table 2: CONTENT OF QA PRODUCT ZIP - FILE NAMING CONVENTION

S. No.	QA product content file	QA product content file name
1.	Browse Image	<product name>_QA.jpg
2.	A KML file	<product name>_QA.kml
3.	A QA log file	<product name>_QA_LOG.txt
4.	A PDF report with plots, parameters, etc.	<product name>_QA.pdf
5.	An HDF5 containing the QA estimated data comprises of statistics and histogram	<product name>_QA_STATS.h5
6.	A summary of QA parameters	<product name>_QA_SUMMARY.csv
7.	A meta data .met file	<product name>_QA.met

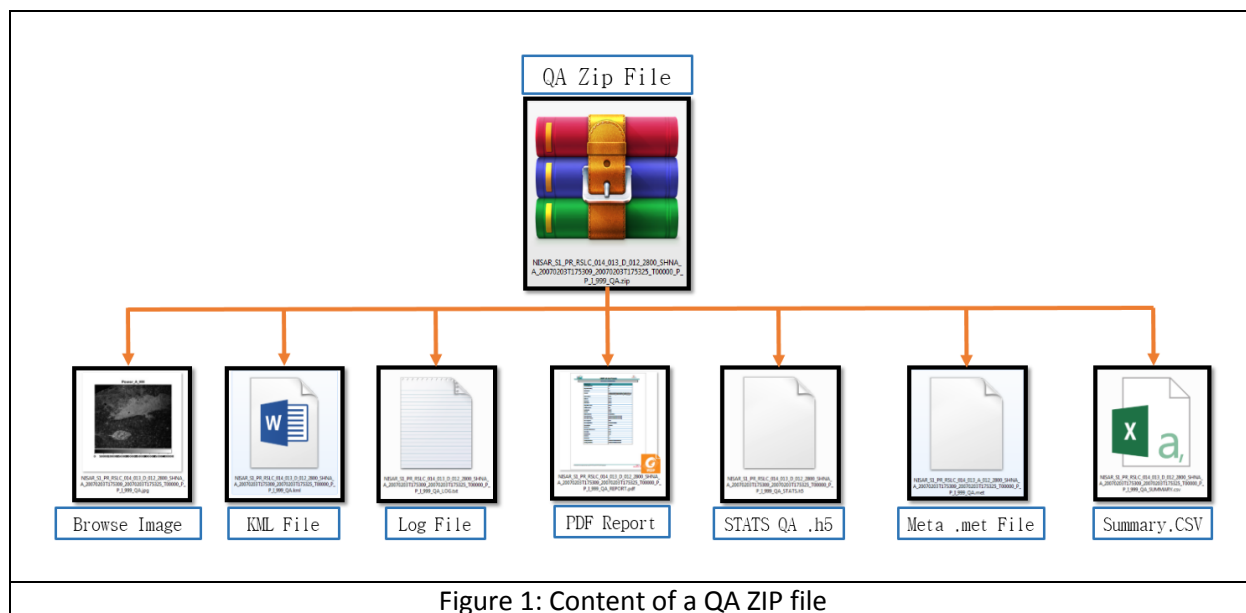


Figure 1: Content of a QA ZIP file

The pdf file contains following subsections: (1) meta data; (2) check list information; (3) images; (4) statistics with plots and tables. The HDF file contains actual data used to generate statistics as documented in subsection (4) of the pdf file. The KML file contains geolocation information of the product along with identification details. An example is described in Annexure-1. The csv file contains QA checklist information file used in subsection (2) of pdf file. This csv file can be used for doing time series analysis with respect to the QA parameters. In addition, the “REASON” column in the csv file will be filled with proper values in case of product QA failure cases. The jpg file is same as browse image of SDP and can be used at the time of data dissemination. Log file contains QA product generation details. The subsequent subsections provide details of HDF file and pdf components of QA product for each individual SDP.

3.1 Range Doppler Single Look Complex (RSLC) QA Product

The Table 3 details dataset’s name, datatype, shape etc. of the QA statistics HDF file for RSLC QA product. The visualization of the HDF file structure is shown in Fig. 2. The identification group in all eight QA products is same as that of SDP products. More details about this group is available in [1].

Table 3 Datasets of a RSLC QA HDF5 File		
RSLC QA parameters		
/science/SSAR/RSLC/QA/data/frequencyA/HH/Phase_MaxValue		
Type: Float32	Shape: scalar	
Description: Phase Maximum Value		
	units	radians
/science/SSAR/RSLC/QA/data/frequencyA/HH/Phase_MeanValue		
Type: Float32	Shape: scalar	
Description: Phase Mean Value		

	units	radians
/science/SSAR/RSLC/QA/data/frequencyA/HH/Phase_MinValue		
Type: Float32	Shape: scalar	
Description: Phase Minimum Value		
	units	radians
/science/SSAR/RSLC/QA/data/frequencyA/HH/Phase_StandardDeviation		
Type: Float32	Shape: scalar	
Description: Phase Standard Deviation		
	units	radians
/science/SSAR/RSLC/QA/data/frequencyA/HH/Sigma0_MaxValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Maximum Value		
	units	dB
/science/SSAR/RSLC/QA/data/frequencyA/HH/Sigma0_MeanValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Mean Value		
	units	dB
/science/SSAR/RSLC/QA/data/frequencyA/HH/Sigma0_MinValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Minimum Value		
	units	dB
/science/SSAR/RSLC/QA/data/frequencyA/HH/Sigma0_StandardDeviation		
Type: Float32	Shape: scalar	
Description: Sigma0 Standard Deviation		
	units	dB
/science/SSAR/RSLC/QA/data/frequencyA/HH/phaseHistogramDensity		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the Phase		
	units	Unitless
/science/SSAR/RSLC/QA/data/frequencyA/HH/azimuthPowerSpectralDensityFarRange		
Type: Compound	Shape: (numScans)	
Description: Azimuth Power Spectrum of the Power Image for FrequencyA Polarization HH Far Range		
	units	Unitless
/science/SSAR/RSLC/QA/data/frequencyA/HH/azimuthPowerSpectralDensityMidRange		
Type: Compound	Shape: (numScans)	
Description: Azimuth Power Spectrum of the Power Image for FrequencyA Polarization HH Mid Range		
	units	Unitless
/science/SSAR/RSLC/QA/data/frequencyA/HH/azimuthPowerSpectralDensityNearRange		
Type: Compound	Shape: (numScans)	
Description: Azimuth Power Spectrum of the Power Image for FrequencyA Polarization HH Near Range		
	units	Unitless
/science/SSAR/RSLC/QA/data/frequencyA/HH/rangePowerSpectralDensity		
Type: Compound	Shape: (numPixels)	
Description: Range Power Spectrum of the Power Image for FrequencyA Polarization HH		
	units	Unitless
/science/SSAR/RSLC/QA/data/frequencyA/HH/sigma0HistogramDensity		
Type: Float32	Shape: (600,2)	

Description: Histogram Density of the sigma naught image		
	units	Unitless
/science/SSAR/RSLC/QA/data/azimuthSpectralFrequencies		
Type: Float32		Shape: (numAzimuthLines)
Description: Frequency coordinates for azimuth power spectra		
	units	Hz
/science/SSAR/RSLC/QA/data/rangeSpectralFrequencies		
Type: Float32		Shape: (numRangeLines)
Description: Frequency coordinates for range power spectra		
	units	MHz
/science/SSAR/RSLC/identification/*		
Type: Same as RSLC product		Shape: Same as RSLC product
Description: Same as RSLC product		
	units	Same as RSLC product

RSLC PRODUCT	RSLC QA H5 PRODUCT
▼ NISAR_S1_PR_RSLC_001_071_A_001_2800_SHNA ▼ science ▼ SSAR ▼ RSLC ▶ metadata ▼ swaths ▼ frequencyA - HH - acquiredCenterFrequency - acquiredRangeBandwidth - listOfPolarizations - nominalAcquisitionPRF - numberOfSubSwaths - processedAzimuthBandwidth - processedCenterFrequency - processedRangeBandwidth - sceneCenterAlongTrackSpacing - sceneCenterGroundRangeSpacing - slantRange - slantRangeSpacing - validSamplesSubSwath1 - zeroDopplerTime - zeroDopplerTimeSpacing ▶ identification	▼ NISAR_S1_PR_RSLC_001_071_A_001_2800_SHNA_A_20070 ▼ science ▼ SSAR ▼ RSLC ▼ QA ▼ data - azimuthSpectralFrequencies ▼ frequencyA ▼ HH - Phase_MaxValue - Phase_MeanValue - Phase_MinValue - Phase_StandardDeviation - Sigma0_MaxValue - Sigma0_MeanValue - Sigma0_MinValue - Sigma0_StandardDeviation - azimuthPowerSpectralDensityFarRange - azimuthPowerSpectralDensityMidRange - azimuthPowerSpectralDensityNearRange - phaseHistogramDensity - rangePowerSpectralDensity - sigma0HistogramDensity - rangeSpectralFrequencies ▶ identification

Figure 2: Inut RSLC Product vs RSLC QA Product HDF hierarchy

The Table 4 below summarizes the statistical details (subsection 4) of pdf file for RSLC QA product.

Table 4: Statistical details of pdf file for RSLC QA Product	
Plots	Statistics
• Sigma0 Image (1 per frequency (L or S)/polarization) • Sigma0 Histogram (1 per frequency) • Phase Histogram (1 per frequency) • Sigma0 Range Profile (1 per frequency) • Sigma0 Azimuth Profile (1 per frequency) • Power Spectrum Azimuth Profile Near Range (1 per frequency) • Power Spectrum Azimuth Profile Mid Range (1 per frequency) • Power Spectrum Azimuth Profile Far Range (1 per frequency) • Power Spectrum Range Profile (1 per frequency)	• Sigma0 (Min/Max/Mean/Std) • Phase (Min/Max/Mean/Std)

The Fig. 3 to Fig. 7 shows partial snapshots of the contents of a pdf file for RSLC QA product.

 Product Type: RSLC NISAR QA Analysis Report 	
META-DATA INFORMATION	
PARAMETER	VALUE
AbsoluteOrbitNumber	123
CompositeReleaseId	D00301
DiagnosticModeFlag	0
FrameNumber	1
GranuleId	NISAR_S1_PR_RSLC_001_071_A_001_2800_SHNA_A_2 0070203T175310_20070203T175324_D00301_N_F_I_005
InstrumentName	SSAR
IsDithered	FALSE
IsFullFrame	TRUE
IsGeocoded	FALSE
IsJointObservation	FALSE
IsMixedMode	FALSE
IsUrgentObservation	FALSE
ListOfFrequencies	['A']
LookDirection	RIGHT
MissionId	NISAR
OrbitPassDirection	ASCENDING

Figure 3: Metadata Information of the RSLC Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	-	-
QA6	FIELD EMPTY	PASS	-

Figure 4: Checklist information of the RSLC Product



Figure 5: Image content of the RSLC Product

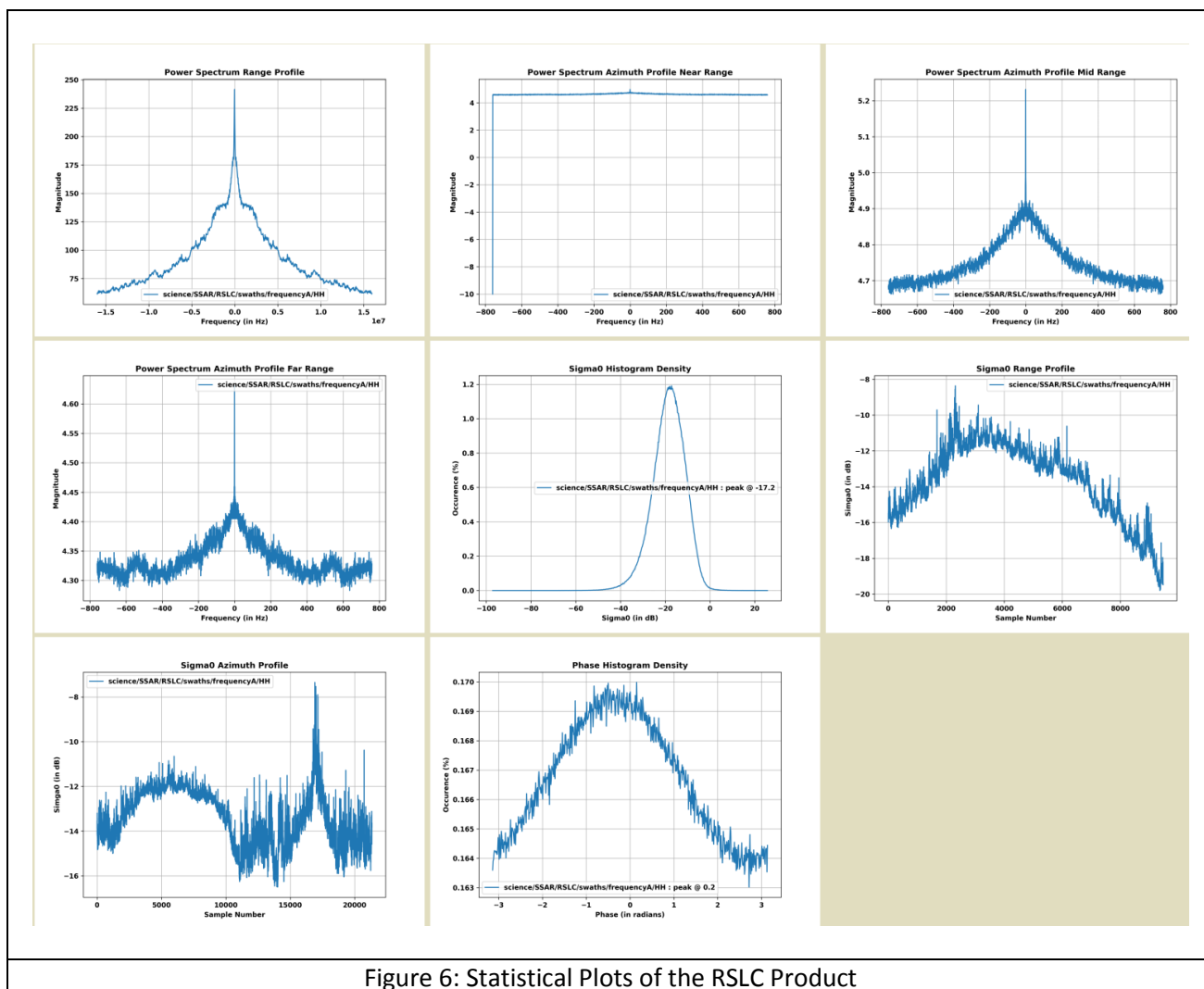
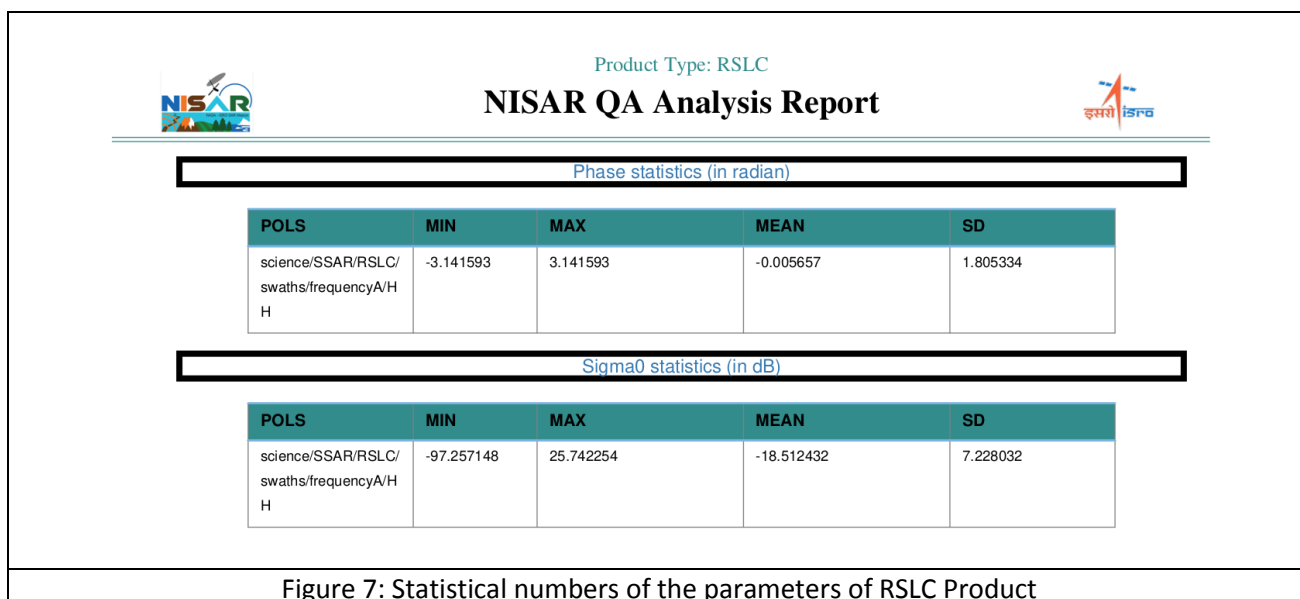


Figure 6: Statistical Plots of the RSLC Product



3.2 Geocoded Single Look Complex (GSLC) QA Product

The Table 5 details dataset's name, datatype, shape etc. of the QA statistics HDF file for GSLC QA product. The visualization of the HDF file structure is shown in Fig. 8.

Table 5: Datasets of a GSLC QA HDF5 File		
GSLC QA parameters		
/science/SSAR/GSLC/QA/data/frequencyA/HH/Phase_MaxValue		
Type: Float32	Shape: scalar	
Description: Phase Maximum Value		
	units	radians
/science/SSAR/GSLC/QA/data/frequencyA/HH/Phase_MeanValue		
Type: Float32	Shape: scalar	
Description: Phase Mean Value		
	units	radians
/science/SSAR/GSLC/QA/data/frequencyA/HH/Phase_MinValue		
Type: Float32	Shape: scalar	
Description: Phase Minimum Value		
	units	radians
/science/SSAR/GSLC/QA/data/frequencyA/HH/Phase_StandardDeviation		
Type: Float32	Shape: scalar	
Description: Phase Standard Deviation		
	units	radians
/science/SSAR/GSLC/QA/data/frequencyA/HH/Sigma0_MaxValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Maximum Value		
	units	dB
/science/SSAR/GSLC/QA/data/frequencyA/HH/Sigma0_MeanValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Mean Value		
	units	dB
/science/SSAR/GSLC/QA/data/frequencyA/HH/Sigma0_MinValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Minimum Value		
	units	dB
/science/SSAR/GSLC/QA/data/frequencyA/HH/Sigma0_StandardDeviation		
Type: Float32	Shape: scalar	
Description: Sigma0 Standard Deviation		
	units	dB
/science/SSAR/GSLC/QA/data/frequencyA/HH/phaseHistogramDensity		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the Phase		
	units	Unitless
/science/SSAR/GSLC/QA/data/frequencyA/HH/sigma0HistogramDensity		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the sigma naught image		
	units	Unitless

/science/SSAR/GSLC/identification/*		
Type: Same as GSLC product		Shape: Same as GSLC product
Description: Same as GSLC product		
	units	Same as GSLC product

GSLC PRODUCT	GSLC QA H5 PRODUCT
▼ NISAR_S2_PR_GSLC_001_071_A_001_2800_SH ▼ science ▼ SSAR ▼ GSLC ▼ grids ▼ frequencyA - HH - azimuthBandwidth - centerFrequency - listOfPolarizations - mask - numberOfSubSwaths - projection - rangeBandwidth - rtcGammaToSigmaFactor - slantRangeSpacing - xCoordinateSpacing - xCoordinates - yCoordinateSpacing - yCoordinates - zeroDopplerTimeSpacing ▶ metadata ▶ identification	▼ NISAR_S2_PR_GSLC_001_071_A_001_2800_SH ▼ science ▼ SSAR ▼ GSLC ▼ QA ▼ data ▼ frequencyA ▼ HH - Phase_MaxValue - Phase_MeanValue - Phase_MinValue - Phase_StandardDeviation - Sigma0_MaxValue - Sigma0_MeanValue - Sigma0_MinValue - Sigma0_StandardDeviation - phaseHistogramDensity - sigma0HistogramDensity ▶ identification

Figure 8: GSLC Product vs GSLC QA Product HDF hierarchy

The Table 6 below summarizes the statistical details (subsection 4) of pdf file for GSLC QA product.

Table 6: Statistical details of pdf file for GSLC QA Product	
Plots	Statistics
• Sigma0 Image (1 per frequency/polarization) • Sigma0 Histogram (1 per frequency) • Sigma0 Range Profile (1 per frequency) • Sigma0 Azimuth Profile (1 per frequency) • Phase Histogram (1 per frequency)	• Sigma0 (Min/Max/Mean/Std) • Phase (Min/Max/Mean/Std)

The Fig. 9 to Fig. 13 shows partial snapshots of the contents of a pdf file for GSLC QA product.

	Product Type: GSLC	
NISAR QA Analysis Report		
META-DATA INFORMATION		
PARAMETER	VALUE	
AbsoluteOrbitNumber	123	
CompositeReleaseId	D00301	
DiagnosticModeFlag	0	
FrameNumber	1	
GranuleId	NISAR_S2_PR_GSLC_001_071_A_001_2800_SHNA_A_2_0070203T175310_20070203T175324_D00301_N_F_I_005	
InstrumentName	SSAR	
IsDithered	FALSE	
IsFullFrame	TRUE	
IsGeocoded	TRUE	
IsJointObservation	FALSE	
IsMixedMode	FALSE	
IsUrgentObservation	FALSE	
ListOfFrequencies	[A]	
LookDirection	RIGHT	
MissionId	NISAR	
OrbitPassDirection	ASCENDING	

Figure 9: Metadata Information of the GSLC Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	-	-
QA6	FIELD EMPTY	PASS	-

Figure 10: Checklist information of the GSLC Product

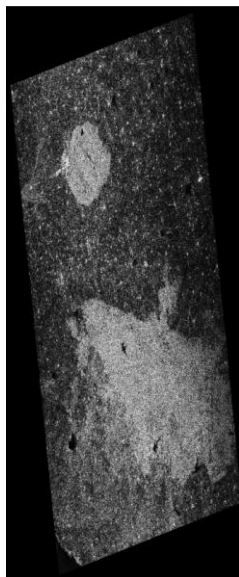


Figure 11: Image content of the GSLC Product

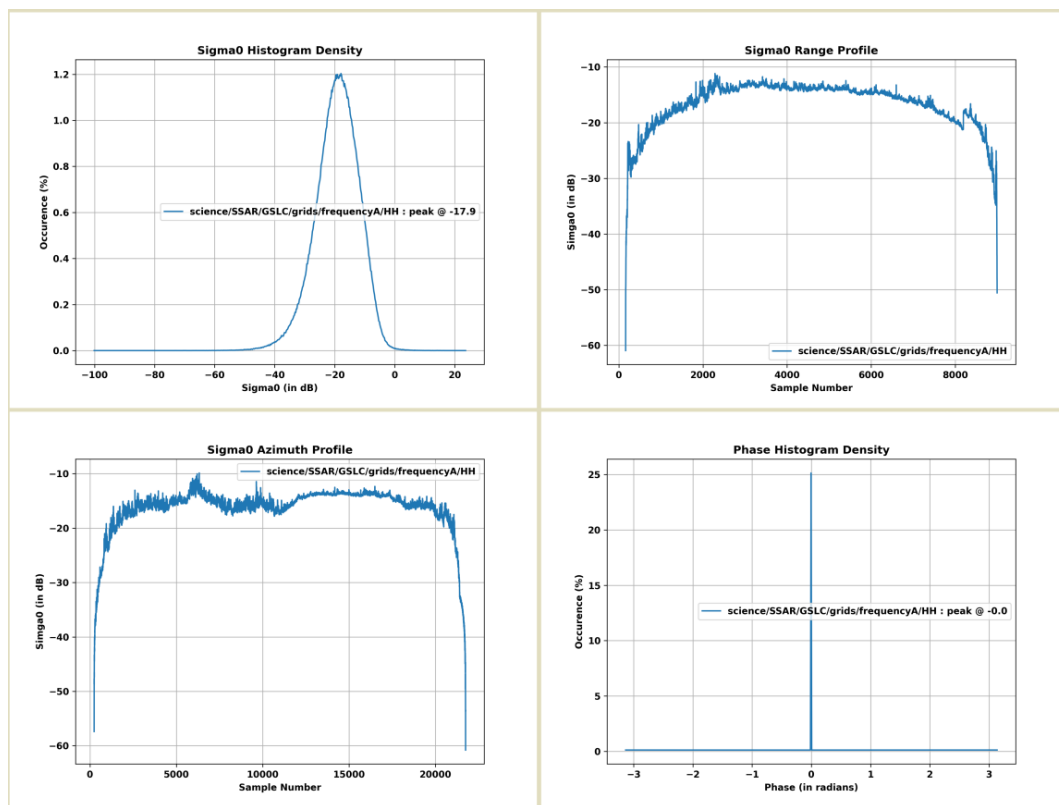
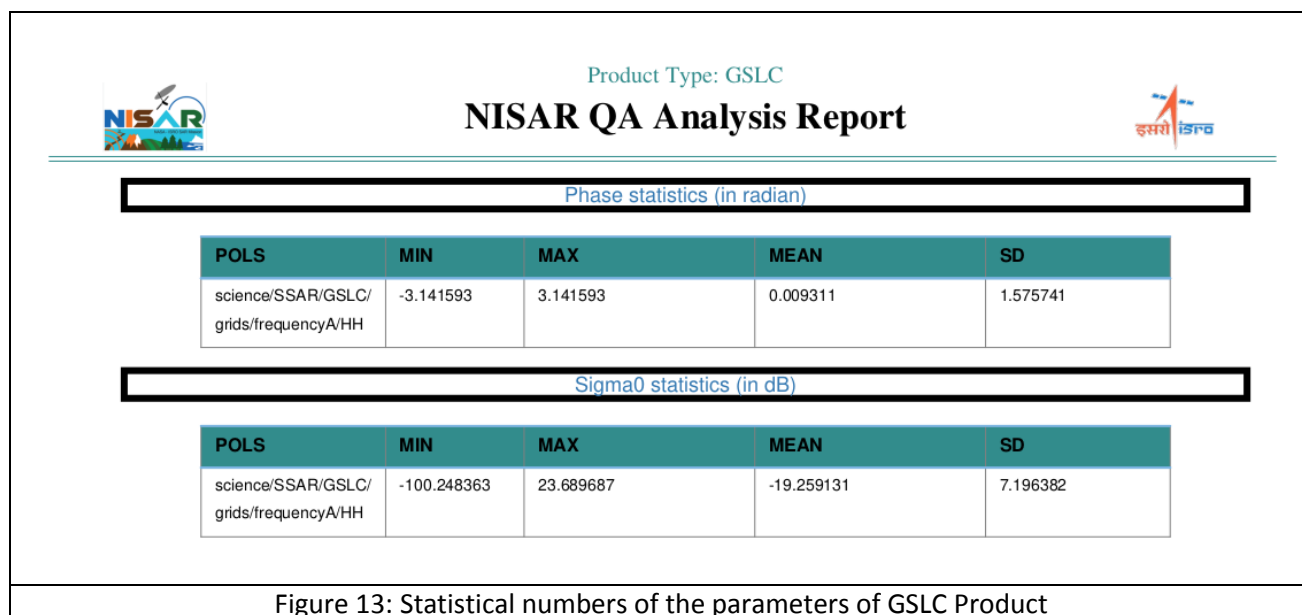


Figure 12: Statistical Plots of the GSLC Product



3.3 Geocoded Polarimetric Covariance (GCOV) QA Product

The Table 7 details dataset's name, datatype, shape etc. of the QA statistics HDF file for GCOV QA product. The visualization of the HDF file structure is shown in Fig.14.

Table 7: Datasets of a GCOV QA HDF5 File		
GCOV QA parameters		
/science/SSAR/GCOV/QA/data/frequencyA/HHHH/Sigma0_MaxValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Maximum Value		
	units	dB
/science/SSAR/GCOV/QA/data/frequencyA/HHHH/Sigma0_MeanValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Mean Value		
	units	dB
/science/SSAR/GCOV/QA/data/frequencyA/HHHH/Sigma0_MinValue		
Type: Float32	Shape: scalar	
Description: Sigma0 Minimum Value		
	units	dB
/science/SSAR/GCOV/QA/data/frequencyA/HHHH/Sigma0_StandardDeviation		
Type: Float32	Shape: scalar	
Description: Sigma0 Standard Deviation		
	units	dB
/science/SSAR/GCOV/QA/data/frequencyA/HHHH/sigma0HistogramDensity		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the sigma naught image		

	units	Unitless
/science/SSAR/GCOV/identification/*		
Type: Same as GCOV product		Shape: Same as GCOV product
Description: Same as GCOV product		
	units	Same asGCOV product

GCOV PRODUCT	GCOV QA H5 PRODUCT
▼ NISAR_S2_PR_GCOV_001_071_A_016_3700_DH ▼ science ▼ SSAR ▼ GCOV ▼ grids ▼ frequencyA - HHHH - HHHV - HVHV - listOfCovarianceTerms - listOfPolarizations - mask - numberOfLooks - numberOfSubSwaths - projection - rtcGammaToSigmaFactor - xCoordinateSpacing - xCoordinates - yCoordinateSpacing - yCoordinates ▶ metadata ▶ identification	▼ NISAR_S2_PR_GCOV_001_071_A_016_3700_DH ▼ science ▼ SSAR ▼ GCOV ▼ QA ▼ data ▼ frequencyA ▼ HHHH - Sigma0_MaxValue - Sigma0_MeanValue - Sigma0_MinValue - Sigma0_StandardDeviation - sigma0HistogramDensity ▼ HHHV - Phase_MaxValue - Phase_MeanValue - Phase_MinValue - Phase_StandardDeviation - Sigma0_MaxValue - Sigma0_MeanValue - Sigma0_MinValue - Sigma0_StandardDeviation - phaseHistogramDensity - sigma0HistogramDensity ▶ HVHV ▶ identification

Figure 14: GCOV Product vs GCOV QA Product HDF hierarchy

The Table 8 below summarizes the statistical details (subsection 4) of pdf file for GCOV QA product.

Table 8: Statistical details of pdf file for GCOV QA Product	
Plots	Statistics
• Sigma0 Image (1 per frequency/polarization) • Phase Histogram for off-diagonal terms • Sigma0 Histogram (1 per frequency) • Sigma0 Range Profile (1 per frequency) • Sigma0 Azimuth Profile (1 per frequency)	• Sigma0 (Min/Max/Mean/Std) • Phase (Min/Max/Mean/Std)

The Fig. 15 to Fig. 19 shows partial snapshots of the contents of a pdf file for GCOV QA product.

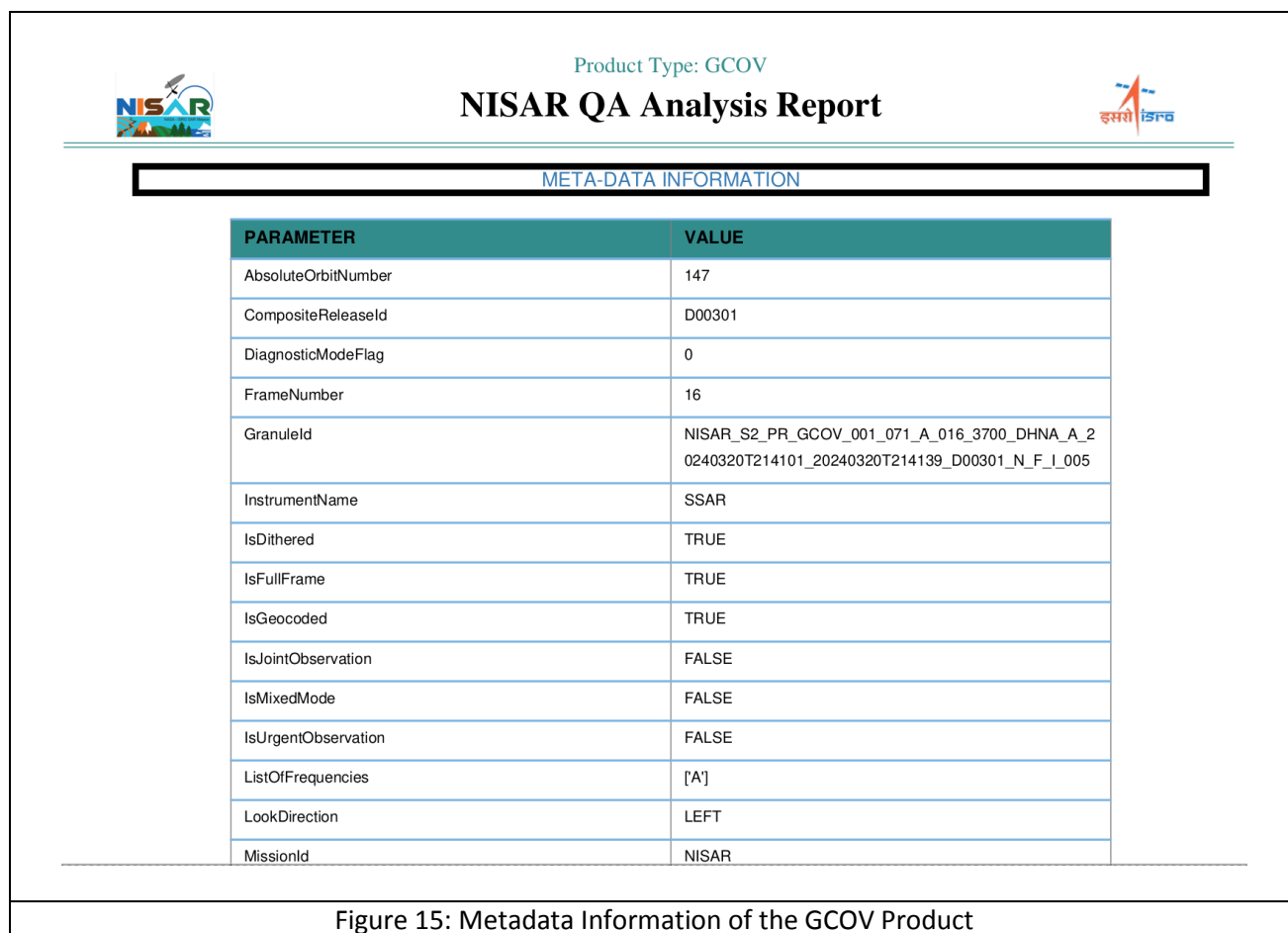


Figure 15: Metadata Information of the GCOV Product

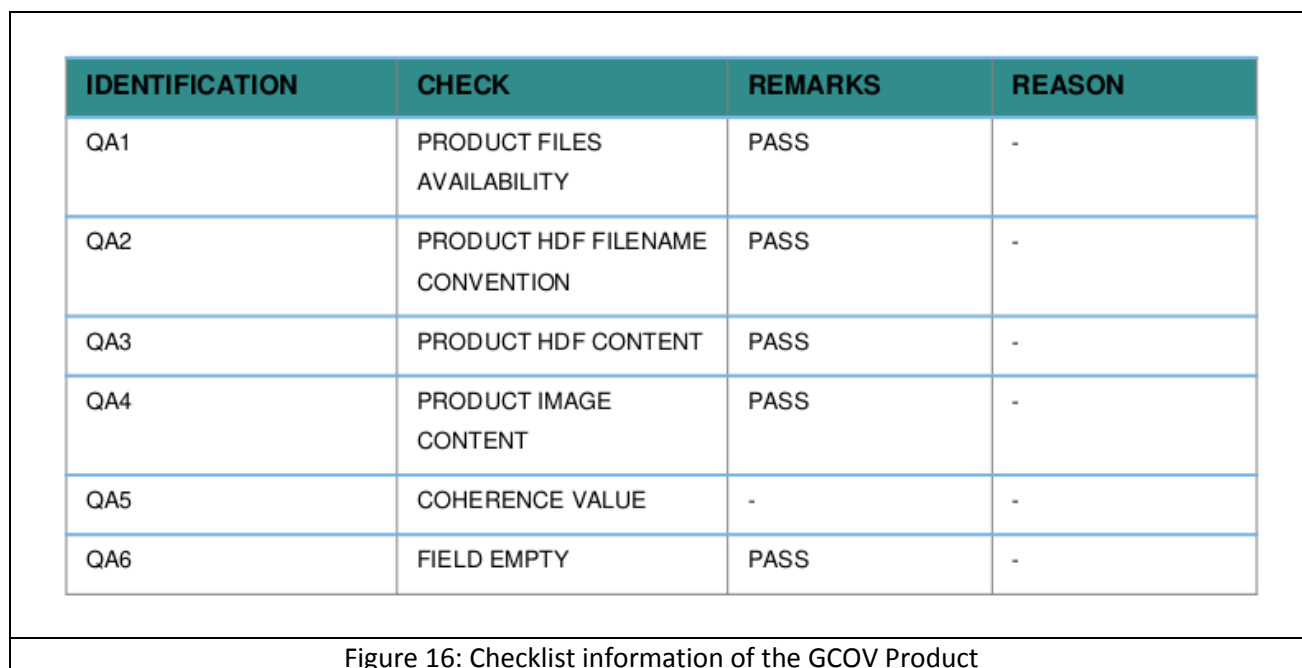


Figure 16: Checklist information of the GCOV Product

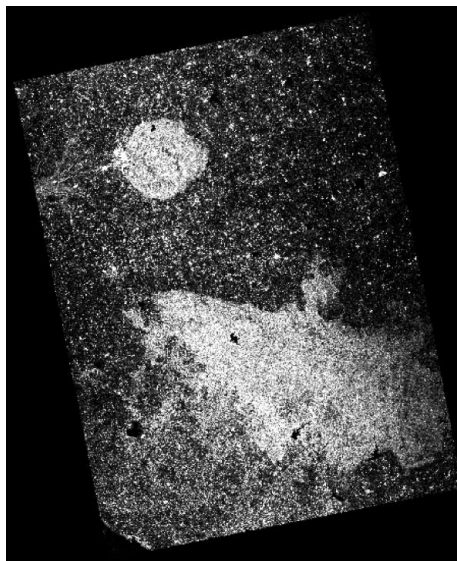


Figure 17: Image content of the GCOV Product

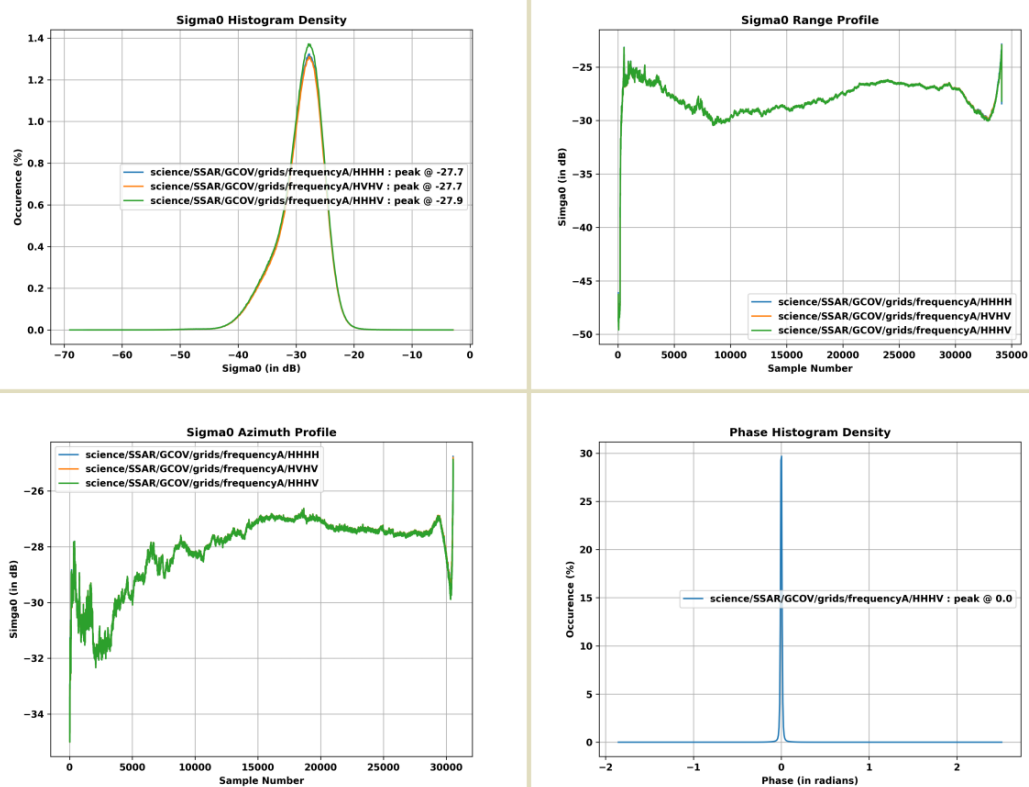
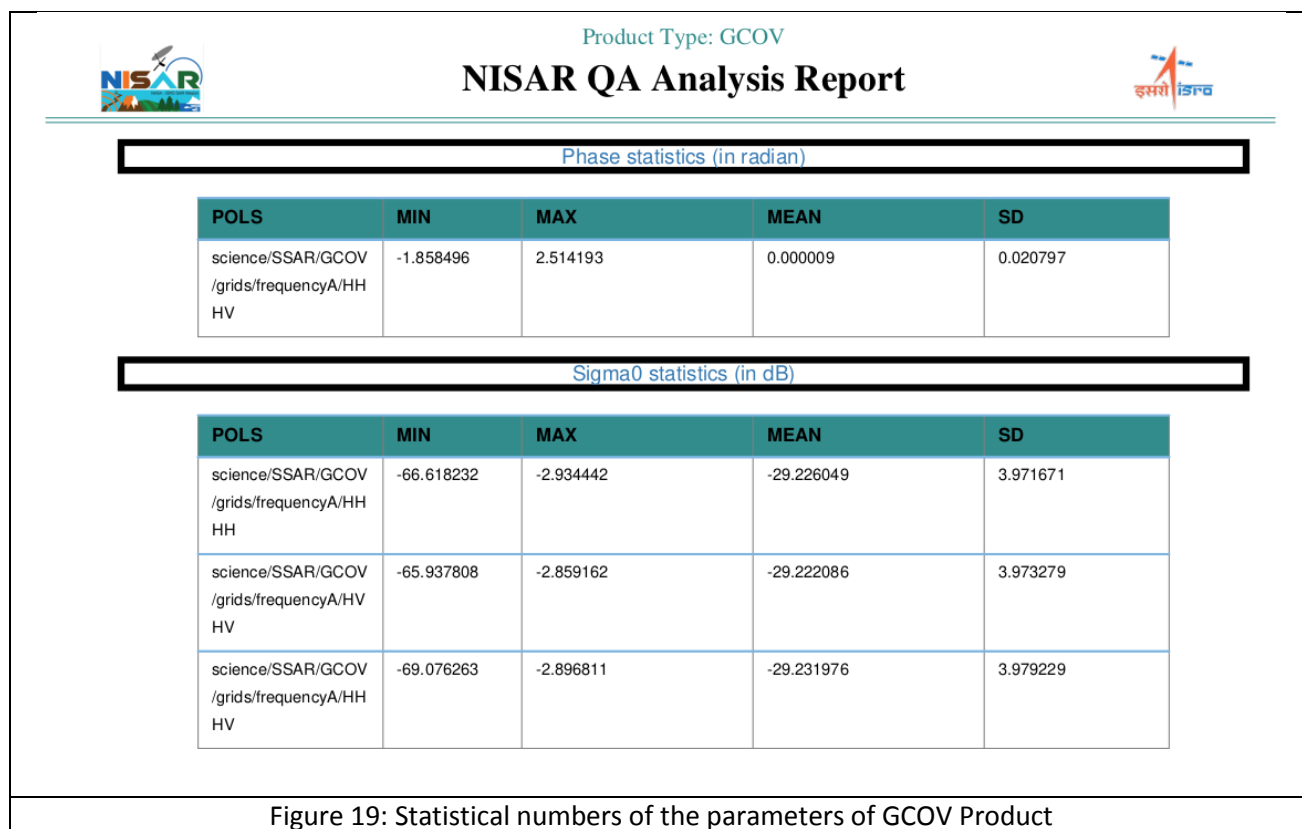


Figure 18: Statistical Plots of the GCOV Product



3.4 Range Doppler Wrapped Interferogram (RIFG) QA Product

The Table 9 details dataset's name, datatype, shape etc. of the QA statistics HDF file for RIFG QA product. The visualization of the HDF file structure is shown in Fig. 20.

Table 9: Datasets of a RIFG QA HDF5 File		
RIFG QA parameters		
/science/SSAR/RIFG/QA/data/frequencyA/HH/alongtrackoffset_MaxValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Maximum Value		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/alongtrackoffset_MeanValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Mean Value		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/alongtrackoffset_MinValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Minimum Value		
	units	meters

/science/SSAR/RIFG/QA/data/frequencyA/HH/alongtrackoffset_StandardDeviation		
Type: Float32		Shape: scalar
Description: alongtrackoffset Standard Deviation		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/alongtrackoffsetHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the alongtrackoffset		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/coherencemagnitude_MaxValue		
Type: Float32		Shape: scalar
Description: coherencemagnitude Maximum Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/coherencemagnitude_MeanValue		
Type: Float32		Shape: scalar
Description: coherencemagnitude Mean Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/coherencemagnitude_MinValue		
Type: Float32		Shape: scalar
Description: coherencemagnitude Minimum Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/coherencemagnitude_StandardDeviation		
Type: Float32		Shape: scalar
Description: coherencemagnitude Standard Deviation		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/coherencemagnitudeHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the coherencemagnitude		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/correlationsurfacepeak_MaxValue		
Type: Float32		Shape: scalar
Description: correlationsurfacepeak Maximum Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/correlationsurfacepeak_MeanValue		
Type: Float32		Shape: scalar
Description: correlationsurfacepeak Mean Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/correlationsurfacepeak_MinValue		
Type: Float32		Shape: scalar
Description: correlationsurfacepeak Minimum Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/correlationsurfacepeak_StandardDeviation		
Type: Float32		Shape: scalar
Description: correlationsurfacepeak Standard Deviation		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/correlationsurfacepeakHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the correlationsurfacepeak		

	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/slanrangeoffset_MaxValue		
Type: Float32		Shape: scalar
Description: slanrangeoffset Maximum Value		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/slanrangeoffset_MeanValue		
Type: Float32		Shape: scalar
Description: slanrangeoffset Mean Value		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/slanrangeoffset_MinValue		
Type: Float32		Shape: scalar
Description: slanrangeoffset Minimum Value		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/slanrangeoffset_StandardDeviation		
Type: Float32		Shape: scalar
Description: slanrangeoffset Standard Deviation		
	units	meters
/science/SSAR/RIFG/QA/data/frequencyA/HH/slanrangeoffsetHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the slanrangeoffset		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/wrappedinterferogram_MaxValue		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Maximum Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/wrappedinterferogram_MeanValue		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Mean Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/wrappedinterferogram_MinValue		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Minimum Value		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/wrappedinterferogram_StandardDeviation		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Standard Deviation		
	units	Unitless
/science/SSAR/RIFG/QA/data/frequencyA/HH/wrappedinterferogramHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the wrappedinterferogram		
	units	Unitless
/science/SSAR/RIFG/identification/*		
Type: Same as RIFG product		Shape: Same as RIFG product
Description: Same as RIFG product		
	units	Same as RIFG product

RIFG PRODUCT	RIFG QA H5 PRODUCT
▼  NISAR_S1_PR_RIFG_001_071_A_001_002_2800_SH_20 ◆ complex64 ▼  science ▼  SSAR ▼  RIFG ▶  metadata ▼  swaths ▼  frequencyA  centerFrequency ▼  interferogram ▼  HH  coherenceMagnitude  digitalElevationModel  wrappedInterferogram  mask  sceneCenterAlongTrackSpacing  sceneCenterGroundRangeSpacing  slantRange  slantRangeSpacing  zeroDopplerTime  zeroDopplerTimeSpacing  listOfPolarizations ▼  pixelOffsets ▶  HH  mask  sceneCenterAlongTrackSpacing  sceneCenterGroundRangeSpacing  slantRange  slantRangeSpacing  zeroDopplerTime  zeroDopplerTimeSpacing ▶  identification	▼  NISAR_S1_PR_RIFG_001_071_A_001_002_2800_SH_20070203' ▼  science ▼  SSAR ▼  RIFG ▼  QA ▼  data ▼  frequencyA ▼  HH  alongTrackOffset_MaxValue  alongTrackOffset_MeanValue  alongTrackOffset_MinValue  alongTrackOffset_StandardDeviation  alongtrackoffsetHistogram  coherenceMagnitude_MaxValue  coherenceMagnitude_MeanValue  coherenceMagnitude_MinValue  coherenceMagnitude_StandardDeviation  coherencemagnitudeHistogram  correlationSurfacePeak_MaxValue  correlationSurfacePeak_MeanValue  correlationSurfacePeak_MinValue  correlationSurfacePeak_StandardDeviation  correlationsurfacepeakHistogram  slantRangeOffset_MaxValue  slantRangeOffset_MeanValue  slantRangeOffset_MinValue  slantRangeOffset_StandardDeviation  slantrangeoffsetHistogram  wrappedInterferogram_MaxValue  wrappedInterferogram_MeanValue  wrappedInterferogram_MinValue  wrappedInterferogram_StandardDeviation  wrappedinterferogramHistogram ▶  identification

Figure 20: RIFG Product vs RIFG QA Product HDF hierarchy

The Table 10 below summarizes the statistical details (subsection 4) of pdf file for RIFG QA product.

Table 10: Statistical details of pdf file for RIFG QA Product			
S.No.	Layer Name	Plots	Statistics
1.	Wrapped Interferogram	- Image - Histogram	Min/Max/Mean/Std
2.	Coherence Magnitude	- Image - Histogram	Min/Max/Mean/Std
3.	Along track Offset	- Image - Histogram	Min/Max/Mean/Std
4.	Slant Range Offset	- Image - Histogram	Min/Max/Mean/Std
5.	Correlation Surface Peak	- Image - Histogram	Min/Max/Mean/Std

The Fig. 21 to Fig. 25 shows partial snapshots of the contents of a pdf file for RIFG QA product.

 	
NISAR QA Data Products	
META-DATA INFORMATION	
PARAMETER	VALUE
AbsoluteOrbitNumber	321
DiagnosticModeFlag	0
FrameNumber	12
GranuleId	NISAR_S1_PR_RIFG_014_013_D_012_014_2800_SH_20070203T175309_20070203T175325_20071222T175218_20071222T175234_T00000_P_P_I_999
InstrumentName	SSAR
IsDithered	FALSE
IsGeocoded	FALSE
IsMixedMode	FALSE
IsUrgentObservation	FALSE
ListOfFrequencies	['A']
LookDirection	RIGHT
MissionId	NISAR
OrbitPassDirection	ASCENDING
PlannedDataTakeId	['2007-02-03T17:53:09.39363980', '2007-12-22T17:52:18.15363764']
PlannedObservationId	['2007-02-03T17:53:09.39363980', '2007-12-22T17:52:18.15363764']
ProcessingCenter	ISRO
ProcessingDateTime	2024-07-01 09:03:42
ProcessingType	NOMINAL
ProductLevel	L1
ProductSpecificationVersion	1.0.0
ProductType	RIFG

Figure 21: Metadata Information of the RIFG Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	PASS	-
QA6	FIELD EMPTY	PASS	-

Figure 22: Checklist information of the RIFG Product

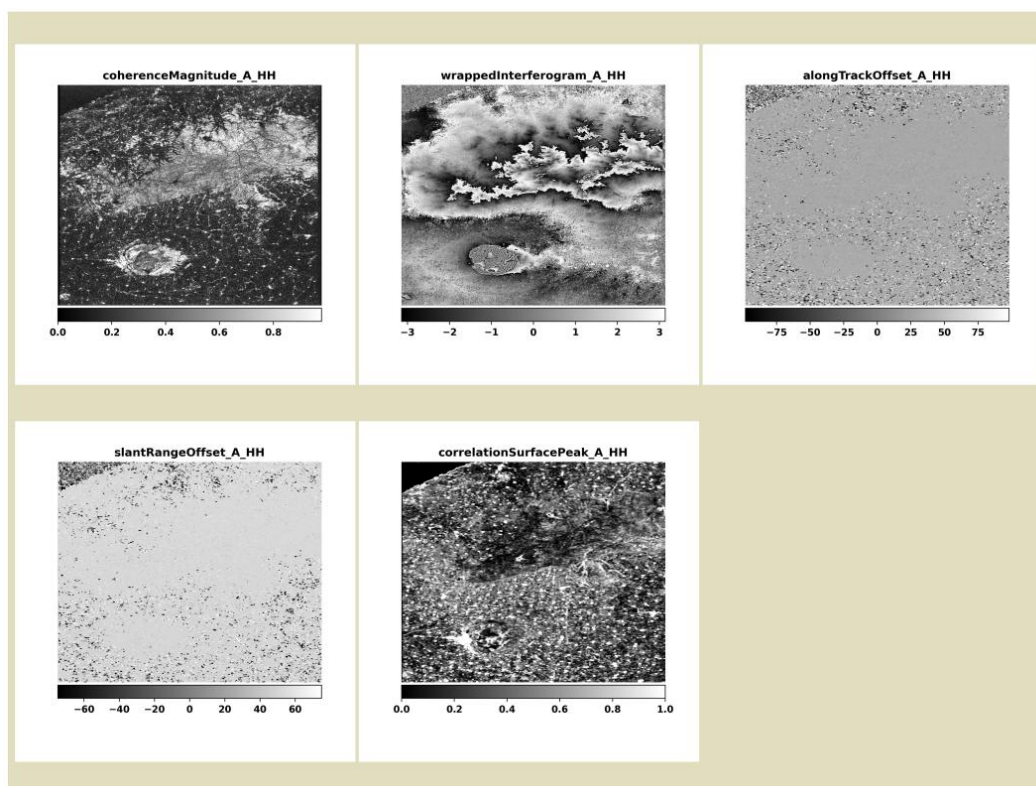


Figure 23: Image content of the RIFG Product

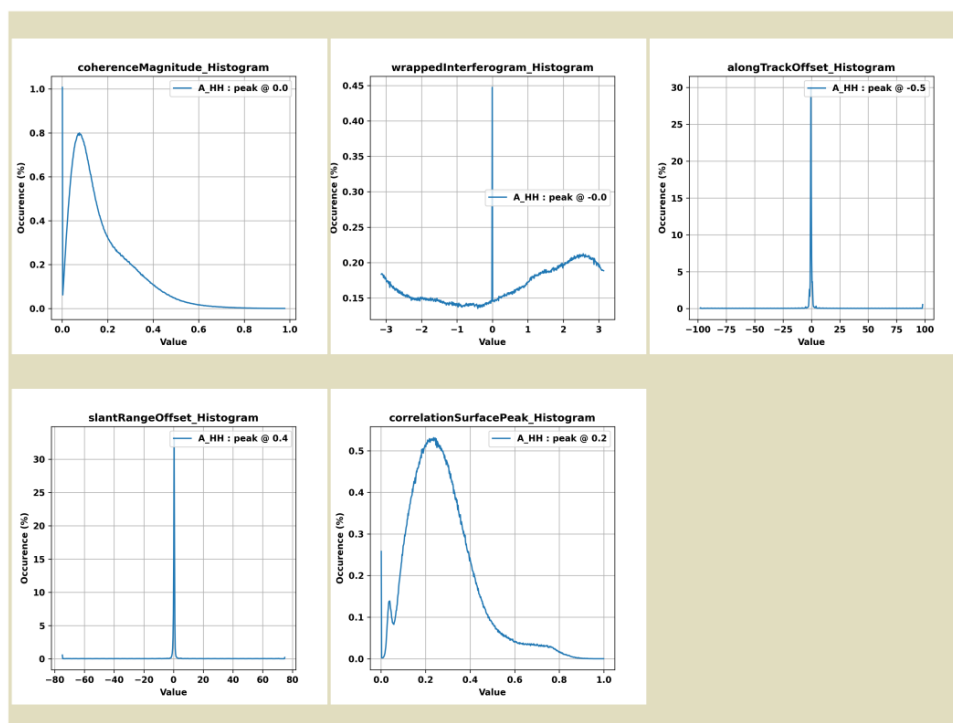


Figure 24: Statistical Plots of the RIFG Product

NISAR QA Data Products				
coherenceMagnitude statistics (unitless)				
POLS	MIN	MAX	MEAN	STD
A_HH	0.0	0.978921	0.172552	0.132945
wrappedInterferogram statistics (unitless)				
POLS	MIN	MAX	MEAN	STD
A_HH	-3.141591	3.141592	0.18723	1.866254
alongTrackOffset statistics (in meters)				
POLS	MIN	MAX	MEAN	STD
A_HH	-98.13876	98.13876	-0.02185	18.490383
slantRangeOffset statistics (in meters)				
POLS	MIN	MAX	MEAN	STD
A_HH	-74.94811	74.94811	0.025288	14.174499
correlationSurfacePeak statistics (unitless)				
POLS	MIN	MAX	MEAN	STD
A_HH	0.0	1.0	0.279934	0.146959

Figure 25: Statistical numbers of the parameters of RIFG Product

3.5 Range Doppler UnWrapped Interferogram (RUNW) QA Product

The Table 11 details dataset's name, datatype, shape etc. of the QA statistics HDF file for RUNW QA product. The visualization of the HDF file structure is shown in Fig. 26.

Table 11: Datasets of a RUNW QA HDF5 File		
RUNW QA parameters		
/science/SSAR/RUNW/QA/data/frequencyA/HH/alongtrackoffset_MaxValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Maximum Value		
	units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/alongtrackoffset_MeanValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Mean Value		
	units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/alongtrackoffset_MinValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Minimum Value		
	units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/alongtrackoffset_StandardDeviation		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Standard Deviation		
	units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/alongtrackoffsetHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the alongtrackoffset		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/coherencemagnitude_MaxValue		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Maximum Value		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/coherencemagnitude_MeanValue		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Mean Value		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/coherencemagnitude_MinValue		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Minimum Value		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/coherencemagnitude_StandardDeviation		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Standard Deviation		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/coherencemagnitudeHistogram		
Type: Float32	Shape: (600,2)	

Description: Histogram Density of the coherencemagnitude		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/connectedComponents_NumNonZeroCCLabel		
Type: Float32	Shape: scalar	
Description: Number of non zero CC labels in connectedComponents		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/connectedComponents_PercentagePixelLargestCC		
Type: Float32	Shape: scalar	
Description: Percentage of Pixels in Largest CC in connectedComponents		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/connectedComponents_PercentagePixelNonZeroCC		
Type: Float32	Shape: (600,2)	
Description: Percentage of Pixels with Non Zero CC in connectedComponents		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/correlationsurfacepeak_MaxValue		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Maximum Value		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/correlationsurfacepeak_MeanValue		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Mean Value		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/correlationsurfacepeak_MinValue		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Minimum Value		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/correlationsurfacepeak_StandardDeviation		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Standard Deviation		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/correlationsurfacepeakHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the correlationsurfacepeak		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreen_MaxValue		
Type: Float32	Shape: scalar	
Description: ionospherephasescreen Maximum Value		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreen_MeanValue		
Type: Float32	Shape: scalar	
Description: ionospherephasescreen Mean Value		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreen_MinValue		
Type: Float32	Shape: scalar	
Description: ionospherephasescreen Minimum Value		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreen_StandardDeviation		

Type: Float32	Shape: scalar
Description: ionospherephasescreen Standard Deviation	
units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreenHistogram	
Type: Float32	Shape: (600,2)
Description: Histogram Density of the ionospherephasescreen	
units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_MaxValue	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Maximum Value	
units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_MeanValue	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Mean Value	
units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_MinValue	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Minimum Value	
units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_StandardDeviation	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Standard Deviation	
units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertaintyHistogram	
Type: Float32	Shape: (600,2)
Description: Histogram Density of the ionospherephasescreenuncertainty	
units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/slanrangeoffset_MaxValue	
Type: Float32	Shape: scalar
Description: slanrangeoffset Maximum Value	
units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/slanrangeoffset_MeanValue	
Type: Float32	Shape: scalar
Description: slanrangeoffset Mean Value	
units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/slanrangeoffset_MinValue	
Type: Float32	Shape: scalar
Description: slanrangeoffset Minimum Value	
units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/slanrangeoffset_StandardDeviation	
Type: Float32	Shape: scalar
Description: slanrangeoffset Standard Deviation	
units	meters
/science/SSAR/RUNW/QA/data/frequencyA/HH/slanrangeoffsetHistogram	
Type: Float32	Shape: (600,2)
Description: Histogram Density of the slanrangeoffset	
units	Unitless

/science/SSAR/RUNW/QA/data/frequencyA/HH/unwrappedphase_MaxValue		
Type: Float32		Shape: scalar
Description: unwrappedphase Maximum Value		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/unwrappedphase_MeanValue		
Type: Float32		Shape: scalar
Description: unwrappedphase Mean Value		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/unwrappedphase_MinValue		
Type: Float32		Shape: scalar
Description: unwrappedphase Minimum Value		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/unwrappedphase_StandardDeviation		
Type: Float32		Shape: scalar
Description: unwrappedphase Standard Deviation		
	units	radians
/science/SSAR/RUNW/QA/data/frequencyA/HH/unwrappedphaseHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the unwrappedphase		
	units	Unitless
/science/SSAR/RUNW/identification/*		
Type: Same as RUNW product		Shape: Same as RUNW product
Description: Same as RUNW product		
	units	Same as RUNW product

RUNW PRODUCT	RUNW QA PRODUCT
▼ NISAR_S1_PR_RUNW_001_071_A_001_002_2800_SH ❖ complex64 ▼ science ▼ SSAR ▼ RUNW ▶ metadata ▼ swaths ▼ frequencyA - centerFrequency ▼ interferogram ▼ HH - coherenceMagnitude - connectedComponents - digitalElevationModel - ionospherePhaseScreen - ionospherePhaseScreenUncertainty - losDeformation - unwrappedPhase - mask - sceneCenterAlongTrackSpacing - sceneCenterGroundRangeSpacing - slantRange - slantRangeSpacing - zeroDopplerTime - zeroDopplerTimeSpacing - listOfPolarizations ▼ pixelOffsets ▶ HH - mask - sceneCenterAlongTrackSpacing - sceneCenterGroundRangeSpacing - slantRange - slantRangeSpacing - zeroDopplerTime - zeroDopplerTimeSpacing ▶ identification	▼ NISAR_S1_PR_RUNW_001_071_A_001_002_2800_SH_20070203T175310 ▼ science ▼ SSAR ▼ RUNW ▼ QA ▼ data ▼ frequencyA ▼ HH - alongTrackOffset_MaxValue - alongTrackOffset_MeanValue - alongTrackOffset_MinValue - alongTrackOffset_StandardDeviation - alongtrackoffsetHistogram - coherenceMagnitude_MaxValue - coherenceMagnitude_MeanValue - coherenceMagnitude_MinValue - coherenceMagnitude_StandardDeviation - coherencemagnitudeHistogram - connectedComponents_NumNonZeroCCLabel - connectedComponents_PercentagePixelLargestCC - connectedComponents_PercentagePixelNonZeroCC - correlationSurfacePeak_MaxValue - correlationSurfacePeak_MeanValue - correlationSurfacePeak_MinValue - correlationSurfacePeak_StandardDeviation - correlationsurfacepeakHistogram - ionospherePhaseScreenUncertainty_MaxValue - ionospherePhaseScreenUncertainty_MeanValue - ionospherePhaseScreenUncertainty_MinValue - ionospherePhaseScreenUncertainty_StandardDeviation - ionospherePhaseScreen_MaxValue - ionospherePhaseScreen_MeanValue - ionospherePhaseScreen_MinValue - ionospherePhaseScreen_StandardDeviation - ionospherephasescreenHistogram - ionospherephasescreenuncertaintyHistogram

Figure 26: RUNW Product vs RUNW QA Product HDF hierarchy

The Table 12 below summarizes the statistical details (subsection 4) of pdf file for RUNW QA product.

Table 12: Statistical details of pdf file for RUNW QA Product			
S.No.	Layer Name	Plots	Statistics
1.	Unwrapped Phase	- Image - Histogram	Min/Max/Mean/Std
2.	Coherence Magnitude	- Image - Histogram	Min/Max/Mean/Std
3.	Along track Offset	- Image - Histogram	Min/Max/Mean/Std
4.	Slant Range Offset	- Image - Histogram	Min/Max/Mean/Std
5.	Connected Components (CC)	- Image - Histogram	- Number of non-zero CC labels % of pixels with non-zero CC % of pixels in largest CC
6.	Ionospheric Phase Screen	- Image - Histogram	Min/Max/Mean/Std
7.	Ionospheric Phase Screen Uncertainty	- Image - Histogram	Min/Max/Mean/Std
8.	Correlation Surface Peak	- Image - Histogram	Min/Max/Mean/Std

The Fig. 27 to Fig. 31 shows partial snapshots of the contents of a pdf file for RUNW QA product.

 	
NISAR QA Data Products	
META-DATA INFORMATION	
PARAMETER	VALUE
AbsoluteOrbitNumber	321
DiagnosticModeFlag	0
FrameNumber	12
GranuleId	NISAR_S1_PR_RUNW_014_013_D_012_014_2800_SH_2 0070203T175309_20070203T175325_20071222T175218_2 0071222T175234_T00000_P_P_I_999
InstrumentName	SSAR
IsDithered	FALSE
IsGeocoded	FALSE
IsMixedMode	FALSE
IsUrgentObservation	FALSE
ListOffrequencies	[A]
LookDirection	RIGHT
MissionId	NISAR
OrbitPassDirection	ASCENDING
PlannedDataakeId	["2007-02-03T17:53:09.39363980", "2007-12-22T17:52:18.15363764"]
PlannedObservationId	["2007-02-03T17:53:09.39363980", "2007-12-22T17:52:18.15363764"]
ProcessingCenter	ISRO
ProcessingDateTime	2024-07-01 09:03:43
ProcessingType	NOMINAL
ProductLevel	L1
ProductSpecificationVersion	1.0.0
ProductType	RUNW

Figure 27: Metadata Information of the RUNW Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	PASS	-
QA6	FIELD EMPTY	PASS	-

Figure 28: Checklist information of the RUNW Product

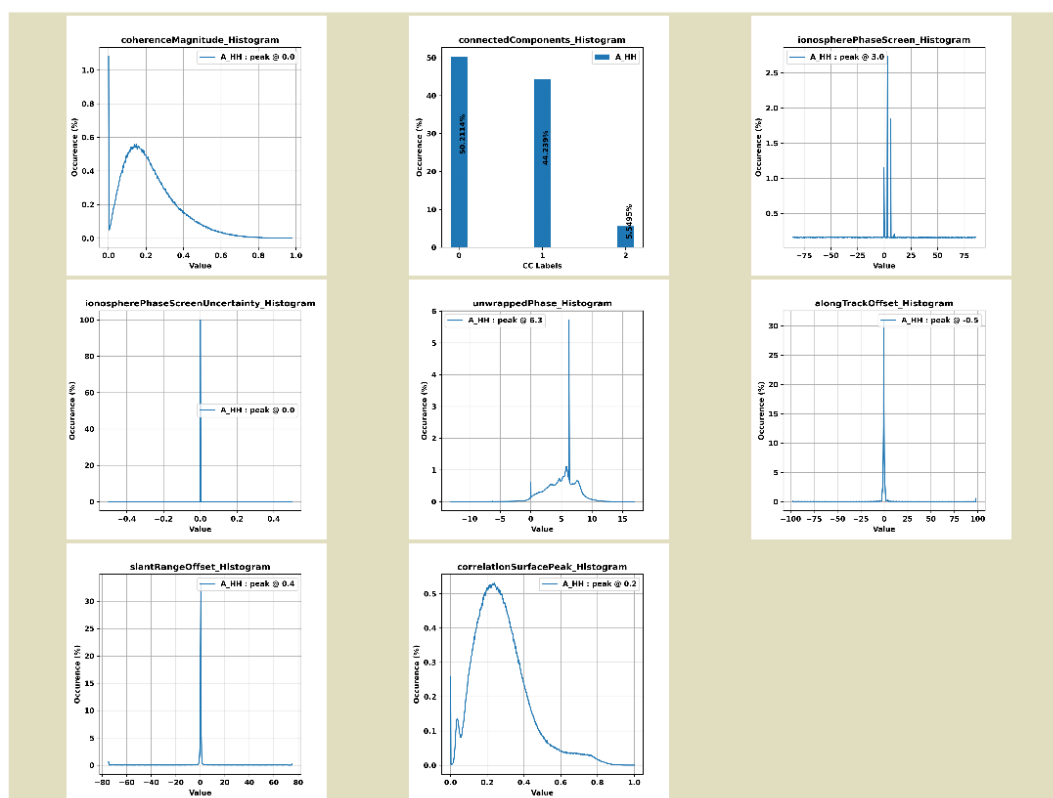


Figure 29: Statistical Plots of the RUNW Product

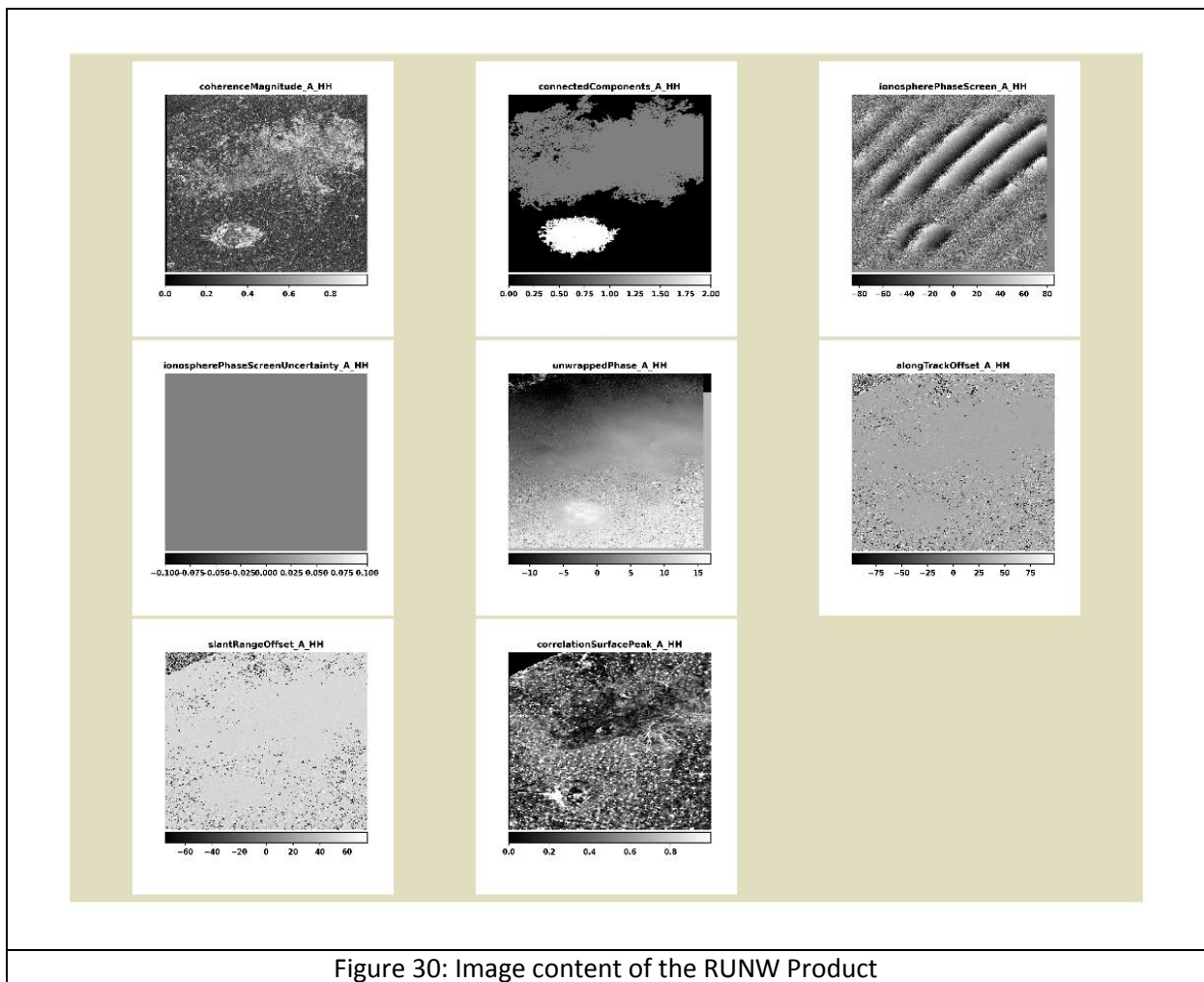


Figure 30: Image content of the RUNW Product



coherenceMagnitude statistics (unitless)

POLS	MIN	MAX	MEAN	STD
A_HH	0.0	0.995154	0.404419	0.164691

connectedComponents statistics (unitless)

POLS	NONZERO CC LABELS	NONZERO PIXEL(%)	LARGEST CC
A_HH	1	92.246323	92.246323

ionospherePhaseScreen statistics (in radian)

POLS	MIN	MAX	MEAN	STD
A_HH	-85.942696	85.94267	0.140918	48.772728

ionospherePhaseScreenUncertainty statistics (in radian)

POLS	MIN	MAX	MEAN	STD
A_HH	0.0	0.0	0.0	0.0

unwrappedPhase statistics (unitless)

POLS	MIN	MAX	MEAN	STD
A_HH	-14.603212	4.326129	-5.989574	0.682582

alongTrackOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD
A_HH	-114.26128	114.26128	0.001082	8.026371

slantRangeOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD
A_HH	-149.89622	149.89622	0.000863	10.109956

correlationSurfacePeak statistics (unitless)

POLS	MIN	MAX	MEAN	STD
A_HH	0.0	1.0	0.442702	0.216945

Figure 31: Statistical numbers of the parameters of RUNW Product

3.6 Geocoded Unwrapped Interferogram Product (GUNW) QA Product

The Table 13 details dataset's name, datatype, shape etc. of the QA statistics HDF file for GUNW QA product. The visualization of the HDF file structure is shown in Fig. 32.

Table 13: Datasets of a GUNW QA HDF5 File		
GUNW QA parameters		
/science/SSAR/GUNW/QA/data/frequencyA/HH/alongtrackoffset_MaxValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Maximum Value		
	units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/alongtrackoffset_MeanValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Mean Value		
	units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/alongtrackoffset_MinValue		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Minimum Value		
	units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/alongtrackoffset_StandardDeviation		
Type: Float32	Shape: scalar	
Description: alongtrackoffset Standard Deviation		
	units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/alongtrackoffsetHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the alongtrackoffset		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/coherencemagnitude_MaxValue		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Maximum Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/coherencemagnitude_MeanValue		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Mean Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/coherencemagnitude_MinValue		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Minimum Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/coherencemagnitude_StandardDeviation		
Type: Float32	Shape: scalar	
Description: coherencemagnitude Standard Deviation		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/coherencemagnitudeHistogram		
Type: Float32	Shape: (600,2)	

Description: Histogram Density of the coherencemagnitude		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/connectedComponents_NumNonZeroCCLabel		
Type: Float32	Shape: scalar	
Description: Number of non zero CC labels in connectedComponents		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/connectedComponents_PercentagePixelLargestCC		
Type: Float32	Shape: scalar	
Description: Percentage of Pixels in Largest CC in connectedComponents		
	units	Unitless
/science/SSAR/RUNW/QA/data/frequencyA/HH/connectedComponents_PercentagePixelNonZeroCC		
Type: Float32	Shape: (600,2)	
Description: Percentage of Pixels with Non Zero CC in connectedComponents		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/correlationsurfacepeak_MaxValue		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Maximum Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/correlationsurfacepeak_MeanValue		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Mean Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/correlationsurfacepeak_MinValue		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Minimum Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/correlationsurfacepeak_StandardDeviation		
Type: Float32	Shape: scalar	
Description: correlationsurfacepeak Standard Deviation		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/correlationsurfacepeakHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the correlationsurfacepeak		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreen_MaxValue		
Type: Float32	Shape: scalar	
Description: ionospherephasescreen Maximum Value		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreen_MeanValue		
Type: Float32	Shape: scalar	
Description: ionospherephasescreen Mean Value		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreen_MinValue		
Type: Float32	Shape: scalar	
Description: ionospherephasescreen Minimum Value		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreen_StandardDeviation		

Type: Float32	Shape: scalar
Description: ionospherephasescreen Standard Deviation	
units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreenHistogram	
Type: Float32	Shape: (600,2)
Description: Histogram Density of the ionospherephasescreen	
units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_MaxValue	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Maximum Value	
units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_MeanValue	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Mean Value	
units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_MinValue	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Minimum Value	
units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertainty_StandardDeviation	
Type: Float32	Shape: scalar
Description: ionospherephasescreenuncertainty Standard Deviation	
units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/ionospherephasescreenuncertaintyHistogram	
Type: Float32	Shape: (600,2)
Description: Histogram Density of the ionospherephasescreenuncertainty	
units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/slanrangeoffset_MaxValue	
Type: Float32	Shape: scalar
Description: slanrangeoffset Maximum Value	
units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/slanrangeoffset_MeanValue	
Type: Float32	Shape: scalar
Description: slanrangeoffset Mean Value	
units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/slanrangeoffset_MinValue	
Type: Float32	Shape: scalar
Description: slanrangeoffset Minimum Value	
units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/slanrangeoffset_StandardDeviation	
Type: Float32	Shape: scalar
Description: slanrangeoffset Standard Deviation	
units	meters
/science/SSAR/GUNW/QA/data/frequencyA/HH/slanrangeoffsetHistogram	
Type: Float32	Shape: (600,2)
Description: Histogram Density of the slanrangeoffset	
units	Unitless

/science/SSAR/GUNW/QA/data/frequencyA/HH/unwrappedphase_MaxValue		
Type: Float32		Shape: scalar
Description: unwrappedphase Maximum Value		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/unwrappedphase_MeanValue		
Type: Float32		Shape: scalar
Description: unwrappedphase Mean Value		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/unwrappedphase_MinValue		
Type: Float32		Shape: scalar
Description: unwrappedphase Minimum Value		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/unwrappedphase_StandardDeviation		
Type: Float32		Shape: scalar
Description: unwrappedphase Standard Deviation		
	units	radians
/science/SSAR/GUNW/QA/data/frequencyA/HH/unwrappedphaseHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the unwrappedphase		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/wrappedinterferogram_MaxValue		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Maximum Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/wrappedinterferogram_MeanValue		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Mean Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/wrappedinterferogram_MinValue		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Minimum Value		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/wrappedinterferogram_StandardDeviation		
Type: Float32		Shape: scalar
Description: wrappedinterferogram Standard Deviation		
	units	Unitless
/science/SSAR/GUNW/QA/data/frequencyA/HH/wrappedinterferogramHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the wrappedinterferogram		
	units	Unitless
/science/SSAR/GUNW/identification/*		
Type: Same as GUNW product		Shape: Same as GUNW product
Description: Same as GUNW product		
	units	Same as GUNW product

GUNW PRODUCT	GUNW QA H5 PRODUCT
▼ NISAR_S2_PR_GUNW_001_071_A_001_002 ◆ complex64 ▼ science ▼ SSAR ▼ GUNW ▼ grids ▼ frequencyA - centerFrequency - listOfPolarizations ▼ pixelOffsets ▼ HH - alongTrackOffset - correlationSurfacePeak - projection - slantRangeOffset - xCoordinateSpacing - xCoordinates - yCoordinateSpacing - yCoordinates - mask - projection - xCoordinateSpacing - xCoordinates - yCoordinateSpacing - yCoordinates ▼ unwrappedInterferogram ▶ HH - mask - projection - xCoordinateSpacing - xCoordinates - yCoordinateSpacing - yCoordinates ▶ wrappedInterferogram ▶ metadata ▶ identification	▼ NISAR_S2_PR_GUNW_001_071_A_001_002_2800_SH_20070203T175310 ▼ science ▼ SSAR ▼ GUNW ▼ QA ▼ data ▼ frequencyA ▼ HH - alongTrackOffset_MaxValue - alongTrackOffset_MeanValue - alongTrackOffset_MinValue - alongTrackOffset_StandardDeviation - alongTrackOffsetHistogram - coherenceMagnitude_MaxValue - coherenceMagnitude_MeanValue - coherenceMagnitude_MinValue - coherenceMagnitude_StandardDeviation - coherenceMagnitudeHistogram - connectedComponents_NumNonZeroCCLabel - connectedComponents_PercentagePixelLargestCC - connectedComponents_PercentagePixelNonZeroCC - correlationSurfacePeak_MaxValue - correlationSurfacePeak_MeanValue - correlationSurfacePeak_MinValue - correlationSurfacePeak_StandardDeviation - correlationSurfacePeakHistogram - ionospherePhaseScreenUncertainty_MaxValue - ionospherePhaseScreenUncertainty_MeanValue - ionospherePhaseScreenUncertainty_MinValue - ionospherePhaseScreenUncertainty_StandardDeviation - ionospherePhaseScreen_MaxValue - ionospherePhaseScreen_MeanValue - ionospherePhaseScreen_MinValue - ionospherePhaseScreen_StandardDeviation

Figure 32: GUNW Product vs GUNW QA Product HDF hierarchy

The Table 14 below summarizes the statistical details (subsection 4) of pdf file for GUNW QA product.

Table 14: Statistical details of pdf file for GUNW QA Product			
S.No.	Layer Name	Plots	Statistics
1.	Wrapped Interferogram	• Image • Histogram	• Min/Max/Mean/Std
2.	Coherence Magnitude	• Image • Histogram	• Min/Max/Mean/Std
3.	Along track offset	• Image • Histogram	• Min/Max/Mean/Std
4.	Slant Range offset	• Image • Histogram	• Min/Max/Mean/Std
5.	Connected Components (CC)	• Image • Histogram	• Number of non-zero CC labels • % of pixels with non-zero CC • % of pixels in largest CC
6.	Ionospheric Phase Screen	• Image • Histogram	• Min/Max/Mean/Std
7.	Ionospheric Phase Screen Uncertainty	• Image • Histogram	• Min/Max/Mean/Std
8.	Unwrapped Phase	• Image • Histogram	• Min/Max/Mean/Std
9.	Correlation Surface Peak	• Image • Histogram	• Min/Max/Mean/Std

The Fig. 33 to Fig. 37 shows partial snapshots of the contents of a pdf file for GUNW QA product.



NISAR QA Data Products



META-DATA INFORMATION

PARAMETER	VALUE
AbsoluteOrbitNumber	321
DiagnosticModeFlag	0
FrameNumber	12
GranuleId	NISAR_S2_PR_GUNW_014_013_D_012_014_2800_SH_2 0070203T175309_20070203T175325_20071222T175218_2 0071222T175234_T00000_P_P_I_999
InstrumentName	SSAR
IsDithered	FALSE
IsGeocoded	TRUE
IsMixedMode	FALSE
IsUrgentObservation	FALSE
ListOfFrequencies	['A']
LookDirection	RIGHT
MissionId	NISAR
OrbitPassDirection	ASCENDING
PlannedDataId	['2007-02-03T17:53:09.39363980', '2007-12-22T17:52:18.15363764']
PlannedObservationId	['2007-02-03T17:53:09.39363980', '2007-12-22T17:52:18.15363764']
ProcessingCenter	ISRO
ProcessingDateTime	2024-07-01 09:03:43
ProcessingType	NOMINAL
ProductLevel	L2
ProductSpecificationVersion	1.0.0
ProductType	GUNW

Figure 33: Metadata Information of the GUNW Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	PASS	-
QA6	FIELD EMPTY	PASS	-

Figure 34: Checklist information of the GUNW Product

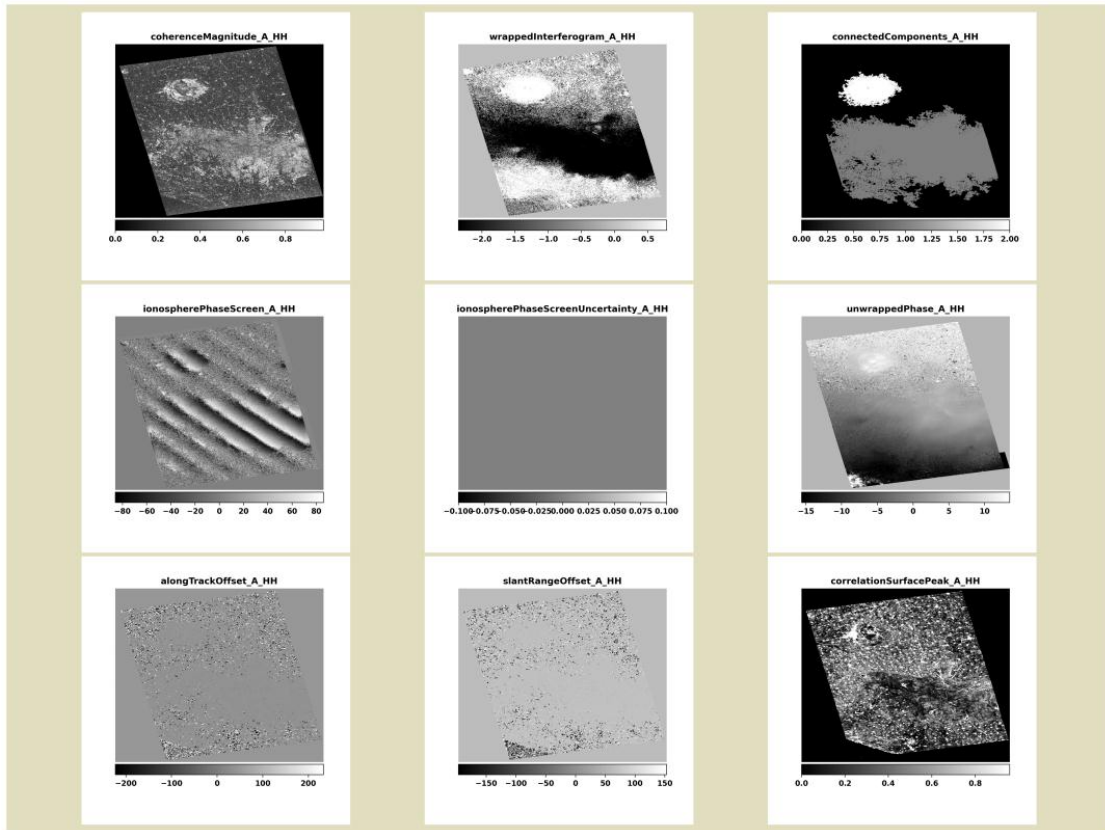


Figure 35: Image content of the GUNW Product

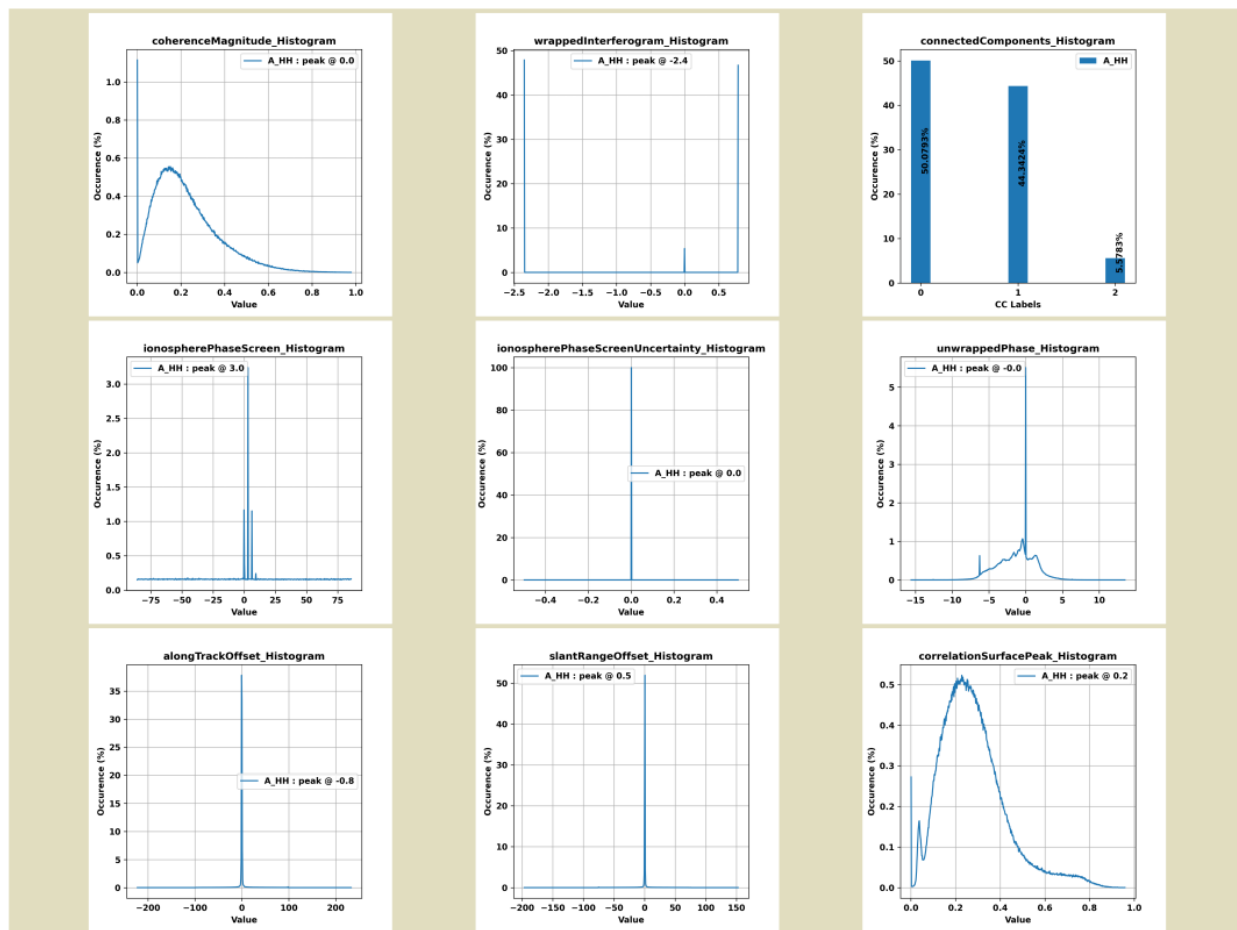


Figure 36: Statistical Plots of the GUNW Product



NISAR QA Data Products



coherenceMagnitude statistics (unitless)

POLS	MIN	MAX	MEAN	STD
A_HH	0.0	0.979697	0.225908	0.143768

wrappedInterferogram statistics (unitless)

POLS	MIN	MAX	MEAN	STD
A_HH	-2.356194	0.785398	-0.76167	1.538533

connectedComponents statistics (unitless)

POLS	NONZERO CC LABELS	NONZERO PIXEL(%)	LARGEST CC
A_HH	2	49.920748	44.342403

ionospherePhaseScreen statistics (in radian)

POLS	MIN	MAX	MEAN	STD
A_HH	-85.9427	85.94285	-0.003175	48.28409

ionospherePhaseScreenUncertainty statistics (in radian)

POLS	MIN	MAX	MEAN	STD
A_HH	0.0	0.0	0.0	0.0

unwrappedPhase statistics (in radian)

POLS	MIN	MAX	MEAN	STD
A_HH	-15.607697	13.515084	-1.220152	2.45346

alongTrackOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD
A_HH	-223.22499	233.05486	-0.015857	15.939215

slantRangeOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD
A_HH	-196.7666	152.97273	0.024779	12.32032

correlationSurfacePeak statistics (unitless)

POLS	MIN	MAX	MEAN	STD
A_HH	0.0	0.959118	0.279979	0.145547

Figure 37: Statistical numbers of the parameters of GUNW Product

3.7 Range Doppler Pixel Offsets (ROFF) QA Product

The Table 15 details dataset's name, datatype, shape etc. of the QA statistics HDF file for ROFF QA product. The visualization of the HDF file structure is shown in Fig. 38.

Table 15: Datasets of a ROFF QA HDF5 File		
ROFF QA parameters		
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_MaxValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Maximum Value of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_MeanValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Mean Value of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_MinValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Minimum Value of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_StandardDeviation		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Standard Deviation of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the alongTrackOffset		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_MaxValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Maximum Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_MeanValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Mean Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_MinValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Minimum Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_StandardDeviation		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Standard Deviation of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVarianceHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the alongTrackOffsetVariance		
	units	Unitless

/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_MaxValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Maximum Value of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_MeanValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Mean Value of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_MinValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Minimum Value of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_StandardDeviation		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Standard Deviation of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeakHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the correlationSurfacePeak		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_MaxValue		
Type: Float32		Shape: scalar
Description: crossOffsetVariance Maximum Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_MeanValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Mean Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_MinValue		
Type: Float32		Shape: scalar
Description: crossOffsetVariance Minimum Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_StandardDeviation		
Type: Float32		Shape: scalar
Description: crossOffsetVariance Standard Deviation of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/crossOffsetVarianceHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the crossOffsetVariance		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_MaxValue		
Type: Float32		Shape: scalar
Description: slantRangeOffset Maximum Value of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_MeanValue		
Type: Float32		Shape: scalar
Description: slantRangeOffset Mean Value of Layer 1		

	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_MinValue		
Type: Float32		Shape: scalar
Description: slantRangeOffset Minimum Value of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_StandardDeviation		
Type: Float32		Shape: scalar
Description: slantRangeOffset Standard Deviation of Layer 1		
	units	meters
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the slantRangeOffset		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_MaxValue		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Maximum Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_MeanValue		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Mean Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_MinValue		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Minimum Value of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_StandardDeviation		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Standard Deviation of Layer 1		
	units	meters^2
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVarianceHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the slantRangeOffsetVariance		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/snr_MaxValue		
Type: Float32		Shape: scalar
Description: snr Maximum Value of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/snr_MeanValue		
Type: Float32		Shape: scalar
Description: snr Mean Value of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/snr_MinValue		
Type: Float32		Shape: scalar
Description: snr Minimum Value of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/snr_StandardDeviation		
Type: Float32		Shape: scalar

Description: snr Standard Deviation of Layer 1		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer1/snrHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the snr		
	units	Unitless
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer2/ *		
Type: Similar to layer1		Shape: Similar to layer1
Description: Similar to layer1		
	units	Similar to layer1
/science/SSAR/ROFF/QA/data/frequencyA/HH/Layer3/ *		
Type: Similar to layer1		Shape: Similar to layer1
Description: Similar to layer1		
	units	Similar to layer1
/science/SSAR/ROFF/identification/*		
Type: Same as ROFF product		Shape: Same as ROFF product
Description: Same as ROFF product		
	units	Same as ROFF product

ROFF PRODUCT	ROFF QA H5 PRODUCT
▼ NISAR_S1_PR_ROFF_001_071_A_001_002_2800_SH ▼ science ▼ SSAR ▼ ROFF ▶ metadata ▼ swaths ▼ frequencyA - centerFrequency - listOfLayers - listOfPolarizations ▼ pixelOffsets ▼ HH ▼ layer1 - alongTrackOffset - alongTrackOffsetVariance - correlationSurfacePeak - crossOffsetVariance - slantRangeOffset - slantRangeOffsetVariance - snr ▼ layer2 - alongTrackOffset - alongTrackOffsetVariance - correlationSurfacePeak - crossOffsetVariance - slantRangeOffset - slantRangeOffsetVariance - snr ▶ layer3 - digitalElevationModel - mask - sceneCenterAlongTrackSpacing - sceneCenterGroundRangeSpacing - slantRange - slantRangeSpacing - zeroDopplerTime - zeroDopplerTimeSpacing ▶ identification	▼ NISAR_S1_PR_ROFF_001_071_A_001_002_2800_SH_20070203T17 ▼ science ▼ SSAR ▼ ROFF ▼ QA ▼ data ▼ frequencyA ▼ HH ▼ Layer1 - alongTrackOffsetHistogram - alongTrackOffsetVarianceHistogram - alongTrackOffsetVariance_MaxValue - alongTrackOffsetVariance_MeanValue - alongTrackOffsetVariance_MinValue - alongTrackOffsetVariance_StandardDeviation - alongTrackOffset_MaxValue - alongTrackOffset_MeanValue - alongTrackOffset_MinValue - alongTrackOffset_StandardDeviation - correlationSurfacePeakHistogram - correlationSurfacePeak_MaxValue - correlationSurfacePeak_MeanValue - correlationSurfacePeak_MinValue - correlationSurfacePeak_StandardDeviation - crossOffsetVarianceHistogram - crossOffsetVariance_MaxValue - crossOffsetVariance_MeanValue - crossOffsetVariance_MinValue - crossOffsetVariance_StandardDeviation - slantRangeOffsetHistogram - slantRangeOffsetVarianceHistogram - slantRangeOffsetVariance_MaxValue - slantRangeOffsetVariance_MeanValue - slantRangeOffsetVariance_MinValue - slantRangeOffsetVariance_StandardDeviation - slantRangeOffset_MaxValue - slantRangeOffset_MeanValue

Figure 38: ROFF Product vs ROFF QA HDF hierarchy

The Table 16 below summarizes the statistical details (subsection 4) of pdf file for ROFF QA product for all the three layers.

Table 16: Statistical details of pdf file for ROFF QA Product			
S.No.	Layer Name	Plots	Statistics
1.	Along Track Offset	- Image - Histogram	Min/Max/Mean/Std
2.	Slant Range Offset	- Image - Histogram	Min/Max/Mean/Std
3.	Slant Range Offset Variance	- Image - Histogram	Min/Max/Mean/Std
4.	Along Track offset Variance	- Image - Histogram	Min/Max/Mean/Std
5.	Cross Offset Variance	- Image - Histogram	Min/Max/Mean/Std
6.	Correlation Surface Peak	- Image - Histogram	Min/Max/Mean/Std
7.	SNR	- Image - Histogram	Min/Max/Mean/Std

The Fig. 39 to Fig. 43 shows partial snapshots of the contents of a pdf file for ROFF QA product.

 	
NISAR QA Data Products	
META-DATA INFORMATION	
PARAMETER	VALUE
AbsoluteOrbitNumber	321
DiagnosticModeFlag	0
FrameNumber	12
GranuleId	NISAR_S1_PR_ROFF_014_013_D_012_014_2800_SH_20 070203T175309_20070203T175325_20071222T175218_20 071222T175234_T00000_P_P_I_999
InstrumentName	SSAR
IsDithered	FALSE
IsGeocoded	FALSE
IsMixedMode	FALSE
IsUrgentObservation	FALSE
ListOfFrequencies	['A']
LookDirection	RIGHT
MissionId	NISAR
OrbitPassDirection	ASCENDING
PlannedDataakeId	['2007-02-03T17:53:09.39363980']
PlannedObservationId	['2007-02-03T17:53:09.39363980']
ProcessingCenter	ISRO
ProcessingDateTime	2024-07-01 09:03:44
ProcessingType	NOMINAL
ProductLevel	L1
ProductSpecificationVersion	1.0.0
ProductType	ROFF

Figure 39: Metadata Information of the ROFF Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	-	-
QA6	FIELD EMPTY	PASS	-

Figure 40: Checklist information of the ROFF Product

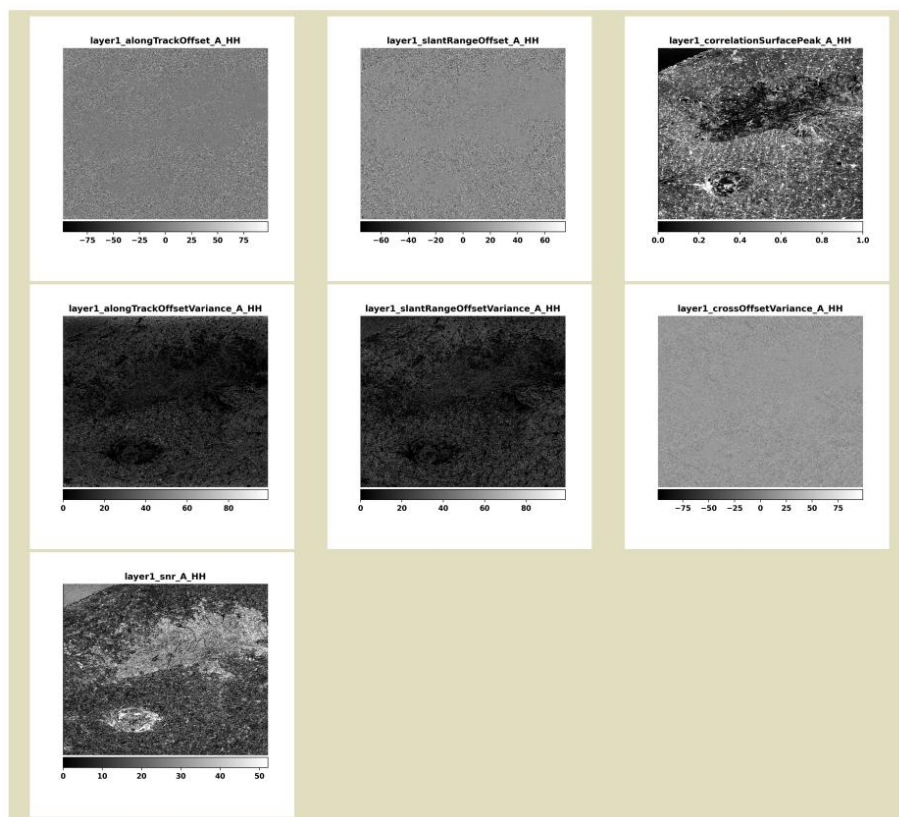


Figure 41: Image content of the ROFF Product (Layer-1)

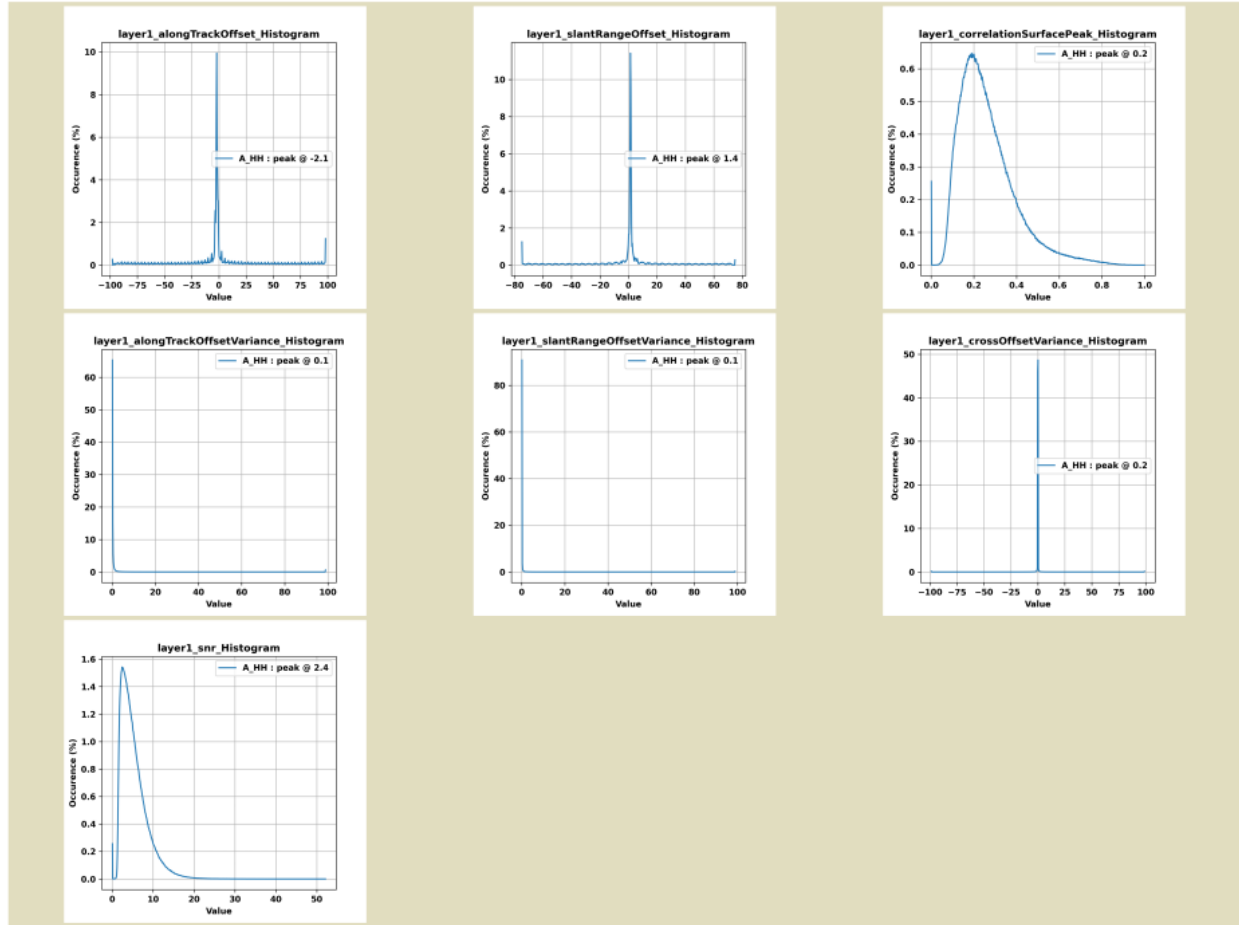


Figure 42: Statistical Plots of the ROFF Product (Layer-1)



NISAR QA Data Products



alongTrackOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-98.13876	98.13876	-0.032237	39.208725	Layer1
A_HH	-98.13876	98.13876	-0.03709	31.819496	Layer2
A_HH	-98.13876	98.13876	-0.02185	18.490383	Layer3

slantRangeOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-74.94811	74.94811	0.03505	27.751663	Layer1
A_HH	-74.94811	74.94811	0.03958	23.433262	Layer2
A_HH	-74.94811	74.94811	0.025288	14.174499	Layer3

correlationSurfacePeak statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	0.0	1.0	0.262594	0.131972	Layer1
A_HH	0.0	1.0	0.257751	0.137785	Layer2
A_HH	0.0	1.0	0.279934	0.146959	Layer3

alongTrackOffsetVariance statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	0.0	99.0	1.317884	8.750793	Layer1
A_HH	0.0	99.0	1.181395	8.319944	Layer2
A_HH	0.0	99.0	0.545345	5.625211	Layer3

slantRangeOffsetVariance statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	0.0	99.0	0.567639	5.93598	Layer1
A_HH	0.0	99.0	0.479585	5.489898	Layer2
A_HH	0.0	99.0	0.191564	3.482915	Layer3

crossOffsetVariance statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-99.0	99.0	-0.007301	6.158593	Layer1
A_HH	-99.0	99.0	-0.012444	5.764742	Layer2
A_HH	-99.0	99.0	-0.004854	3.761512	Layer3

Figure 43: Statistical numbers of the parameters of ROFF Product

3.8 Geocoded Pixel Offset Product (GOFF) QA Product

The Table 17 details dataset's name, datatype, shape etc. of the QA statistics HDF file for GOFF QA product. The visualization of the HDF file structure is shown in Fig. 44.

Table 17: Datasets of a GOFF QA HDF5 File		
GOFF QA parameters		
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_MaxValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Maximum Value of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_MeanValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Mean Value of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_MinValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Minimum Value of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffset_StandardDeviation		
Type: Float32	Shape: scalar	
Description: alongTrackOffset Standard Deviation of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetHistogram		
Type: Float32	Shape: (600,2)	
Description: Histogram Density of the alongTrackOffset		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_MaxValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Maximum Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_MeanValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Mean Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_MinValue		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Minimum Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVariance_StandardDeviation		
Type: Float32	Shape: scalar	
Description: alongTrackOffsetVariance Standard Deviation of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/alongTrackOffsetVarianceHistogram		
Type: Float32	Shape: (600,2)	

Description: Histogram Density of the alongTrackOffsetVariance		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_MaxValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Maximum Value of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_MeanValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Mean Value of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_MinValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Minimum Value of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeak_StandardDeviation		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Standard Deviation of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/correlationSurfacePeakHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the correlationSurfacePeak		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_MaxValue		
Type: Float32		Shape: scalar
Description: crossOffsetVariance Maximum Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_MeanValue		
Type: Float32		Shape: scalar
Description: correlationSurfacePeak Mean Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_MinValue		
Type: Float32		Shape: scalar
Description: crossOffsetVariance Minimum Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/crossOffsetVariance_StandardDeviation		
Type: Float32		Shape: scalar
Description: crossOffsetVariance Standard Deviation of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/crossOffsetVarianceHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the crossOffsetVariance		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_MaxValue		
Type: Float32		Shape: scalar
Description: slantRangeOffset Maximum Value of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_MeanValue		

Type: Float32		Shape: scalar
Description: slantRangeOffset Mean Value of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_MinValue		
Type: Float32		Shape: scalar
Description: slantRangeOffset Minimum Value of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffset_StandardDeviation		
Type: Float32		Shape: scalar
Description: slantRangeOffset Standard Deviation of Layer 1		
	units	meters
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of slantRangeOffset		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_MaxValue		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Maximum Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_MeanValue		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Mean Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_MinValue		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Minimum Value of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVariance_StandardDeviation		
Type: Float32		Shape: scalar
Description: slantRangeOffsetVariance Standard Deviation of Layer 1		
	units	meters^2
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/slantRangeOffsetVarianceHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the slantRangeOffsetVariance		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/snr_MaxValue		
Type: Float32		Shape: scalar
Description: snr Maximum Value of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/snr_MeanValue		
Type: Float32		Shape: scalar
Description: snr Mean Value of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/snr_MinValue		
Type: Float32		Shape: scalar
Description: snr Minimum Value of Layer 1		
	units	Unitless

/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/snr_StandardDeviation		
Type: Float32		Shape: scalar
Description: snr Standard Deviation of Layer 1		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer1/snrHistogram		
Type: Float32		Shape: (600,2)
Description: Histogram Density of the snr		
	units	Unitless
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer2/ *		
Type: Similar to layer1		Shape: Similar to layer1
Description: Similar to layer1		
	units	Similar to layer1
/science/SSAR/GOFF/QA/data/frequencyA/HH/Layer3/ *		
Type: Similar to layer1		Shape: Similar to layer1
Description: Similar to layer1		
	units	Similar to layer1
/science/SSAR/GOFF/identification/*		
Type: Same as GOFF product		Shape: Same as GOFF product
Description: Same as GOFF product		
	units	Same as GOFF product

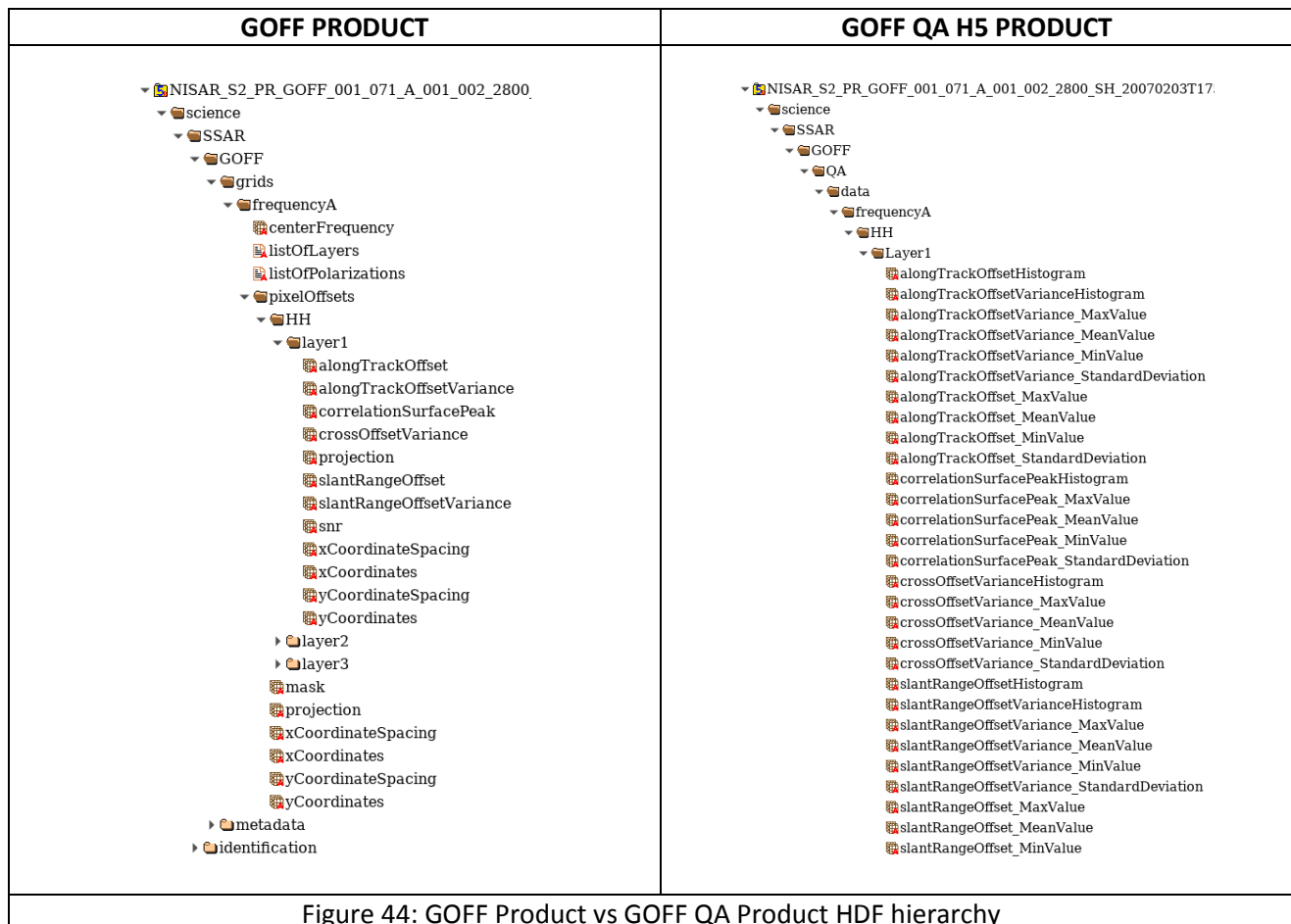


Figure 44: GOFF Product vs GOFF QA Product HDF hierarchy

The Table 18 below summarizes the statistical details (subsection 4) of pdf file for GOFF QA product for all the three layers.

Table 18: Statistical details of pdf file for GOFF QA Product			
S.No.	Layer Name	Plots	Statistics
1.	Along Track Offset	- Image - Histogram	Min/Max/Mean/Std
2.	Slant Range Offset	- Image - Histogram	Min/Max/Mean/Std
3.	Slant Range Offset Variance	- Image - Histogram	Min/Max/Mean/Std
4.	Along Track offset Variance	- Image - Histogram	Min/Max/Mean/Std
5.	Correlation Surface peak	- Image - Histogram	Min/Max/Mean/Std
6.	Cross Offset Variance	- Image - Histogram	Min/Max/Mean/Std
7.	SNR	- Image - Histogram	Min/Max/Mean/Std

The Fig. 45 to Fig. 49 shows partial snapshots of the contents of a pdf file for GOFF QA product.

 	
NISAR QA Data Products	
META-DATA INFORMATION	
PARAMETER	VALUE
AbsoluteOrbitNumber	321
DiagnosticModeFlag	0
FrameNumber	12
GranuleId	NISAR_S2_PR_GOFF_014_013_D_012_014_2800_SH_20070203T175309_20070203T175325_20071222T175218_20071222T175234_T00000_P_P_L_999
InstrumentName	SSAR
IsDithered	FALSE
IsGeocoded	TRUE
IsMixedMode	FALSE
IsUrgentObservation	FALSE
ListOfFrequencies	[A]
LookDirection	RIGHT
MissionId	NISAR
OrbitPassDirection	ASCENDING
PlannedDataId	[2007-02-03T17:53:09.39363980]
PlannedObservationId	[2007-02-03T17:53:09.39363980]
ProcessingCenter	ISRO
ProcessingDateTime	2024-07-01 09:04:16
ProcessingType	NOMINAL
ProductLevel	L2
ProductSpecificationVersion	1.0.0
ProductType	GOFF

Figure 45: Metadata Information of the GOFF Product

IDENTIFICATION	CHECK	REMARKS	REASON
QA1	PRODUCT FILES AVAILABILITY	PASS	-
QA2	PRODUCT HDF FILENAME CONVENTION	PASS	-
QA3	PRODUCT HDF CONTENT	PASS	-
QA4	PRODUCT IMAGE CONTENT	PASS	-
QA5	COHERENCE VALUE	-	-
QA6	FIELD EMPTY	PASS	-

Figure 46: Checklist information of the GOFF Product

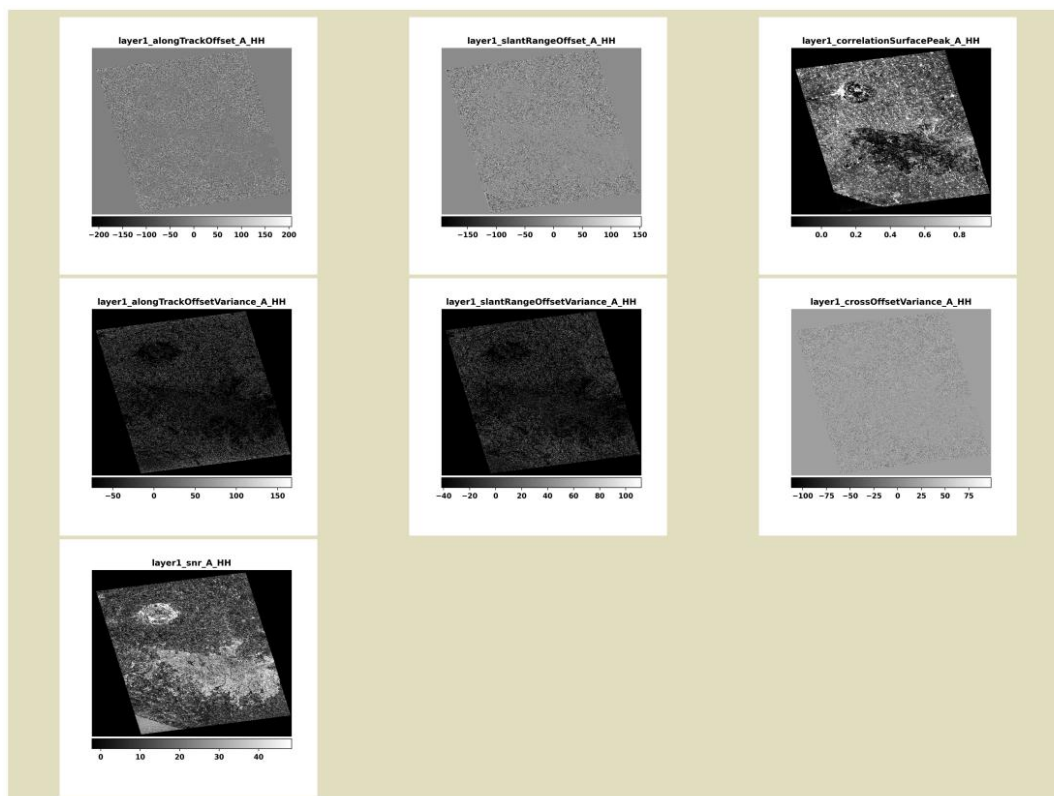


Figure 47: Image content of the GOFF Product (Layer-1)

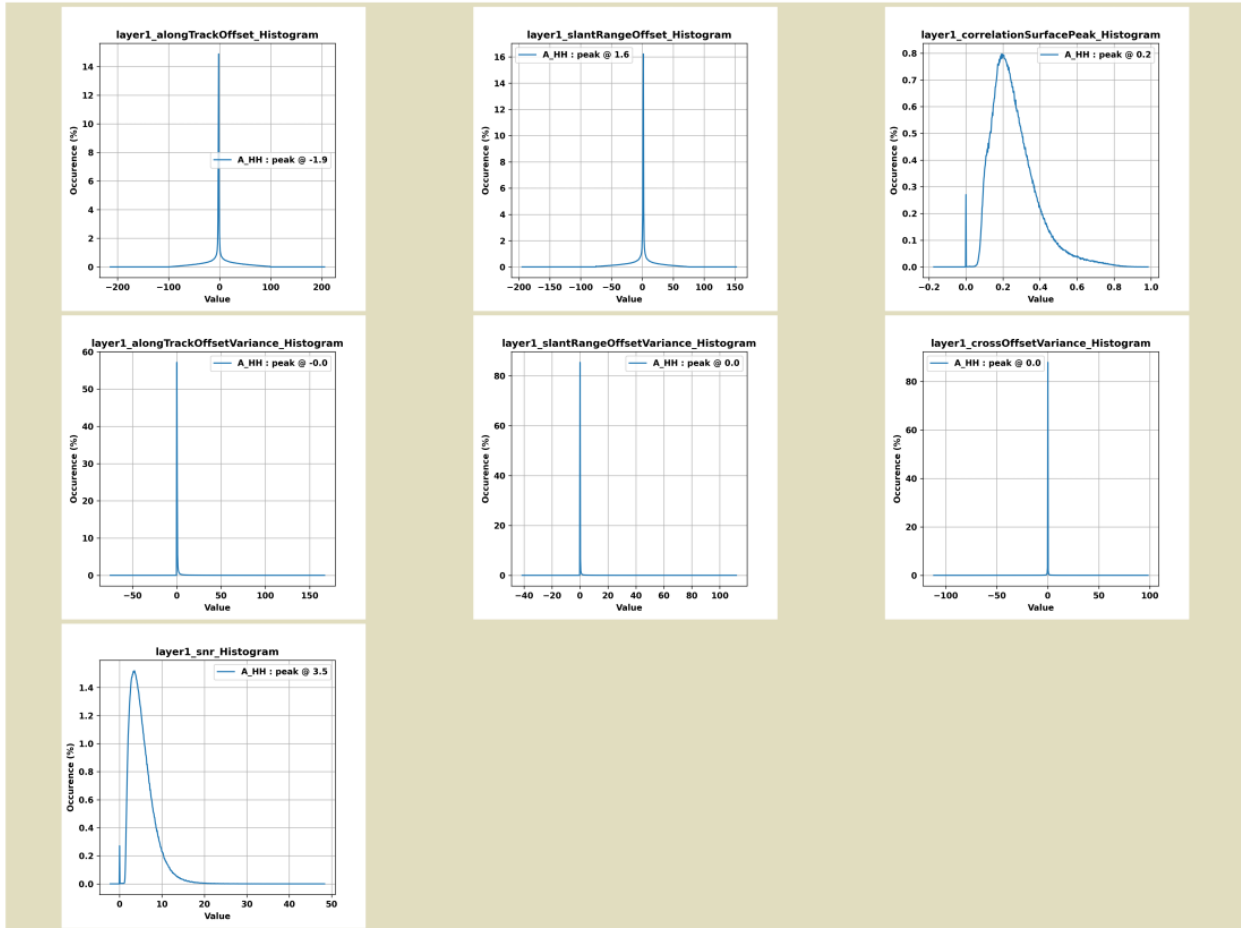


Figure 48: Statistical Plots of the GOFF Product (Layer-1)



NISAR QA Data Products



alongTrackOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-214.52486	205.72707	-0.020873	29.544111	Layer1
A_HH	-186.20554	209.43901	-0.03768	25.22625	Layer2
A_HH	-223.22499	233.05486	-0.015857	15.939215	Layer3

slantRangeOffset statistics (in meters)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-195.1634	152.65785	0.036401	21.19485	Layer1
A_HH	-129.12663	132.3441	0.035716	18.714981	Layer2
A_HH	-196.7666	152.97273	0.024779	12.32032	Layer3

correlationSurfacePeak statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-0.174945	0.984286	0.262611	0.124338	Layer1
A_HH	-0.050111	0.978428	0.257781	0.132954	Layer2
A_HH	0.0	0.959118	0.279979	0.145547	Layer3

alongTrackOffsetVariance statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-75.3717	167.05594	1.319089	5.961668	Layer1
A_HH	-75.26531	157.23857	1.182906	5.722869	Layer2
A_HH	-38.369244	178.07007	0.546012	4.030415	Layer3

slantRangeOffsetVariance statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-41.553535	111.989204	0.569151	4.021988	Layer1
A_HH	-75.42804	124.35597	0.478089	3.69853	Layer2
A_HH	-35.214466	98.631485	0.192824	2.41473	Layer3

crossOffsetVariance statistics (unitless)

POLS	MIN	MAX	MEAN	STD	LayerName
A_HH	-111.988495	98.37828	-0.005202	4.154596	Layer1
A_HH	-124.34398	97.963936	-0.010733	3.855626	Layer2
A_HH	-98.707504	116.49123	-0.004261	2.578599	Layer3

Figure 49: Statistical numbers of the parameters of GOFF Product

REFERENCES

- [1] NISAR L&S Band Level-1 & Level -2 Data Product Format Document Ver1.0, ISRO-SAC-PR-NISAR-2024-051

ACRONYMS

S. No.	ACRONYM	FULL FORM
1.	SDP	Science Data Product
2.	QA	Quality Assurance
3.	HDF	Hierarchical Data Format
4.	CSV	Comma Separated Value
5.	PDF	Portable Document Format
6.	KML	Keyhole Markup Language

Appendix-1

Format of a KML File

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2">
  <Document id="1">
    <Style id="13">
      <LineStyle id="14">
        <color>ff0000ff</color>
        <colorMode>normal</colorMode>
        <width>3</width>
      </LineStyle>
    </Style>
    <name>/nisar1/NISAR_TNE/RSLC/oper/workspace/product/ALPSRP054800410-
L1.0/NISAR_S1_PR_RSLC_014_013_D_012_2800_SHNA_A_20070203T175309_20070203T175325_T000
00_P_P_I_999.h5</name>
    <open>1</open>
    <Schema name="ExtendedData" id="2">
      <SimpleField type="str" name="LookDirection">
        <displayName>Right</displayName>
      </SimpleField>
      <SimpleField type="str" name="orbitPassDirection">
```

```

    <displayName>Ascending</displayName>
  </SimpleField>
  <SimpleField type="str" name="productType">
    <displayName>RSLC</displayName>
  </SimpleField>
  <SimpleField type="str" name="radarBand">
    <displayName>S</displayName>
  </SimpleField>
  <SimpleField type="str" name="trackNumber">
    <displayName>13</displayName>
  </SimpleField>
  <SimpleField type="str" name="frameNumber">
    <displayName>12</displayName>
  </SimpleField>
</Schema>
<GroundOverlay id="9">
  <name>RSLC Ground Overlay</name>
  <Icon id="10">
<href>NISAR_S1_PR_RSLC_001_071_A_001_2800_SHNA_A_20070203T175310_20070203T175324_D00
301_N_F_I_005.jpg</href>
  </Icon>
  <LatLonBox>
    <north>21.77383062</north>
    <south>20.80688162</south>
    <east>71.09797436</east>
    <west>70.25405745</west>
    <rotation>0</rotation>
  </LatLonBox>
</GroundOverlay>
<Placemark id="10">
  <name>WO=ALPSRP054800410-L1.0</name>
  <styleUrl>#13</styleUrl>
  <Polygon id="9">
    <extrude>1</extrude>
    <altitudeMode>relativeToGround</altitudeMode>
    <outerBoundaryIs>
      <LinearRing id="11">
        <coordinates>70.44335174560547,20.72710609436035,0.0
71.11370849609375,20.846492767333984,0.0    70.92608642578125,21.78887939453125,0.0
70.25077819824219,21.66995620727539,0.0    70.44335174560547,20.72710609436035,0.0
        </coordinates>
      </LinearRing>
    </outerBoundaryIs>
  </Polygon>
</Placemark>

```

```
</outerBoundaryIs>  
</Polygon>  
</Placemark>  
</Document>  
</kml>
```

The above KML file when loaded on QGIS software is shown in Fig. 50.



Figure 50: Loaded KML file on QGIS

Format of a .met file

a) RSLC/GSLC/GCOV:

```
{
  "AcquistionMode": "S",
  "Coverage": "F",
  "CycleNumber": 1,
  "DEMCorrection": "NA",
  "DEMSource": "NA",
  "DateOfDump": "02-JUL-2020",
  "DateOfPass": "02-JUL-2020",
  "Datum": "WGS_84",
  "DumpingOrbitNumber": 123,
  "EPSG": "4326",
  "Ellipsoid": "WGS_84",
  "Ephemeris": "Custom",
  "FalseEasting": "NA",
  "FalseNorthing": "NA",
  "FrameNumber": 1,
  "GeneratingAgency": "ISRO",
  "GenerationDateTime": "2025-07-24T21:22:58.487845",
  "GroundTrackVelocity": 6795.686571,
  "ImageFormat": "HDF-5",
  "ImageHeadingAngle": 30.0,
  "ImageLLLat": 20.84420202,
  "ImageLLLon": 70.63506901,
  "ImageLLMapX": -999.9899902,
  "ImageLLMapY": -999.9899902,
  "ImageLRLat": 20.83190478,
  "ImageLRLon": 70.56634567,
  "ImageLRMapX": -999.9899902,
  "ImageLRMapY": -999.9899902,
  "ImageTraceHeadingAngle": 30.0,
  "ImageULLat": 20.80688162,
  "ImageULLon": 70.42701032,
  "ImageULMapX": -999.9899902,
  "ImageULMapY": -999.9899902,
  "ImageURLat": 20.81946428,
  "ImageURLon": 70.49698921,
  "ImageURMapX": -999.9899902,
  "ImageURMapY": -999.9899902,
  "ImagingMode": "W",
  "ImagingOrbitNumber": 123,
  "IncidenceAngle": 42.93464195,
  "InputResolutionAcross": 7.859251939,
  "InputResolutionAlong": 5.555053444,
  "LookAngle": 34.29999998,
  "MapOriginLat": -999.9899902,
```

```

"MapOriginLon": -999.9899902,
"MapProjection": "NA",
"MissingFramesFlag": 0,
"NoOfAzimuthLooks": 1,
"NoOfPolarizations": 1,
"NoOfRangeLooks": 1,
"NoOfPixels": 9477,
"NoScans": 21344,
"Node": "Ascending",
"OTSPProductID":
"NISAR_S1_PR_RSLC_001_071_A_001_2800_SHNA_A_20070203T175310_20070203T175324_D00301_N_F_I
_005_QA",
"ObservationID": "20070203175309",
"OutputLineSpacing": 4.385568509,
"OutputPixelSpacing": 6.876845446,
"PRF": 1520.0,
"ProcessingLevel": "Nominal",
"ProcessingNode": "nisar3",
"ProdCode": "ST0000KED",
"ProdLLLat": 20.84420202,
"ProdLLLon": 70.63506901,
"ProdLLMapX": 9999.0,
"ProdLLMapY": 9999.0,
"ProdLRLat": 20.83190478,
"ProdLRLon": 70.56634567,
"ProdLRMapX": 9999.0,
"ProdLRMapY": 9999.0,
"ProdULLat": 20.80688162,
"ProdULLon": 70.42701032,
"ProdULMapX": 9999.0,
"ProdULMapY": 9999.0,
"ProdURLat": 20.81946428,
"ProdURLon": 70.49698921,
"ProdURMapX": 9999.0,
"ProdURMapY": 9999.0,
"ProductID": "3511498",
"ProductType": "RSLC_QA",
"RTCApplyFlag": "False",
"SatID": "NIS",
"SatelliteAltitude": 747.0,
"SatelliteHeadingAngle": 10.0,
"SceneCenterLat": 21.29295187,
"SceneCenterLon": 70.68790673,
"SceneCenterPitch": -0.001,
"SceneCenterRoll": -34.3,
"SceneCenterYaw": 0.0,
"SceneEndTime": "2007-02-03T17:53:24.75679755",
"SceneNumber": 0,
"SceneStartTime": "2007-02-03T17:53:10.71469235",
"Sensor": "SSAR",
"SensorOrientation": "Right",
"SessionNumber": 0,
"SoftwareVersion": "1.2.01",
"SourceOfAttitude": "Custom",

```

```

    "SourceOfOrbit": "Custom",
    "StationID": "SAN",
    "StripNumber": 1111,
    "TerrainHeightApplied": "NA",
    "TrackNumber": 71,
    "TxRxPol0": "HH",
    "ZoneNo": "NA"
  }

```

b) RIFG/RUNW/GUNW/ROFF/GOFF:

```

{
  "AcquistionMode": "S",
  "Coverage": "F",
  "CycleNumber": 1,
  "DEMCorrection": "NA",
  "DEMSource": "NA",
  "DateOfDump": "12-JUL-2020",
  "DateOfPass": "12-JUL-2020",
  "Datum": "WGS_84",
  "DumpingOrbitNumber": 124,
  "EPSG": 4326,
  "Ellipsoid": "WGS-84",
  "EllipsoidalFlatteningApplied": "NA",
  "Ephemeris": "Custom",
  "FalseEasting": "NA",
  "FalseNorthing": "NA",
  "FrameNumber": 1,
  "GeneratingAgency": "ISRO",
  "GenerationDateTime": "2025-07-24T18:40:15.295394",
  "GroundTrackVelocity": 6739.956643,
  "HydrostaticTroposphericCorrectionApplied": "NA",
  "ImageFormat": "HDF-5",
  "ImageHeadingAngle": 30.0,
  "ImageLLLat": 20.84420202,
  "ImageLLLon": 70.63506901,
  "ImageLLMapX": -999.9899902,
  "ImageLLMapY": -999.9899902,
  "ImageLRLat": 20.83190478,
  "ImageLRLon": 70.56634567,
  "ImageLRMapX": -999.9899902,
  "ImageLRMapY": -999.9899902,
  "ImageTraceHeadingAngle": 30.0,
  "ImageULLat": 20.80688162,
  "ImageULLon": 70.42701032,
  "ImageULMapX": -999.9899902,
  "ImageULMapY": -999.9899902,
  "ImageURLat": 20.81946428,
  "ImageURLon": 70.49698921,
  "ImageURMapX": -999.9899902,
  "ImageURMapY": -999.9899902,
  "ImagingMode": "W",
  "ImagingOrbitNumber": 124,
  "IncidenceAngle": 38.77875137,

```

```

    "InputResolutionAcross": 7.859251939,
    "InputResolutionAlong": 5.555053444,
    "IonospherePhaseCorrectionApplied": "NA",
    "IonosphericPhaseScreenAvailable": "NA",
    "IsOffsetBendingApplied": "NA",
    "L1RSLCReferenceName":
"NISAR_S1_PR_RSLC_001_071_A_001_2800_SHNA_A_20070203T175310_20070203T17532
4_D00301_N_F_I_005.h5",
    "L1RSLCSecondaryName":
"NISAR_S1_PR_RSLC_002_071_A_001_2800_SHNA_A_20071222T175219_20071222T17523
3_D00301_N_F_I_006.h5",
    "LookAngle": -34.3,
    "MapOriginLat": -999.9899902,
    "MapOriginLon": -999.9899902,
    "MapProjection": "NA",
    "MissingFramesFlag": 0,
    "NoOfAzimuthLooks": 15,
    "NoOfPolarizations": 1,
    "NoOfRangeLooks": 8,
    "NoPixels": 1172,
    "NoScans": 1410,
    "Node": "Ascending",
    "OTSProductID":
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    "ParallelBaseline": 527.7755127,
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"SceneNumber": 0,
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"Sensor": "SSAR",
"SensorOrientation": "Right",
"SessionNumber": 0,
"SoftwareVersion": "1.2.01",
"SourceOfAttitude": "Custom",
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"StripNumber": 1112,
"TemporalBaseline": 12,
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"TopographicFlatteningApplied": "NA",
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