

EOS-04 Polarimetric Value Added Data Products

EOS-04 is a follow-on mission of RISAT-1, launched on 14-February 2022 by PSLV C-52 launch vehicle. EOS-04 carries C-band Synthetic Aperture RADAR (SAR) payload which can be operated in various imaging modes with multiple resolutions (MRS, CRS, FRS-1, FRS-2) in single, dual, hybrid or full polarizations. The satellite has all weather, day and night imaging capability.

With a Polarimetric SAR, much more information can be derived compared to conventional SAR systems. Polarimetric SAR data has the potential to exploit many applications in several fields, including agriculture (crop classification, soil moisture extraction, and crop assessment), oceanography (surface currents and wind field retrieval), forestry (forest monitoring, classification, and tree height estimation), disaster monitoring (oil spill detection, disaster assessment), and military (ship detection, target recognition/classification). In view of above possibilities, there is a high demand to understand and further explore the characteristics of polarimetric SAR data.



AOI: Godavari River, Full Polarimetry, Yamaguchi Decomposition (Level-3A), MRS

Table 1: Polarimetric Data Products :

Polarization	Imaging Mode	Level-1C 3-Layer Covariance Product	Level-3A M-delta decomposed Product	Level-3A M-chi decomposed Product
Circular Polarization	FRS-1	✓	✓	✓
	FRS-2	✓	✓	✓
	MRS	✓	✓	✓
	CRS	✓	✓	✓
Full Polarization	Imaging Mode	Level-1C 6-Layer Covariance Product	Level-3A Freeman decomposed Product	Level-3A Yamaguchi decomposed Product
	FRS-1	✓	✓	✓
	FRS-2	✓	✓	✓
	MRS	✓	✓	✓
	CRS	✓	✓	✓

Full Polarimetry(FP) SAR systems record full scattering information of ground targets and can also preserve the relative phase between polarizations. Full polarimetric SAR images have been demonstrated to be useful for several applications and change detection studies. Full polarimetry has better target discrimination capability as it can fully characterize the polarization response of the target. However hybrid polarimetry has the advantage of wider swath and wider off nadir coverage compared to full polarimetry and better scattering information of ground targets compared to conventional dual polarimetry.

Web links:

bhoonidhi.nrsc.gov.in
bhuvan.nrsc.gov.in

For further details, please

☎ +91-40-2388 4423

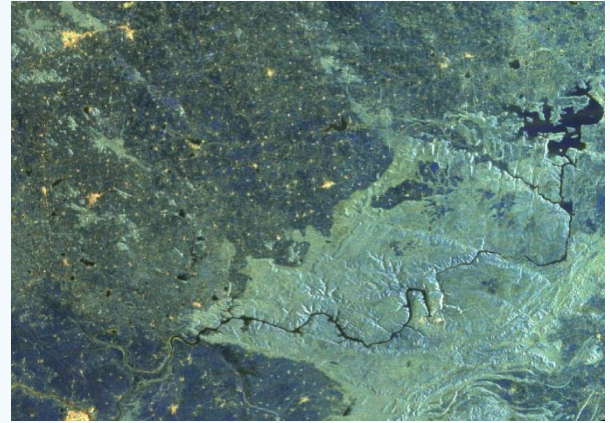
✉ bhoonidhi@nrsc.gov.in, data@nrsc.gov.in,
gdndc@nrsc.gov.in

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EOS-04 Polarimetric Data Products

Because of the capability of EOS-04 to acquire the data in Hybrid/Full polarizations, polarimetric value added products are being provided in addition to standard Level-1 and Level-2 data products.

EOS-04 Polarimetric data products are available in slant range geometry for Level-1C product containing the covariance matrix elements and as geocoded polarimetric decomposed product which is Level-3A product for hybrid and full polarimetric acquisitions. Level-1C product is useful for performing the user selected polarimetric decompositions. Level-3A product is polarimetric decomposed product containing the surface, Even and volume scattering images to perform the target classification.



**AOI: Nallamala Forest, Hybrid polarimetry
M-Chi decomposition (Level-3A), CRS**

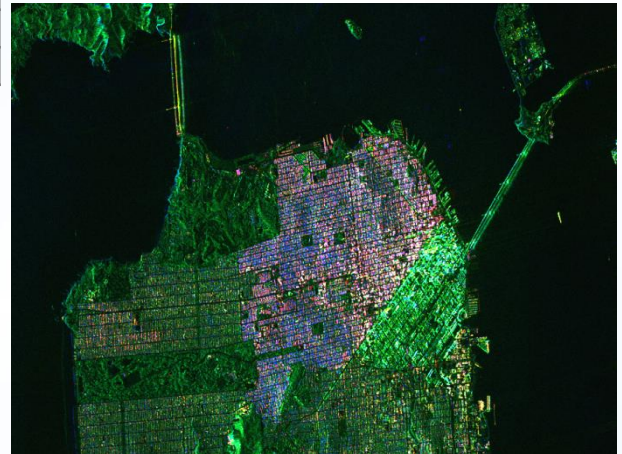
Table 2:EOS-04 Specifications for Hybrid and Full Polarimetry:

Imaging Mode	Swath (km)		Off Nadir distance (km)		Incidence Angle (deg)	
	Hybrid	Full	Hybrid	Full	Hybrid	Full
FRS-1	25	20	100-650	100-400	11-55	11-36
FRS-2	25	20	100-650	100-400	11-55	11-36
MRS	160	115	100-650	100-400	11-55	11-36
CRS	223	168	100-650	100-400	11-55	11-36

Polarimetric data products can be ordered in Bhoonidhi web portal for hybrid/full polarimetric acquisitions under OpenData_OnOrder category for MRS and CRS imaging modes and under priced category for FRS-1 and FRS-2 imaging modes with processing level as P_Polarimetry and by selecting the polarimetric decomposition options.



**AOI: Chinchilla, Australia, Hybrid Polarimetry,
M-delta decomposition (Level-3A), FRS-1**



**AOI: Sanfransisco, Full Polarimetry,
Yamaguchi Decomposition (Level-3A), FRS-1**
Red - Even bounce Scattering
Green - Volume Scattering
Blue - Odd bounce Scattering

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gdndc@nrsc.gov.in