SURFACE WATER SPREAD PRODUCTS
FROM EOS-04 MRS
AT BHOONIDHI

APSDD/ODPG

DATA PROCESSING AREA (DPA)

NATIONAL REMOTE SENSING CENTRE

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Introduction:

Surface water spread information is an important input parameter for hydrological modelling while estimating water balance components and assessment of water resources. Water spread is dynamic in nature as inflows (rainfall, runoff), outflows (utilization) varies. Information on surface water spread area of reservoirs and other water bodies is important to estimate the water storage. Satellite remote sensing technology is being used for capturing the dynamics of surface water spread. Presently, number of datasets from optical sensors is being used for this purpose. However, this has limitation of cloud cover hampering the frequency of observations. Hence, all weather capable microwave sensor data utilization can increase the frequency of observations. In view of this, EOS-04 Medium Resolution Scansar (MRS) data is best suited for the extraction of surface water bodies due to its systematic coverage over India with C Band, dual polarization (HH, HV). A hybrid algorithm is developed to delineate water bodies from MRS images. A novel framework is developed to quickly pre-process the data and to extract water layer from EOS-04 MRS data with this algorithm.

Full India is acquired in 17 days by MRS systematic coverage which is a called a MRS cycle. Full India mosaicked 1^0 X1^0 Terrain Normalized Analysis Ready Data(L2B) tiles were generated at the end of each cycle. These tiles are used to realize surface water spread layers. This cycle wise layer is available to users as 1^0 X1^0 downloadable tiles. For every 1^0 X 1^0 tile following files are available for download.

- surface water spread raster image : Tiff
- corresponding snapshot : Jpg file
- corresponding meta data file : txt file

Products Format Specification:

- Image File Format : Geo TIFF
- Projection : Geographic coordinates (Lat., Long.)
- Datum : WGS-84
- Spatial Resolution : 18m (0.0001636125)
- Radiometric resolution : 2 bits per pixel
- Number of bands : 1
- Water Pixel value(coded output) : 2 - Water,

  0 - No water

  3- No data

File Naming Convention:

Image file naming convention contains the following information:

- Satellite name
- Sensor Type
- Mode of acquisition

- Start date
- End date
- Mission cycle no
- Tile ID
- Product Code

Sample file name: E04_SAR_MRS_09SEP2024_25SEP2024_54_N16E076_J1G0WSHTD.tif

E04 = satellite

SAR = SAR

MRS = Mode of acquisition

Start_date = <ddmmmyyyy> 09SEP2024

End_date = <ddmmmyyyy> 25SEP2024

Tileid = N16E076

Product_code = 1G0WSHTD

Jpeg and Meta files are also having similar naming conventions. Sample files are as follows

E04_SAR_MRS_09SEP2024_25SEP2024_54_N16E076_J1G0WSHTD.jpg

E04_SAR_MRS_09SEP2024_25SEP2024_54_N16E076_J1G0WSHTD.meta

Data Processing:

Data pre-processing for generating the water layer products involves following steps: 1) Speckle removal, 2)Sigma naught generation 3) Surface water layer generation 4) Generation of corresponding Meta and colour coded jpg 5) Dissemination of data. The processing work flow for generation of surface water spread layer is as shown in Figure:1
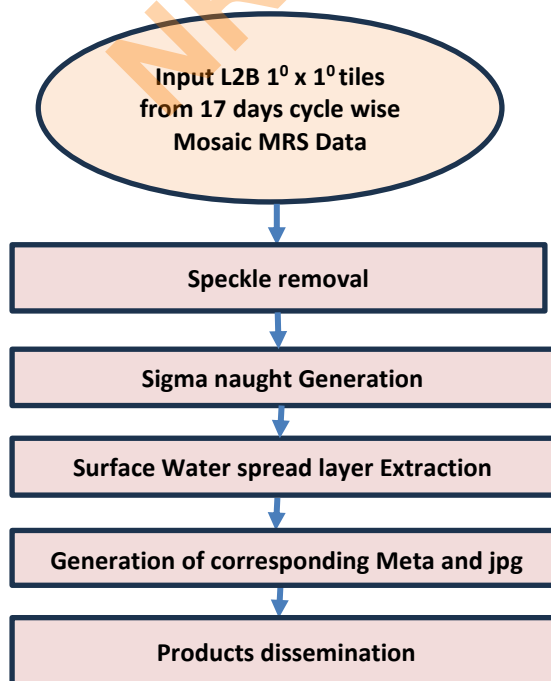

Figure: 1 Processing work flow for generation of surface water spread layer

Validation:

In pixel level, the assessment is performed for all the scenes with near, mid and far ranges separately and then combined to see the applicability of this algorithm. It is observed that the users' accuracy is almost similar (84%-86%) along the range direction. However, the producers' accuracy is found to be higher in far range (67%) compared to the near range (50%). The omission error is observed to be more compared to the commission error in all the scenes. The Kappa coefficient varied between 0.63 and 0.74 from near to far range with an overall Kappa of 0.69 for the pixel level classification. Snapshots of sample surface water spread layers from the L2B tiles are as shown in the below figures: 2,3,4.
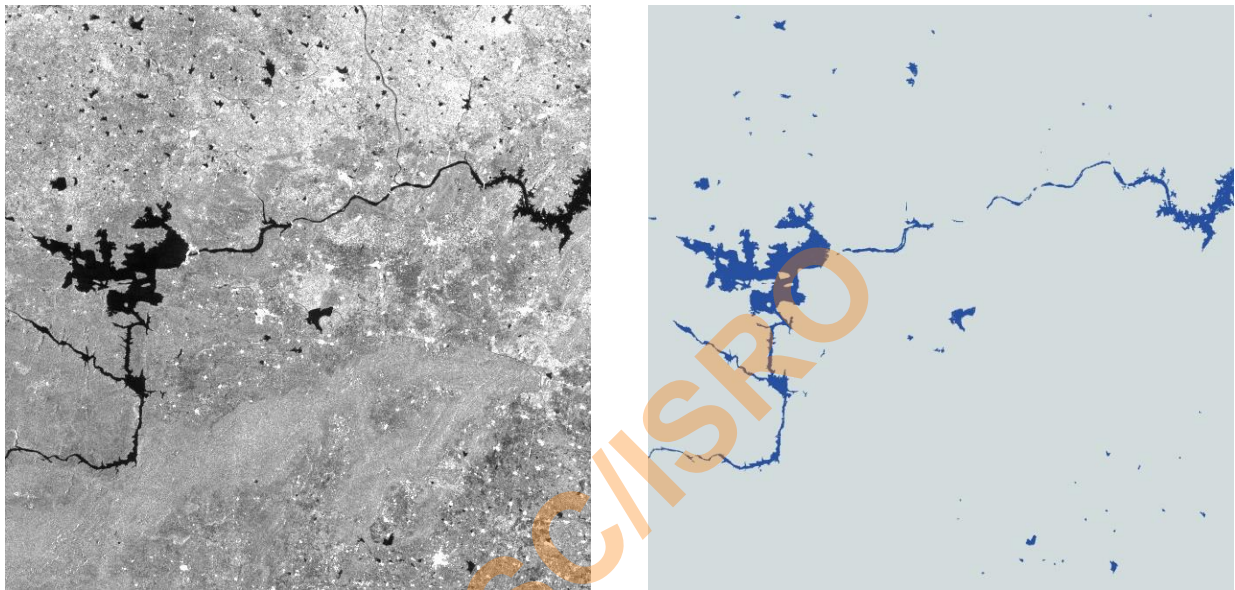

Figure: 2 – Surface water spread layer extracted from EOS-04 MRS data for the 1deg X 1deg tile N16E079 mission cycle-55 (26SEP2024 to 12OCT2024)
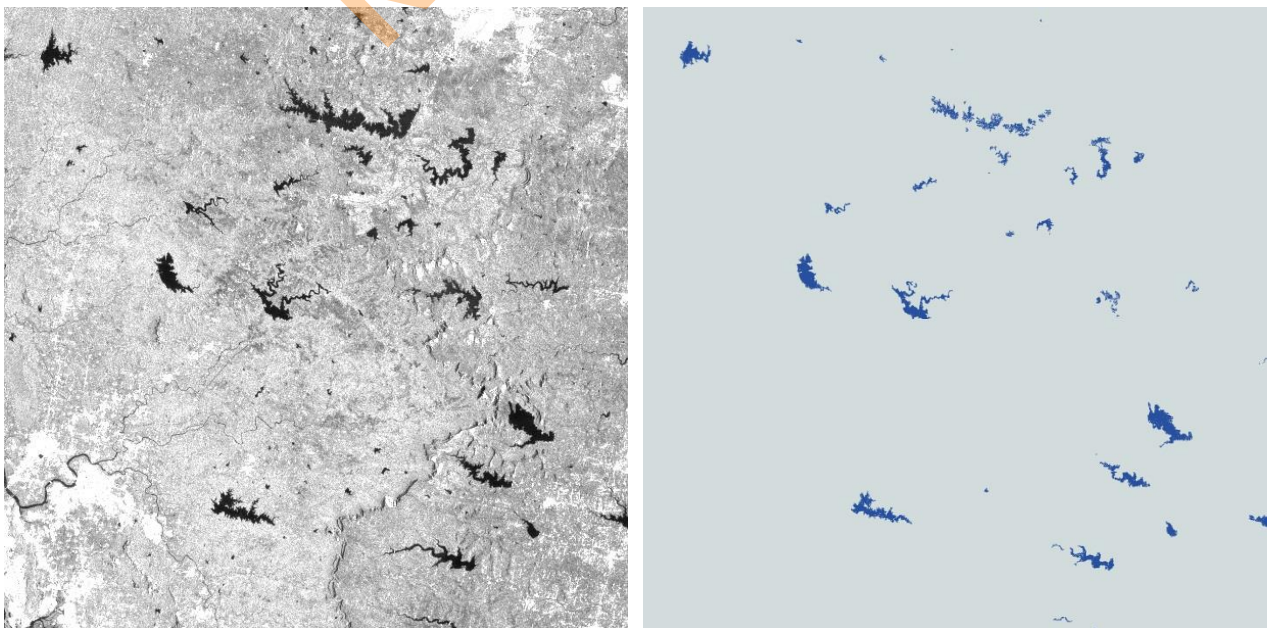

Figure: 3 – Surface water spread layer extracted from EOS-04 MRS data for the 1deg X 1deg tile N19E073 mission cycle-55 (26SEP2024 to 12OCT2024)
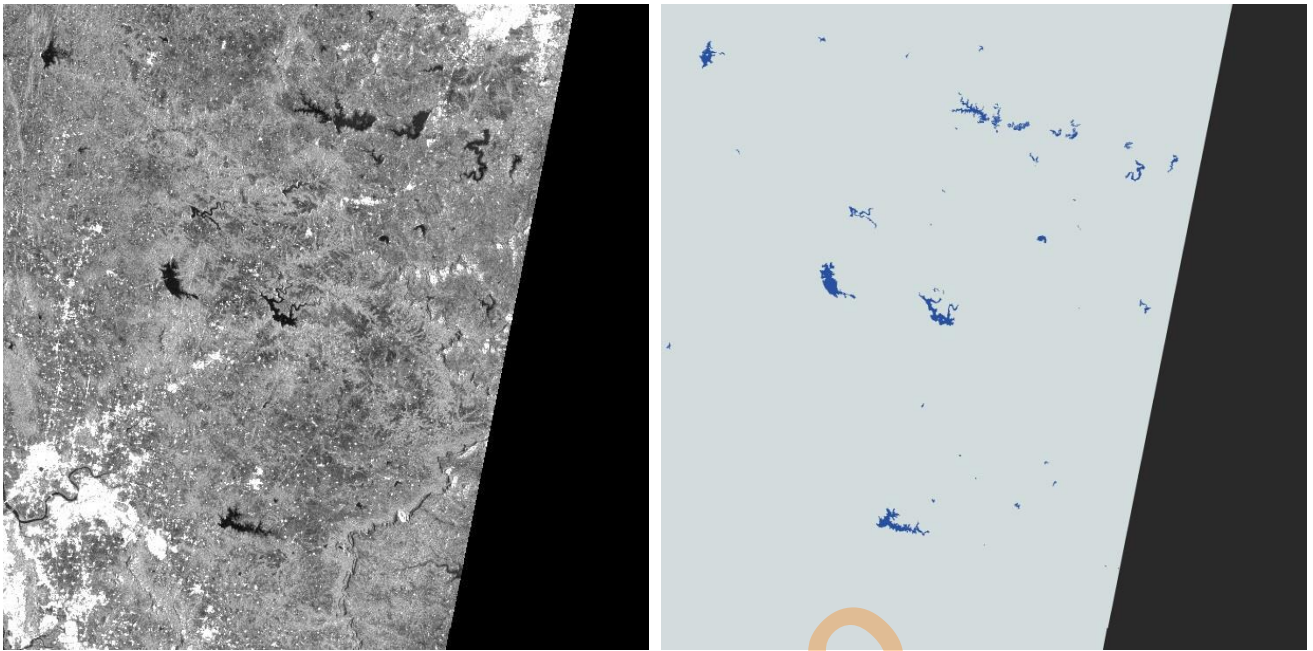
Figure: 4 – Surface water spread layer extracted from EOS-04 MRS data for the 1deg X 1deg tile N19E073 mission cycle-47 (13MAY2024 to 29MAY2024)

References

1. Water layer Extraction from EOS-04 MRS data. Algorithm Theoretical Basis Document, NRSC-RSA WATER RE-WRID-SEP 2022-TR-0002095-V1.0.
2. EOS-04 Data Products Formats (July 2023) Version 1.2.4.