Procedure of creating the NovaSAR-1 Australia National Mosaic

Zheng-Shu Zhou, Suzanne Furby, Xiaoliang Wu

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Introduction

The NovaSAR-1 Australia National Mosaic is an amalgamation of 349 NovaSAR-1 S-band radar images acquired between 2020 and 2023 in tri-polarisation mode (HH, VV, HV) from descending-pass orbits. CSIRO does not recommend the NovaSAR-1 Australia National Mosaic for detailed quantitative analysis, but rather as a qualitative reconnaissance product for exploring relative variations of S-band radar backscatter across large spatial areas in Australia.

The NovaSAR-1 Australian National Mosaic was created using the following procedure:

1. Discovered all available NovaSAR-1 acquisitions between 2020 and 2023 in tri-polarisation mode (HH, VV, HV) from descending orbital passes and both right- and left-looking viewing geometries.

2. Processed the discovered images to generate Normalised Radar Backscatter (NRB) products as per the CEOS analysis ready data (ARD) specification. Pixel values are amplitudes stored as UINT16 data types.

3. Manual quality check of all NRB products to remove those with obvious geometric issues.

4. Manual quality check of remaining NRB products to remove those with radiometric errors and significant radiometric variations based on a preliminary virtual mosaic.

5. Following these quality checks, 349 NRB products were selected for maximum national coverage based on a score derived from a combination of acquisition parameters, optimal seasonality and image quality, and minimising the overall number of acquisitions used in areas of overlap of the candidate images.

6. Edge trimming was applied to all selected candidate images to remove border effects.

7. Each of the three individual polarisation channels (HH, VV, HV) within the 349 NRB products were signal-balanced through minimising the differences in overlapping regions. The differences among overlaps are modelled using a third order 2D polynomial (10 coefficients per channel per image), and

8. A final logarithm transformation was applied to make the composite mosaic more visually appealing before merging the three signal-balanced polarisation channels into tri-pol images

9. The national mosaic was created using a bespoke mosaicking algorithm that selects pixels based on the scores derived in step 5.

10.   An acquisition ID index image was created accordingly, that records the NovaSAR-1 acquisition ID that data is pulled from for each pixel.

N.B: Because a polarisation independent signal-balancing process and a logarithmic transformation have been applied to all NovaSAR-1 source images used, CSIRO does not recommend the NovaSAR-1 Australia National Mosaic for detailed quantitative analysis that involves interrogating the pixel amplitudes. Users seeking to undertake this kind of quantitative analysis should obtain the source NovaSAR-1 imagery for themselves from the NovaSAR-1 National Facility data hub. CSIRO suggests that the NovaSAR-1 Australia National Mosaic is useful as a qualitative reconnaissance product for exploring relative variations of S-band radar backscatter across large spatial areas in Australia.
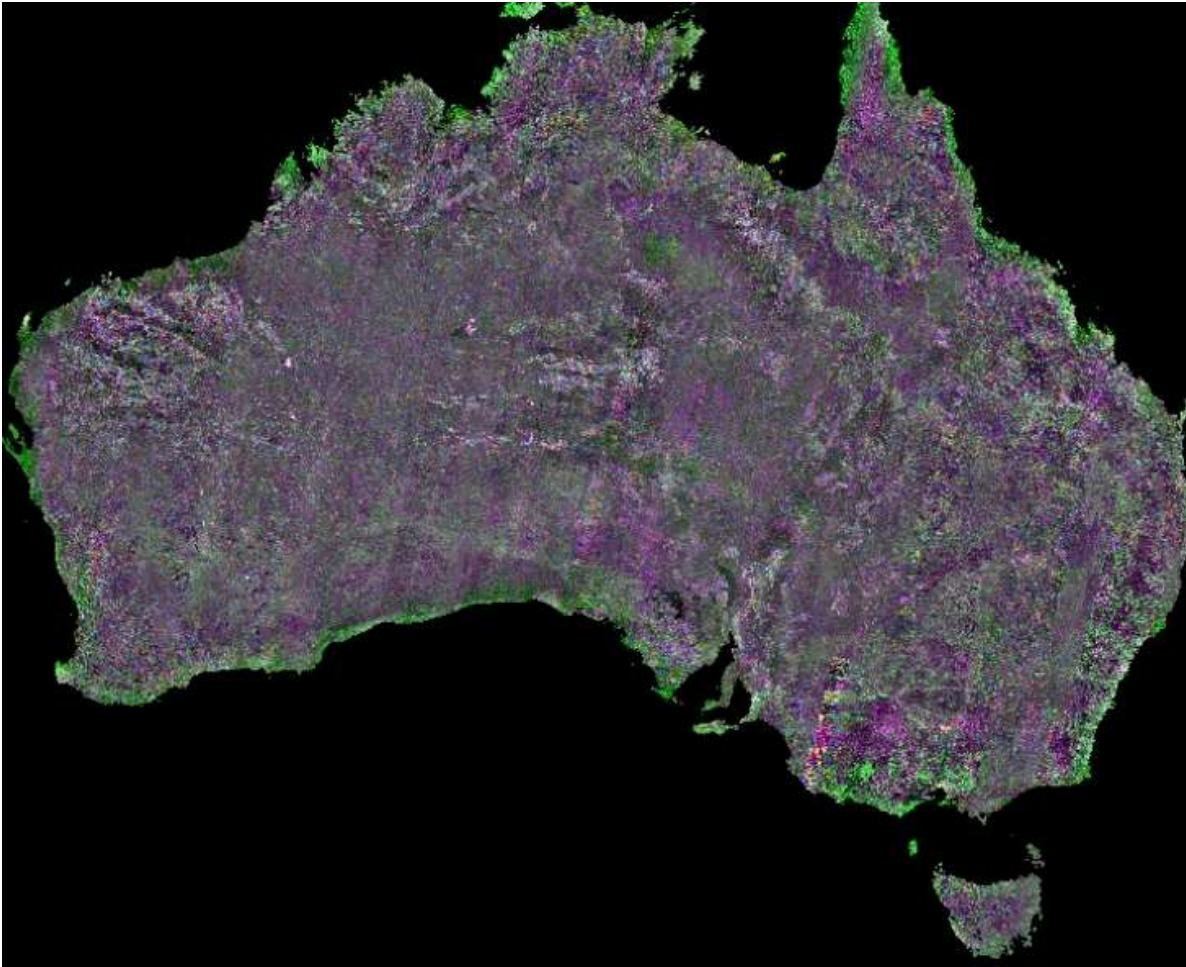

Image of the NovaSAR-1 National Mosaic

Related links

- About NovaSAR-1
- CSIRO NovaSAR-1 National Facility Datahub
- Request New NovaSAR-1 Image Tasking