

EVALUATION OF SAR RADIOMETRIC TERRAIN CORRECTION PRODUCTS OVER AUSTRALIA AND ANTARCTICA

Author(s):

Alex Bradley, Geoscience Australia, alex.bradley@ga.gov.au
Kimberlee Baldry, Geoscience Australia, kimberlee.baldry@ga.gov.au
Aman Chopra, Geoscience Australia, aman.chopra@ga.gov.au
Aaron OHehir, Geoscience Australia, aaron.ohahir@ga.gov.au
Alix Post, Geoscience Australia, alix.post@ga.gov.au
Jonathan Mettes, Geoscience Australia, jonathan.mettes@ga.gov.au
Jeremy Hooke, Geoscience Australia, jeremy.hooke@ga.gov.au
Fuqin Li, Geoscience Australia, fuqin.li@ga.gov.au

Abstract:

Building a Synthetic Aperture Radar (SAR) Earth Observation capability is a current focus for Geoscience Australia's Digital Earth Australia and Antarctica programs. The Committee on Earth Observation Satellites (CEOS) recommends the delivery of a normalised radiometrically terrain corrected Gamma Nought (γ_0) backscatter (NRB) product as Analysis Ready Data (ARD). Generating NRB is not straightforward, requiring complex geocoding of Single-Look Complex (SLC) files to ground coordinates, data processing to γ_0 backscatter, geometric terrain correction and radiometric terrain correction. The GAMMA and SNAP processing software packages are widely used to generate SAR NRB ARD. These software packages provide the backend processing to modern SAR NRB ARD workflows including the S1_NRB (SNAP), PyroSAR (SNAP or GAMMA) and the Alaskan Satellite Facility's Hyp3 (GAMMA) software packages. Recently, a new area-based projection method has been developed by the NASA Jet Propulsion Laboratory, which aims to improve the accuracy and speed of the geocoding and radiometric terrain correction processes. This method has been implemented in the InSAR Scientific Computing Environment (ISCE-3) processing software and a new OPERA-RTC (ISCE-3) ARD workflow which will be used to produce ARD from the upcoming NASA-ISRO SAR (NISAR) mission.

In this presentation we introduce an evaluation framework to assess various ARD workflows based on the radiometric, geometric, and geolocation quality of NRB products. The framework builds on previous evaluation studies and links quantitative metrics to qualitative differences in processing methodology. Our evaluation enables users to rationalise observed differences between products, building trust in the quality of ARD products. We will present our assessment of the quality of NRB ARD products for Australia and Antarctica built on GAMMA, SNAP and ISCE-3 workflows, including the application of the atmospheric corrections from the Extended Timing Annotation Dataset (ETAD). Our results demonstrate the benefits provided by a new area-based projection method and ETAD products in an Australian and Antarctic context. This forms a reproducible rationale for our Digital Earth programs when implementing continental-scale processing pipelines for the Sentinel-1 and forthcoming NISAR missions.