Comparative study of point target response and radiometric calibration of SLC, Ground-range and Geo-referenced products

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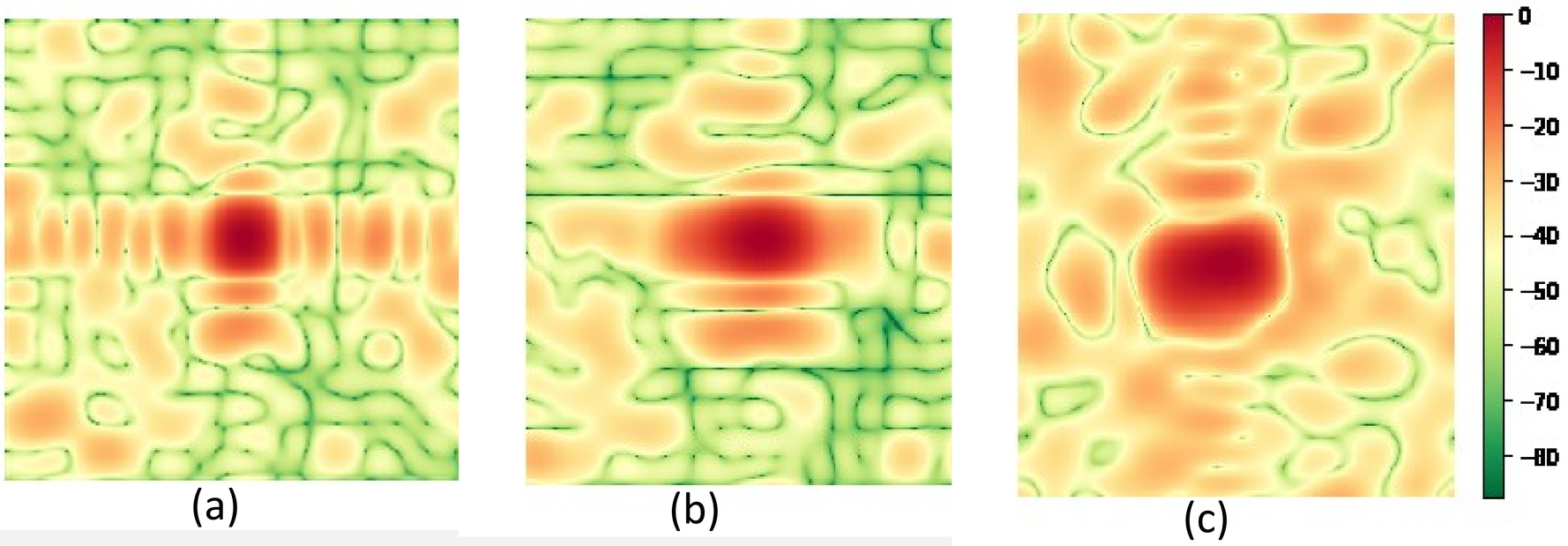
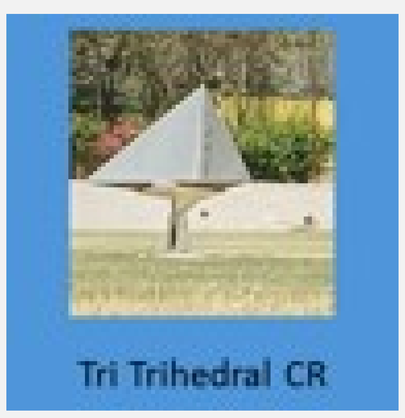
- Absolute radiometry in SAR images degraded due to various factors, e.g, degradation or modification in system parameters, center freq. modification,, burst control timings, ionospheric effects, RF interference etc.
- Thus absolute calibration of SAR products is essential for effective uses. The paper discusses the comparative analysis of impulse response in SLC, GRD and L2 (Geo-referenced) products.
- Due to different geometry point target response is different in different types of products. In GRD the response is stretched or compressed in cross track direction depending on whether the point target (CR) is right or left to center. In L2 due to rotation followed by flips in one or both (range/azimuth) the directions the IR parameters like PSLR/ISLR can not be analyzed however radiometric accuracy still can be established.



(a) (b) (c)

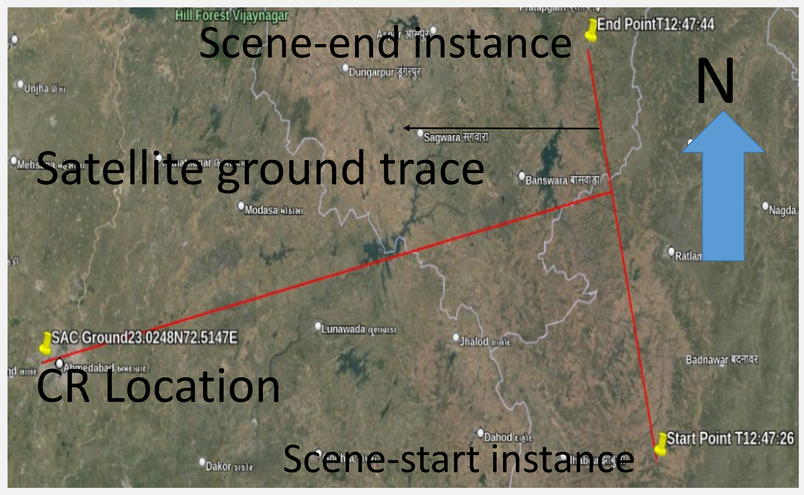
2D impulse response using triangular trihedral CR (a) SLC (b) GRD (c) L2)

- We first pan to calibrate the SLC using the reference RCS, further, the radiometries of GRD and SLC can be relatively established with respect to SLC.
- The reference or theoretical RCS of the Tri-CR is computed using the following formula $\sigma_{ref} = (4/3)\ \pi\ a^4 / \lambda^2$. Using this the calibration constant is computed as $K_\sigma = \varepsilon_p * \sin(i_p) / \sigma_{ref}$, where ε_p is the clutter removed energy and i_p is the incidence angle.



Tri. Trihed. CR

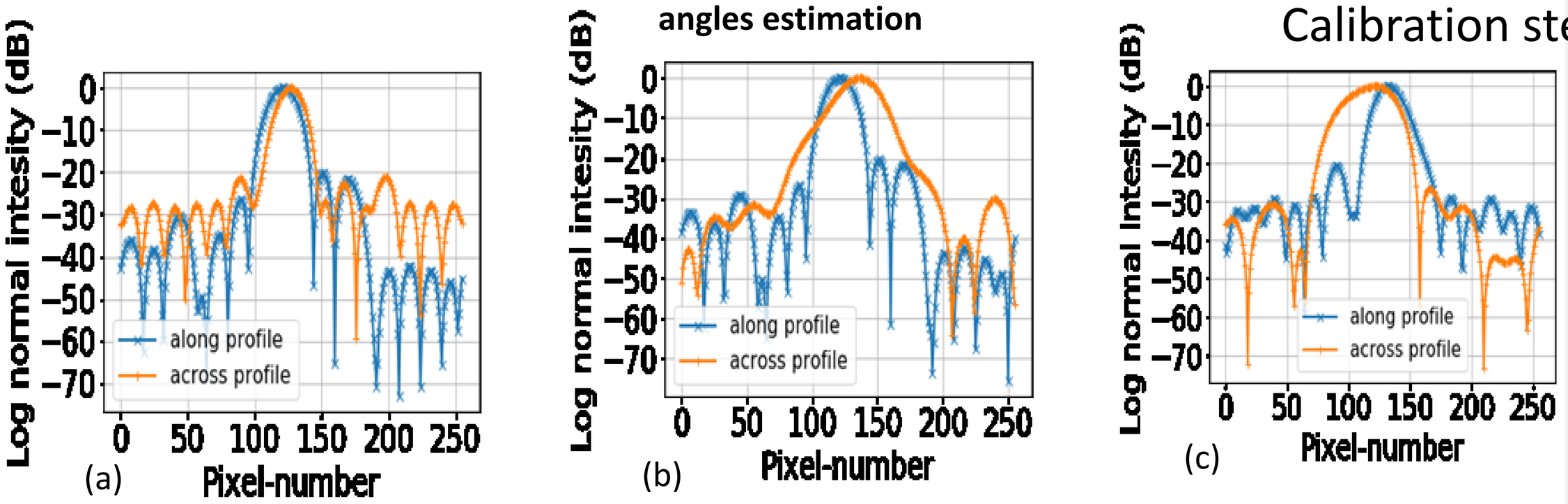
Sq. Trihed. CR



Geometry for alignment angles estimation

- Uniform site selection and CR alignment angles (elevation/azimuth) estimation using OAT and ground trace
- Estimation of theoretical RCS of CR
- Computation of clutter removed energy in dB from image as per CEOS guidelines
- Interpolation for incidence angle using the grid.
- Computation of calibration constant (K_σ)
- Regeneration of calibrated image using updated Kσ

Calibration steps



Impulse response of point-target in Range (across)/Azimuth (along) directions
(a) SLC (b) GRD (c) L2