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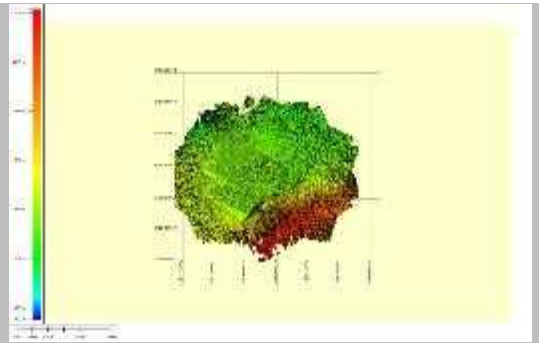

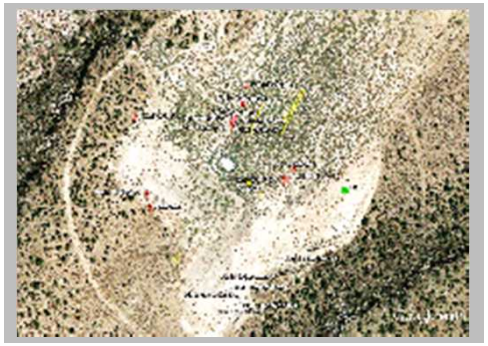

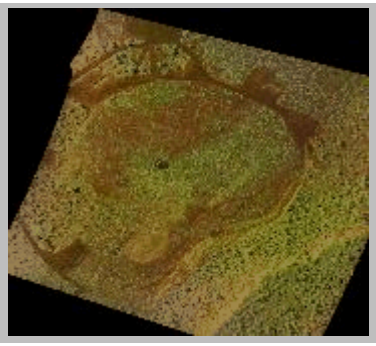

Utility of Characterizing and Monitoring Suspected Underground Nuclear Sites with VideoSAR

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Sandia National Laboratories

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U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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Background

How can unique collection geometries offered by airborne synthetic aperture radar (SAR) be used to monitor a suspected nuclear test site?

The site: An old nuclear test site on Nevada National Security Site.

The program: Underground Nuclear Explosion Signature Experiment (UNESE) funded by DOE NA-22.

The sensor: Sandia National Laboratories (SNL)-built SARs.

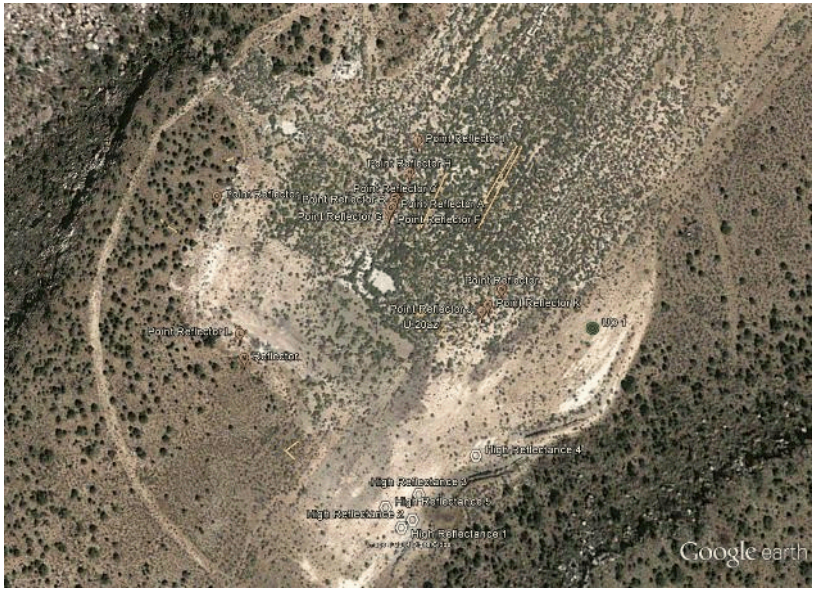
Collection mode: VideoSAR - A continuous spotlight collection with a collection path that inscribes the site of interest.

Airborne Synthetic Aperture RADAR (SAR) Monitoring: VideoSAR

Two different SARs
1. Ku-Band (16.8 GHz) 8-inch resolution VV polarization
2. X-Band (9.6 GHz), 4-inch resolution fully-polarimetric

Ku-Band “movie” of the UNESE test site.

Cultural artifacts sensed by Ku-Band VideoSAR collection stored as KMZ files and displayed on Google Earth© Items: old cables, pipes, fencing, and other man-made objects. Excellent agreement with ground truth.

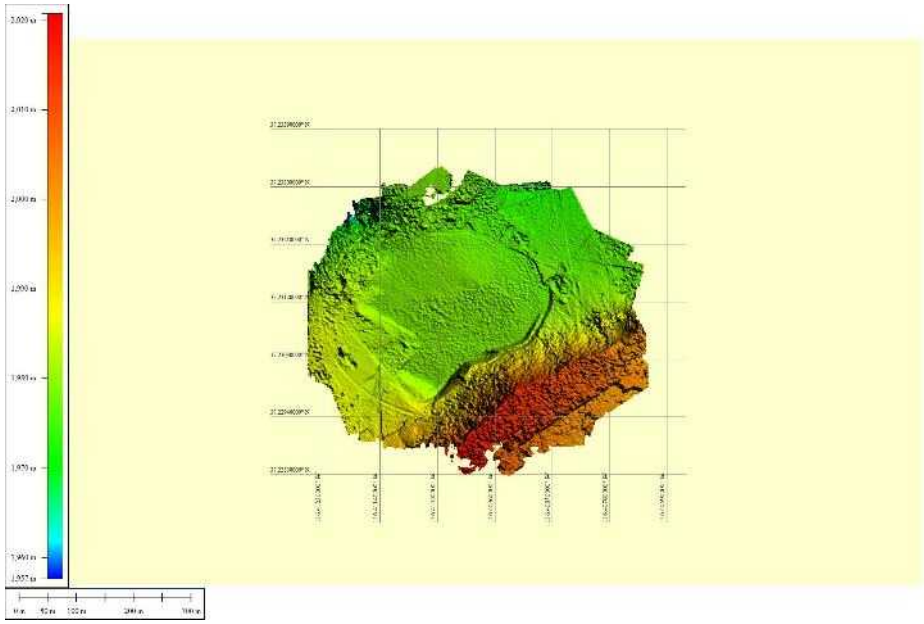


SAR detected cultural artifacts displayed on Google Earth©

VideoSAR Characterization: Digital Elevation Maps

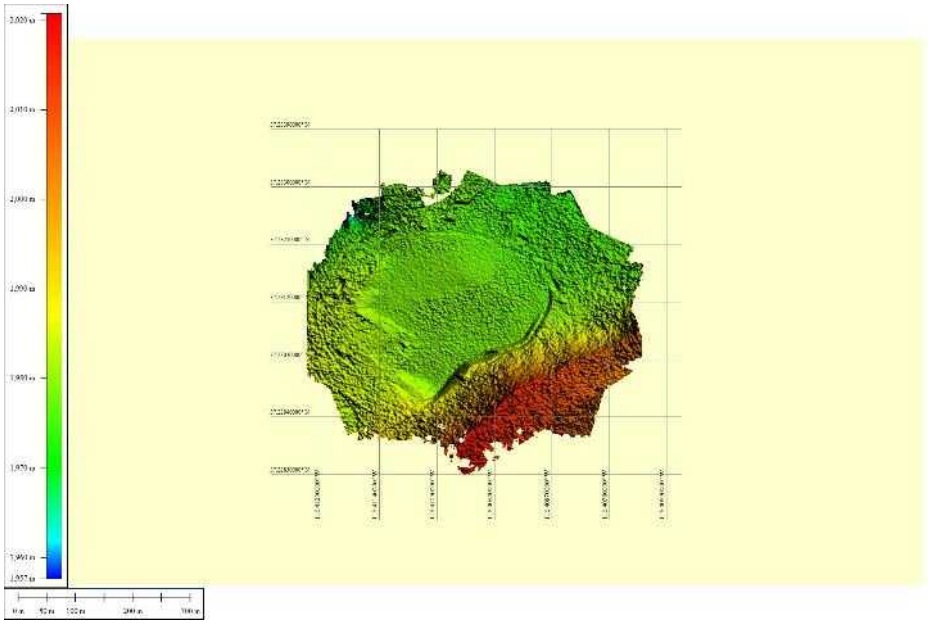
Continuous, spotlight collection allows information to be gathered from all aspect angles, eliminating shadows.

Two-pass interferometry



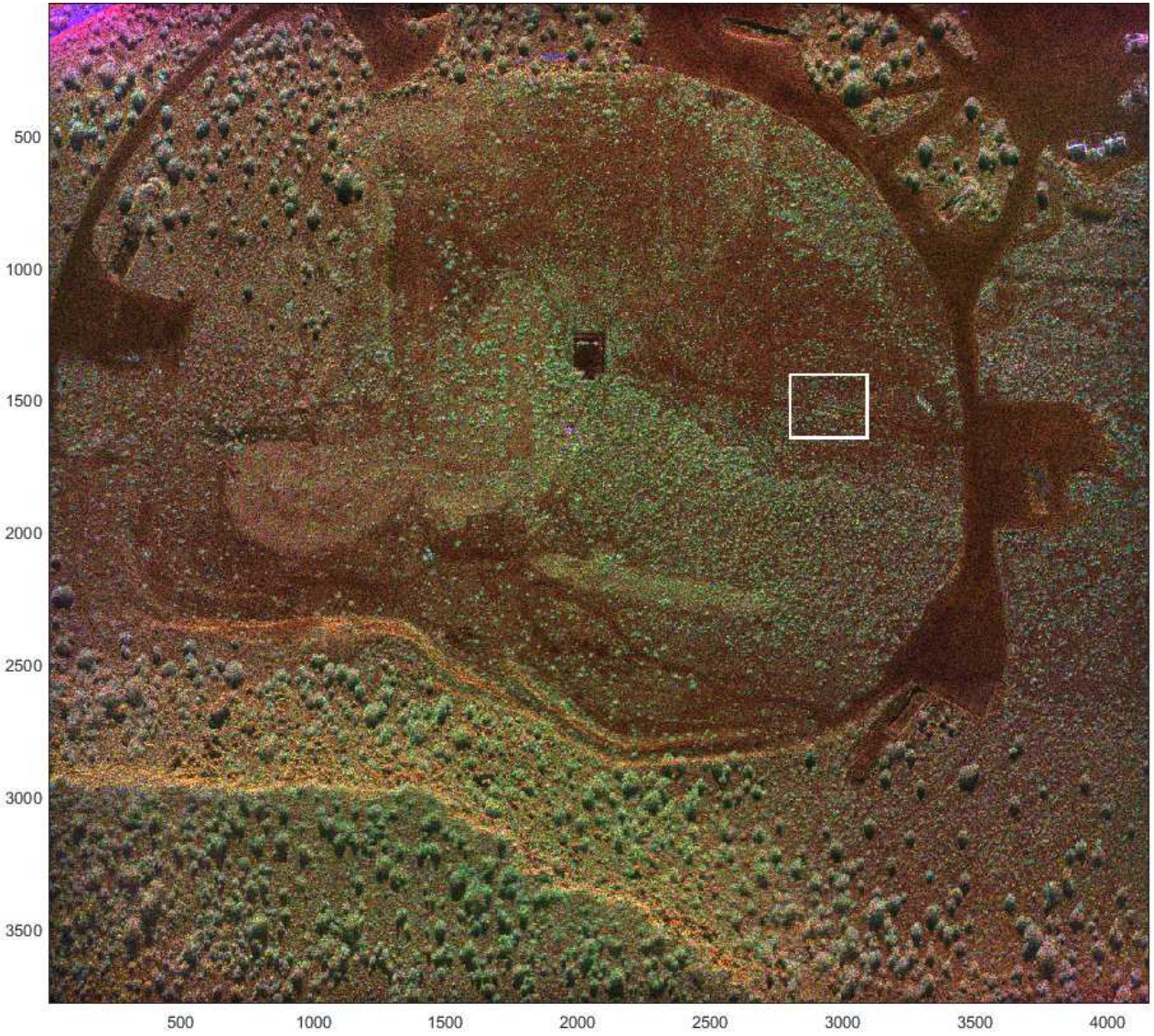
Eight interferometric DEMs combined for final DEM on 0.5-m post spacing

Single-pass stereo

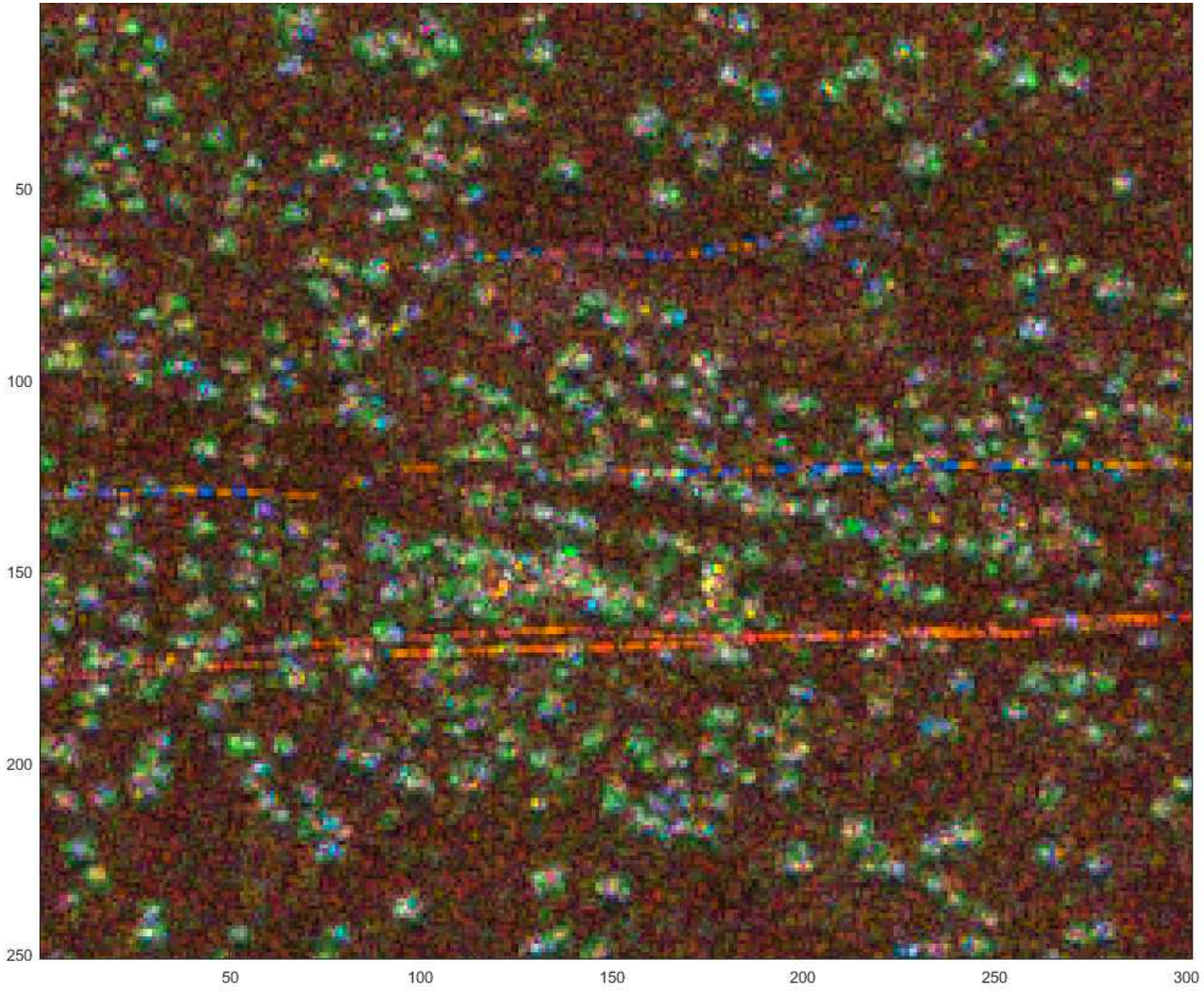


Eight stereo DEMs combined for final DEM on 0.5-m post spacing

Polarimetric SAR image



Polarimetric SAR image



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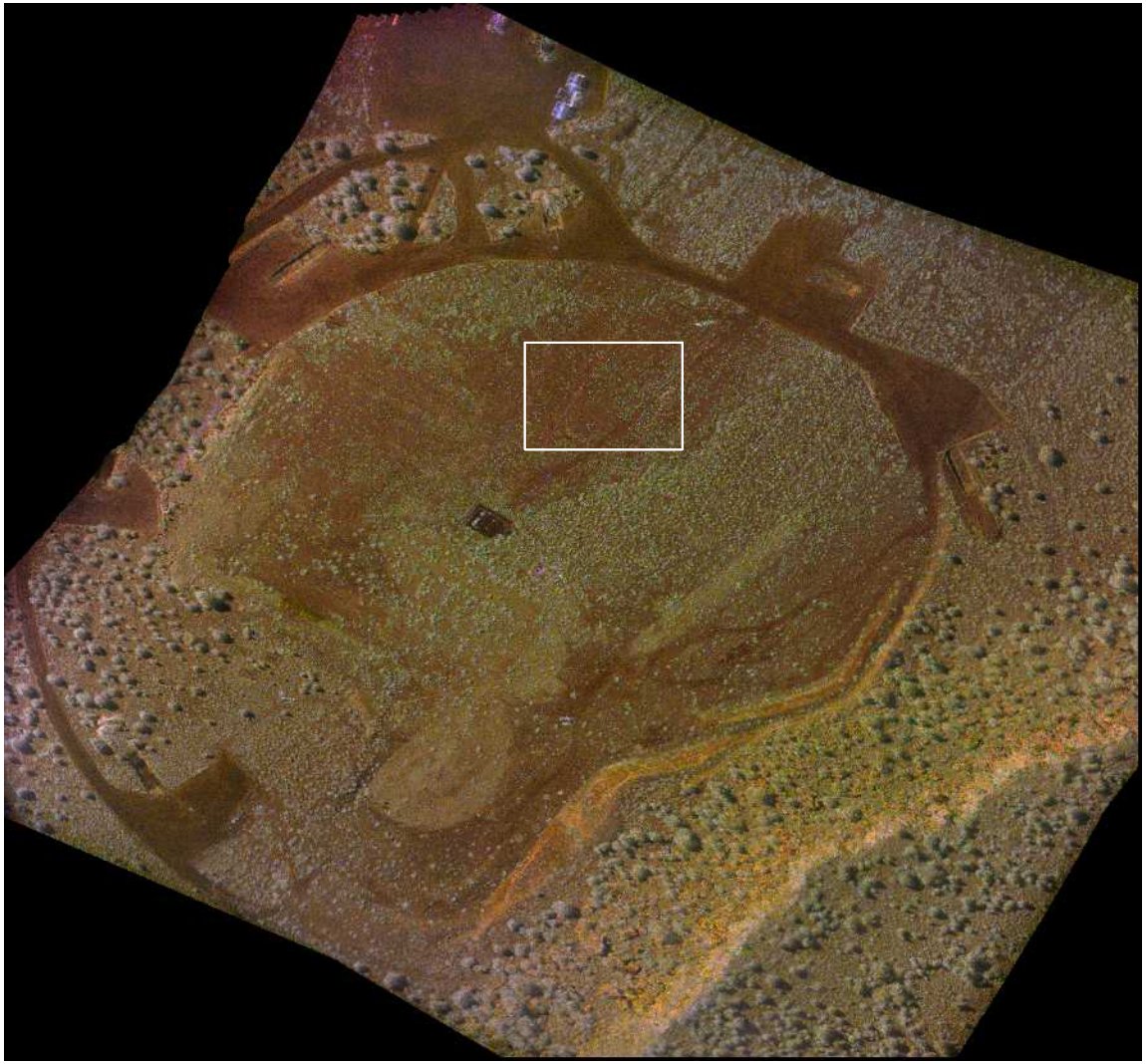
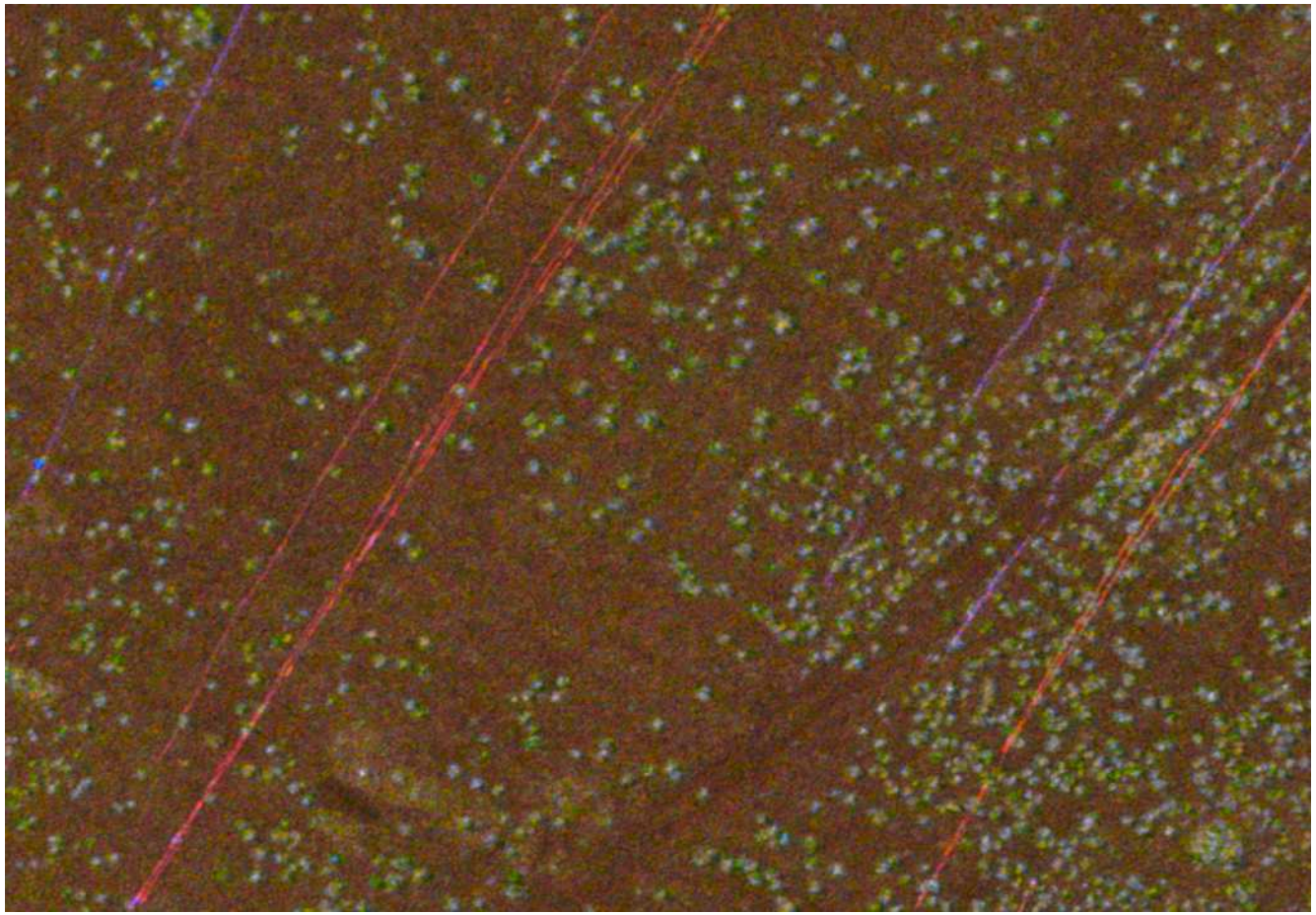


Polarimetric SAR image



Conclusion

- Unique collection geometries of airborne SAR with polarimetric capabilities can be used to locate cultural artifacts associated with nuclear test sites and to create digital elevation maps.

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