

Displacement Mapping

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PS-InSAR Displacement Mapping Part I Overview



Persistent Scatterer Interferometric Synthetic Aperture Radar

Permanent Scatterers
Distributed Scatterers
Time-Series DInSAR
SBAS (Small Baseline Analysis)
etc



PS-InSAR Technology

- To average-out system noise, estimate DEM errors and suppress atmospheric effects requires 20-40 appropriate images.
- To select proper images, optimize software parameters and tune the processing regimen requires an expert Analyst.
- Previously, planning such a project, performing analysis and preparing a report typically cost \$50,000 to \$150,000 per project.
- Software alone is NOT a feasible solution to persons and facilities who need radar data-derived Information and have no desire to develop inhouse expertise in Advanced T-S DInSAR analysis.



PS-InSAR Technology in IMAGINE

- A very easy, cost-effective way for anyone is to use the existing IMAGINE DInSAR Wizard Workflow to monitor regions of interest for "hotspots".
- Once located, an IMAGINE "DInSAR as a Service" User Interface can be used to delineate the hotspot AOI and submit a request for an in-depth analysis service.
- A cost estimate based on size of area and type of Service will be developed by Hexagon and Planetek.
- When Service is completed, Product Information is delivered via the Hexagon M.App Chest.
- Product Information can then be evaluated and exploited within IMAGINE with appropriate Tools.





PS-InSAR has 2 **IMAGINE** access points; Radar Utilities and Radar Interferometry





Service Request GUI is fully integrated into IMAGINE Viewer



Service Request GUI is fully integrated into IMAGINE Viewer



Applications

- > Hydrocarbon Extraction
- ➤ Mining
- Water Aquifer Monitoring
- City Services Infrastructure
- High-Speed Rail
- Motorways Monitoring
- > Critical Infrastructure (e.g. Dams, Power Plants)
- Tunneling
- Earthquake Prediction
- Landslide Prediction





Hydrocarbon Extraction



- Subsidence is not a simple circular phenomena
- A sparse array of point-wise detectors has no chance of capturing the actual displacement fields
- A uniform integrated area coverage is required to "get the picture"



Hydrocarbon Extraction



- Unremediated displacement results in damage
- Damage to infrastructure and the environment, injury to personnel, lost production
- \$\$\$\$\$\$



Mining



WHAT?

 Monitoring subsidence induced by the mining and extraction of fluids from the subsoil

WHO?

- Mining operators
- Public administration authorizing mining activities

WHY?

 Monitor the stability of urban areas and infrastructures above the mining areas

WHEN?

Monthly update



Mining









Subsidence Induced by Mining Activities



Measured Mean Speed Over the Monitoring Period



City Services Infrastructure























Critical Infrastructure









PS-InSAR Subsidence Mapping Part II Aquifer Monitoring



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Got it!









x^R ∧ ^{8:59 AM} 3/25/2020 ₹





















hexagon.com



































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Displaceme

Displacement

Scatterer Code	Product	Orbit	Coherence (%)	Normalized Coherence (%)	Altitude (m)	Velocity * (mm/year)	Acceleration * (mm/year ²)
L06125P06141	PS	D	75	50	594.4	-21	20.5

* Period of interest: Global

Powered by Dark Sky

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ent Maps (mm)

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Displacement

Scallerer Code	Product	Ofbit	(%)	(%)	(m)	(mm/year)	(mm/year ²)
• L06125P06141	PS	D	75	50	594.4	-21	20.5

* Period of interest: Global

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PS	D	75	50	594.4	-21	20.5

* Period of interest: Global

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* Period of interest: Global

Powered by Dark Sky

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Displacement

, Arizona, United States of America [LAT: 33.835; LON: -113.4677]



No Rainfall More info Rainfall V

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Scatterer Code	Product	Orbit	Coherence (%)	Normalized Coherence (%)	Altitude (m)	Velocity * (mm/year)	Acceleration * (mm/year ²)
• L06162P05530	PS	D	84	68	614.1	-13	19.5
L06161P05537	PS	D	78	56	613.2	-14	18.6
• L06162P05529	PS	D	77	54	615.8	-13	23.4

* Period of interest: Global

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Displacement

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No Rainfall More info Rainfall V

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• L06162P05529	PS	D	77	54	615.8	-13	23.4

* Period of interest: Global

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-15 0 +15 1 1 1 1 (mm/year)





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Thank You

