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Subsidence over Hampton Roads: SqueeSAR Cosmo-SkyMed Analysis

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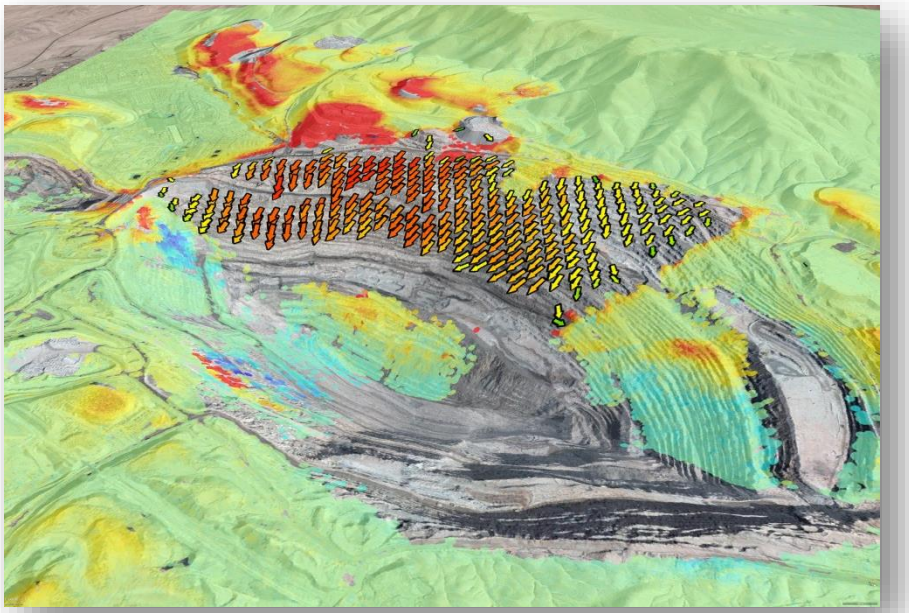
What is InSAR?

(Interferometric Synthetic Aperture Radar)

Remote sensing technique for measuring ground deformation:

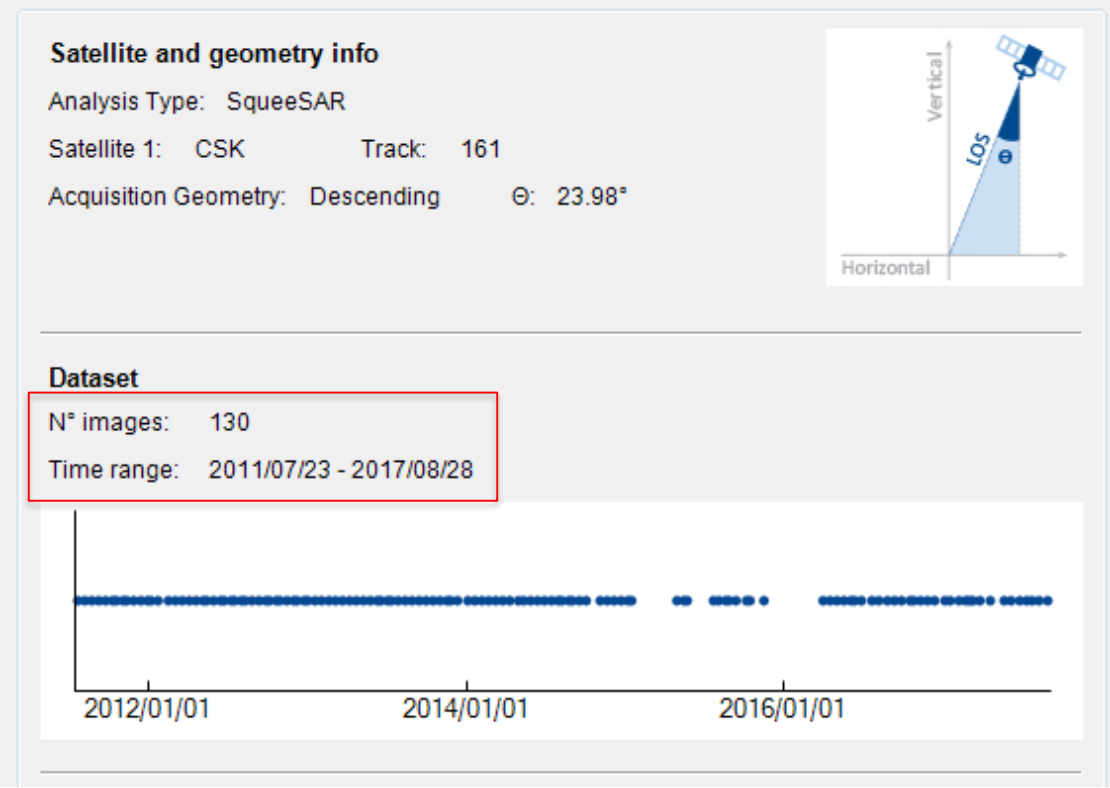
- Using data from radar satellites
- Without the need to install instrumentation on the ground



Summary of Analysis

- An InSAR analysis was carried out over Hampton Roads, Virginia using radar imagery collected from 2011 to present.
- The objective of this project was to quantify subsidence rates with sub-millimetric accuracy and help to identify coastal areas most vulnerable to flooding/sea level rise.
- This presentation summarizes the initial results obtained over this area.

Imagery

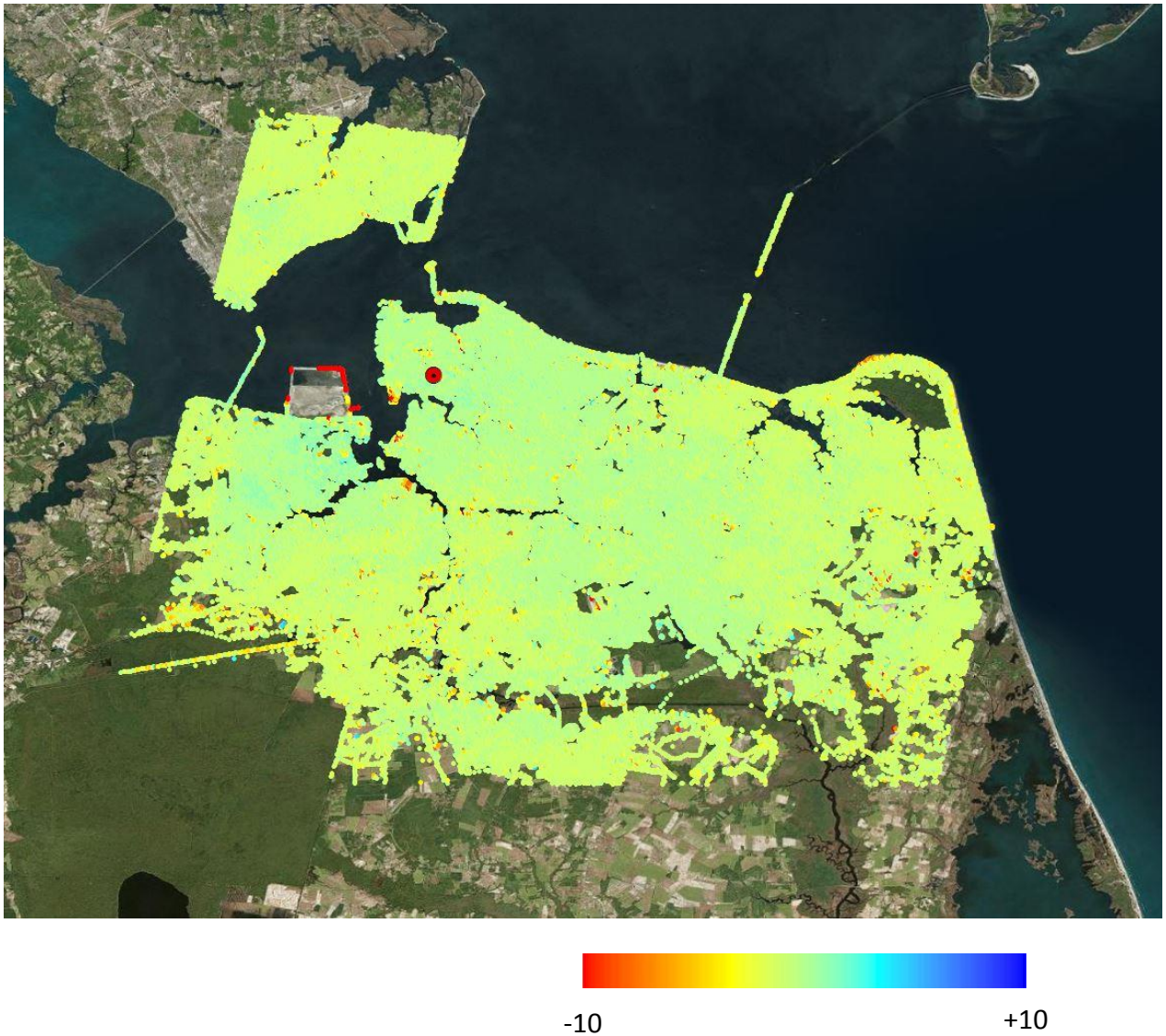


- 130 Cosmo-SkyMed images analyzed over 6 years (2011 – 2017)
- **4,176,201 measurement points identified** (from natural features)

Area of Interest

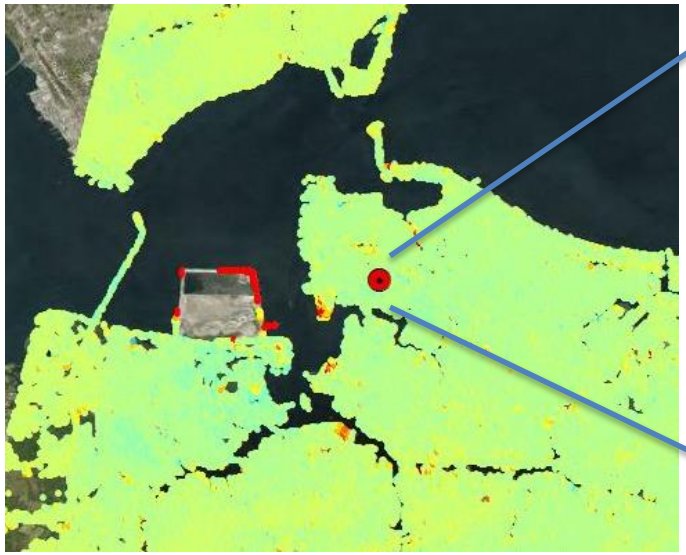
- Hampton Roads, Virginia
- The full area processed was approximately 2,000 km^2 in size

Displacement Rates



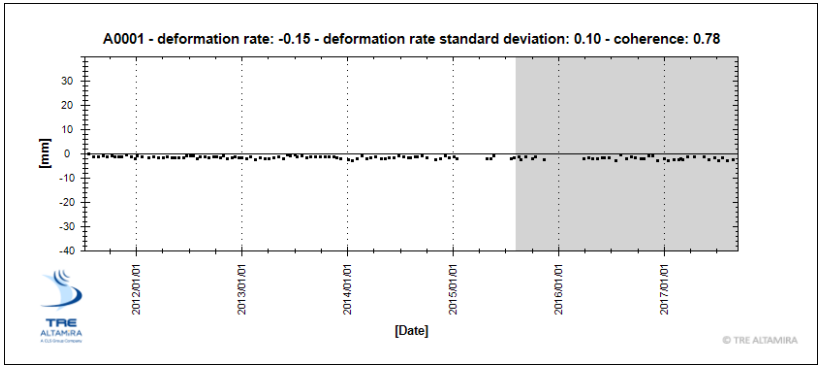
- Average displacement rate **-1.01 mm/year**
- The range of displacement rates identified was -48.9 to +16.1 mm/year

Reference Point

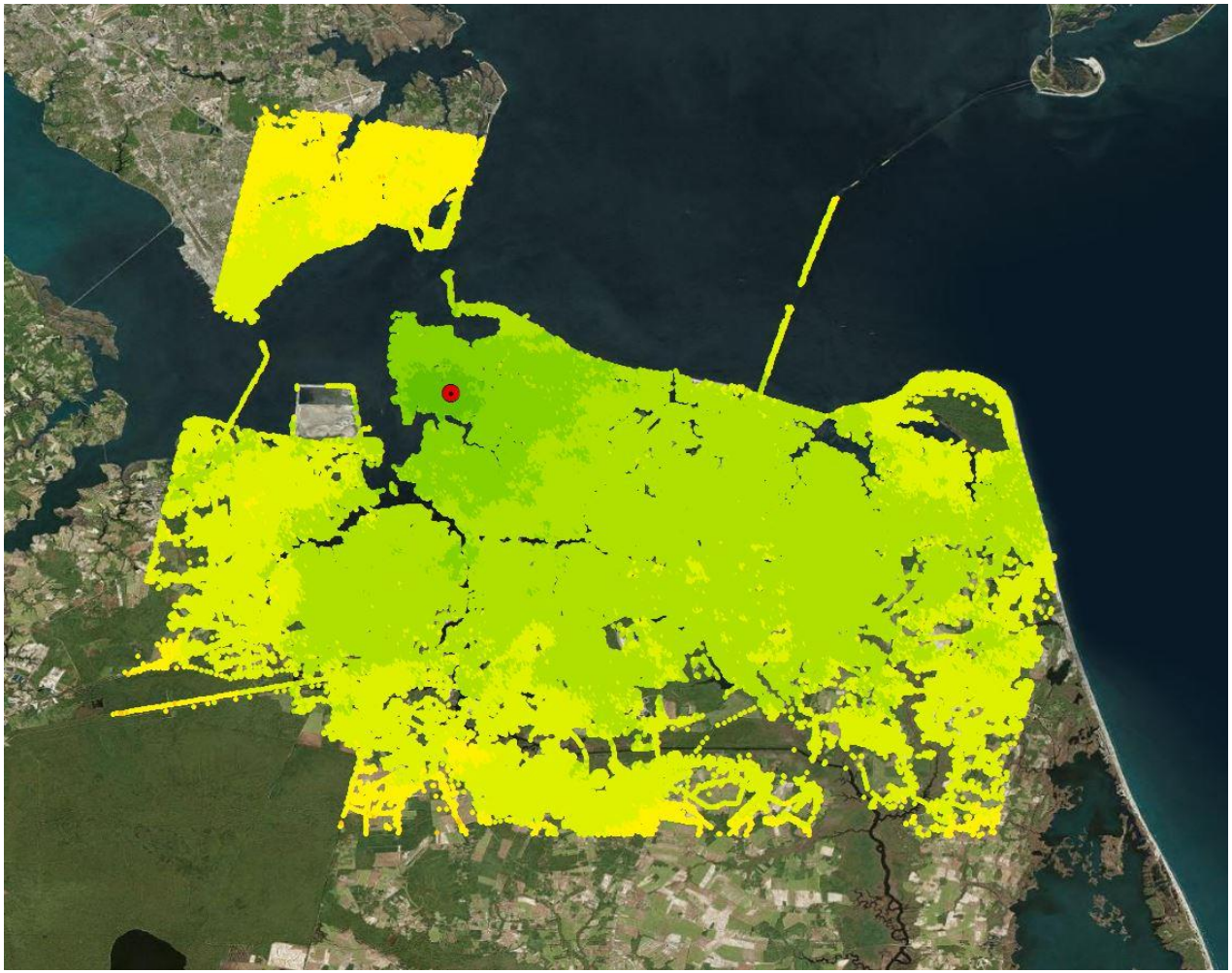


-10 +10

- The reference point was selected based on processing algorithm
- Conversion to absolute movement rates is possible with GPS control

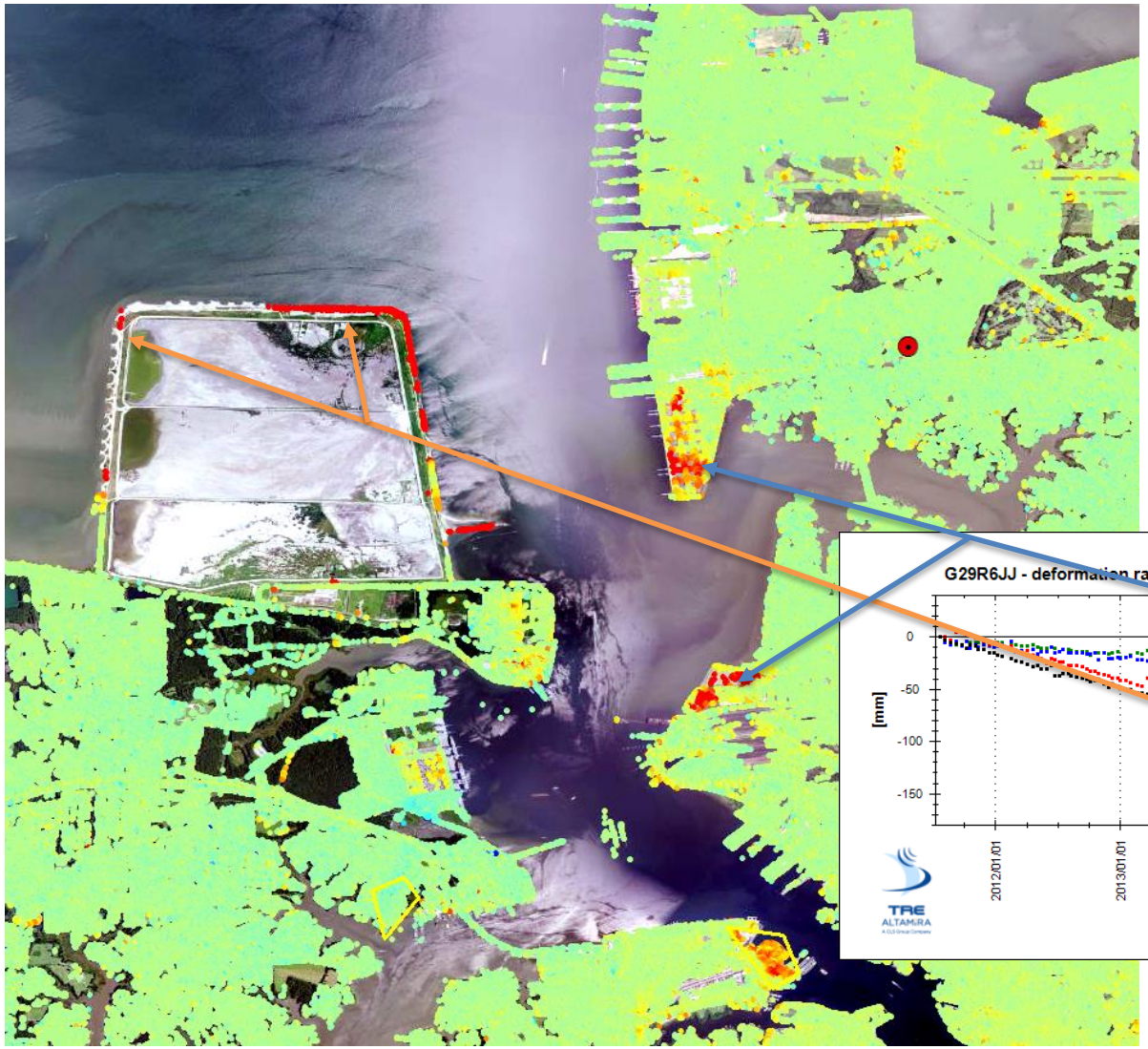


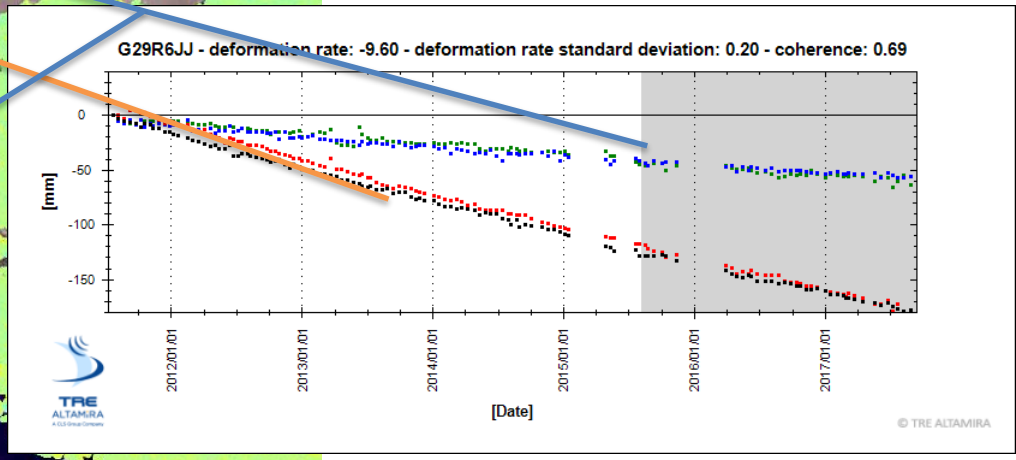
Displacement Rate Standard Deviation



- Average standard deviation value of measured rates **±0.34 mm/year**
- The range of standard deviation values identified was ±0 to ±0.6 mm/year

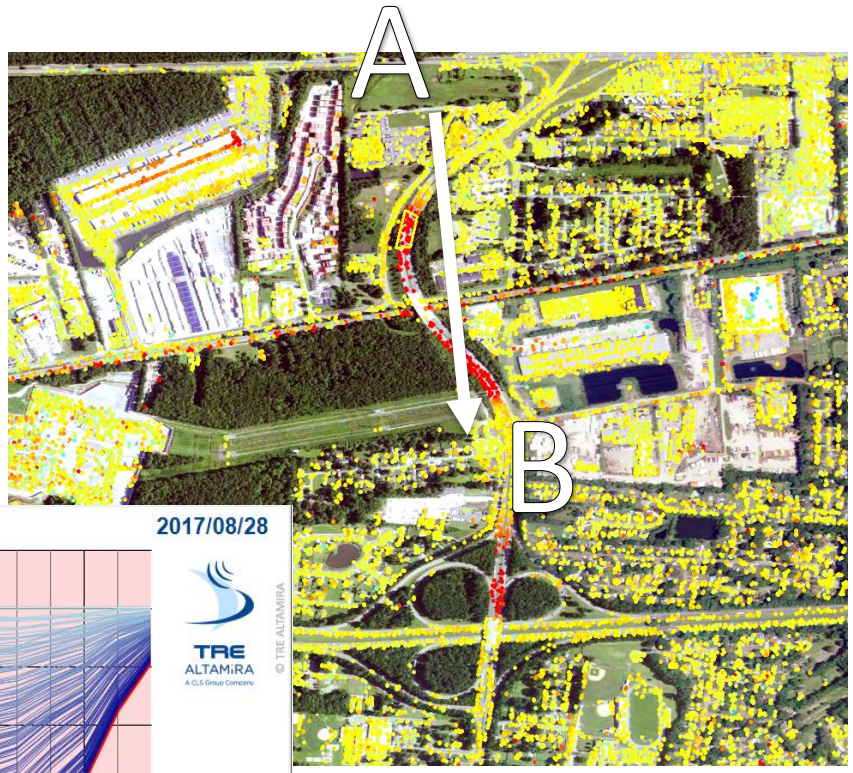
Maximum Subsidence – Craney Island and Port

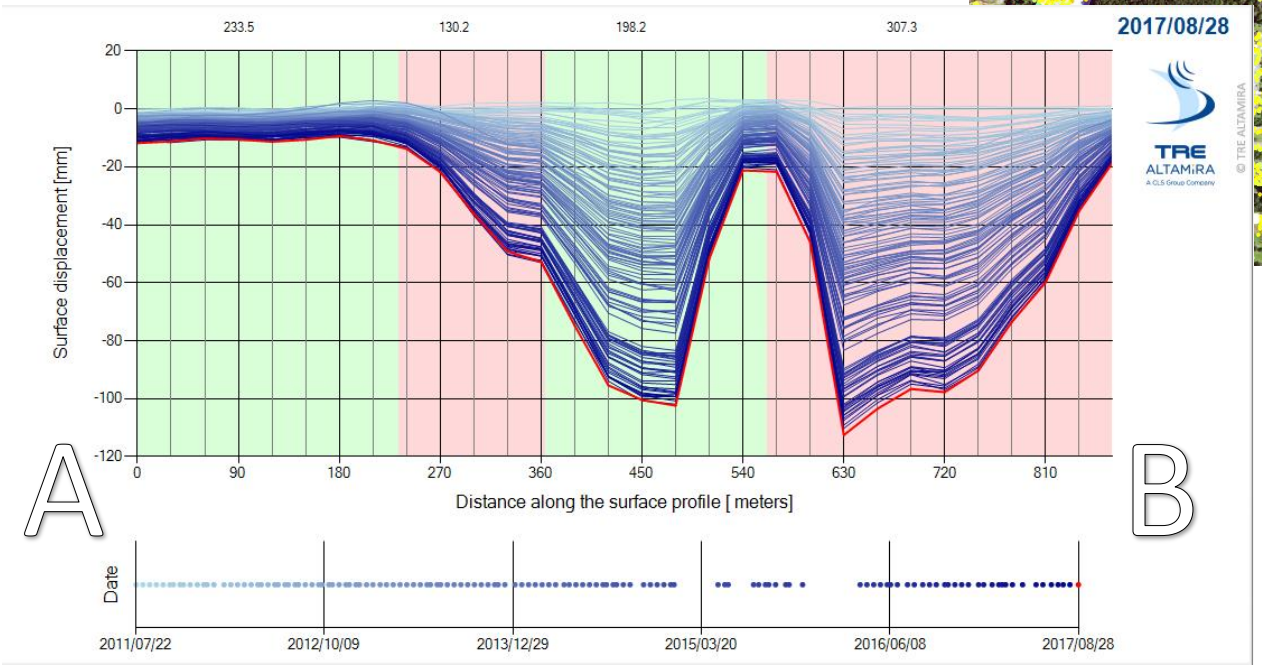




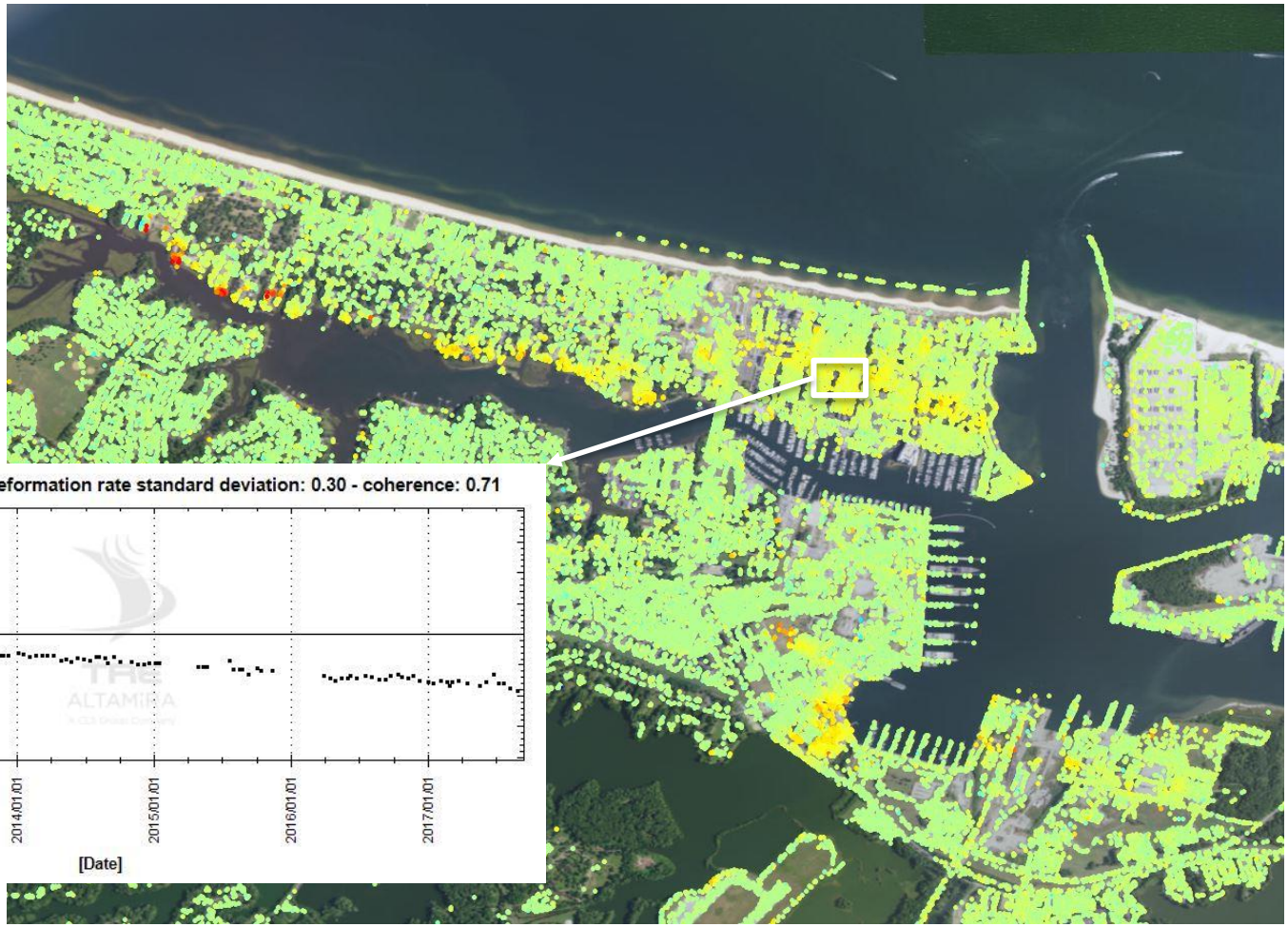
Subsiding Roads, Bridges, Overpasses

- Bridge approach on George Washington Highway over Yadkin Road



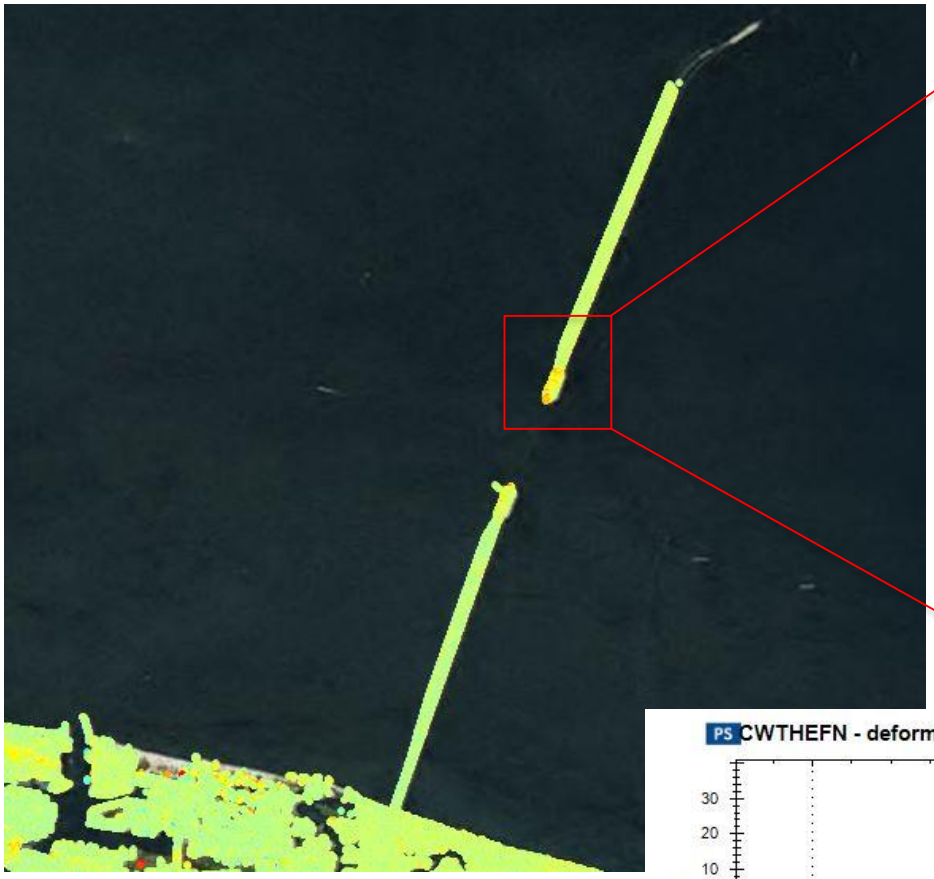


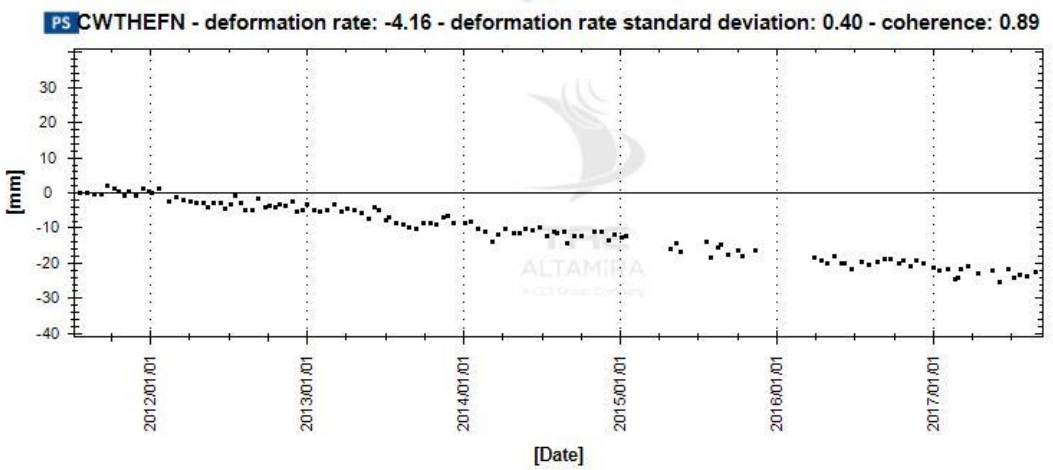
East Ocean View Development



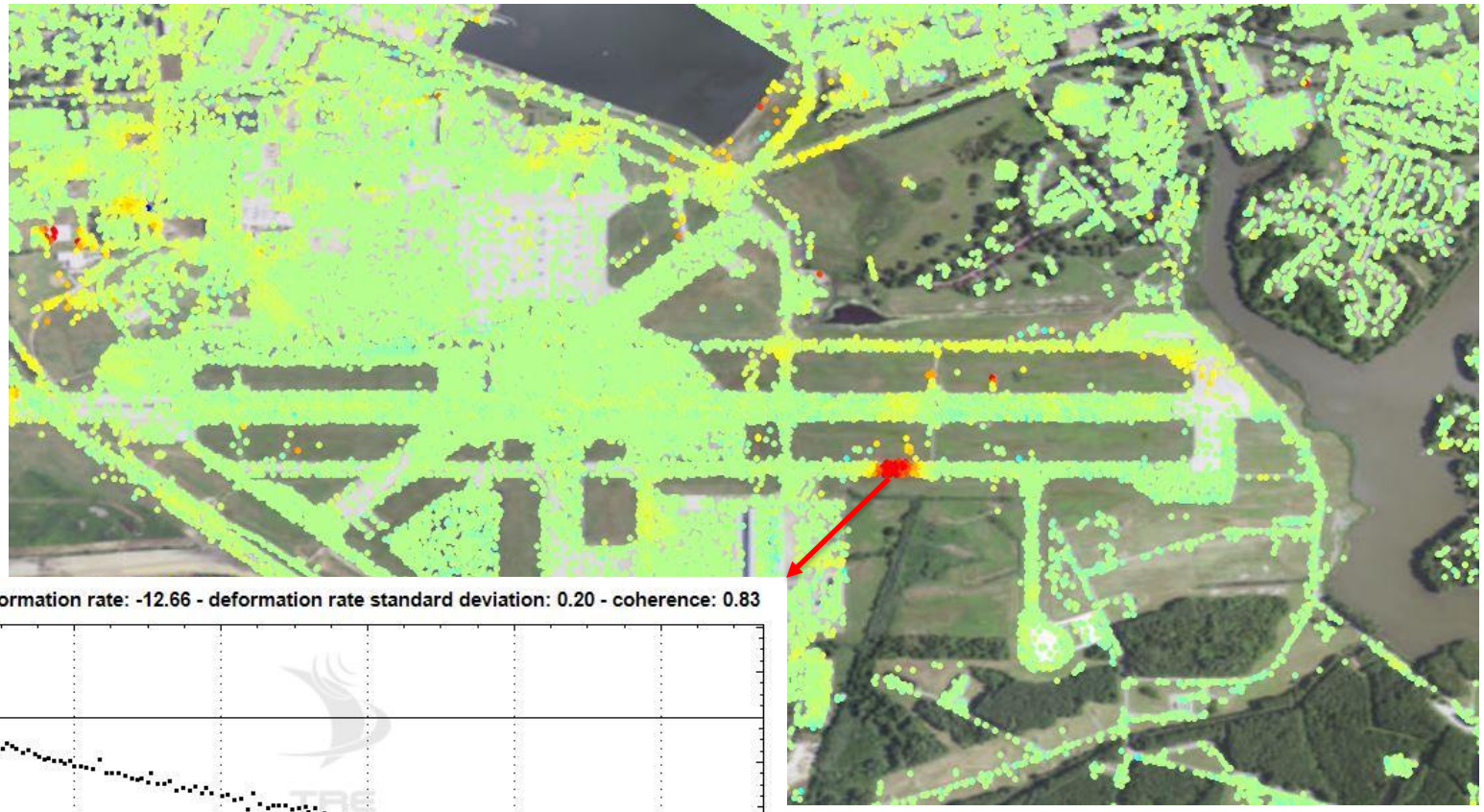
-10 +10

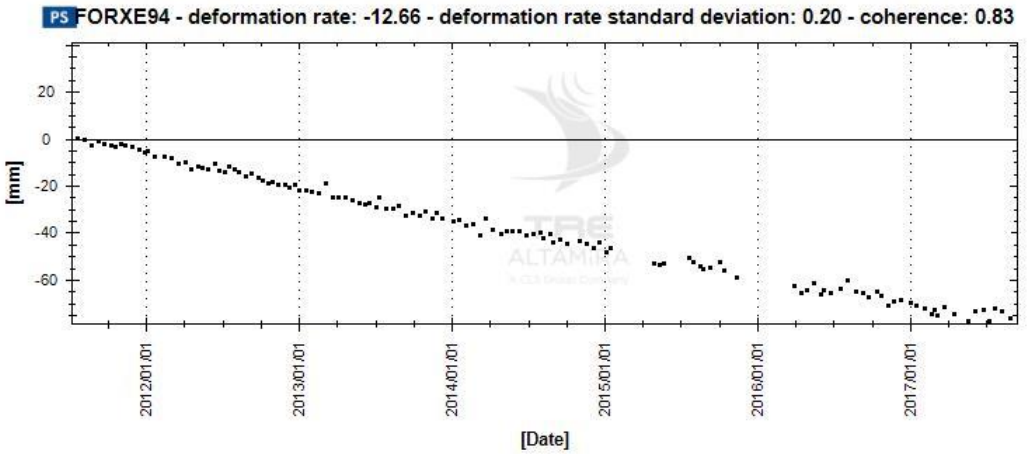
Chesapeake Bay Bridge



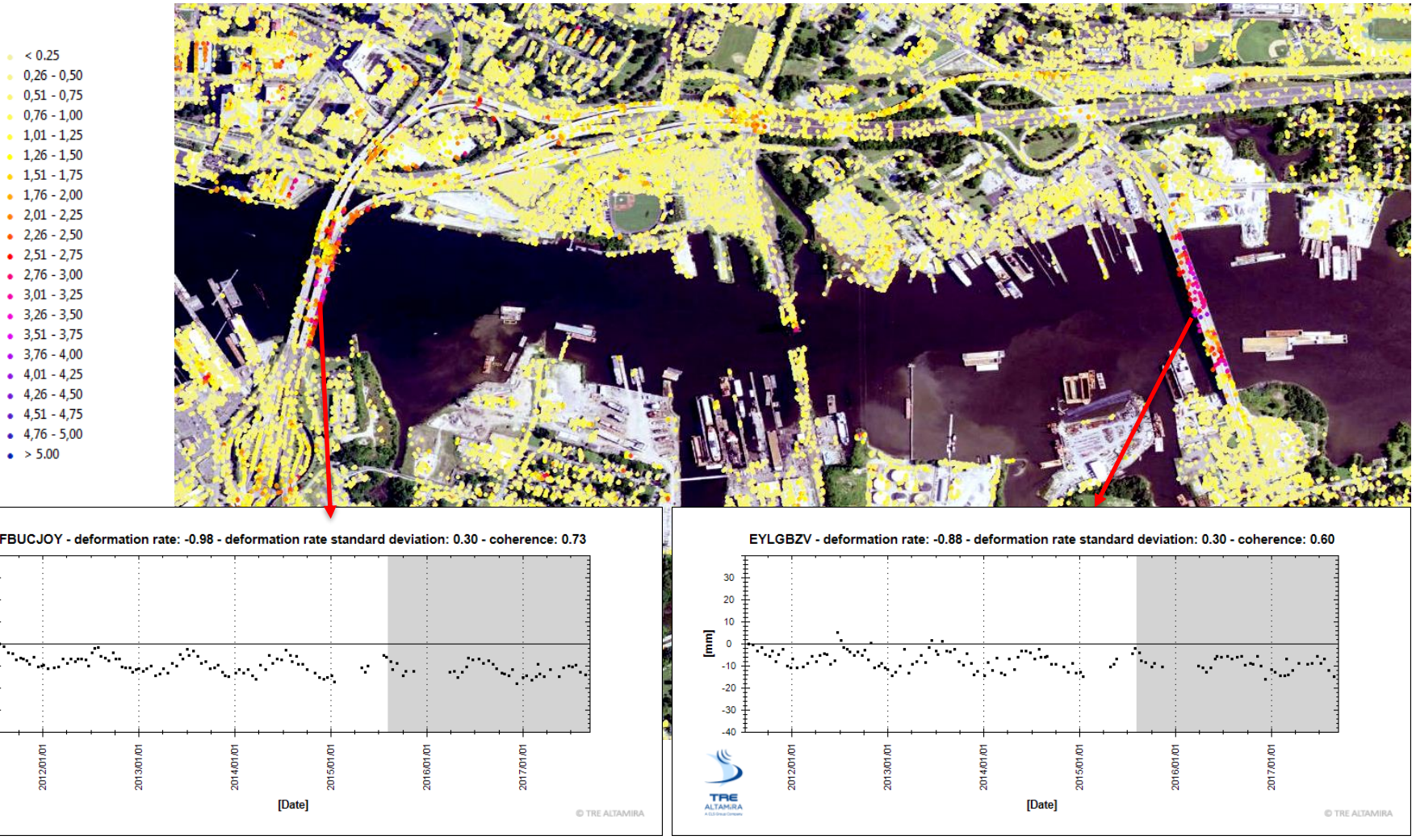


Norfolk Airport





Seasonality – Bridges (Seasonal Amplitude)



TREmaps – Data delivery

» Data delivery will include upload to TRE Altamira's online webGIS platform TREmaps: https://tremaps.tre-altamira.com/

Summary – Next Steps

- Validation of displacement results with other sources of monitoring information (such as long-term GPS observations or precise leveling).
- Conversion of displacement results from relative measurements to absolute (using GPS control).
- Analysis of Sentinel (C-band) imagery to be carried out and results of the Cosmo-SkyMed and Sentinel InSAR analyses to be compared and contrasted.
- Displacement results to be integrated with other types of monitoring information.