Westlake US 2
Received 8/28/2023

TSX/PAZ Satellite Update
InSAR Subsidence
August 25, 2023

Longuist comment:

The PAZ satellite from the TSX/PAZ constellation (4 & 7-day revisit) passed by Sulphur on Friday August 25. We received the dataset today and noted that the new data point is below trend in the same areas where consecutive below-trend values were noted in the prior update sent last Wednesday. We will be performing additional geospatial and trend evaluation on this dataset, and will follow-up with our observations. The attached time series plots have been prepared for reference.

The next dataset will be from the SNT satellite with an image capture date of 8/29 (tomorrow) and we anticipate receiving the data this Thursday. That data will be reviewed for comparison to these observations in the TSX/PAZ dataset.

Submitted by: Nathaniel Byars (Lonquist)

TSX/PAZ Constellation Update

Continuous InSAR Monitoring of Ground Displacement Near Western Caverns and Dome Flank

Sulphur Dome
Westlake Chemicals

August 25, 2023 Update

Date Signed: August 28, 2023
Austin, TX

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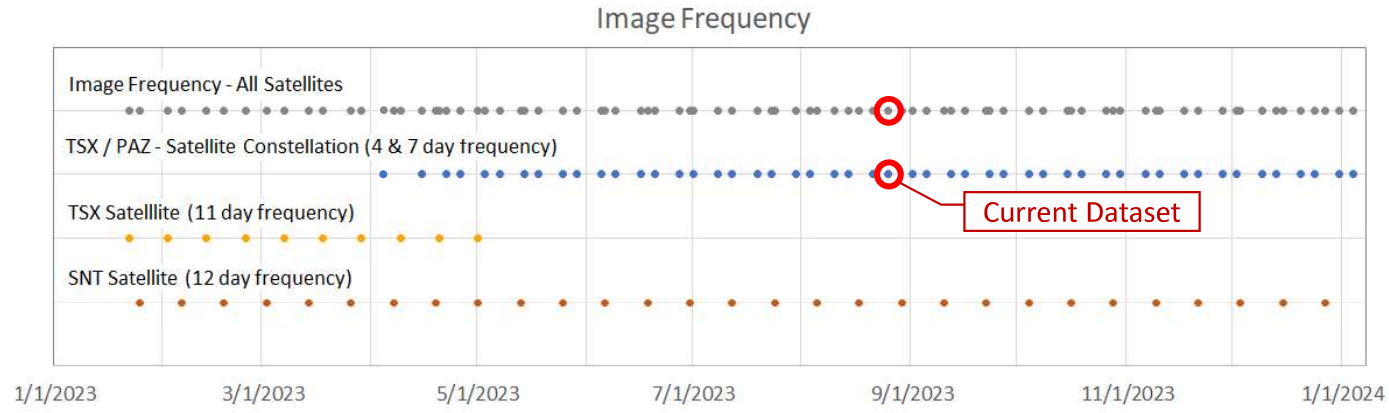
LONQUIST & CO. LLC
PETROLEUM ENGINEERS | ENERGY ADVISORS

Parameters of InSAR Dataset and Collection Frequency

- Satellite Data Delivery Frequency as of April 2023:
  - Sentinel 1 (SNT) 12 days
  - TSX / PAZ Constellation 4 & 7 days
  - 3.96-day avg. frequency

			TSX/PAZ Constellation	
	Sentinel-1	TerraSAR-X	TerraSAR-X	PAZ
Mode / Resolution	16 x 65 ft	Spotlight (3 x 3 ft)	Spotlight (3 x 3 ft)	Spotlight (3 x 3 ft)
Track	T136	T29	T67	T120
Band (wavelength)	C-Band (2.32 in)	X-Band (1.22 in)	X-Band (1.22 in)	X-Band (1.22 in)
Nominal frequency	12- day	11- day	11- day	11- day
Orbit (LOS angle)	Ascending 43°	Descending 17°	Descending 37°	Descending 37°
Date range	04 Oct 2016 – 20 Jan 2024	16 Jun 2022 – 01 May 2023	24 Jan 2023 – 11 Jan 2024	28 Jan 2023 – 15 Jan 2024
Number of images	199	30	34	33



Overview and Monitoring History

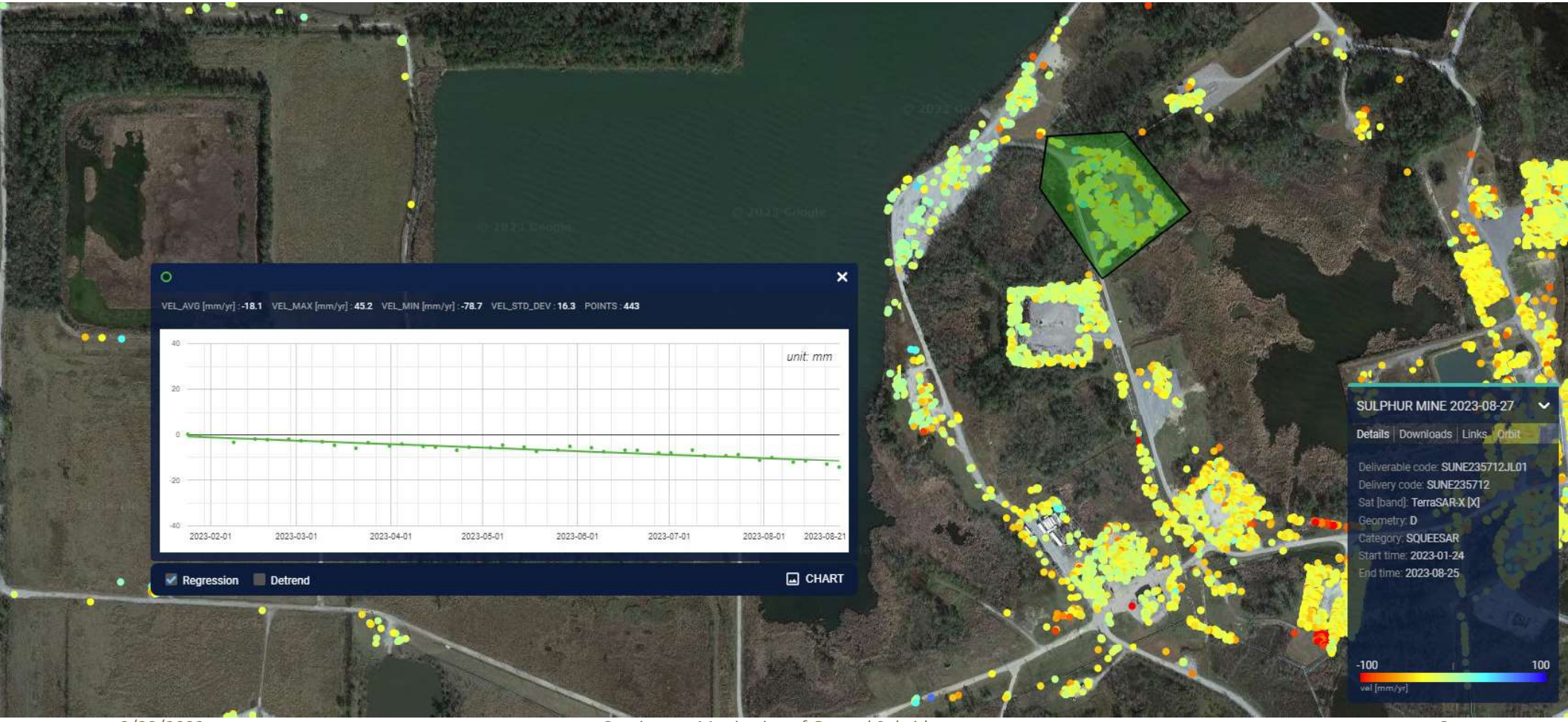
- Beginning in late January, ground displacement over the western portion of the Sulphur Mines Salt Dome has been evaluated following the delivery of each dataset update from TRE-Altamira
- An automated process and set of deliverables to convey the results of the datasets is being developed that will evaluate multiple factors including trend consistency and mapped acceleration of ground displacement
- Current updates are focused on the review of time series charts of averaged data for selections of points around the dome and caverns on the western flank
- The TSX/PAZ satellite constellation (4 & 7-day revisit) passed by Sulphur on Friday August 25, 2023
- The following slides present the time series and associated linear trends for each location evaluated from this dataset
- The prior few updates from the TSX/PAZ satellite constellation appear show a slight increase in downward displacement rates in the areas of PPG 6, PPG 7, PPG 22, AOI #1, and AOI #2. The data is currently being evaluated to further define the apparent trend deviation

TSX/PAZ Constellation – August 25, 2023 Update

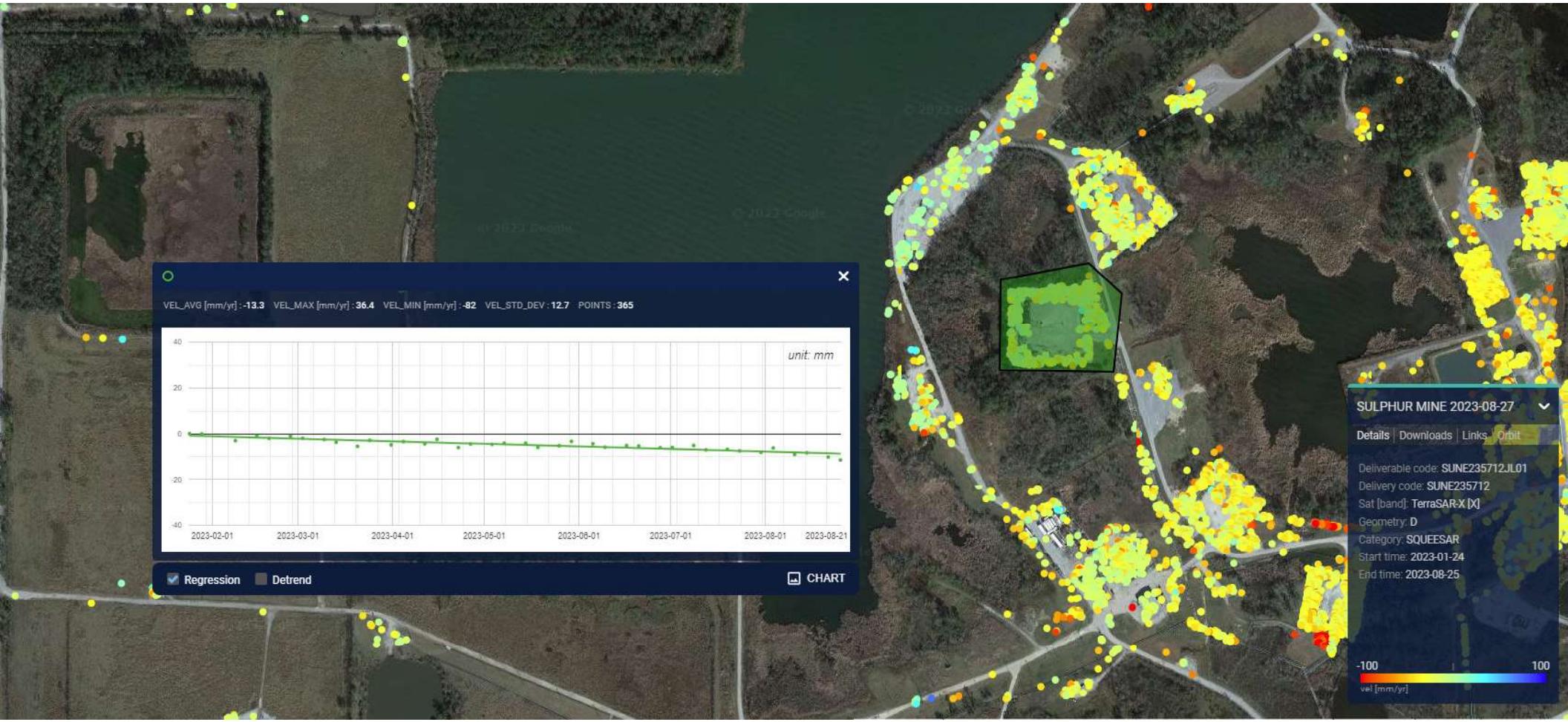
PPG 21


VEL_AVG [mm/yr] : -11.3 VEL_MAX [mm/yr] : 37.3 VEL_MIN [mm/yr] : -76.4 VEL_STD_DEV : 19.1 POINTS : 128
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
SULPHUR MINE 2023-08-27
Details | Downloads | Links | Orbit
Deliverable code: SUNE235712JL01
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

PPG 6


VEL_AVG [mm/yr] : -18.1 VEL_MAX [mm/yr] : 45.2 VEL_MIN [mm/yr] : -78.7 VEL_STD_DEV : 16.3 POINTS : 443
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
SULPHUR MINE 2023-08-27
Details | Downloads | Links | Orbit
Deliverable code: SUNE235712JL01
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

PPG 7


VEL_AVG [mm/yr] : -13.3
VEL_MAX [mm/yr] : 36.4
VEL_MIN [mm/yr] : -82
VEL_STD_DEV : 12.7
POINTS : 365
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
SULPHUR MINE 2023-08-27
Details
Downloads
Links
Orbit
Deliverable code: SUNE235712.JL01
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

PPG 22


VEL_AVG [mm/yr] : -24.3 VEL_MAX [mm/yr] : 25.9 VEL_MIN [mm/yr] : -108.1 VEL_STD_DEV : 17.8 POINTS : 108
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
SULPHUR MINE 2023-08-27
Details | Downloads | Links | Orbit
Deliverable code: SUNE235712JL01
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

AOI #1


VEL_AVG [mm/yr] : -20.3 VEL_MAX [mm/yr] : 46.1 VEL_MIN [mm/yr] : -81.3 VEL_STD_DEV : 21.1 POINTS : 194
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
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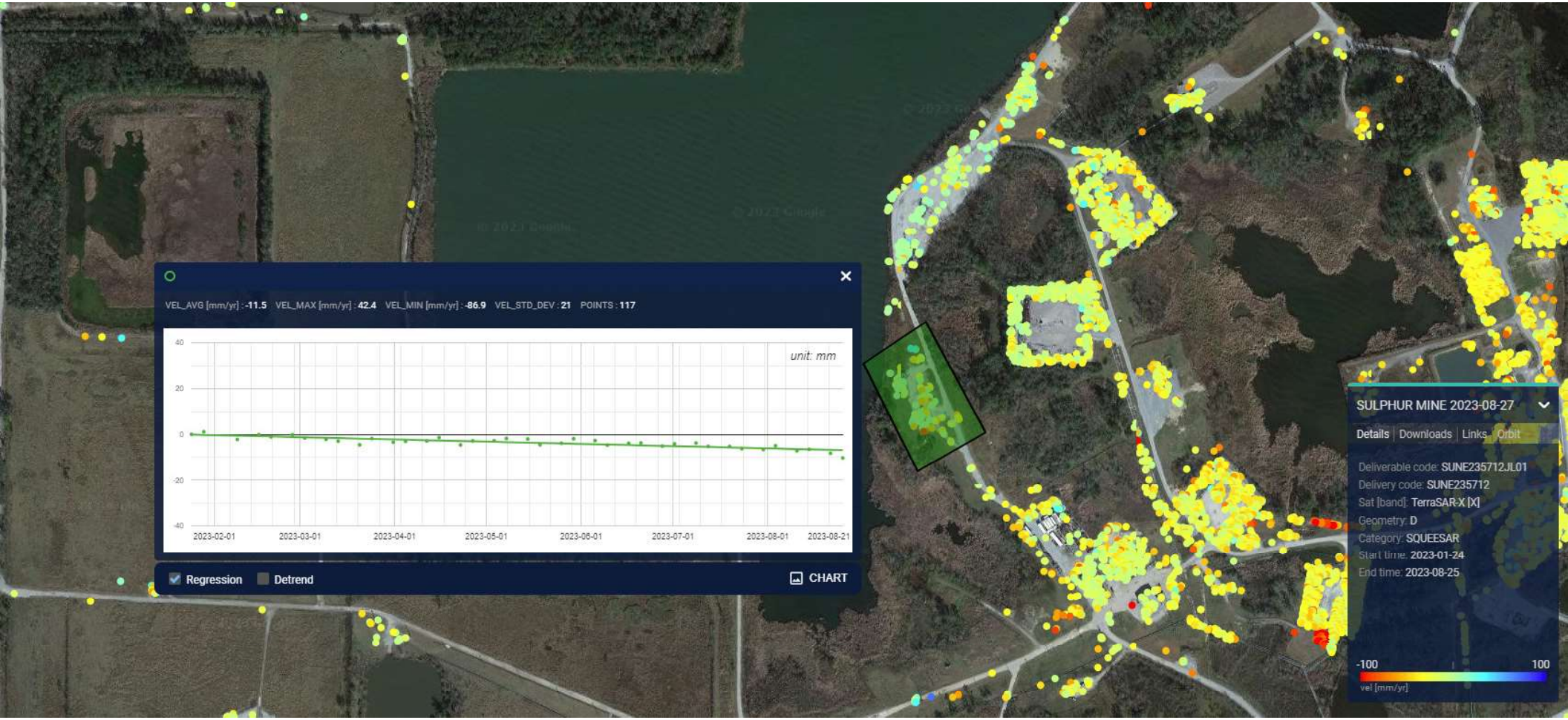
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

AOI #2


VEL_AVG [mm/yr] : -11.5 VEL_MAX [mm/yr] : 42.4 VEL_MIN [mm/yr] : -86.9 VEL_STD_DEV : 21 POINTS : 117
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
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Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

AOI #3


VEL_AVG [mm/yr] : 0.2 VEL_MAX [mm/yr] : 40.5 VEL_MIN [mm/yr] : -47.7 VEL_STD_DEV : 12 POINTS : 144
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
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Deliverable code: SUNE235712JL01
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
vel [mm/yr]

AOI #4


VEL_AVG [mm/yr] : -5 VEL_MAX [mm/yr] : 25 VEL_MIN [mm/yr] : -44.3 VEL_STD_DEV : 13.6 POINTS : 78
unit: mm
40
20
0
-20
-40
2023-02-01
2023-03-01
2023-04-01
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-08-21
Regression
Detrend
CHART
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Deliverable code: SUNE235712.JL01
Delivery code: SUNE235712
Sat [band]: TerraSAR-X [X]
Geometry: D
Category: SQUEESAR
Start time: 2023-01-24
End time: 2023-08-25
-100
100
val [mm/yr]