

The first result of geodetic implications on intra-graben subsidence along the eastern part of the Gediz graben

Yavuz Gül¹, **Huseyin Duman**^{2*}, Kemal Özgür Hastaoğlu¹,
Fatih Poyraz¹, İbrahim Tiryakioğlu³, Hediye Erdoğan⁴,
Alperen Doğan⁵, Süleyman Güler¹

¹Sivas Cumhuriyet University, Faculty of Engineering, Dept. of Geomatics Engineering, Sivas, Turkey (yvzgul58@gmail.com)

²Yildiz Technical University, Civil Engineering Faculty, Geomatic Engineering, Istanbul, Turkey (hduman@yildiz.edu.tr)

³Afyon Kocatepe University, Faculty of Engineering, Dept. of Geomatics Engineering, Afyonkarahisar, Turkey

⁴Aksaray University, Faculty of Engineering, Dept. of Geomatics Engineering, Aksaray, Turkey

⁵Manisa Celal Bayar University, Sarigöl Vocational School, Manisa, Turkey

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Introduction

- ▶ The Western Anatolian extensional, tectonically active regime, develops a set of approximately E-W trending Horst-Graben systems.
- ▶ The Gediz graben accommodates many fertile lands where intensive grape cultivation has carried out.
- ▶ That type of agriculture requires irrigation. Recently, as a results of increasing farming activities, the groundwater budget decreases permanently.
- ▶ Towards the center of graben, where the farming activities are gradually increased, deformation rates are also gradually increased.

Introduction

- ▶ To clarify deformations along the graben, we used InSAR data from late 2014 through the of of 2020, and GPS data in the second half of 2020 (too short to analyze but gives an implication).
- ▶ This study is a part of the ongoing project supported by TUBITAK (No: 119Y180), and only summarizes the first results.

Sentinel-1A/B Interferograms from LiCSAR archive (González et al., 2016)

- ▶ Ascending orbit (FrameID: 131A_05153_131313)
 - ▶ 2014-11-07 to 2021-03-17
- ▶ Descending orbit (FrameID: 138D_05142_131313)
 - ▶ 2014-10-15 to 2021-03-12

GPS stations

- ▶ SRGL (out of graben)
- ▶ ITFY, SUDP, and CNKC (towards the center of graben, respectively)

Data and Methodology

InSAR Processing

For InSAR processing

- ▶ LiCSBAS software (Morishita et al., 2020) was used.
- ▶ The processing has the following two-phase;

Prepare Stack of UNW Data

- ▶ GeoTiff files were converted to float32 and uint8 format
- ▶ Interested area (i.e., 28/29/38/39 [lon1/lon2/lat1/lat2]) was clipped
- ▶ Tropospheric corrections were applied using GACOS data
- ▶ Low coherent areas were masked (threshold: 0.2)

Time series Processing

- ▶ Quality check for bad interferograms
- ▶ Loop closure for bad UNWs
- ▶ Small baseline inversion via the least-squares
- ▶ Computing standard deviations of LOS velocities
- ▶ Masking time-series with default values
- ▶ Applying spatio-temporal filter to the time-series

Data and Methodology

GPS Data Processing

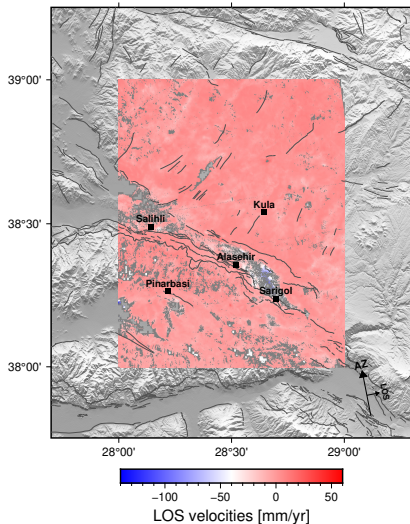
For GPS data processing

- ▶ GipsyX-1.7 software was used in PPP mode (Zumberge et al., 1997).
- ▶ In processing steps following constraints were applied;
 - ▶ GPS-only observations
 - ▶ JPL Orbit and Clock Products
 - ▶ FES2004 Ocean Loading Model
 - ▶ Up-to-date antex file from IGS
 - ▶ 7° elevation cut-off angle
 - ▶ VMF1 for tropospheric correction

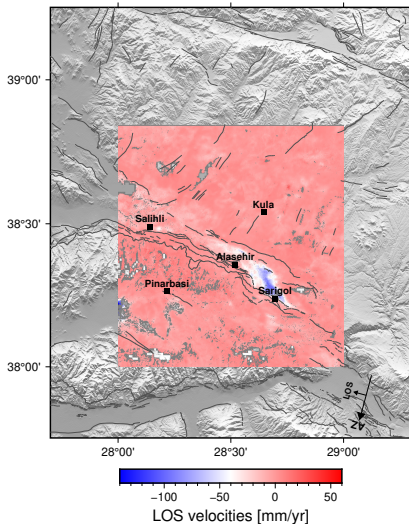
Results

LiCSBAS LOS velocities

Ascending Orbit (131A)

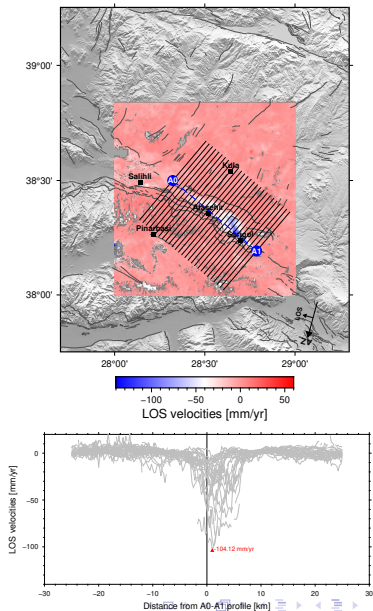
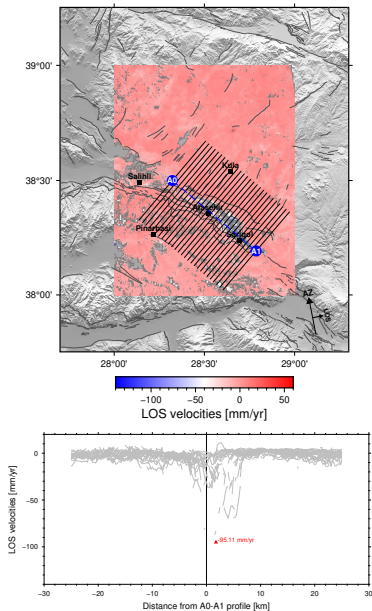


Descending Orbit (138D)



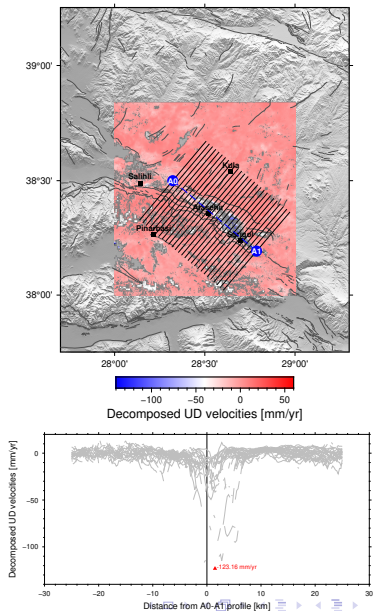
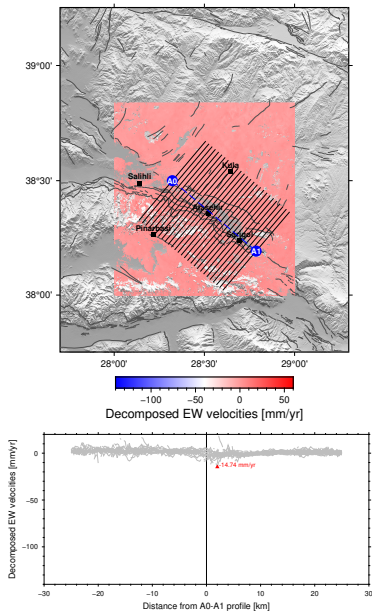
Results

LiCSBAS LOS velocities (Profiles)



Results

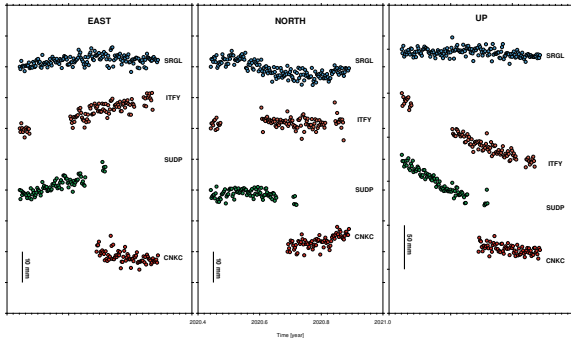
LiCSBAS Decomposed EW and UD velocities



Results

GPS Time-series

- ▶ Data gaps due to unknown reasons
- ▶ Too short to analyze thoroughly
- ▶ For up component for intra-graben GPS sites, there is a visible subsidence, while for SRGL station there is not.



Conclusions

- ▶ In the graben, farming activities are conducted, which needs to high level of irrigation causing permanent subsidence at a level.
- ▶ As expected, InSAR analysis shows a visible subsidence both ascending (up to -95 mm/yr) and descending orbit (up to -104 mm/yr). However, the most places were masked due to low coherence caused by farming activities.
- ▶ Once decomposed using these frames, there is not almost a visible deformation in EW component, whilst up to -123 mm/yr subsidence could be visible.
- ▶ As for the GPS stations, there is no sufficient data for now to analyze in detail. But even so three stations except for SRGL illustrates us a significant subsidence.

References

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- ▶ Morishita, Y.; Lazecky, M.; Wright, T.J.; Weiss, J.R.; Elliott, J.R.; Hooper, A. LiCSBAS: An Open-Source InSAR Time Series Analysis Package Integrated with the LiCSAR Automated Sentinel-1 InSAR Processor. Remote Sens. 2020, 12, 424, <https://doi.org/10.3390/RS12030424>.
- ▶ Zumberge, J. F., Heflin, M. B., Jefferson, D. C., Watkins, M. M., Webb, F. H. (1997). Precise point positioning for the efficient and robust analysis of GPS data from large networks. Journal of geophysical research: solid earth, 102(B3), 5005-5017.