



# LAND SUBSIDENCE IN JHARIA COALFIELDS, JHARKHAND, INDIA – DETECTION, ESTIMATION AND ANALYSIS USING PERSISTENT SCATTERER INTERFEROMETRY

**Vamshi Krishna Rao Karanam<sup>1,2,3</sup>, Mahdi Motagh<sup>2,3</sup>, and Kamal Jain<sup>1</sup>**

<sup>1</sup>Department of Civil Engineering, Indian Institute of Technology Roorkee, Roorkee, India (vk@ce.iitr.ac.in)

<sup>2</sup>Institute for Photogrammetry and Geo-Information, Leibniz University Hannover, Hannover, Germany

<sup>3</sup>Remote Sensing and Geoinformatics, GFZ German Research Centre for Geosciences, Potsdam, Germany



# INTRODUCTION



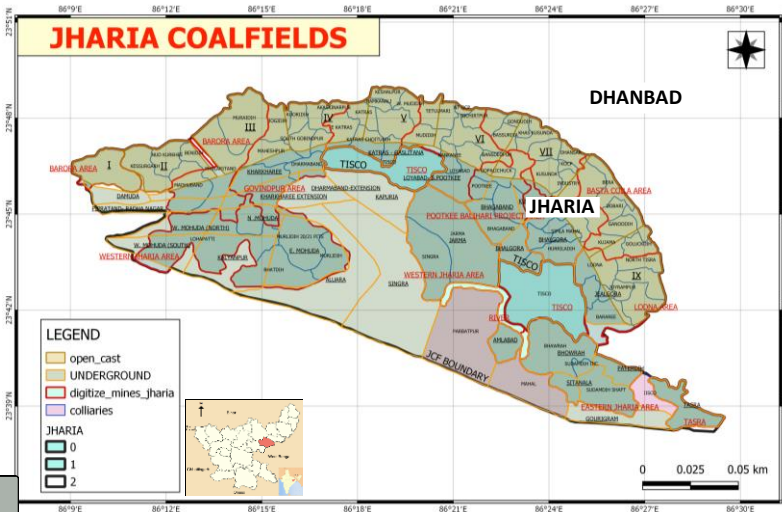
## LOCATION

- Dhanbad district, Jharkhand, India



## SIGNIFICANCE

- It is the largest and one of the oldest (since 1894) coal mines in India
- One of the most densely populated coalfields in the world
- Known as the exclusive storehouse of prime coking coal in the country



## PROBLEM

- Coal fires resulting in land subsidence associated with roof collapse is the primary environmental hazard in this coal field
- Due to subsidence, crack appear It lets oxygen in helping in combustion of coal and further increasing the subsidence.



## METHODOLOGY

### SNAP

Subsidence detection and pre-processing for StaMPS analysis



### StaMPS

Persistent scatterer Time Series analysis

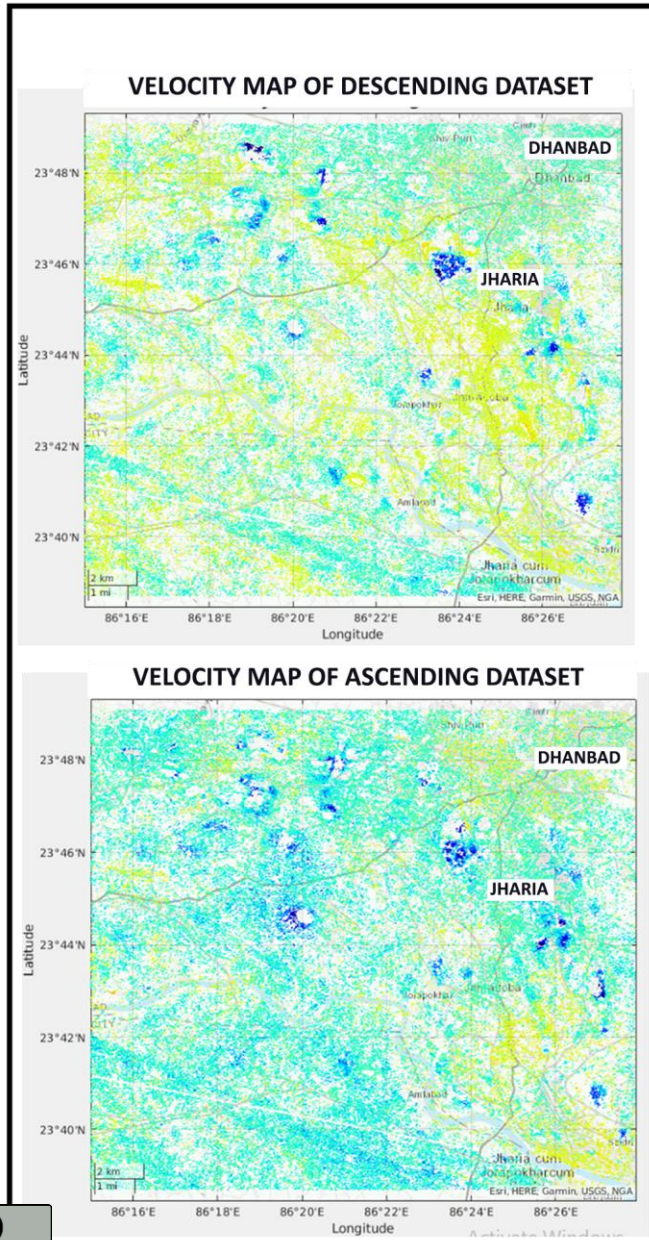


### TRAIN

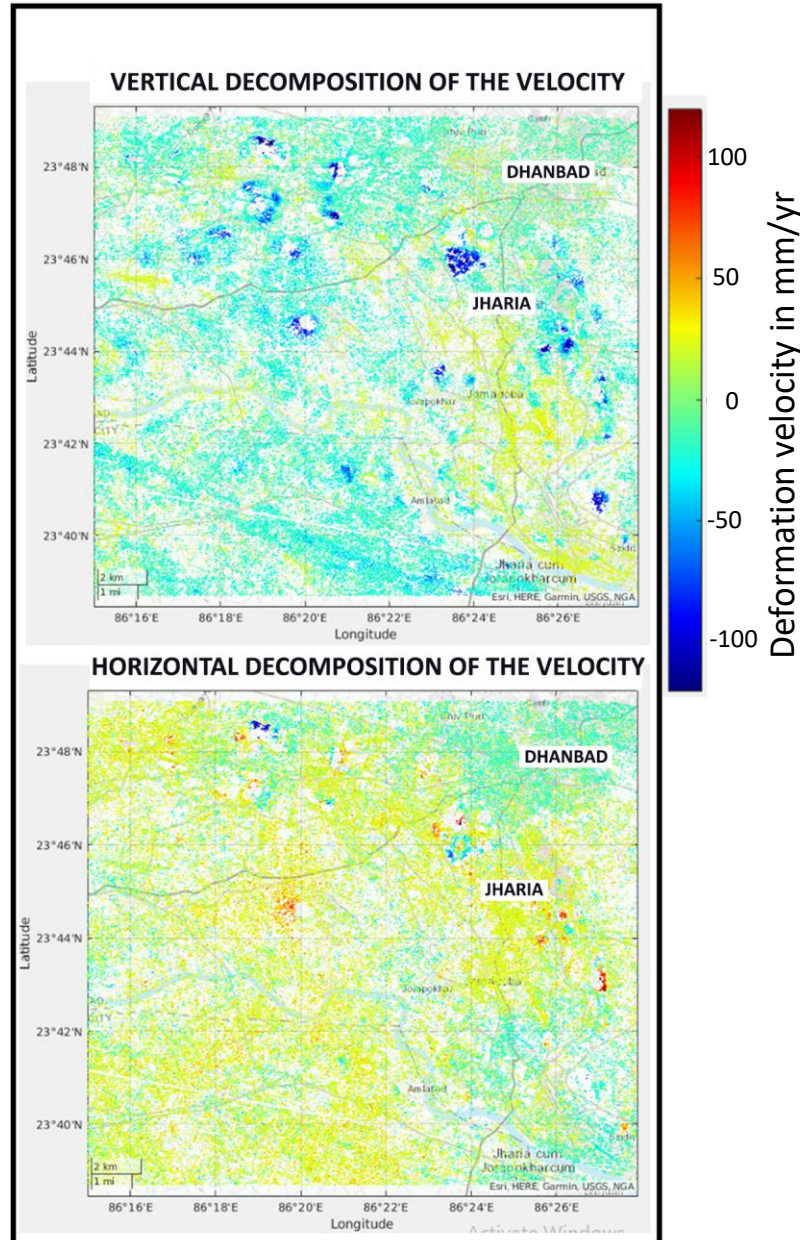
Atmospheric correction using GACOS model



## VELOCITY MAPS AFTER GACOS CORRECTION



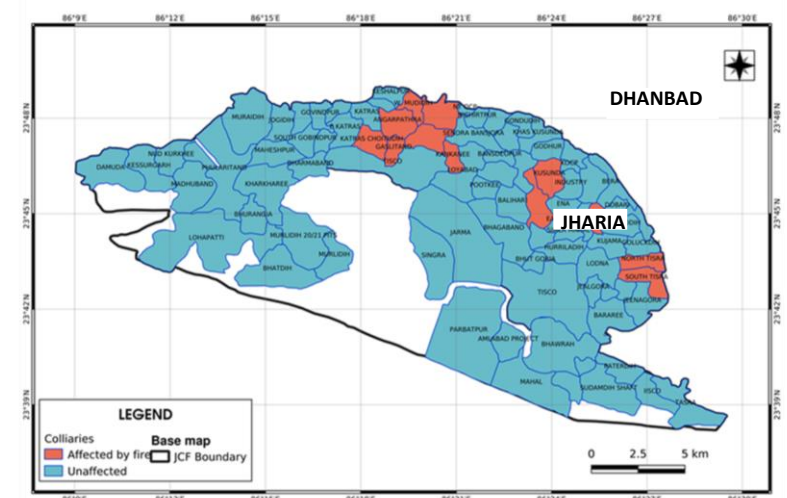
## VERTICAL AND HORIZONTAL DECOMPOSITION



## NOV 2017-APR 2018 (PHASE I)

- Velocity maps are derived for both the directions and decomposed into vertical and horizontal components
- Results show subsidence velocity of up to 140 mm/yr
- 12 out of the 21 collieries are affected by the subsidence

## COLLIERIES AFFECTED BY SUBSIDENCE



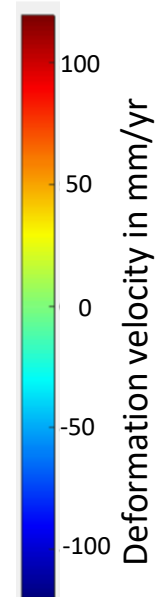
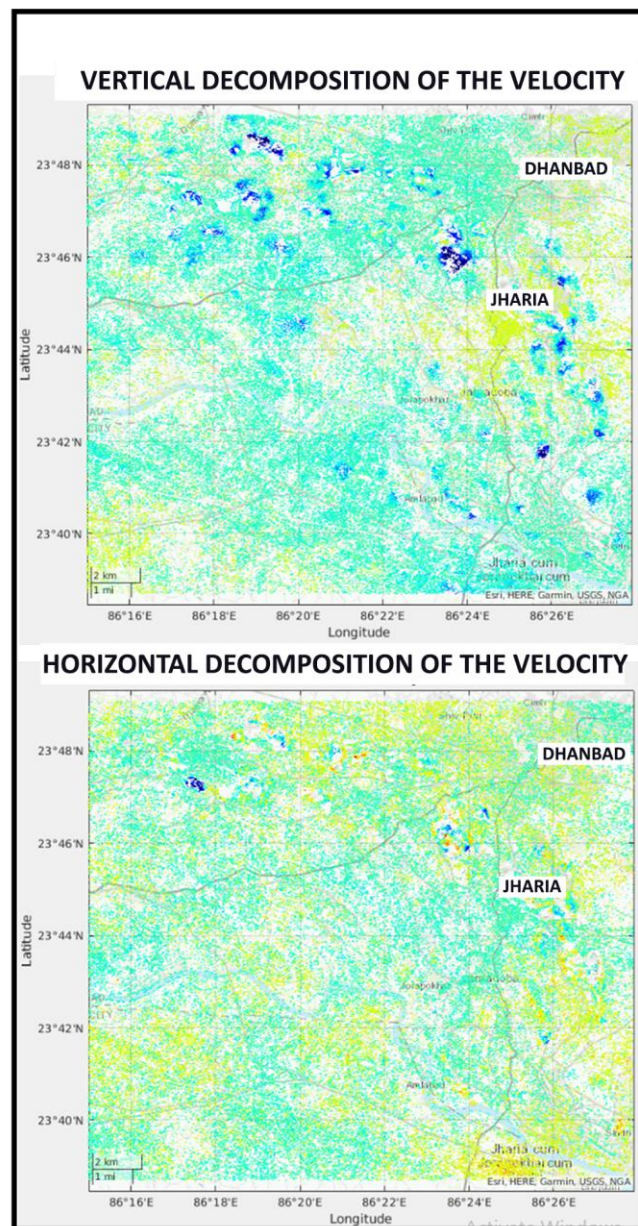
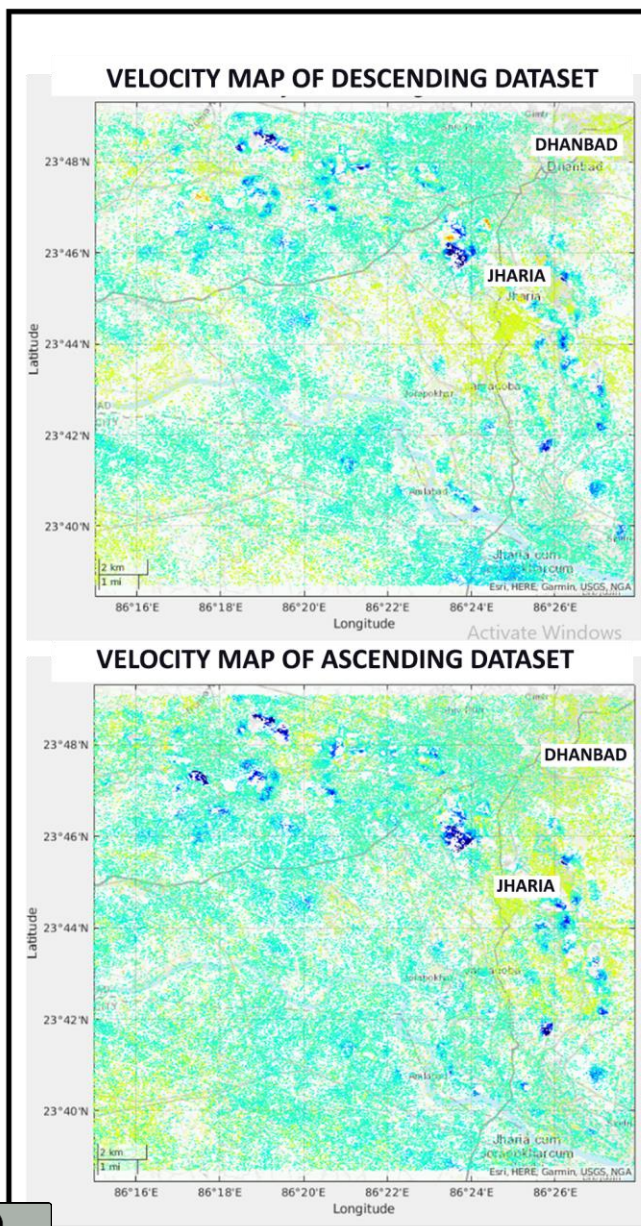




## VELOCITY MAPS AFTER GACOS CORRECTION

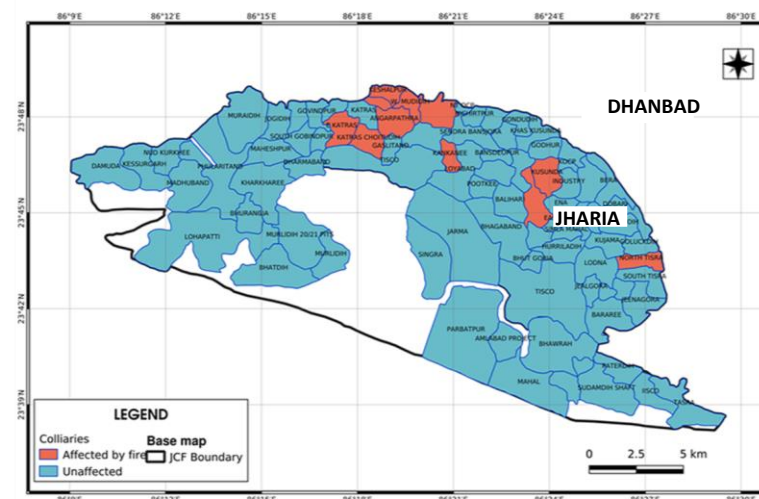
## VERTICAL AND HORIZONTAL DECOMPOSITION

NOV 2018-APR 2019 (PHASE II)



- Results show subsidence velocity of up to 160 mm/yr
- 11 out of the 21 collieries are affected by the subsidence
- Kusunda, W. Mudidih, Katras and Nort Tisra collieries are significantly affected by subsidence

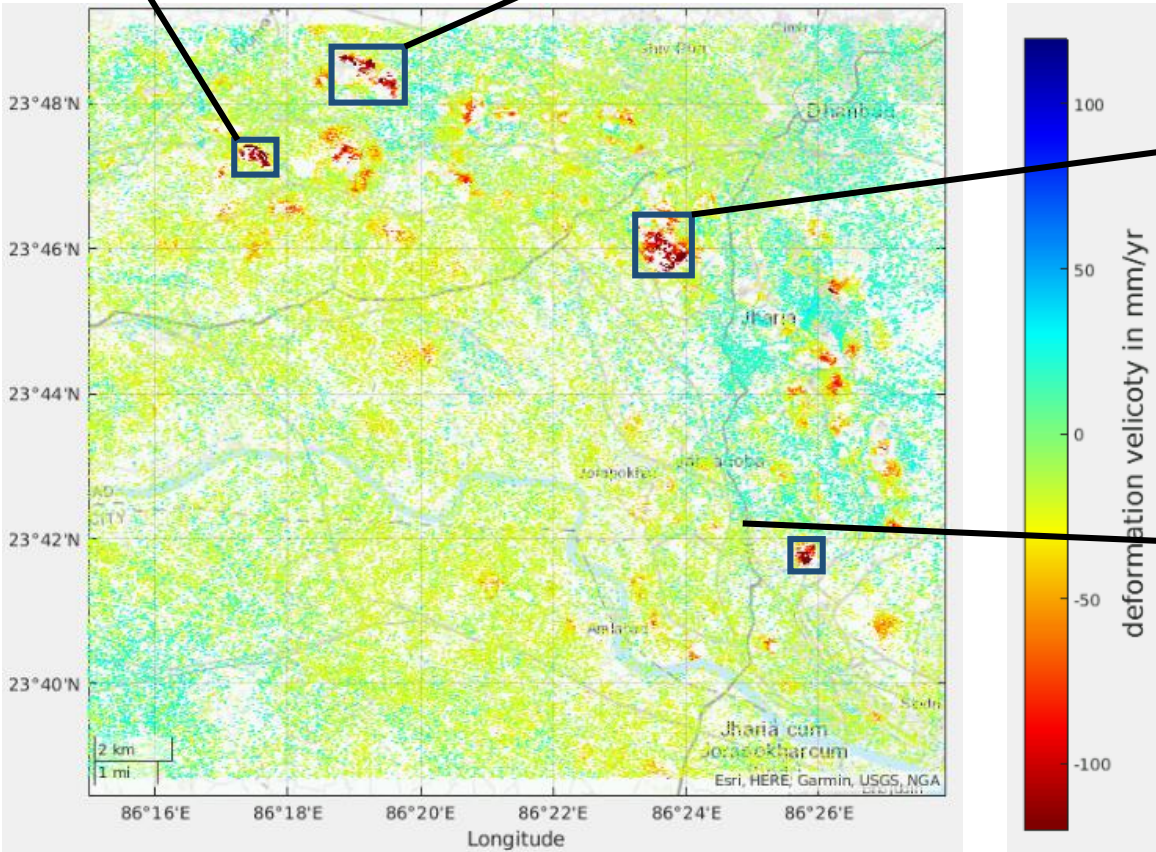
## COLLIERIES AFFECTED BY SUBSIDENCE







# MAJOR SUBSIDENCE ZONES





# CONCLUSIONS

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- By using the PS-InSAR analysis, we could identify several new subsidence areas with velocities of up to 14 cm/yr.
- Kusunda, W. Mudidih, Katras and Nort Tisra collieries are significantly affected by subsidence throughout the study period and need urgent intervention.
- These subsidence zones are only a few hundred meters far from the infrastructure and residential zones and pose a severe threat to the lives and livelihoods.
- While the collieries affected by subsidence has been reduced from 12 in the Phase-I to 11 in the Phase-II, the subsidence in some of the existing zones has been accelerated
- The causes of the subsidence in coalmines are complex, e.g., coal fires, rainfall and activity in the mines
- For further analysis, a comparison of the obtained deformation areas with the areas affected by coal fires and rainfall can provide a good understanding of cause of subsidence.