

PROJECT TITLE: Subsidence analysis of SW Spain

PROJECT DESCRIPTION :

The city of Huelva, at SW Spain, is settle over an unconsolidated, but very stable Miocene sandstone Formation. However, recent suburbs and huge amounts of industrial wastes have been developed and deposited, respectively, over soft Quaternary marshes. The possibility that these areas are currently suffering subsidence is therefore high.

Although this region is not a first order seismic area, it is under the influence of the Gibraltar- Azores Transform Fault. Considering that soft sediments under pressure are especially sensible to seismic events, it should be possible to link the subsidence of the study area, if any, with the earthquakes < 4 mgLb that recurrently occur nearby.

A historical subsidence analysis of this region would provide useful information for evaluating the potential response of the city of Huelva, and specifically of those areas settle over marshes, to eventual earthquakes of higher magnitude.

For a first evaluation, and for identifying potential areas subsiding around the city of Huelva I **developed a SAR time series analysis of Sentinel 1 data with CNR IREA P-SBAS.**

MAIN GOAL OF THE PROJECT

Bulletin of Engineering Geology and the Environment (2022) 81:304
<https://doi.org/10.1007/s10064-022-02809-6>

ORIGINAL PAPER



InSAR-based mapping of ground deformation caused by industrial waste disposals: the case study of the Huelva phosphogypsum stack, SW Spain

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Received: 30 March 2022 / Accepted: 30 June 2022
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Abstract

Close to the city of Huelva, SW Spain, and near the Atlantic Ocean, there is a phosphogypsum (PG) stack that accumulates 100 Mt of wastes and extends over 1000 ha. The stack lies directly over estuarine unconsolidated sediments with no protective layer in between. Here, we evaluate for the first time the structural stability of the PG stack, monitoring the deformation suffered by the salt-marsh basement. Through the web-based Geohazard Exploitation Platform (GEP) of the European Space Agency (ESA), a specific differential SAR interferometry (DInSAR) algorithm known as Parallel Small Baseline Subset (P-SBAS) has been used to process 279 ESA Sentinel-1 images acquired between October 2016 and June 2021. Resulting displacement maps and time-series curves reveal vertical displacements of up to 16 cm/year. This vertical motion has been associated to subsidence. In parallel with subsidence, horizontal movements > 2.5 cm/year have been also accounted and linked to talus destabilization. The analysis also demonstrates that the Huelva PG stack is vulnerable to adverse weather condition. The present study demonstrates that the InSAR-based methods are effective tools for monitoring the stability and ground motion of large waste stockpiles.

Keywords SAR · InSAR · Sentinel-1 · Subsidence · Phosphogypsum · Ground deformation

Paper with strong visibility



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MAIN TOOL USED

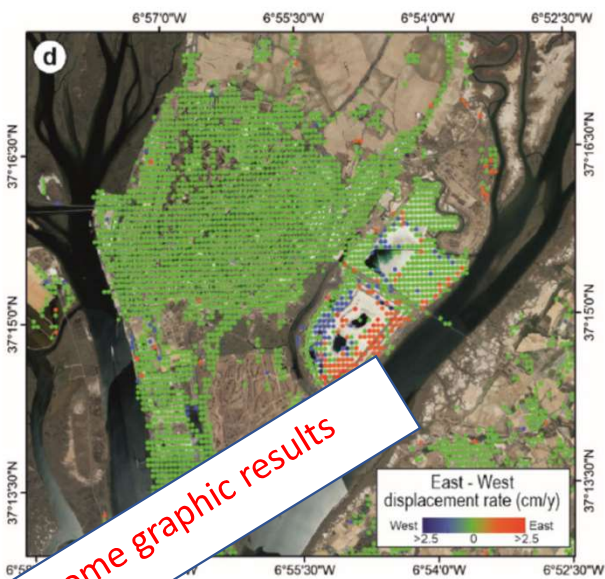
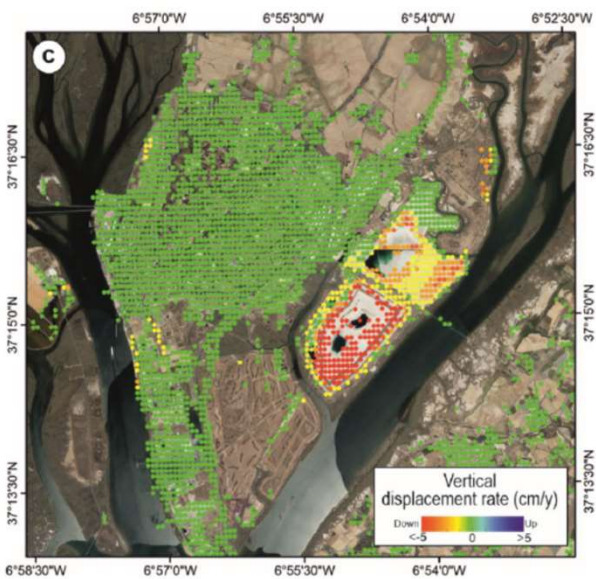


CNR-IREA P-SBAS InSAR Sentinel-1 TOPS (GEP)

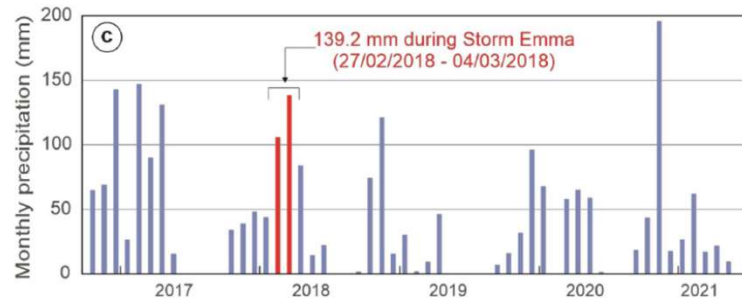
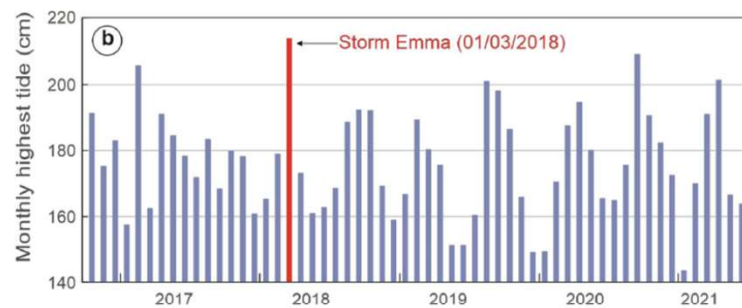
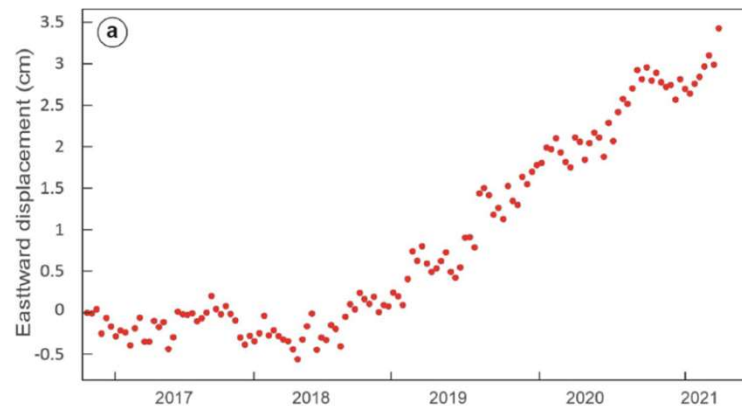
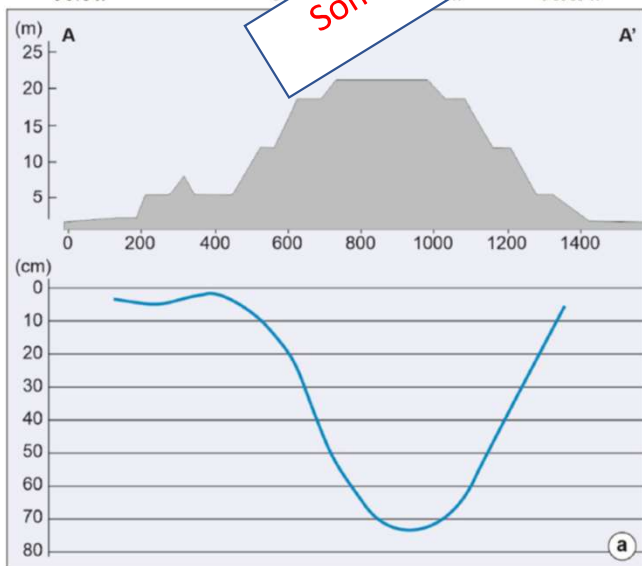
Main characteristics of the Sentinel-1 datasets used for the analysis

Orbital track	Band/polarization	Acquisition geometry	Revision period (days)	Start date	End date	Images used	Interferograms
147	C/VV	Ascending	35	10/10/2016	22/06/2021	137	394
142	C/VV	Descending	35	04/10/2016	28/06/2021	142	409

The study demonstrates that a thick pile of industrial wastes, 0.5km from the city of Huelva (145.000h aprox.), is causing strong subsidence in a marsh environment. It also alerts of the extraordinarily high risk of chemical pollution and talus destabilization



Some graphic results





Andalucía

Un estudio certifica hundimientos en las balsas de fosfoyesos junto a Huelva

En determinadas zonas alcanza hasta 15 centímetros al año

CONTAMINACIÓN FOSFOYESOS
Estudio certifica hundimientos en balsas de fosfoyesos junto a Huelva capital
Huelva, 9 jul (EFE).- Un estudio publicado por la revista the Environment, del profesor Felipe González P... Universidad de Huelva, ha alertado de que en 700 hectáreas, agrupan residuos m...

A study with strong social impact

Un estudio científico de la Universidad de Huelva confirma el riesgo de derrumbe de las balsas de fosfoyesos
TELEONUBA

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Los fosfoyesos se hunden junto a la zona más radiactiva
Un estudio científico confirma el hundimiento de los fosfoyesos: hasta 70 centímetros en solo 5 años. Hay desplomes junto a la zona contaminada con cesio-137.

Un estudio científico alerta de hundimientos generalizados en las balsas de fosfoyesos
TELEONUBA
Un estudio científico de la Universidad de Huelva confirma el riesgo de derrumbe de las balsas de fosfoyesos

Unete a Actualidad
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