The geodetic monitoring of the Corinth rift observatory with GNSS and SAR interferometry

P. Briole, CNRS/ENS, 22 September 2023



Elias & Briole, 2018

Observing the Earth from space



Emmanouela Konstantakopoulou collecting GNSS data near the village (and fault) of Helike, in the south side of the rift (photo S.Bufféral, 2022)

Observing the Earth from space



Alexandros Papadopoulos collecting GNSS data on the Antirio castle (photo P. Briole, 2023)

GNSS (Global Navigation Satellites System)

The satellites carry accurate clocks that broadcast their time. The positioning is deduced from the different arrival times of the signals arriving from the various

satellites.

Galileo satellite







Simon Bufféral collecting GNSS data near the village of Sergoula, in the north side of the rift

Synthetic Aperture Radar Interferometry (InSAR)

The satellites carries a radar imager and collects the backscattered signal of the imager

ESA Sentinel-1 satellite







No equipment on the ground

Want to know where is your satellite?

IXION – http://climserv.ipsl.polytechnique.fr/ixion/



The electromagnetic spectrum



The propagation of the electromagnetic waves



Continuous GNSS measurements



Permanent GNSS receiver at the University of Patras

Real time GNSS at the university of Patras

Real time GNSS at Patras (see the CNES PPP Wizard)



24h Sliding Window, last epoch: 2019/09/20 05:42:0 (UTC)



Campaign measurements

Grzegorz Marut at the point X000 near Derveni, south coast, in 2022







Partners - Literature - Projects - Data-products - Resources - Education - Links -

Corinth Rift Laboratory







Lear more at http://crlab.eu



Get data and products



Recherche...

30s raw data from the permanent stations

0	Data access through the <u>NOAnet GSAC</u> repository	NETWORKS
crl 2016-11-06	RAW data from the CLR ftp server at ENS (sorted by station and year)	Seismological arrayThe GNSS array
GNSS	RINEX data from the CRL ftp server at ENS (sorted by year and doy)	
	Last CRL data processing (daily data processed with GIPSY v6.4)	INTRANET
	Last processing of data from the NOA GSAC	DirectoryAdmin
	Folder with <u>daily solutions</u> – Folder with daily <u>tropospheric delays</u>	

Correlation of images



<u>Principle:</u> match the amplitude of the signal and calculate the difference of the phases



InSAR requires two epochs of observations – it is a differential technique

Correlation of SAR images



Aigion, M_s=6.2, 15 June 1995





Co-seismic deformations mesured by GPS and SAR interferometry



Routine interferogram production (NOA processor)



Routine interferograms production (CNRS processor)

Interferograms (see also complete catalogue)

Last descending interferogram track 80 (~04:35 UT)



Corrected and filtered interferogram (CNRS processor)

Troposphere-phase relation in the last descending (track 80) interferogram

Last corrected descending interferogram track 80 (~04:35 UT)



Get interferograms from the CRL portal

Interferograms		Recherche Q
crl 2016-11-06 InSAR	 SENTINEL-1 last routine interferogram from <u>AIPS</u> Track 80 : <u>unfiltered</u>, <u>filtered</u> Track 175 : <u>unfiltered</u>, <u>filtered</u> Track 7 : <u>unfiltered</u>, <u>filtered</u> 	NETWORKS • Seismological array • The GNSS array
	 SENTINEL-1 archived routine interferograms from <u>AIPS</u> Track 80 unfiltered: <u>Figures</u>, <u>high res pngs</u>, <u>geotif phase</u>, <u>geotif amplitude</u> filtered: <u>Figures</u>, <u>high res pngs</u>, <u>geotif phase</u>, <u>geotif amplitude</u> 	INTRANET • Directory • Admin
	 Track 175 unfiltered: <u>Figures</u>, <u>high res pngs</u>, <u>geotif phase</u>, <u>geotif amplitude</u> filtered: <u>Figures</u>, <u>high res pngs</u>, <u>geotif phase</u>, <u>geotif amplitude</u> Track 7 unfiltered: <u>Figures</u>, <u>high res pngs</u>, <u>geotif phase</u>, <u>geotif amplitude</u> filtered: <u>Figures</u>, <u>high res pngs</u>, <u>geotif phase</u>, <u>geotif amplitude</u> 	PAGES Borehole CRL School CRL-links Data-products