Introducing "TIO": Optical imagery time series analysis on the Geohazards Exploitation Platform

Volat Matthieu* , Pascal Lacroix[†1], Noëlie Bontemps[‡2], and Marie-Pierre Doin[§3]

[1]ISTerre – Institut de recherche pour le développement [IRD] : UMR237 – France
[2]Université Joseph Fourier (Grenoble 1 UJF) – Université Joseph Fourier - Grenoble I – Université Joseph Fourier - BP 53 - 38041 Grenoble Cedex 9, France
[3]ISTerre – Centre National de la Recherche Scientifique - CNRS – Université Grenoble Alpes ISTerre CS 40700 38058 GRENOBLE Cedex 9, France

Résumé

Services on the Geohazards Exploitation Platforms (GEP), a European Space Agency (ESA) initiative, allow to process only single or a single pair of products for ground deformation. Processing time series with InSAR data, but its scope remained difficult due to the complexity of such processing.
Here we present the Timeseries displacement Inversion from Optical images processing, or "TIO": a new processing service implemented on GEP geared toward quick ground deformation/movement measurement based on optical imagery time series analysis. The basis of the processing was introduced in [Bontemps 2017]. Our aim is to integrate this method in a toolbox that would take optical product as input and output the inverted time serie. Ease of use and automation are two crucial criteria as we aim to propose this service to a broad community with little experience in the technical aspects of the processing, nor access to existing processing facilities.

As a processing designed from start to run on GEP, TIO relies and takes advantage of GEP facilities. Product are first received from the online catalog. We choose to focus first on Sentinel-2 imagery due to the dataset availability in the catalog and its quick return time.After retrieving the products in SAFE format, the first step is to create correlation maps between various dates. A large number of pairs should be selected to provide redundancy in the correlation measurement. The GEP platform allows to reuse block from other services and we hoped to apply the MPIC processor, where this step is optimized, especially for large scale datasets. Due to delays in availability and constrained time windows, we opted to implement a simple correlation processor.

TIO is designed with a strong emphasis on ease of use, as does GEP. We integrate with the web portal interface, and choose to limit the number of parameters to the necessary minimum. We provide sensible defaults for the parameters.

*Intervenant
[†]Auteur correspondant: pascal.lacroix@univ-grenoble-alpes.fr
[‡]Auteur correspondant: noelie.bontemps@ujf-grenoble.fr
[§]Auteur correspondant: marie-pierre.doin@univ-grenoble-alpes.fr

Presenting results is even more important. Without the possibility to interactively analyze results on the portal, we need to present the output with some qualitative information so the user could decide whether the data is worthy of downloading or need reprocessing with different parameters. GEP way of presenting outputs is to generate quicklooks overlayed on a map. Instead of naively displaying raw output data, we use matplotlib to generate quicklooks with color scales and annotations. But displaying that many images is burdensome. No animation format is supported by the GEP portal, but we worked around this limitation by using the APNG format that fools the portal into thinking it displays PNG imagery.

After discussing with potential users, and using previous experiences, we decided to not overprocess nor analyze the data on the platform, as scientists usualy prefer to perform those tasks with inhouse or well understood tools.
We showed how a reliable and easy to use ground displacement service can be implemented on the GEP platform. We also underlined the necessity to display some qualitative information about the result so the user can decide to fetch them or not.