**Title**

Arc selection strategies for application-aligned monitoring using InSAR

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**Abstract**

Interferometric Synthetic Aperture Radar (InSAR) is a geodetic technique that is capable of monitoring surface displacements up to millimeter-level of precision. The end products from conventional InSAR processing are application-agnostic, which means that they are not optimized for any particular application. InSAR products could be more beneficial if tailored for a relevant application, particularly if expert users can tune the products according to their monitoring requirement. Here, we develop tools for application-aligned monitoring by means of the selection of application-relevant arcs between scatterers in InSAR. We are interested in the use of local (short) arcs between point scatterers, as these arcs are more likely to be better suited for monitoring localized differential deformation, and may provide observations of better quality due to the fact that they are less prone to atmospheric noise.

We first compare the time series of local arcs and conventional time series w.r.t.\ a common reference point based on their deformation behavior. The comparison reveals that the time series of local arcs are capable of providing additional information on deformation behavior over the conventional method. However, the quality of observations in local arcs in general is found to be more variable, and often even worse than those from the conventional method. Most likely, the reason for this is the absence of noise reduction in local arcs in comparison to the time series from the conventional method which optimizes the selection of the common reference point to reduce noise in the time series.

In addition, to optimize the arc selection for a given application, we propose an arc tuning strategy, where criteria can be set based on arc parameters, i.e., the length, the elevation difference (between point scatterers) and the azimuth of the arc. We also introduce the arc clustering method as an exploratory data analysis algorithm for general-purpose monitoring using local arcs. Both of these methods are demonstrated on test scenarios over the quay walls along the canal network of Amsterdam. The demonstration on arc tuning shows that arc setting criteria on arc geometry parameters are adequate to select arcs with certain orientations, and the selection can be further aided by estimating displacement parameters with multiple hypothesis testing. The results from the arc clustering show the potential of detect instability over a certain area using arcs without knowing the motion of the specific object.

This study contributes to monitoring deformation where the InSAR data can be optimally attuned based on a particular application. In order to convey information on selected arcs effectively, a visualization tool based on an interactive map is created in a jupyter notebook environment.