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The integration of Multiridge and ScalFun techniques to analize the volcanic ground deformation pattern: the Okmok volcano (Alaska, USA) case study.

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Volcanic phenomena are nowadays monitored by the regular detection of physical and chemical dimensions. One of these is represented by the ground surface deformation field caused by the variations of several geometrical and physical parameters of magmatic reservoirs.
Since the development of the remote sensing techniques, a great amount of deformation field data is available and so the exploitation of these information becomes an important task. Currently, the most employed methods are essentially based on the optimization/inversion procedures of model parameters, but they are characterized by the not uniqueness solution problem.
In this context, we propose and validate a new methodology for the estimation of the simple source geometrical parameters responsible of the ground deformation field, recorded by DInSAR technique, in a volcanic environment. Assuming the linear elastic behavior of the media and the half space isotropicity, and considering the Love's argumentation on the potential theory of the deformation field, we use Multiridge and ScalFun techniques to achieve univocal information about depth, horizontal location and shape of active sources.
We firstly verify the methodology on Mogi source model synthetic tests, obtaining a 3 % maximum error on the estimation of depth source, and then we validate it on the Okmok Volcano ground deformation field, achieving results extraordinarily compatible with the previous works.
We conclude that the proposed methodology provides important univocal solutions that can be used to reduce the number of unknown parameters in a possible classical above mentioned investigation procedures of source parameters.