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Learning methods for the calculation of deformation maps in Earth sciences, from optical images

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Optical satellite images are proving to be a valuable tool for quantifying the deformation of the ground surface caused by an earthquake, especially in the direct vicinity of the co-seismic surface rupture, where InSAR often saturates, due to the amplitude of the displacement. When comparing an image acquired before the earthquake with an image acquired after, using correlation to measure pixel displacement, some areas may pose a problem, due to the effect of diachronism. The objective of this work is to try to solve this problem, using machine learning. We believe it is possible to train a neural network with synthetic examples of pre- and post-earthquake satellite image pairs to directly measure the displacement field. To that end, we created a training dataset, based on real satellite images (Sentinel-2), in which synthetic displacement was added. This dataset is used to train a CNN (convolutional neural network) ent-to-end, to measure displacement field more robustly against the effects of diachronism.

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