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Seismic Source Inversion by Neural Networks and InSAR

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We present an innovative approach to exploit the capabilities of neural networks in seismology. In particular the work aims to the quantitative modelling of the seismic source and the interferogram inversion for retrieving the fault plane geometric parameters. The problem can be sum up as follows. When a moderate-to-strong earthquake occurs we can apply SAR Interferometry (InSAR) technique to compute a differential interferogram and measure the surface displacements. Each differential interferogram contains the information concerning the geometry of the seismic source the earthquake comes from; its shape and size, the number of fringes, the lobe orientation and number are the main features of the surface effects field. The earthquake has been generated by an active, seismogenic, fault; therefore an artificial neural network is properly generated and trained to provide an inversion procedure applied to single out the geometric parameters of the fault. We first computed the forward models (the synthetic interferograms) by varying the main fault parameters within a certain range and step. The parameter inversion has been then applied to some test cases (Izmit earthquake, 1999; Bam earthquake, 2003) thus providing a reliable estimate of such parameters.