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Application of seismic interferometry by multidimensional deconvolution to earthquakes data recorded in Malargue, Argentina

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Seismic interferometry allows one to turn a receiver into a so-called virtual source. Conventionally, simple cross correlations suffice to retrieve a virtual-source response. This approach, however, has limitations in case of irregularities of in the distribution of the illuminating sources (e.g., noise, earthquakes). Seismic interferometry by multidimensional deconvolution (MDD) allows one to correct the virtual-source responses retrieved using conventional seismic interferometry (i.e. by crosscorrelation). This is achieved through deconvolution of these responses by a so-called point-spread function, which can be built from the recordings themselves.

We apply seismic interferometry by MDD to surface waves originating from regional earthquakes. For that purpose, we use the Malargüe seismic array in Argentina (aperture $\sim$60 km). This T-shaped array consists of two perpendicular lines of stations. We turn the receivers along one of the two lines into virtual sources whose responses are recorded by the receivers along the other receiver line.

We first model the retrieval of virtual-source responses using different distributions of synthetic earthquakes. We find that the application of seismic interferometry by MDD results in retrieved surface-wave responses that are more accurate than the responses retrieved using seismic interferometry by cross correlation. In particular, we find that the MDD responses are more stable in terms of arrival time. Second, we apply the technique to the field data (a total of 11 earthquakes along the coast of Chile). For this limited number of earthquakes, the retrieval of interferometric responses is more challenging, but we expect the MDD responses of the field data to show improvement with respect to the virtual-source responses retrieved using conventional seismic interferometry.