



Coherence-loss from InSAR data in the Atacama Desert after the March 2015 extreme event.

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The heavy rain event occurred on March 2015 affected a large area of the Southern Atacama Desert. This hyper arid to semiarid area is characterized by scarce vegetation and ephemeral rivers. This event was responsible of the flooding of larger and triggered several debris flows in the Copiapó watershed which destroyed many roads and houses affecting thousands of people. Although the nature of the flows has already been yet discussed in the literature many issues remain unclear concerning the behaviour of desert areas against extreme rains. The evaluation of the erosive response lacks maps of surface erosion processes activated after extreme rain. It is known that the erosion pattern is controlled by the rain amount and intensity. Nevertheless, in the study area many lithologies present different erodibility behaviour which lead onto differential response of the landscape against erosion after the March 2015.

We take advantage of the availability of InSAR data acquired from October 2014 to December 2015 acquired by Sentinel satellite to construct a large time series of InSAR coherence images. From the subset of images acquired before the event, we quantified the variability of the coherence values and we analysed the large coherence value variations (above the 95.7 quantiles) in the interferogram encompassing the event. To discriminate the loss of coherence due to surface erosion or sediment transport from change in soil moisture, we examined the temporal evolution of the coherence from the subset of images acquired after the event. The resulting map of erosion patterns reveal an obvious relation positive correlation within areas with larger amounts of precipitation but also a clear relationship between loss of coherence and lithology. Deeper analysis reveal that several areas of dune fields and valley floor with anthropic influence are subjected to continuous loss of coherence whilst caldera and hydrothermal alteration zones are prone to be intensively influenced after this event.

Future work in the behaviour of this area needs to be focused on the highlighted areas that arise from the InSAR analysis.

Keywords: InSAR, Atacama, extraordinary event, erosion