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Redefinition of Seismic Sources of Nevado del Ruiz Volcano Using HYPODD

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In this study we use the double-difference algorithm, HypoDD (Waldhauser and Ellsworth, 2000), to relocate every seismicity in the area of Nevado del Ruiz volcano (VNR) from 2000 to 2016. Earthquakes were originally located using Hypo71 (Lee and Lahr, 1972). These data are amenable to this relocation technique due to the large number of earthquakes with clear body wave arrivals and the robust local network of 17 seismic stations with good network geometry. Resulting earthquake locations define faults and structures with greater precision than original locations. The seismic activity of VNR is concentrated in an area of approximately 100 km². Based on initial hypocentral locations, we analyzed the volcano-tectonic (VT) earthquakes <0.5 ML (>12000 events) to identify VT seismicity sources at the volcano. The seismic activity distribution was mainly concentrated within 4 km (2000-2012) and 9 km (2012-2016) of the active vent, the Arenas crater (CA). During 2000 – 2012, VT events were located within CA and at nearby sources, SSW-SE of CA, and occasionally WSW of CA. Subsequent to 2012 the spatial distribution changed, and seven active sources were observed: CA, SSW-SE, WSW, NE, NE-NNE, NW, and far NNW. The shallow sources are CA and SSW-SE; they have seismicity mainly <4 km depth with low to intermediate energy levels. The NE, NE-NNE, NW and SSW sources are characterized by VT events mainly between 4 and 6 km depth with high energy levels and large numbers of events. The F-NNW and NNE (northernmost part) sources are the most recent sources; they also have high energy levels and large numbers of events. Some of these sources are observed along existing geologic fault systems. The NNE and SSW-SE sources are located along the Villamaria-Termale and Palestina Faults, respectively.