

Diffuse CO₂ Monitoring at Cerro Negro Volcano, Nicaragua

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Cerro Negro is an active basaltic volcano belonging to the active Central American Volcanic Arc which includes a 1,100 Km long chain of 41 active volcanoes from Guatemala to Panama. Cerro Negro first erupted in 1850 and has experienced 21 eruptive eruptions with inter eruptive average periods between 7 and 9 years. Since the last eruption occurred on 5 August 1999, with erupted lava flows and ash clouds together with gas emissions, a collaborative research program between INETER and ITER was established for monitoring diffuse CO₂ emissions from this volcano. Until 2012, twelve soil CO₂ emission surveys covering an area of 0.6 km² have been performed by means of the accumulation chamber method to evaluate the spatial and temporal variations of CO₂ degassing rate in relation to the eruptive cycle of Cerro Negro. A total diffuse CO₂ emission output of 1,869 t/d was estimated for the 1999 survey; just 3 months after the 1999 eruption which can be considered within the post-eruptive phase. For the April, 2002 and March, 2008 surveys, considered within the inter-eruptive phase, a clear decreasing tendency on the total diffuse CO₂ output was observed, with estimates of 431 and 10 t/d, respectively, except a small increment in 2004, to 256 t/d, associated with an anomalous seismic activity. The higher anomalies are located around the crater of 1995 and 1999. An increasing on the total CO₂ emission has been observed, from December 2008 to February 2011, with total diffuse CO₂ output estimates from 12 t/d to 43 t/d, respectively. These temporal variations show a close relationship between diffuse CO₂ emission and the eruptive cycle at Cerro Negro. This relationship indicates that monitoring CO₂ emission is an important geochemical tool for the volcanic surveillance at Cerro Negro.