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# Diffuse helium emission and heat flux from Cerro Negro Volcano (Nicaragua)

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Cerro Negro volcano (726 m.a.s.l.) is a cinder cone formed in 1850, erupting 23 times since then (last eruption in 1999), located in the NW of El Hoyo-Las Pilas volcanic complex, Nicaragua, and belonging to the active Central American Volcanic Arc. As part of the geochemical monitoring program for the volcanic surveillance of the volcano, four diffuse He emission and heat flux surveys have been performed in 2011, 2012, 2016 and 2017. Both parameters were calculated using the information from 100 sampling sites distributed inside the main crater covering an area of 0.14 $km^2$. Soil gas was collected at each sampling site and stored in 10 cc glass vials and later analyzed for He content by a quadrupole mass spectrometer. Diffusive and convective emission components of He were estimated at each sampling site following the Fick and Darcy's laws respectively. The heat flux was calculated following the method described by Dawson (1964). Sequential Gaussian simulation was used to construct spatial distribution maps of the emission values and to estimate the emission of the study area. The calculated heat fluxes and He emission rates were 13, 11 and 9 MW, and 6.6, 17.9 and 4.2 $kg \cdot d^{-1}$ for 2011, 2012 and 2016 respectively. For 2017 survey the calculated heat flux is 11 MW. He flux is being evaluated at the time of writing this abstract. The observed increase in the He flux in 2012 might suggest the uprise of less-degassed magma from deep to shallower levels beneath the volcano in the period 2011-2012. The combined heat flux and He emission studies provide valuable information to improve early warning system of the volcano.

**References:**

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