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Sustainable research on a Central American volcano

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Masaya volcano (Nicaragua) is an 11 km long, 6 km wide basaltic caldera which has been emitting gas continuously for more than 150 years from one of its summit craters (Santiago crater). Those emissions affect a large area in Nicaragua (over 1250 km2) in a region between the volcano and the Pacific Ocean, and have important effects on the wellbeing of local residents by damaging their health, and also deteriorating local infrastructures through the formation of acid rain. Plinian eruptions have also taken place at Masaya in the past, affecting an area where today more than 1.5 million people live, including the capital Managua and the city of Masaya. The recent (October 2015) resurfacing of a stable lava lake at the bottom of Santiago (with a return period of $\sim$20 years over the last century) has renewed the interest of film crews, research teams and tourists to visit and work on the volcano, which was already one of the main tourist attractions in Nicaragua.

These relatively short periods in which Masaya gains international attention are a good opportunity to improve our knowledge of a potentially dangerous volcano. However, in order to more accurately characterize its evolution and understand the signs that foretell shifts in activity in the future, long term monitoring efforts are required that complement the work done by local institutions like INETER (Nicaragua's institution in charge of land management and natural hazards monitoring). Sustaining this type of long-term programs is an increasingly difficult task since most research grants today tend to focus on short-term projects.

The Open University (UK) and other universities in collaboration with the Earthwatch Institute have been working on Masaya Volcano almost every year since 1996. Benefitting from a stable model of Citizen Scientists and volunteers contributing towards research has proved extremely successful not only as a funding mechanism, but also in providing the necessary work hours for certain types of data collection (i.e. extensive geological/geophysical surveys) that would be impossible otherwise. This scheme also opens up the possibility for organizations such as the GEOARC Foundation to expand the horizons and carry out "extreme" research endeavours that tackle problems such as the sampling of the highly convective (with speeds over 30 m/s) lava lake at the bottom of Santiago Crater. A new expedition in July 2018 will aim at safely accessing the secondary crater San Fernando to characterize its ecosystem and assess the extent of the superficial magma reservoir under the summit area.