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FOGO-2014: Monitoring the Fogo 2014 Eruption, Cape Verde

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Fogo volcano, located in the Cape Verde Archipelago offshore Western Africa, is a complete stratovolcano system that was created by the Cape Verde hotspot, forming the island of Fogo. The top (Pico do Fogo) reaches ~2830m above sea level, and raises ~1100m above Chã das Caldeiras, an almost flat circular area with approximately 10 kilometres in the north-south direction and 7 kilometres in the east-west direction. Chã das Caldeiras, surrounded towards the West by the ~1000m high Bordeira rampart, has been inhabited since the early 20th Century, because it is one of the most productive agricultural areas in this semi-arid country.

Fogo volcano erupted on November 23, 2014 (~10:00UTC) on a subsidiary vent of the main cone, after 19 years of inactivity. C4G (Collaboratory for Geosciences), a distributed research infrastructure created in 2014 in the framework of the Portuguese Roadmap for Strategic Research Infrastructures, immediately offered support to the Cape Verdean authorities, with the goal of complementing the permanent geophysical monitoring network operated in Fogo island by INMG, the Cape Verdean Meteorological and Geophysical Institute. This permanent network is composed of seven seismographic stations and three tiltmeter stations, and the data is transmitted in real time to the INMG geophysical laboratory in São Vicente Island, where it is analysed on a routine basis.

Pre-eruptive activity started to be detected by the permanent monitoring network on October 2014, with earthquakes occurring at depths larger than 15 km. These events led to a first volcanic warning to the Cape Verdean Civil Protection Agency. On November 22 several volcano-tectonic earthquakes were recorded at shallow depths, indicating shallow fracturing. On the basis of this activity, INMG issued a formal alert of an impending eruption to the Civil Protection Agency, ~24 hours before the onset of the eruption. Volcanic tremor and clear tiltmeter signals were recorded about one hour before the eruption began. The Copernicus Emergency Management Service was also activated and several maps of lava flows advance and general site information were produced, based on Earth Observation, to facilitate crisis management.

The eruption caused no casualties or personal injuries. The lava expelled by the current eruption (still active at the time of submission, January 6, 2015, but declining) destroyed the two main villages in the caldera (~1000 inhabitants), previously evacuated, and covered vast areas of agricultural land, causing very large economic losses and an uncertain future of the local populations.

The C4G team installed a network of seven cGNSS receivers and nine seismometers, distributed in Fogo Island. The operation of the equipment started on 28th November 2014, and will continue until the end of January 2015. The mission also included a new detailed gravimetric survey of the island, the acquisition of geological samples, and the analysis of the air quality during the eruption.

We present here a detailed description of the monitoring efforts carried out during the eruption as well as initial results of the analysis of the data collected.

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