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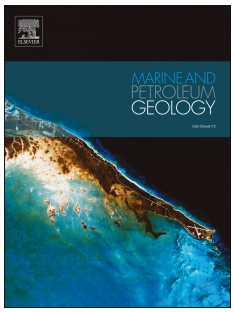

Drone high resolution infrared imaging of the Lusi mud eruption

F. Di Felice, A. Mazzini, G. Di Stefano, G. Romeo

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Drone high resolution infrared imaging of the Lusi mud eruption

F. Di Felice (1), A. Mazzini (2), G. Di Stefano (1), G. Romeo (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Italy.

(2) Centre for Earth Evolution and Dynamics, University of Oslo, Oslo, Norway

Abstract

The use of low-cost hand-held infrared (IR) thermal cameras based on uncooled micro-bolometer detector arrays became more widespread during the recent years. Thermal cameras have the ability to estimate temperature values without contact and therefore can be used in conditions where targets are difficult or dangerous to reach such as volcanic eruptions. Since May 2006 the Indonesian Lusi mud eruption continues to spew boiling mud, water, aqueous vapour, CO_2, CH_4 and covers a surface of nearly 7 km^2. Here we performed surveys above and around the erupting crater using a specifically equipped remote-controlled aerial vehicle (drone). Despite the harsh logistics and the continuously varying gas concentrations, we managed to collect IR images composing mosaics to estimate the crater zone spatial and temporal thermal variations as well as that in the surrounding regions. In this manuscript we provide a) a description of the main processes that affect and control the acquisition of IR images; b) an overview of still non disclosed physical model used by the thermal camera employed during our survey (i.e. Flir I7 IR); c) a method for capturing high resolution infrared images over an erupting clastic system; d) analysis and interpretation of the acquired data and scientific results. The results show that it is possible to obtain good quality mosaics also in inaccessible areas such as erupting craters where fixed reference points are not constant, and where the presence of IR attenuation factors introduce errors in terms of temperature estimates. However the IR camera radiative transfer model (based on Lowtran model) allows the