

PACLELE MARI AND MICI MUD VOLCANO ACTIVITY IN BERCA (BUZAU, ROMANIA) STUDIED VIA DINSAR (DIFFERENTIAL SAR) INTERFEROMETRY

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ABSTRACT

Mud volcanoes are not generally considered to be inherently dangerous. Nevertheless, in the wake of the deadly Java Island eruption (05/29/2006) which left 15,000 homeless and turned a verdant landscape into an uninhabitable moonscape, one might well question their potential risk. The resemblances between the Berca and the Java Island mud volcanoes, in particular the proximity of drilling operations and frequent, intense seismic activity (earthquakes: 1977 ($M = 7.2$), 1986 ($M = 6, 9$) and 1990 ($M = 7.1$) must thus be addressed. The majority of fluids which surface from mud volcanos, originating from subterranean depths of 200 to 300 m for Berca, are methane gas bubbles which enter the atmosphere directly. One obvious risk is their contribution to global warming. A second risk is landscape transformation. Mud volcanoes are thus a potential factor in both climate change and geomorphology. There is, thus, reason to document their contribution to the increase in gas and mud freed into the atmosphere. Our study monitored the activity of these volcanoes over a short period of time, from October and December 2004 to April 2005, detecting minor deformations via differential (DinSAR) interferometry by means of SAR images obtained from the ENVISAT platform. The principal objective was the detection and monitoring of minor deformations (a study of the deformation field) attributable to mud volcano activity in the vicinity of Berca, the volcanoes being a distinctive characteristic of region and of the Buzau Valley. We employed differential interferograms to document fringe displacement in two sets of ENVISAT images over intervals of 70 to 105 days. The coherence images thus obtained show significant surface coherence for each volcano between the two acquisition periods, and so demonstrate the reliability of the differential interferometry thus generated. We found that, during the acquisition period, the northern volcano (Paclele

Mici) was more active than the southern volcano (Paclele Mari).

KEYWORDS

Mud Volcanoes; Radar; Differential Interferometry; SAR; DinSAR; Envisat; Romania.

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1. INTRODUCTION

Few studies have been devoted to these volcanos which are relatively unknown. Generally, they are not considered a major threat. Nevertheless, the catastrophic eruption of the Lusi Volcano (Sdorjo, Java island, Indonesia) has raised questions concerning the risk potential of drilling and earthquakes, the possible explanations for this eruption). The Lusi Volcano erupted two days after the May 27, 2006, earthquake, whose epicenter was 280 km away, and one day after the May 28 Lapindo Brantas industrial accident which was attributed to drilling operations and which occurred 200 m from the eruption zone. The consequences of the eruption were catastrophic. Since the eruption, billions of tons of mud have devastated the industrial region of the Java Island. Over a three-year period, a once verdant landscape was transformed into a barren expanse where mud reigns supreme. Astonishingly, the mud and gas emissions show no sign of abating, and the eruption, which left 15,000 homeless, has come to be considered as one of strangest of natural disasters. Several hypotheses have been advanced to explain what triggered the eruption: (i) an earthquake; (ii) a wellbore in the vicinity; (iii) the geology of Java. One wonders, nevertheless, why the phenomenon suddenly manifested itself at that precise point in time. The reactivation of the geological

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