rent phases, which all have different seismic characteristics. The first phase, while the crater was still covered by meltwater, was very unstable. In the second phase, the ash production was less intensive and after a while it was clear that lava was flowing out of the crater. In the first week of May, after an intense swarm of earthquakes at considerable depth, the eruption revived with heavy ashfall that lasted for over two weeks. On 21 May the activity had almost died down, but still there were occasional ash explosions. At the end of May no magma was coming from the crater, but it was still degassing and steam was rising. This presentation will focus on the monitoring of the two eruptions.

References:


SD14/P111/D1239 - SIMULATED VOLCANIC SEISMICITY SCALING ACCORDING TO BRITTLE-FAILURE IN THE ABSENCE OF FLUID FLOW

R. Harrington, P. Benson

Karlsruhe Institute of Technology; University College London

Here we present a new analysis of experimental data meant to simulate the types of seismic signals seen in a volcanic environment. Two rock deformation experiments performed under both water saturated and unsaturated conditions produce acoustic emission events which resemble hybrid earthquake commonly observed in a volcanic environment. We obtain the source spectra of events occurring in both the unsaturated experiment and during the decompression phase of the saturated experiment using an empirical Green’s function method, and estimate their spectral corner frequencies, which are inversely proportional to event duration. Spectral fits indicate that the acoustic emission events occurring under dry conditions follow the expected scaling of moment and corner frequency for standard brittle failure in an elastic medium with constant stress drop, namely $M_o = f_1^{3/2}$. The events occurring during the fluid decompression phase of the saturated experiment using an empirical Green’s function method, and estimate their spectral corner frequencies, which are inversely proportional to event duration. The observed scaling for the events under dry conditions suggest that the duration changes in a predictable way with increasing moment. Conversely, the lack of any obvious scaling between corner frequency and moment for the wet events suggests that the durations do not change in any particular way with increasing size.

A comparison of the moment–corner frequency scaling between experiments suggests an observation of $M_o = f_1^{3/2}$. Scaling must result from a standard stick-slip (i.e. brittle failure) source. Furthermore, such scaling should rule out fluid flow as a source of the observed waveforms, as there is no plausible reason for the driving pressure for fluid flow to be dependent on duration in any specific way. If such a $M_o = f_1^{3/2}$ is observed for low-frequency events in a field environment, it would require such a similar brittle-failure source to explain such source parameter scaling. The implications of our work are that hybrid earthquakes in a volcanic environment do not always require fluid flow to explain their signal, and therefore are not necessarily indicative of sub-surface fluids.

TS - TSUNAMIS: NEW EFFORTS IN TSUNAMIGENIC EARTHQUAKES MONITORING AND ESTABLISHMENT OF WARNING SYSTEMS IN THE EURO-MEDITERRANEAN REGION

TP1/P1/D240 - THE USE OF PROBABILISTIC TSUNAMI HAZARD ASSESSMENT IN EARLY WARNING SYSTEM DESIGN

M. Sørensen, M. Spada, A. Babeyko, S. Wimmer, G. Grünthal

1Dept. of Earth Science, University of Bergen, Norway; 2Swiss Seismological Service, ETH Zürich, Switzerland; 3GFZ German Research Centre for Geosciences, Potsdam, Germany

TSUNAMIS are a useful framework for such evaluation. Estimating the occurrence probability of tsunami events is furthermore critical for setting construction standards and, more generally, prioritizing risk mitigation efforts. Tsunami hazard in the Mediterranean region has traditionally been estimated by considering scenarios of tsunami impact for limited geographical regions, but little attention has been paid to the probability of any given scenario. We present the first probabilistic estimate of a volcanic earthquake generated tsunami hazard for the entire Mediterranean, and we estimate the annual probability of exceeding a given runup height at any coastal location in the region. The highest hazard is in the Eastern Mediterranean owing to earthquakes along the Hellenic Arc, but most of the Mediterranean coastline is prone to tsunami impact. Our method allows us to identify the main sources of tsunami hazard at any given location, and to investigate the potential for issuing timely tsunami warnings. We find that the probability of a tsunami wave exceeding 1 m somewhere in the Mediterranean in the next 30 years is greater than 95 percent. This underlines the urgent need for a tsunami warning system in the region.

The 27 February 2010 Chile M=8.8 earthquake generated a tsunami that had disastrous effects along a quite long portion of the central Chile coastline and that also propagated across the entire Pacific Ocean with much more moderate consequences. In the hours following the earthquake the attention was very much concentrated on the trans-Pacific propagation of the tsunami waves and on the response and performance of the Pacific tsunami warning system. But the tsunami had already taken only about 20 minutes to attack the Chilean coasts and to produce large destruction, without any local warning or alarm issue. The entity of the effects produced by the tsunami in the near-field was assessed by a number of post-event field surveys carried out by different international teams under the umbrella of the UNESCO-IOC-ITIC. We summarise the results of the survey carried out by the authors of this contribution from 8 to 11 April 2010 in different sectors of the stretch of the VI Region coastline ranging from Llo-lleo in the north to Puerto Montt to the south. The places visited were Llo-lleo, La Boca de Rapel, Las Brisas de Navidad, Matanzas and Puertecillo. In some places, especially in Llo-lleo, the traces of the tsunami already disappeared, but in the other places the tsunami signature was still evident. Following the ITIC guidelines, a large amount of material was collected, including interviews to eyewitnesses and local people, pictures, videos, flow depth, run-up and inundation measures. The latter were collected by using a kinematic GPS approach. In general, we found that the topography of the sites had strong influence on the tsunami effect pattern. Sand dunes demonstrated to be an excellent protection against the impact of the incoming waves, while the presence of rivers or even small streams favoured the wave invasion. As an example, the tsunami was able to travel upstream the Rapel river for about 1 km and a very narrow stream in Puertecillo for about 700 m. Run-ups varied significantly even at local scales: the largest value (circa 16 m) was measured in La Boca de Rapel and corresponded to the largest inundation distance. A final important note regards the awareness of the tsunami hazard that we found in almost all the people we interviewed. In the absence of a local tsunami alarm issue, the knowledge local people have about the tsunami greatly helped in saving lives. The survey has been funded by an Italian project on tsunamis and tsunami early warning system (FIRB- RBAP04FE3A_004).


A. Armigliato, G. Pegnini, A. Repetto, M. Alaggio, S. Tinti, P. Winkler

1Università di Bologna, Dipartimento di Fisica, Settore Geofisica; 2Università de Valparaíso, Chile; 3Universidad Santa Maria, Chile; 4Ingeniería Civil Oceanica, Universidad de Valparaíso, Chile

In the aftermath of the 2004 Indian Ocean Tsunami, efforts to establish an early warning system have been initiated. As the devastating impact of this event revealed the absence of a tsunami warning system in the region, a number of Asian and African countries have expressed interest in developing a regional early warning organization. Hence, the Regional Integrated Multi-hazard Early Warning System for Africa and Asia, also known as RIMES, evolved. As an end-to-