HUMAN ADJUSTMENTS TO THE 1906 ERUPTION OF VESUVIUS, ITALY

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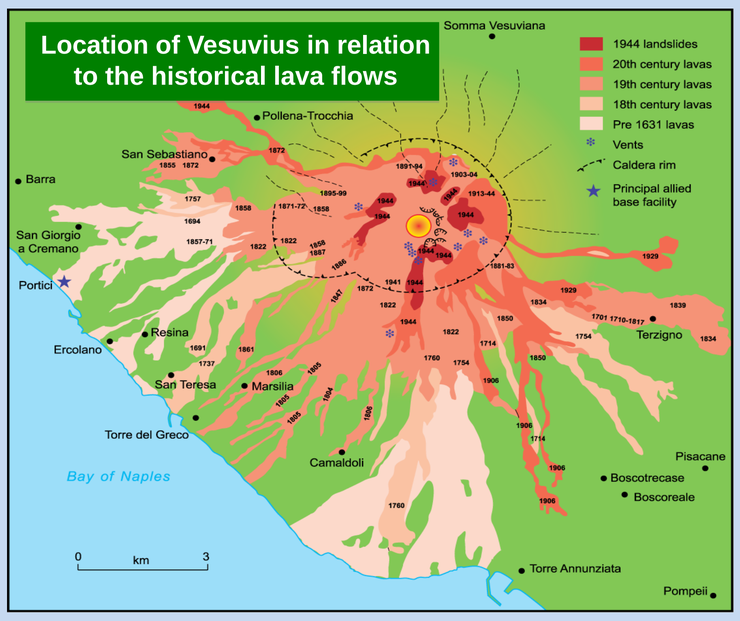
"Vesuvius, yesterday, today and tomorrow" (Lirer *et al*., 2005)

Mount Vesuvius is one of the most studied and dangerous volcanoes in the world due to its long eruptive history and its continued activity. Around 600 000 people live on its flanks and around a further 3 million are estimated to be within range of a future eruption. The stratovolcano has shown many different styles of activity with observations from literate observers stretching back to the classical era. The 1906 eruption of Vesuvius is well known for being an excellent example of a sub-plinian event, which had a significant impact on a densely populated area. From 1872, Vesuvius had been in a relatively continuous period of mild effusion of lavas.

Some reports indicated that signs of increased activity, marked by the notable ash content of the plume together with elevated seismicity, had been first observed on the morning of April 2 1906. This paper is based, *inter alia*, on numerous historical records and in addition to the bibliographic sources used by previous writers, the authors have made extensive use of an account produced by the British military attaché and eye witness reportage contained in English language newspapers of record. Detailed studies of human responses to historic eruptions highlights important lessons that are of value to present day hazard managers.



Phase 1 - Initial Phase (April 4th - 8th)

Summary of volcanic activity

(i) On April 4,5 and 6 lava flows were erupted from a number of vents that opened at progressively lower altitudes on the south-east flank of the volcano.

(ii) Lava effusion was associated with moderate explosions activity at the summit which waxed and waned every few hours, changing from strombolian to vulcanians activity.

(iii) On April 7 fire fountains reached a height of 3 km and lava entered the Church of Santa Anna before coming to a stop on April 8.

Summary of human impacts and responses to this phase

(i) Lava destroyed part of the town of Boscotrecase, with around 100 homes being destroyed in the suburb of Oratorio.

(ii) Lava entered the Church of Santa Anna before coming to a stop 10 km from the cemetery at Torre Annunziata.

Phase 2 - Second Phase (April 8th)

Summary of volcanic activity

(i) On April 8 the central crater became the site of explosive activity, which increased in intensity.

(ii) At 00.30 hrs there were strong explosions and an earthquake and the emission of a considerable quantity of ash, which covered the north-east sector of the volcano. After 03.00-04.00 hrs a sub-plinian column was generated and reached a height of 13 km.

(iii) This sub-plinian phase lasted 18 hours and eroded the walls of the crater, leading to the collapse of the summit cone.

Summary of human impacts and responses to this phase

(i) Roof of the Oratorio church in San Giuseppe collapsed and killed some of the 105 people sheltering inside.

(ii) Italian Military troops sent to Torre Annunziata from Naples as a precautionary measure. Occupied zones around the mountain put under the orders of a Colonel or Major-General to transfer supplies and information (first line).

picture

picture

Phase 3 - Final Phase (April 9th – 22nd)

Summary of volcanic activity

(i) On April 9 – 22 large volumes of ash were erupted and heavy rainfall generated lahars.

(ii) The eruption ended on April 22 and in total some 20 x 106 m^3 of magma had been erupted causing more damage to the cone than any other since 1822.

Summary of human impacts and responses to this phase

(i) Heavy rainfall generated lahars causing extensive damage particularly in and around Ottajano.

(ii) Railway line inhibited along the coast between San Giovanni and Torre Scassato before being restored by the troops on April 13.

(iii) Efforts of the troops were directed towards warning the population when danger was imminent, keeping communication open, removing the sick and injured to the field hospitals established in each zone, searching for and supporting the refugees, protecting buildings from looting and fire and the deconstruction of buildings deemed to be of a dangerous condition and to maintain order.

Human Adjustment to the eruption

The explosive and effusive eruption of 1906 lasted 18 days and concluded a 34 year long cycle that had been characterised by prevalent effusive activity (Bertagnini *et al.,* 1991; Mastrolorenzo *et al*., 1993; Villemant *et al*., 1993) reducing the height of Vesuvius by 115 m and forming a new crater 700 m across and 600 m in depth. The April 1906 eruption was not a unique case in the history of the volcano, as similar sequences of events occurred during many of the so-called 'Final Eruptions,' that typically begin with effusive outpourings of lava, bringing to a close the short strombolian cycles that characterized the volcano in the 1631 – 1944 period. Observations made of the eruption by Mercalli, G., (1906); Perret, F.A., (1924); Lacroix, A., (1906); Johnston-Lavis, H.J., (1909) and from the British military attaché to the Italian government: Lt. Col. Sir Charles Delmé-Radcliffe, archived in the official archives of the U.S.A and of the U.K, detail the sequence of events of the eruption and the damage caused.

There was heavy involvement of the Italian army in coordinating civil defence measures and providing disaster relief to the region and the example of the King and Queen of Italy and by the Duke and Duchess of Aosta had been noted to be inspiring to the inhabitants. In the villages of Ottajano (now named Ottaviano) and San Giuseppe, 216 people were killed and 112 injured by roof collapses caused by tephra, and a further 11 died and 30 were injured in Naples.

More than 76 700 ht of land was adversely affected by the eruption, 9542 ht being covered by tephra or alluvium, and around 34 000 people became refugees. In Torre del Greco, Resina, Portici, San Giorgio and San Sebastiano, for example, the ashes were reported to have been a foot or 18 inches deep, destroying houses and vineyards.

Legacy of the eruption

The 1906 eruption highlights how difficult it was at the time to successfully manage a sub-plinian eruption and the problems for the authorities of managing both the immediate aftermath and long-term relief.

Today population density is much higher and, despite much better civil defence plans being in place, such an eruption would severely test the ability of the authorities, although they would no doubt have the benefit of a period of warning. Religion is a major means by which 'local' people make sense of the eruptions and societal adjustments could facilitate more effective hazard prevention plans, through improved interaction amongst social scientists, civil defence authorities and the local communities.

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