Geophysical Research Abstracts, Vol. 8, 08244, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08244

Syn-eruptive features and sedimentary processes associated with pyroclastic flows entering the sea: the 79 AD eruption of Vesuvius, Naples Bay, Italy

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Seismic reflection profiles and gravity core samples illustrated in this study document the stratigraphic signature of volcaniclastic deposits associated with the entrance of pyroclastic flows into the seawater off Herculaneum during the eruption of the Vesuvius between 24 and 25 August of 79 AD. A volcaniclastic apron was detected at a water depth of 40 to 140 m. This unit is a fan-shaped lithosome about 6 km long and 7 km wide and has a volume of approximately 0.3 km^3.

In the mid apron, the occurrence of large sediment waves (200-300 m wavelength) and hummocky cross stratification suggest deposition of layers by tractive currents accompanied by an excess of suspended sediment load. Gravity cores have sampled a stratigraphic succession characterized by cm-thick, sharp-based, sand-silt graded layers. They are interpreted as deposits controlled by water waves and currents induced by the rapid entry of pyroclastic flows into the sea, and are interbedded with an up to 2 m thick graded coarse grained bed containing shallow water shell detritus and reworked fragments, associated to a tsunami.

The development of the volcaniclastic apron offshore Herculaneum during the 79 AD eruption of Vesuvius was the result of the interplay between the entrance of hot pyroclastic flows into the sea and the reworking of these deposits due to the induced anomalous waves. Based on the results of this study a reconstruction model of the syn-eruptive sedimentary processes that occurred off the city of Herculaneum during the 79 AD eruption of Vesuvius is also proposed.