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Re-calibration of the magnitude scales at Campi Flegrei, Italy, on the basis of measured path and site and transfer functions.

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The quantification of the seismic energy of earthquakes occurring in volcanic regions is of great importance because in order to better understand the dynamics of the volcano. The amount of the released energy and its variation during seismic crises can be considered as an indicator of the source processes acting inside the volcano. In this context, the effect of the propagation in attenuative media should be considered to correct for path effects and to properly estimate the seismic energy released at the source. Moreover, in order to allow a comparison with the dynamic processes occurring in different volcanic areas, the use of magnitude scales as homogeneous as possible is strongly recommended,

In this framework, new duration-based Local (M_l) and Moment (M_w) magnitude scales are obtained for the Campi Flegrei area (southern Italy), by analysing a data-set of local volcano-tectonic earthquakes. First the S-wave quality factor for the investigated area was experimentally calculated and then the distance-correction curve, $logA_0(r)$, to be used in the Richter formula $M_l = logA_{max} - logA_0(r)$, was numerically estimated by measuring the attenuation properties and hence propagating a synthetic S-wave-packet in the earth medium. The Local magnitude scale was normalized in order to fit the Richter formula valid for Southern California at a distance of 10 km. M_l magnitude was estimated by synthesizing Wood-Anderson seismograms and measuring the maximum amplitude. For the same data-set, Moment magnitude from S-wave distance and site corrected displacement spectra was obtained. Comparisons

between Local and Moment magnitudes determined in the present paper, and the old Duration magnitude (M_d) routinely used at the Istituto Nazionale di Geofisica e Vulcanologia - Osservatorio Vesuviano are presented. Moreover, relationships between M_l and M_w calculated for two reference sites are also derived.