

# Supporting Information for "Noise-based seismic monitoring of the Campi Flegrei caldera"

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1. Figures S1 to S4

**Introduction** This supporting information provides some additional figures that motivate the choices operated during the intermediate steps of the analysis (Fig.S1 and Fig.S2); and verify the relationship between  $\Delta v/v$  temporal variations and cumulated rainfall (Fig.S3), or ground shaking (Fig.S4).

Precipitation data come from the Centro Agrometeorologico of the Campania Region (<http://www.agricoltura.regione.campania.it/meteo/agrometeo.htm>) and have been

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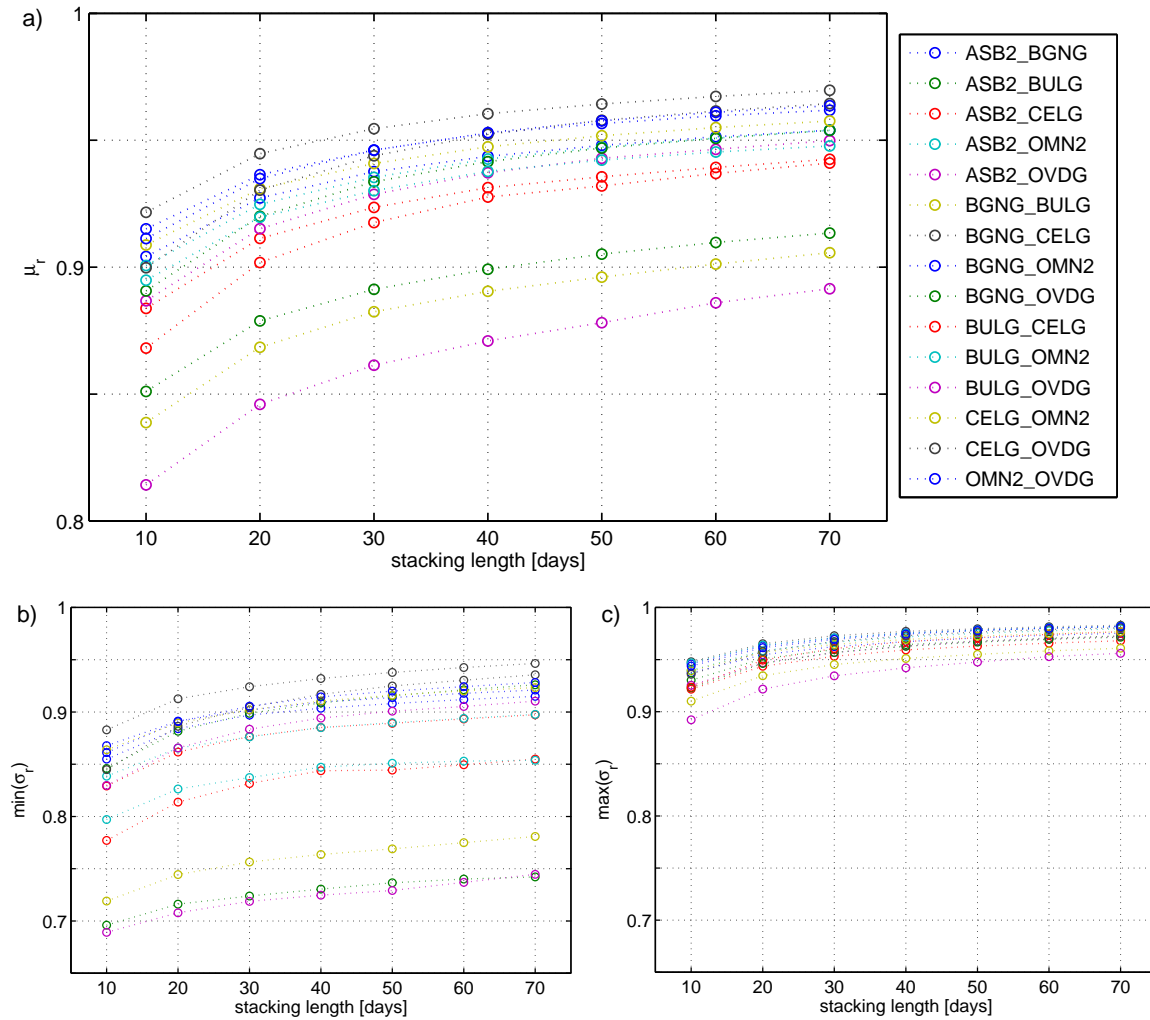
collected at the Pozzuoli-Licola-Cuma station (PLC, green diamond in Fig.1 of the manuscript). This station was operating until the 15 June 2014, when it was dismissed.

The ground shaking was computed as peak ground acceleration (PGA) values per day averaged over all seismic stations. We took into account both local (located inside the caldera,  $M_l > 1$ ) and regional (located in a 100 km radius from Pozzuoli town,  $M_l > 3$ ) events. Local events are from the internal catalog of the INGV-Osservatorio Vesuviano, they are 25 in total. The regional earthquakes are listed in the ISIDe database [*ISIDe working group*, 2016], which counts for 44 events within a distance of 100 km from Pozzuoli and with  $M_l > 3$ , the maximum magnitude is a  $M_l$  5.0 occurred on the 23 December 2013 (the main peak on Fig.S4).

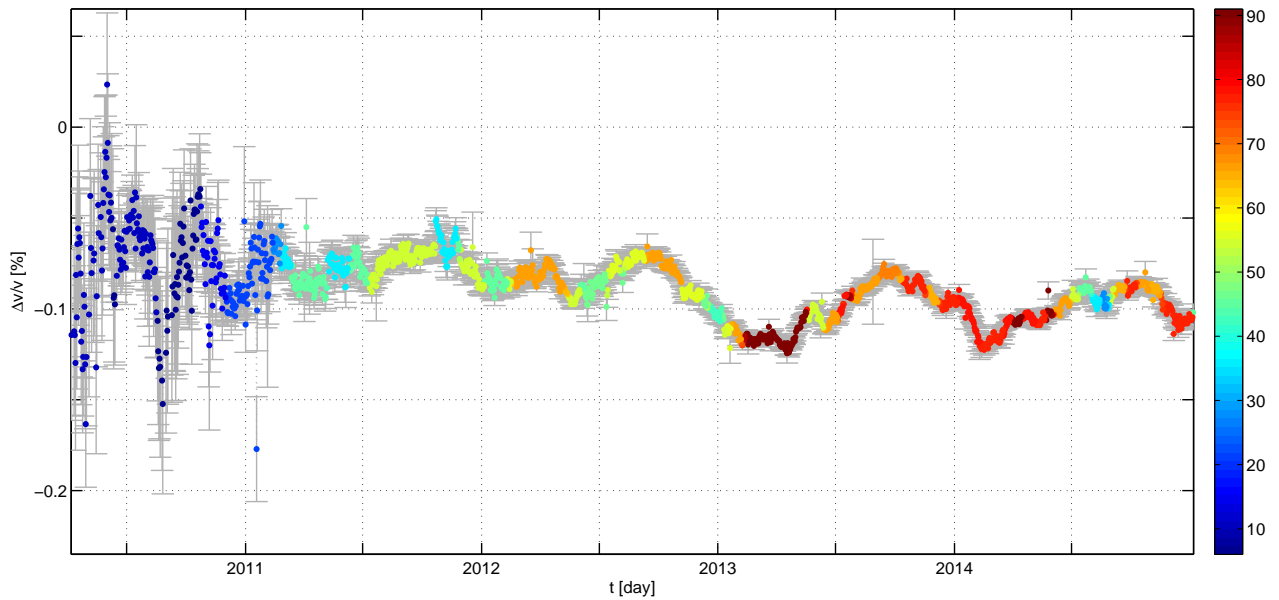
## References

ISIDe working group (2016), version 1.0, DOI: 10.13127/ISIDe.

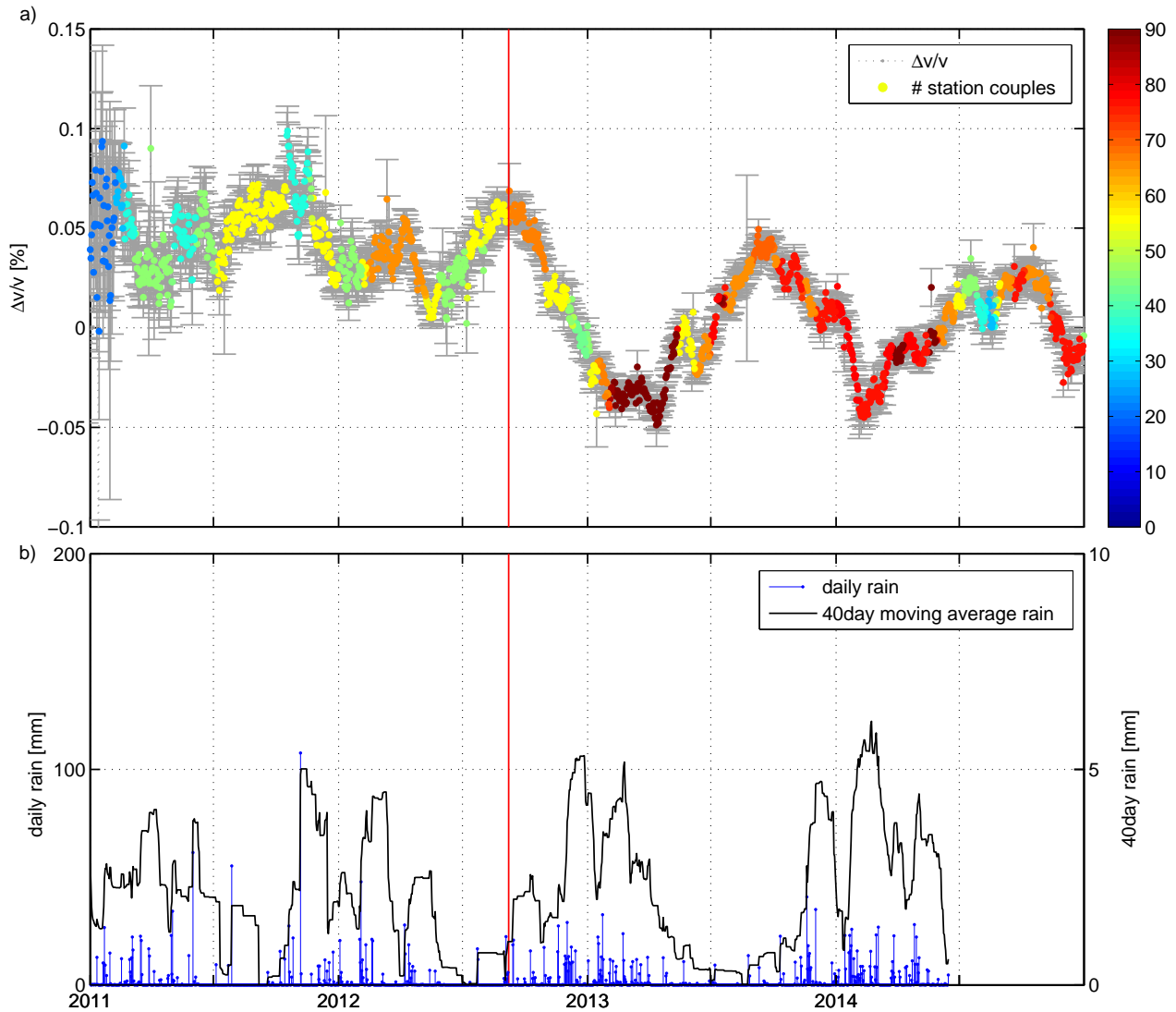
VanDecar J.C., and R.S. Crosson (1990), Determination of teleseismic relative phase arrival times using multi-channel cross-correlation and least squares, *Bull. Seismol. Soc. Am.*, *80*, 150–169.



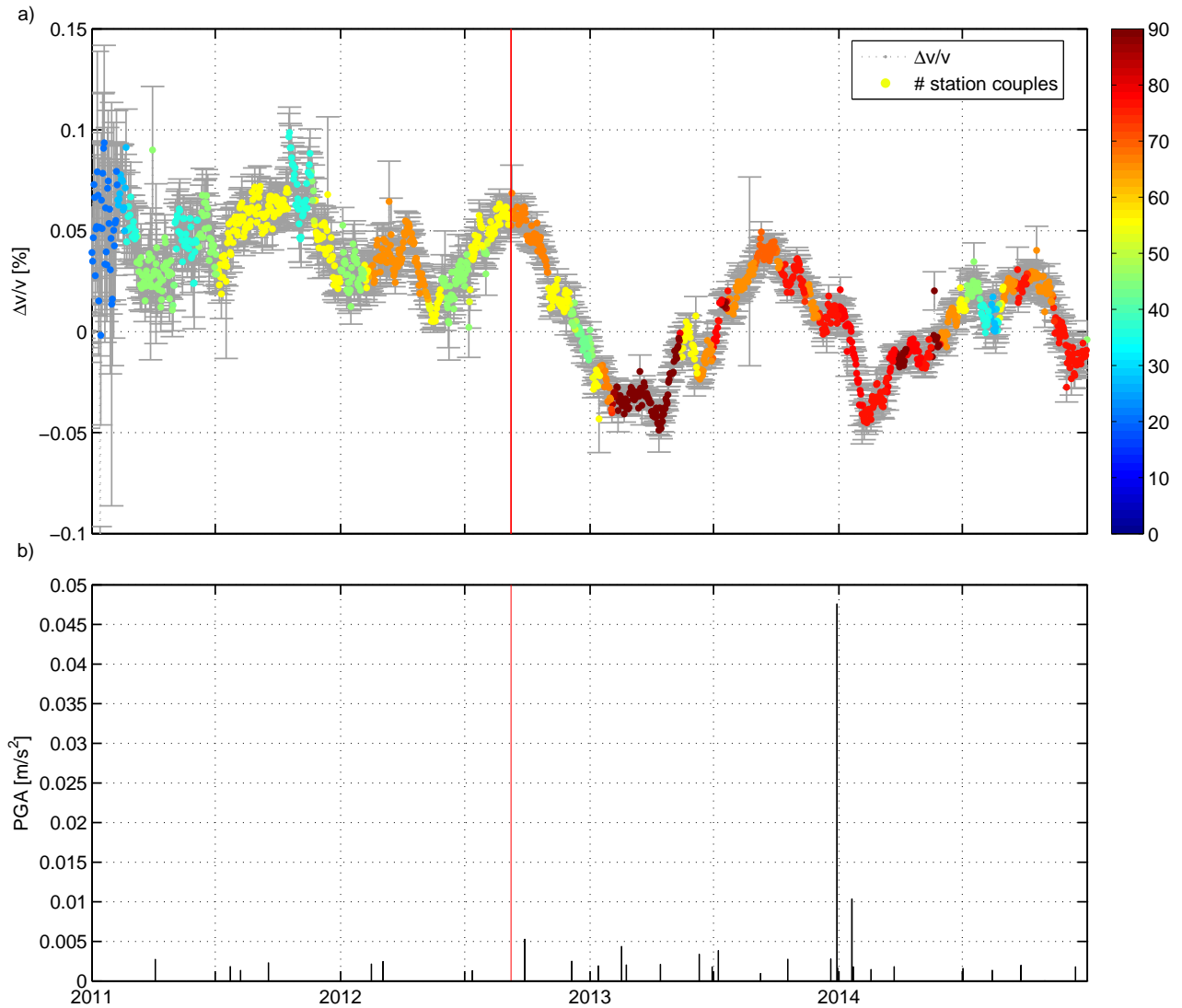
**Figure S1.** Correlation coefficient,  $r$ , versus stacking length for the more long-running 6 stations (15 couples). Mean values ( $\mu_r$ , panel a) and bottom and upper error limits ( $\min(\sigma_r)$  and  $\max(\sigma_r)$ , respectively on panel b and c) have been computed after Fisher transformation of  $r$  in an almost normally distributed variable [VanDecar and Crosson, 1990].



**Figure S2.** Relative velocity variations results for the entire period of investigation (2010-2014). Each value is plotted at the end of the 40 day time window considered for defining the current function. Color bar as in Fig.2 indicates the number of station couples used in each computation. The great variance of the 2010 values is due to the few station couples involved in the measurements (blue colors), and therefore this year is not taken into account in the following analysis.



**Figure S3.** Comparison between relative velocity variations (a) and rainfall (b) time series. The rain data have been collected at the Pozzuoli-Licola-Cuma site (PLC in Fig.1), and are presented either as daily values either as cumulated precipitations in the previous 40 days, sliding 1 day (for comparison with  $\Delta v/v$  results). Both time series show a seasonal trend (annual periodicity). The red vertical line mark the seismic swarm occurrence. Color bar as in Fig.2.



**Figure S4.** Relative velocity variations (a) and daily PGA values (b) for the entire period 2010-2014. Color bar as in Fig.2. PGA is the maximum value of the average (on the entire network) PGAs obtained for each event recorded on a single day. PGA have been computed for 25 local events, and 44 regional earthquakes occurred during the period 2010-2014 under study. The peak value corresponds to the Ml 5.0 occurred on the 23 December 2013.