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MED-SUV CUBE arrays 2014 - Report

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Abstract
This data set contains continuous recordings of seismic noise, which have been made on the surface of a shallow volcanic crater in the Phlegrean Fields volcanic complex near Naples, Italy, where a significant level of volcanic-hydrothermal activity is presently concentrated (MED-SUV = Mediterranean Supersite Volcanoes). As part of the Phlegrean Fields, the Solfatara crater is a 0.4 × 0.5 km sub-rectangular structure whose geometry is mainly due to the control exerted by N40–50W and N50E trending normal fault systems, along which geothermal fluids can ascend. These systems crosscut the study area and have been active several times in the past.

Coordinates: 40.8273N, 14.1218E
Keywords: EARTH SCIENCE > SOLID EARTH > TECTONICS > VOLCANIC ACTIVITY; seismic noise, arrays

1. Introduction

Repeated phase and amplitude measurements done on active and/or passive seismic data including shots, vibrations, earthquakes and ambient noise were carried out in order to characterize the structure of the volcano and track its evolution through time. The characterization of the medium properties is performed through the reconstruction of an image of the elastic and anelastic properties of the propagation medium crossed by seismic waves. The resolution of the tomographic models is influenced by the number and spatial distribution of data. The expected resolution thus guided the setup. To recognize and monitor changes in the properties of the propagation medium without performing an active survey we identify a fast proxy based on the time evolution of the *Vp*/*Vs* ratio.

2. Data Acquisition

2.1 Experiment design and schedule

During 19-22 May and 9-12 November 2014, 50 seismic sensors were deployed irregularly on the surface of the crater, covering an area of 350 m × 320 m. Each CUBE 24-bit digitizer was synchronized using GPS reference time and recorded seismic noise continuously on more than three consecutive days at 400 samples per second. Every sensing unit was connected to an external, PE-6/B 3-component, 4.5 Hz geophone providing an excellent signal-to-noise ratio on all three components for frequencies higher than 1 Hz.

2.2 *Geometry/Location*

WGS 84	May 2014		November 2014	
	Lat (° N)	Lon (° E)	Lat (° N)	Lon (° E)
min	40.82583	14.13756	40.82631	14.13778
max	40.82870	14.14144	40.82891	14.14141

The coordinates of the geophones during the array measurements in May and November 2014 are provided in Appendix 1 and 2.

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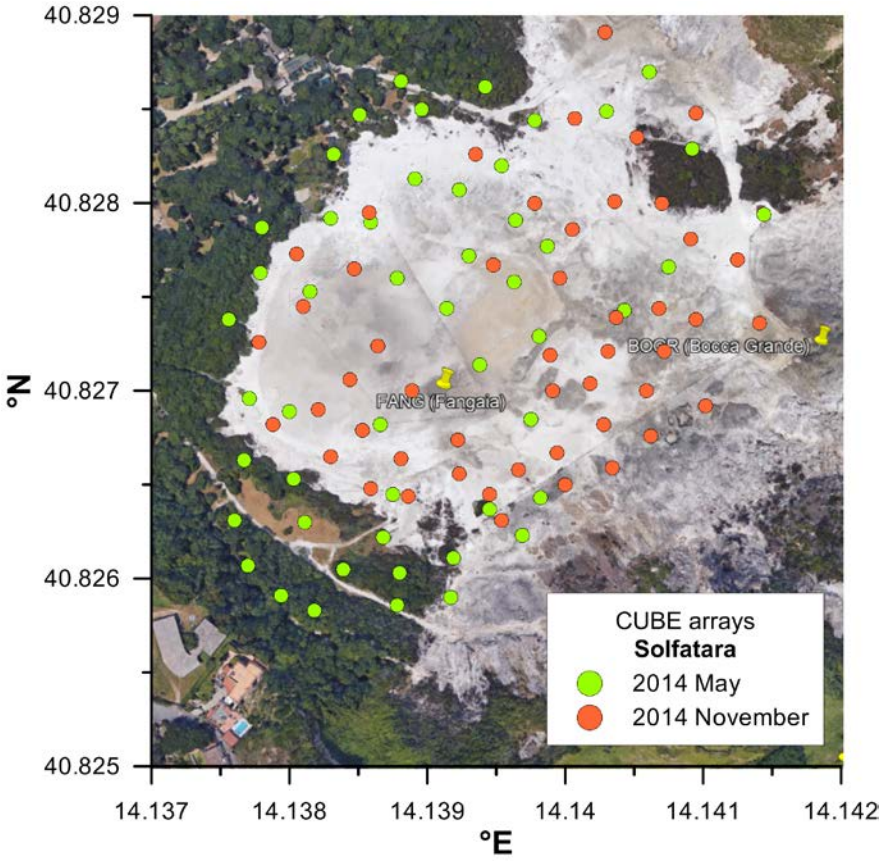

Figure 1: Location map (Naples, Italy)

2.3 Instrumentation

In the experiment Data Cube recorder (3-channels; manufacturer: Omnirecs/DIGOS; www.digos.eu) and PE-6/B 3-component, 4.5 Hz geophones (manufacturer: SENSOR Netherlands) were used.

2.4 Acquisition parameters

For locations please see Figure 1 and Appendices. The data loggers recorded continuously at 400 samples per second.

3. Data Processing

No processing has been done regarding the provided raw data set.

4. Data Description

4.1 File format (s)

Data are stored in the raw CUBE format, which can be converted into a variety of formats using GIPP-tools being provided at:
https://www.gfz-potsdam.de/en/section/geophysical-deep-sounding/infrastructure/geophysical-instrument-pool-potsdam-gipp/software/gipptools/

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4.2 Data content and structure:
Data are organized in the following structure according to field deployment (May or November 2014) and recorder-ID.:

/raw/2014-05/XXX
/raw/2014-11/YYY

XXX are recorder ID: 680, 682, 684, 686, 688, 690, 692, 694, 774, 776, 778, 780, 782, 784, 790, 792, 794, 811, 813, 815, 817, 819, 821, 823, 837, 681, 683, 685, 687, 689, 691, 693, 773, 775, 777, 779, 781, 783, 789, 791, 793, 810, 812, 814, 816, 818, 820, 822, 824, 838

YYY are recorder ID: 634, 636, 638, 652, 654, 656, 658, 666, 668, 670, 672, 674, 676, 678, 680, 682, 684, 686, 688, 690, 692, 694, 725, 864, 873, 635, 637, 651, 653, 655, 657, 665, 667, 669, 671, 673, 675, 677, 679, 681, 683, 685, 687, 689, 691, 693, 714, 727, 865, 876

5. Data Quality/Accuracy

The relative position of the arrays nodes was determined with a theodolite to an accuracy of several centimeters.

6. Data Availability/Access

Data is archived at the “GIPP Experiment and Data Archive” where it is freely available for further use under a “Creative Commons 4.0 International License” (CC BY 4.0). When using the data please cite the data publication and report (see below) and make reference to Pilz et al. (2017) and Amoroso et al. (2017).

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8. References

Amoroso, O., G. Festa, P. P. Bruno, L. D'Auria, G. De Landro, V. Di Fiore, S. Gammaldi, S. Maraio, M. Pilz, P. Roux, G. Russo, V. Serlenga, M. Serra, H. Woith, and A. Zollo (2017). Integrated tomographic methods for seismic imaging and monitoring of volcanic caldera structures and geothermal areas, J. Appl. Geophys. https://doi.org/10.1016/j.jappgeo.2017.11.012

Pilz, M., S. Parolai, and H. Woith (2017). A 3-D algorithm based on the combined inversion of Rayleigh and Love waves for imaging and monitoring of shallow structures, Geophys. J. Int. 209 152-166, https://doi.org/10.1093/gji/ggx005

Appendix 1: Deployment in May 2014

CUBE	*lat (°N)*	*lon (°E) WGS 84*
680	40.82813	14.13891
681	40.82766	14.14075
682	40.82870	14.14061
683	40.82829	14.14092
684	40.82862	14.13942
685	40.82743	14.14043
686	40.82777	14.13987
687	40.82794	14.14144
688	40.82645	14.13875
689	40.82807	14.13923
690	40.82758	14.13963
691	40.82729	14.13981
692	40.82682	14.13866
693	40.82772	14.13930
694	40.82820	14.13954
773	40.82631	14.13760
774	40.82844	14.13978
775	40.82849	14.14030
776	40.82790	14.13859
777	40.82791	14.13964
778	40.82663	14.13767
780	40.82850	14.13896
784	40.82865	14.13881
779	40.82753	14.13815
781	40.82738	14.13756
782	40.82591	14.13794
783	40.82653	14.13803
789	40.82622	14.13868
790	40.82847	14.13851
791	40.82744	14.13914
792	40.82714	14.13938
793	40.82689	14.13800
794	40.82826	14.13832
810	40.82623	14.13969
811	40.82760	14.13878
812	40.82763	14.13779
813	40.82637	14.13945
814	40.82611	14.13919
815	40.82696	14.13771
816	40.82605	14.13839
817	40.82586	14.13878
818	40.82787	14.13780
819	40.82603	14.13880
820	40.82630	14.13811
821	40.82583	14.13818
822	40.82792	14.13830
823	40.82607	14.13770
824	40.82590	14.13917
837	40.82685	14.13975
838	40.82643	14.13982

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Appendix 2: Deployment in November 2014

CUBE	*lat (°N)*	*lon (°E) WGS 84*
680	40.82744	14.14068
681	40.82682	14.13788
682	40.82745	14.13810
683	40.82773	14.13805
684	40.82848	14.14095
685	40.82800	14.14070
686	40.82645	14.13945
687	40.82736	14.14141
688	40.82650	14.14000
689	40.82682	14.14028
690	40.82739	14.14037
691	40.82760	14.13996
692	40.82631	14.13954
693	40.82835	14.14052
694	40.82700	14.14059
773	40.82658	14.13966
774	40.82891	14.14029
775	40.82845	14.14007
776	40.82801	14.14036
777	40.82644	14.13886
778	40.82767	14.13948
779	40.82704	14.14018
780	40.82648	14.13859
781	40.82781	14.14091
782	40.82692	14.14102
783	40.82700	14.13991
784	40.82826	14.13935
789	40.82659	14.14034
790	40.82667	14.13994
791	40.82674	14.13922
792	40.82665	14.13830
794	40.82679	14.13853
810	40.82690	14.13821
811	40.82770	14.14125
812	40.82721	14.14031
813	40.82800	14.13978
814	40.82738	14.14095
815	40.82795	14.13858
816	40.82700	14.13889
817	40.82719	14.13989
818	40.82706	14.13844
819	40.82724	14.13864
820	40.82721	14.14072
821	40.82664	14.13881
822	40.82786	14.14005
823	40.82765	14.13847
824	40.82726	14.13778
837	40.82656	14.13923
838	40.82676	14.14062

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