Supplement of

Multi-array analysis of volcano-seismic signals at Fogo and Brava, Cape Verde

Carola Leva et al.

Correspondence to: Carola Leva (leva@geophysik.uni-frankfurt.de)

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**Figure S1** (a) Array configuration of the array AF. Red triangles: broadband stations; blue triangles: short-period stations. The green circles mark diameters of 700 m and 350 m, respectively. (b) Array transfer function of the array AF for a reference frequency of 5 Hz. Red circles correspond to apparent velocities of 3 and 6 km/s, respectively. (c) Same as in (b) for a reference frequency of 7.5 Hz. (d) Same as in (b) for a reference frequency of 15 Hz.
S2 Time-domain array analysis

Figure S2.1 Time-domain array analysis of an earthquake on 22 July 2017 (23:35 UTC) at the array BR. (a) Analysis window of 2 s length with the stacking window marked in red. Traces are displayed before shifting and stacking and are filtered between 2 and 24 Hz. (b) Resulting time-domain energy stack. Red circle: maximum beam energy. (c) Time-shifted traces. The upper green trace represents the sum trace. (d) To retrieve the standard deviation of the back azimuth, the stacking window is varied 100 times by values between -0.2 and 0.2 s. The standard deviation is estimated from the 100 resulting back-azimuth values. Shown here is the stack of the 100 energy plots.
Figure S2.2 Same as in Figure S2.1 for array CG. Traces are filtered between 2 and 21 Hz.
**S3 Beam determination**

*Figure S3* Intersection of the beams during the multi-array analysis. For this purpose, the error associated to the standard deviation of the back azimuth is determined (e.g. a standard deviation of 90° corresponds to an error of 25%). These errors are used to determine the width of the beams (i.e. in the example before a beam with a width of 100% of the error contains all energy values ≥75% of the highest energy value). The event shown is an earthquake on 22 July 2017 (23:35 UTC). Fogo and Brava are outlined in white. **a)** A beam with a width corresponding to 80% of the error is projected on a map of the study area. It is assigned the value 1, whereas the area outside the beam has the value 0. **b)** In the next step the beam containing all energy values ≥60% of the error is projected on top of the first beam. It is assigned the value 2. **c)** The third beam comprises the energy values ≥40% of the error with the value 3, **d)** the fourth beam the energy values ≥20% with the value 4 and **e)** the narrowest beam the energy values ≥1% of the error with the value 5. **f)** For a finer intersection of the beam, the steps are chosen as 1% steps. Therefore, the broadest beam corresponds to 100% of the error and is assigned the value 1, the second beam to 99% with value 2, the third beam to 98% with value 3. The last (narrowest) beam contains the energy values of 1% of the error and is assigned the value 100. Finally, the values are normalized. The result is the final stepped beam of array AF shown. **g)** Final stepped beam of array BR. **h)** Final stepped beam of array CG. **i)** Intersected stepped beams with the determined epicenter marked in red. The determined epicenter corresponds to the highest value of the intersected beams.
Figure S4 Intersection of the beams resulting from the standard deviation analysis of varying frequencies. The analysis frequencies for each array are varied between 2 Hz and 8 Hz for the lower and between 15 Hz and 30 Hz for the upper cut-off frequency. This variation is performed 100 times. The resulting standard deviation of the back-azimuth values is small leading to narrow beams. Thus, the effect of the chosen cut-off frequency on the result is negligible.
**S5 Reference earthquakes located with a classical localization technique**

**Figure S5** Locations of the reference earthquakes, which are used to determine the systematic deviation of back-azimuth and apparent slowness values at the arrays on Fogo and Brava. The earthquakes are located using a classical localization technique. For more details see the text. Green circles represent the earthquake locations; black circles: array locations; black diamonds: single station locations. Topography and bathymetry data are from Ryan et al. (2009).
**S6 Comparison of earthquake traces and spectrograms, recorded on Fogo and Brava**

Figure S6  

**Figure S6 a)** Top: example of a typical earthquake recorded at the broad-band station AF00 on Fogo on 13 Dec 2017 (08:12 UTC). Bottom left: spectrogram of the vertical component, bottom right: corresponding frequency content.  

**Figure S6 b)** Same earthquake, recorded at the broadband station BR01 on Brava. The event is located close to Brava.
Figure S7 Earthquake locations including error bars from 18 Jan 2017 to 12 Jan 2018. Black circles: array locations, black diamonds: short-period single stations. Topography and bathymetry data are from Ryan et al. (2009).
S8 Vertical traces of a hybrid event recorded on Fogo

Figure S8 Vertical traces of a hybrid event recorded on 17 Aug 2017 (02:54 UTC) occurring in the collapse scar of Fogo. Traces of short-period stations are normalized for a better comparison.
S9 Spectrograms of the three components of a hybrid event

Figure S9 Traces and corresponding spectrograms of a hybrid event recorded on Fogo on 17 Aug 2017 (02:54 UTC). Top: traces filtered between 1 and 50 Hz to remove ocean noise. Bottom left: spectrogram of the corresponding trace. Bottom right: corresponding frequency content. (a) E component, (b) N component and (c) vertical Z component.
S10 Array analysis of hybrid event

Figure S10.1 Time-domain array analysis of a hybrid event on 17 August 2017 (02:54 UTC) at the array AF. (a) Analysis window of 2 s length with the stacking window marked in red. Traces are displayed before shifting and stacking and are filtered between 2 and 16 Hz. (b) Resulting time-domain energy stack. Red circle: maximum beam energy. (c) Time-shifted traces. The upper green trace represents the sum trace.
Figure S10.2 Time-domain array analysis of a hybrid event on 17 August 2017 (02:54 UTC) at the array CG. (a) Analysis window of 2 s length with the stacking window marked in red. Traces are displayed before shifting and stacking and are filtered between 2 and 16 Hz. (b) Resulting time-domain energy stack. Red circle: maximum beam energy. (c) Time-shifted traces. The upper green trace represents the sum trace.
S11 Locations of earthquake swarms beneath Fogo in August 2016 and September 2017

Figure S11 Locations of the subcrustal earthquake swarm of August 2016 (Leva et al., 2019) in red and locations of the shallow crustal earthquakes in September 2017 in blue. White and grey circles mark the array locations, white and grey diamonds mark the single station locations. White stations/arrays were operational in 2016 and 2017, grey stations/arrays were operational in 2017. Topography and bathymetry data are from Ryan et al. (2009).
S12 Comparison of the number of hybrid events and precipitation data

Figure S12 Number of hybrid events per month in 2017 compared to the amount of precipitation per month in 2017. The precipitation data are taken from WorldWeatherOnline.com (2021) for a weather station in Praia.
S13 Distribution of backazimuth values

Figure S13.1 Distribution of back-azimuth values of earthquakes at the three arrays binned in 10° steps. Topography and bathymetry data are from Ryan et al. (2009).

Figure S13.2 Distribution of back-azimuth values of hybrid events at the three arrays binned in 10° steps. Topography and bathymetry data are from Ryan et al. (2009).
References

Leva, C., Rümpker, G., Link, F., and Wölbern, I.: Mantle earthquakes beneath Fogo volcano, Cape Verde: Evidence for subcrustal fracturing induced by magmatic injection, J. Volcanol. Geoth. Res., 386, 106672, doi:10.1016/j.jvolgeores.2019.106672, 2019.

Ryan, W. B. F., Carbotte, S. M., Coplan, J. O., O’Hara, S., Melkonian, A., Arko, R., Weissel, R. A., Ferrini, V., Goodwillie, A., Nitsche, F., Bonczkowski, J., and Žemska, R.: Global Multi–Resolution Topography synthesis, Geochem. Geophy. Geosy., 10, Q03014, doi:10.1029/2008GC002332, 2009.

World Weather Online, https://www.worldweatheronline.com/praia-weather-averages/praia/cv.aspx, last access: 30 March 2021.

S14 Table of station locations

| Station | Latitude [°] | Longitude [°] | Elevation [m] |
|---------|--------------|---------------|---------------|
| AF00    | 14.865133    | -24.351583    | 751           |
| AF01    | 14.8684      | -24.351683    | 805           |
| AF02    | 14.863617    | -24.348517    | 716           |
| AF03    | 14.86315     | -24.354183    | 711           |
| AF04    | 14.865933    | -24.3547      | 760           |
| AF05    | 14.866617    | -24.34885     | 781           |
| AF06    | 14.862933    | -24.351083    | 716           |
| AF07    | 14.864683    | -24.352983    | 744           |
| AF08    | 14.86645     | -24.352483    | 734           |
| AF09    | 14.865117    | -24.349967    | 746           |
| CG00    | 14.951517    | -24.461833    | 578           |
| CG00    | 14.95181     | -24.46188     | 570           | From 19 Oct ’17 |
| CG01    | 14.954617    | -24.461883    | 572           |
| CG01    | 14.95474     | -24.46220     | 617           | From 14 June ’17 |
| CG02    | 14.949917    | -24.459267    | 609           |
| CG03    | 14.949417    | -24.464333    | 551           |
| CG04    | 14.952283    | -24.464883    | 521           |
| CG05    | 14.953283    | -24.459183    | 613           |
| CG06    | 14.94925     | -24.461133    | 596           |
| CG07    | 14.951033    | -24.463367    | 562           |
| CG07    | 14.95111     | -24.46336     | 550           | From 28 Nov ’17 |
| CG08    | 14.952917    | -24.4626      | 558           |
| CG08    | 14.95312     | -24.46288     | 538           | From 4 Dec ’17  |
| CG09    | 14.951533    | -24.46025     | 594           |
| BR00    | 14.84755     | -24.716233    | 643           |
| BR01    | 14.8506      | -24.716183    | 666           |
| BR01    | 14.85024     | -24.71664     | 659           | From 18 Oct ’17 |
| Array | Date       | Time      | baz [°] | app. velocity [km/s] | baz std. [°] | app. velo. std. [km/s] | longitude [°] | latitude [°] | error lon. Min [°] | error lon. Max [°] | error lat. Min [°] | error lat. Max [°] | Magnitude M<sub>L</sub> |
|-------|------------|-----------|---------|-----------------------|--------------|------------------------|---------------|--------------|-------------------|-------------------|-------------------|-------------------|---------------------|
| BR02  | 14.8459    | -24.7135  | 664     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR03  | 14.845417  | -24.718733| 642     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR04  | 14.848233  | -24.719383| 616     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR05  | 14.84905   | -24.713417| 672     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR06  | 14.845267  | -24.715483| 650     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR07  | 14.847033  | -24.717833| 647     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR08  | 14.848667  | -24.7171   | From 24 Jan ’17 |                   |              |                       |               |              |                   |                   |                   |                   |                     |
| BR09  | 14.847483  | -24.7146   | 650     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| CV10  | 14.928417  | -24.359517| 1777    |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| CV11  | 15.0397    | -24.370667| 415     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| CV12  | 14.922967  | -24.48345 | 346     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| CV13  | 14.864567  | -24.44535 | 336     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| CV14  | 14.975844  | -24.337828| 1659    | From 29 Aug ’17       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR10  | 14.833533  | -24.691633| 619     |                       |              |                       |               |              |                   |                   |                   |                   |                     |
| BR11  | 14.878533  | -24.686133| 274     |                       |              |                       |               |              |                   |                   |                   |                   |                     |

**S15 Table of results from the multi-array analysis**

**Table S15.1: Table of analyzed hybrid events**
| Array | Date     | Time    | u [m/s] | app. velocity [km/h] | std. [m/s] | app. velo. std. [km/h] | longitude [°] | latitude [°] | Error lon. Min. | Error lon. Max. | Error Lat. Min. | Error Lat. Max. | Magnitude M. |
|-------|----------|---------|---------|----------------------|------------|------------------------|--------------|--------------|----------------|----------------|----------------|----------------|---------------|
| AF    | 01_03_2017 | 08:58   | 271.9   | 6.8                  | 74.0       | 1.3                    | -24.738      | 14.907       | -24.748         | -24.728        | 14.893         | 14.916         | 1.4           |
| BR    | 01_06_2017 | 20:19   | 253.2   | 5.9                  | 59.9       | 1.2                    | -24.625      | 14.799       | -24.692         | -24.569        | 14.773         | 14.835         | 2.3           |
| BR    | 01_09_2017 | 17:54   | 240.0   | 6.8                  | 74.0       | 1.6                    | -24.852      | 14.577       | -24.896         | -24.818        | 14.530         | 14.640         | 2.3           |
| CG    | 01_01_2017 | 05:17   | --      | --                   | --         | --                     | --           | --           | --              | --              | --             | --             | --            |
| AF    | 02_02_2017 | 08:27   | 237.3   | 6.1                  | 38.4       | 1.5                    | -24.824      | 14.609       | -24.865         | -24.779        | 14.560         | 14.703         | 3.1           |
| BR    | 02_05_2017 | 02:00   | 266.5   | 6.3                  | 67.0       | 5.6                    | -24.734      | 14.851       | -24.850         | -24.716        | 14.827         | 14.865         | -0.1          |
| CG    | 02_05_2017 | 17:37   | --      | --                   | --         | --                     | --           | --           | --              | --              | --             | --             | --            |
| AF    | 02_08_2017 | 17:48   | 271.9   | 6.8                  | 106.9      | 1.9                    | -24.743      | 14.878       | -24.800         | -24.716        | 14.848         | 14.930         | 2.5           |
| BR    | 03_03_2017 | 02:12   | 251.6   | 6.4                  | 87.3       | 1.2                    | -24.673      | 14.732       | -24.682         | -24.660        | 14.701         | 14.750         | 0.5           |
| BR    | 03_06_2017 | 00:49   | 252.7   | 6.1                  | 59.1       | 1.4                    | -24.794      | 14.727       | -24.837         | -24.755        | 14.680         | 14.787         | 1.2           |
| BR    | 03_10_2017 | 04:27   | 250.9   | 7.4                  | 90.9       | 1.9                    | -24.793      | 14.712       | -24.850         | -24.760        | 14.650         | 14.762         | 0.9           |
| BR    | 04_05_2017 | 02:09   | 268.3   | 6.0                  | 74.3       | 1.3                    | -24.742      | 14.866       | -24.790         | -24.716        | 14.848         | 14.918         | 0.4           |
| BR    | 04_10_2017 | 02:14   | 253.5   | 7.2                  | 61.2       | 1.7                    | -24.767      | 14.750       | -24.820         | -24.739        | 14.700         | 14.782         | 0.8           |
| AF    | 05_02_2017 | 21:56   | 263.1   | 6.1                  | 59.3       | 1.3                    | -24.691      | 14.819       | -24.713         | -24.659        | 14.787         | 14.844         | 1.4           |
| AF    | 05_03_2017 | 02:09   | 248.6   | 6.8                  | 73.5       | 2.0                    | -24.773      | 14.702       | -24.807         | -24.730        | 14.650         | 14.813         | 2             |
| BR    | 05_03_2017 | 02:11   | 251.0   | 6.6                  | 85.8       | 1.2                    | -24.762      | 14.724       | -24.796         | -24.748        | 14.670         | 14.759         | 0.7           |
|        | 200.3 | 3.5  | 83.9 | 2.2 |
|--------|--------|------|------|-----|
| BR     | 202.1  | 5.9  | 75.2 | 1.3 |
| CG     | 228.4  | 8.4  | 88.3 | 2.2 |
| AF 05_03_2017 15:57 | 243.4 | 6.5  | 90.1 | 1.5 |
| BR     | 199.8  | 5.3  | 116.7| 2.1 |
| CG     | 254.3  | 9.7  | 81.9 | 2.0 |
| AF 05_12_2017 04:19 | 252.6 | 5.5  | 73.1 | 6.2 |
| BR     | 39.5   | 9.2  | 83.4 | 3.2 |
| CG     | 262.9  | 8.4  | 99.7 | 2.6 |
| AF 05_12_2017 10:23 | 264.7 | 6.3  | 77.0 | 1.5 |
| BR     | 116.5  | 13.0 | 104.9| 3.3 |
| CG     |        |      |      |     |
| AF 06_03_2017 23:29 | 262.9 | 6.3  | 62.6 | 1.6 |
| BR     | 57.2   | 12.2 | 104.4| 5.1 |
| CG     | 257.2  | 9.0  | 71.1 | 2.6 |
| AF 06_09_2017 16:50 | 271.8 | 6.2  | 66.7 | 1.6 |
| BR     | 0.1    | 16.9 | 111.7| 7.9 |
| CG     |        |      |      |     |
| AF 07_03_2017 07:52 | 281.3 | 6.6  | 83.6 | 1.7 |
| BR     | 25.5   | 8.7  | 105.9| 3.8 |
| CG     |        |      |      |     |
| AF 07_05_2017 04:20 | 253.3 | 6.5  | 52.0 | 1.1 |
| BR     | 205.8  | 6.3  | 87.4 | 1.7 |
| CG     |        |      |      |     |
| AF 07_05_2017 05:39 | 259.1 | 6.4  | 66.2 | 2.0 |
| BR     | 80.2   | 6.9  | 83.5 | 7.3 |
| CG     | 254.3  | 7.0  | 89.4 | 2.0 |
| AF 07_05_2017 05:40 | 266.3 | 6.5  | 85.9 | 3.7 |
| BR     | 84.1   | 7.0  | 98.4 | 2.6 |
| CG     | 254.1  | 7.0  | 78.2 | 1.8 |
| AF 07_11_2017 04:54 | 264.5 | 6.5  | 47.4 | 1.2 |
| BR     | 325.6  | 10.5 | 130.4| 10.9|
| CG     | 271.8  | 6.4  | 99.6 | 2.2 |
| AF 08_05_2017 06:15 | 237.3 | 6.1  | 55.5 | 1.3 |
| BR     | 202.1  | 5.9  | 105.2| 1.5 |
| CG     | 242.1  | 10.6 | 80.9 | 2.4 |
| AF 08_07_2017 02:55 | 282.6 | 5.5  | 99.6 | 1.7 |
| BR     |        |      |      |     |
| CG     | 272.0  | 7.0  | 106.7| 1.5 |
| AF 08_08_2017 03:10 | 258.3 | 6.9  | 65.9 | 2.5 |
| BR     | 163.7  | 8.1  | 115.4| 2.2 |
| CG     |        |      |      |     |
| AF 08_09_2017 18:52 | 251.0 | 6.6  | 56.3 | 1.7 |
| BR     | 72.5   | 5.5  | 98.0 | 1.3 |
| CG     |        |      |      |     |
| AF 10_06_2017 09:47 | 251.0 | 6.6  | 70.8 | 1.8 |
| BR     | 128.0  | 7.0  | 81.5 | 2.5 |
| CG     | 253.3  | 6.5  | 98.1 | 1.3 |
| AF 10_06_2017 09:56 | 251.0 | 6.6  | 57.7 | 1.6 |
| BR     | 128.0  | 7.0  | 77.3 | 2.7 |
| CG     | 230.9  | 9.9  | 111.6| 3.8 |
| AF 10_06_2017 15:07 | 252.8 | 6.7  | 75.4 | 1.6 |
| BR     | 128.0  | 7.0  | 75.1 | 2.8 |
| CG     |        |      |      |     |
| AF 11_09_2017 09:10 | 241.8 | 6.4  | 74.0 | 1.7 |
| BR     | 206.6  | 5.7  | 106.9| 1.2 |
| CG     | 249.0  | 7.3  | 73.3 | 1.9 |
| AF 12_03_2017 00:29 | 266.8 | 5.8  | 66.8 | 1.5 |
| BR     | 18.5   | 21.4 | 81.4 | 2.385|
| CG     | 263.7  | 3.7  | 90.8 | 1.6 |
| AF 12_03_2017 08:56 | 271.9 | 6.8  | 75.4 | 1.1 |
| BR     | 14.1   | 9.9  | 96.5 | 3.5 |
| CG     |        |      |      |     |
| AF 12_03_2017 20:28 | 281.7 | 6.9  | 94.8 | 1.0 |
| BR     | 47.3   | 11.5 | 76.4 | 3.3 |
| CG     |        |      |      |     |
| AF 12_03_2017 20:41 | 266.8 | 5.8  | 47.7 | 1.5 |
| BR     |        |      |      |     |
| CG     |        |      |      |     |
| Date       | Time  | BR  | CG  | AF  | BR  |
|------------|-------|-----|-----|-----|-----|
| 12_03_2017 | 20:55 | 13.4| 9.4 | 102.0| 2.6 |
| 12_07_2017 | 16:42 | 263.1| 6.1 | 98.3 | 1.8 |
| 13_12_2017 | 08:12 | 261.3| 6.3 | 64.2 | 1.6 |
| 14_02_2017 | 03:53 | 252.7| 6.1 | 63.9 | 1.8 |
| 14_03_2017 | 05:30 | 234.4| 5.7 | 109.1| 2.6 |
| 15_05_2017 | 06:08 | 271.9| 6.8 | 72.9 | 1.4 |
| 15_06_2017 | 06:02 | 261.3| 6.3 | 74.0 | 1.7 |
| 15_06_2017 | 06:10 | 257.3| 6.4 | 67.8 | 1.5 |
| 15_06_2017 | 06:02 | 261.3| 6.3 | 74.0 | 1.7 |
| 15_07_2017 | 01:00 | 262.2| 6.9 | 75.2 | 1.8 |
| 15_07_2017 | 13:31 | 257.7| 6.2 | 82.7 | 1.6 |
| 15_07_2017 | 15:12 | 265.0| 6.0 | 84.6 | 1.2 |
| 15_07_2017 | 23:00 | 265.0| 6.0 | 84.6 | 1.2 |
| 15_07_2017 | 15:12 | 265.0| 6.0 | 84.6 | 1.2 |
| 15_07_2017 | 23:00 | 265.0| 6.0 | 84.6 | 1.2 |
|    |  80.9 |  8.0 |  66.5 |  4.9 |
|----|-------|------|-------|------|
| BR |  53.1 |  8.1 | 123.9 |  2.6 |
| CG |  248.4 |  5.9 |  94.6 |  1.4 |
| AF |  254.8 |  22.7 | 14.750 | 24.830 | 24.741 | 14.700 | 14.806 |  0.6 |
|    | 210.9 |  8.7 |  72.7 |  3.7 |
|    | 201.1 |  5.9 |  84.3 |  1.9 |
|    | 243.5 | 11.4 |  73.9 |  4.1 |
|    | 249.7 |  7.1 |  65.8 |  2.2 |
|    | 131.9 |  7.6 |  71.5 |  2.7 |
|    | 270.1 |  17.0 |  69.8 |  5.9 |
|    | 268.5 |  7.5 |  65.0 |  2.0 |
|    | 271.8 |  6.2 |  119.2 |  2.1 |
|    | 353.0 |  25.2 | 105.7 |  21.4 |
|    | 255.6 |  6.4 |  86.3 |  1.8 |
|    | 284.1 |  6.2 |  69.0 |  3.1 |
|    | 4.5 |  15.6 |  149.5 |  4.1 |
|    | 37.2 |  6.5 |  97.0 |  7.3 |
|    | 272.0 |  7.0 |  88.5 |  1.8 |
|    | 272.3 |  8.1 |  104.4 |  1.9 |
|    | 285.7 |  6.6 |  72.8 |  1.7 |
|    | 340.6 |  11.3 |  54.4 |  4.6 |
|    | 265.8 |  7.5 |  65.0 |  2.0 |
|    | 271.8 |  6.2 |  119.2 |  2.1 |
|    | 4.5 |  13.0 |  103.2 |  2.7 |
|    | 234.4 |  6.1 |  72.4 |  1.4 |
|    | 181.1 |  4.0 |  80.2 |  0.8 |
|    | 223.4 |  8.2 |  75.4 |  2.0 |
|    | 268.3 |  6.0 |  72.6 |  1.6 |
|    | 67.0 |  5.7 |  57.6 |  1.5 |
|    | 260.6 |  6.7 |  69.9 |  1.3 |
|    | 271.9 |  6.8 |  82.0 |  1.4 |
|    | 310.3 |  11.9 |  92.0 |  15.8 |
|    | 247.8 |  9.1 |  83.5 |  1.5 |
|    | 275.0 |  8.8 |  76.1 |  4.0 |
|    | 353.1 |  6.1 |  93.9 |  3.2 |
|    | 122.7 |  12.2 |  86.0 |  4.2 |
|    | 249.0 |  5.5 |  9.6 |  101.2 |  3.3 |
|    | 210.9 |  11.6 |  104.7 |  4.0 |
|    | 255.5 |  7.3 |  67.6 |  2.0 |
|    | 200.8 |  9.1 |  83.5 |  3.5 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |
|    | 213.7 |  6.3 |  97.1 |  1.6 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 248.4 |  6.4 |  97.2 |  2.8 |
|    | 213.7 |  6.3 |  97.1 |  1.6 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 118.5 |  16.2 |  70.1 |  5.3 |
|    | 210.9 |  11.6 |  104.7 |  4.0 |
|    | 200.8 |  9.1 |  83.5 |  3.5 |
|    | 119.7 |  12.6 |  92.8 |  4.5 |
|    | 213.7 |  6.3 |  97.1 |  1.6 |
|    | 262.9 |  8.4 |  114.7 |  1.8 |
|    | 264.1 |  7.0 |  91.9 |  1.6 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |  24.349 | 14.895 | 24.353 | 24.339 | 14.866 | 14.932 |  0.3 |
|    | 210.9 |  11.6 |  104.7 |  4.0 |  24.353 | 14.887 | 24.358 | 24.352 | 14.867 | 14.921 |  0.2 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |  24.349 | 14.895 | 24.353 | 24.339 | 14.866 | 14.932 |  0.3 |
|    | 210.9 |  11.6 |  104.7 |  4.0 |  24.353 | 14.887 | 24.358 | 24.352 | 14.867 | 14.921 |  0.2 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |  24.349 | 14.895 | 24.353 | 24.339 | 14.866 | 14.932 |  0.3 |
|    | 210.9 |  11.6 |  104.7 |  4.0 |  24.353 | 14.887 | 24.358 | 24.352 | 14.867 | 14.921 |  0.2 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |  24.349 | 14.895 | 24.353 | 24.339 | 14.866 | 14.932 |  0.3 |
|    | 210.9 |  11.6 |  104.7 |  4.0 |  24.353 | 14.887 | 24.358 | 24.352 | 14.867 | 14.921 |  0.2 |
|    | 259.5 |  7.4 |  101.9 |  1.9 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |
|    | 247.8 |  6.4 |  65.5 |  3.2 |  24.349 | 14.895 | 24.353 | 24.339 | 14.866 | 14.932 |  0.3 |
| Date       | Time  | CG 1  | CG 2  | CG 3  | BR 1  | BR 2  | BR 3  |
|------------|-------|-------|-------|-------|-------|-------|-------|
| 25/06/2017 | 13:49 | -     | -     | -     | -24689| 14.935| -24709|
|            |       | 18.5  | 8.0   | 112.3 | 1.8   |       |       |
|            |       | 265.8 | 7.5   | 77.2  | 3.4   |       |       |
| 25/06/2017 | 13:50 | -     | -     | -     | -24705| 14.927| -24721|
|            |       | 6.1   | 10.6  | -     | 84.4  | 2.7   |       |
|            |       | 264.3 | 6.7   | 93.3  | 1.9   |       |       |
| 25/09/2017 | 00:36 | 356.2 | 6.8   | 104.3 | 2.9   | -24352| 14.866|
|            |       | 91.4  | 5.0   | 56.8  | 1.8   |       |       |
|            |       | 124.6 | 12.9  | 60.5  | 4.6   |       |       |
| 25/10/2017 | 06:35 | 264.8 | 6.1   | 68.9  | 1.2   | -24666| 14.837|
|            |       | 102.5 | 7.3   | 84.1  | 2.4   |       |       |
| 26/09/2017 | 05:19 | 257.9 | 7.1   | 62.2  | 2.0   | -24756| 14.952|
|            |       | 341.6 | 12.8  | 124.7 | 4.0   |       |       |
|            |       | 270.0 | 7.5   | 84.3  | 1.4   |       |       |
| 27/01/2017 | 05:37 | 235.1 | 6.6   | 110.3 | 1.5   | -24698| 14.773|
|            |       | 166.8 | 6.6   | 80.5  | 1.2   |       |       |
| 27/09/2017 | 23:04 | 277.2 | 6.3   | 74.4  | 2.5   | -24618| 14.903|
|            |       | 60.6  | 11.1  | 83.1  | 2.8   |       |       |
| 27/10/2017 | 01:20 | 268.2 | 6.6   | 69.7  | 1.5   | -24739| 14.889|
|            |       | 330.3 | 12.6  | 147.7 | 16.4  |       |       |
|            |       | 276.4 | 7.5   | 89.6  | 1.5   |       |       |
| 28/01/2017 | 05:15 | 242.7 | 6.2   | 34.4  | 0.7   | -24800| 14.656|
|            |       | 203.7 | 3.3   | 71.7  | 1.8   |       |       |
| 28/01/2017 | 05:29 | 48.4  | 5.6   | 100.1 | 2.4   | -24678| 14.881|
|            |       | 252.0 | 5.2   | 77.3  | 0.9   |       |       |
| 29/06/2017 | 22:34 | 270.0 | 6.6   | 90.3  | 1.9   | -24717| 14.860|
|            |       | 353.8 | 22.4  | 118.7 | 7.4   |       |       |
| 29/09/2017 | 19:15 | 262.2 | 6.9   | 83.1  | 4.2   | -24736| 14.812|
|            |       | 152.5 | 7.2   | 87.0  | 2.7   |       |       |
| 30/06/2017 | 00:46 | 271.8 | 6.2   | 83.6  | 1.6   | -24716| 14.871|
|            |       | 354.4 | 20.2  | 138.3 | 7.4   |       |       |
| 30/12/2017 | 02:36 | 266.1 | 7.0   | 70.3  | 1.7   | -24688| 14.837|
|            |       | 111.3 | 8.2   | 89.4  | 1.6   |       |       |
| 31/07/2017 | 04:59 | 250.5 | 6.2   | 72.0  | 1.4   | -24711| 14.832|
|            |       | 161.5 | 9.2   | 78.8  | 2.7   |       |       |
| 31/07/2017 | 05:03 | 257.3 | 6.4   | 70.3  | 1.8   | -24709| 14.814|
|            |       | 168.1 | 10.5  | 74.8  | 2.4   |       |       |
| 31/08/2017 | 16:12 | 278.6 | 6.1   | 83.7  | 1.5   | -24680| 14.929|
|            |       | 24.0  | 6.9   | 83.4  | 2.2   |       |       |
| 31/12/2017 | 06:07 | 261.1 | 6.3   | 59.3  | 2.1   | -24708| 14.851|
|            |       | 66.8  | 13.3  | 115.9 | 4.5   |       |       |
| 31/12/2017 | 06:07 | 260.2 | 6.9   | 104.3 | 1.9   |       |       |