Data Article

Environmental magnetism data of Brantas River bulk surface sediments, Jawa Timur, Indonesia

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A B S T R A C T

This article presents measurement data using environmental magnetism method on the bulk surface sediments related to the research article entitled “Heavy metal contents and magnetic properties of surface sediments in volcanic and tropical environment from Brantas River, Jawa Timur Province, Indonesia” Mariyanto et al., 2019. Surface sediments were taken from 20 different locations along Brantas River. In the laboratory, a series of magnetic measurements was conducted on sediment samples i.e. magnetic susceptibility, ARM (Anhysteretic Remanent Magnetization) and IRM (Isothermal Remanent Magnetization). These environmental magnetism data were used to characterize bulk surface sediments in the study area.

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In this paper we present detailed data on the environmental magnetism measurement of Brantas River bulk surface sediments [1]. A review has shown recent developments between environmental magnetism with other sciences such as physics, chemistry and biology [2]. Table 1 shows magnetic susceptibility measurement data on Brantas river bulk surface sediment samples. Several other studies have shown that magnetic susceptibility measurement was not only conducted on sediments from rivers [3,4] but also on sediments from coasts [5,6] and lakes [7,8] and other materials such as mineral deposit [9] and guano [10,11]. Previous studies have shown that frequency-dependent magnetic susceptibility was used to determine superparamagnetic grain content in sediments [12,13].

The ARM measurement data for representative bulk surface sediment samples are shown in Table 2. Raw data sets for ARM measurements are presented in ".xlsx" format (excel file) in Appendix A. Fig. 1 shows ARM decay curve for typical bulk surface sediment samples. Previous studies showed that ARM measurements were acquired on various samples such as dusts [14], soils [15] and sediments [16,17] for environmental magnetism studies.

Meanwhile IRM measurement data for representative bulk surface sediment samples are shown in Table 3. The raw data sets for IRM measurements are presented in ".xlsx" format (excel file) in Appendix A.
Appendix B. Fig. 2 shows IRM saturation curve for typical bulk surface sediment samples. Previous studies showed that IRM measurements were performed on red clay sediments [18] and loess/paleosol sequence [19,20] for paleomagnetism studies.

### Table 1
Magnetic susceptibility measurement data of bulk surface sediment samples. $\chi_{lf}$ is mass-specific magnetic susceptibility at low frequency, $\chi_{hf}$ is mass-specific magnetic susceptibility at high frequency and $\chi_{fd}$ is frequency-dependent magnetic susceptibility.

| Sample ID | $\chi_{lf}$ ($\times 10^{-8}$m$^3$kg$^{-1}$) | $\chi_{hf}$ ($\times 10^{-8}$m$^3$kg$^{-1}$) | $\chi_{fd}$ (%) |
|-----------|---------------------------------|---------------------------------|---------------|
| B1        | 3163.7                          | 3161.5                          | 0.07          |
| B2        | 2832.5                          | 2824.3                          | 0.29          |
| B3        | 4472.8                          | 4344.4                          | 2.87          |
| B4        | 3164.2                          | 3071.1                          | 2.94          |
| B5        | 3471.7                          | 3428.3                          | 1.25          |
| B6        | 3302.8                          | 3213.3                          | 2.71          |
| B7        | 3782.9                          | 3761.7                          | 0.56          |
| B8        | 3737.7                          | 3729.2                          | 0.23          |
| B9        | 4716.3                          | 4667.3                          | 1.04          |
| B10       | 7231.4                          | 7200.1                          | 0.43          |
| B11       | 1927.3                          | 1896.9                          | 1.58          |
| B12       | 1994.1                          | 1975.9                          | 0.91          |
| B13       | 2385.1                          | 2364.7                          | 0.86          |
| B14       | 2442.9                          | 2438.2                          | 0.19          |
| B15       | 3942.3                          | 3925.3                          | 0.43          |
| B16       | 1753.6                          | 1737.4                          | 0.92          |
| B17       | 1422.8                          | 1410.2                          | 0.89          |
| B18       | 1810.4                          | 1806.2                          | 0.23          |
| B19       | 2059.8                          | 2059.8                          | 0.00          |
| B20       | 844.0                           | 825.3                           | 2.22          |
| Mean      | 3022.9                          | 2992.1                          | 1.03          |
| Min       | 844.0                           | 825.3                           | 0.00          |
| Max       | 7231.4                          | 7200.1                          | 2.94          |

### Table 2
ARM measurement data of bulk surface sediment sample. N-ARM is Normalized ARM.

| H (mT) | ARM Intensity ($\times 10^{-8}$ A.m$^2$kg$^{-1}$) | N-ARM |
|--------|-------------------------------------------------|-------|
| 0      | 264.31                                          | 1.00  |
| 5      | 207.73                                          | 0.79  |
| 10     | 147.10                                          | 0.56  |
| 15     | 93.14                                           | 0.35  |
| 20     | 61.33                                           | 0.23  |
| 25     | 35.15                                           | 0.13  |
| 30     | 20.15                                           | 0.08  |
| 35     | 10.51                                           | 0.04  |
| 40     | 5.89                                            | 0.02  |
| 45     | 1.82                                            | 0.01  |
| 50     | 1.81                                            | 0.01  |

2. Experimental design, materials, and methods

Sampling of surface sediment samples was conducted in 20 different locations along the main-stream of the Brantas river. This river is in Jawa Timur province, Indonesia and passes through several cities or regencies from Batu to Mojokerto. Table 4 shows the locations and coordinates of the sampling
sites. Surface sediments were sieved (2 mm) then dried at room temperature to produce the bulk surface sediment samples. They were mashed using a set of mortar and pestle. A cylindrical plastic holder was used to place the samples.

A series of magnetic measurements i.e. magnetic susceptibility, ARM and IRM was conducted to measure magnetic properties of samples. Measurement of magnetic susceptibility was conducted using Bartington MS2B Susceptibility meter at dual frequencies (470 Hz and 4700 Hz). Measurement of ARM was conducted by applying a steady field of 0.05 mT together with an alternating magnetic field of up to 50 mT using Molspin AF Demagnetizer. Measurement of IRM was carried out by applying DC magnetic field of up to 1 T using an electromagnetic generator. Minispin Fluxgate Magnetometer was used to measure ARM and IRM intensity as the magnetic field changes.

Table 3
IRM measurement data of bulk surface sediment sample. N-IRM is Normalized IRM.

| H (mT) | IRM Intensity (× 10⁻⁸ A.m²kg⁻¹) | N-IRM |
|--------|---------------------------------|-------|
| 12.02  | 117.38                          | 0.07  |
| 57.77  | 1080.72                         | 0.64  |
| 118.76 | 1508.53                         | 0.89  |
| 181.37 | 1591.57                         | 0.94  |
| 243.17 | 1630.37                         | 0.96  |
| 303.36 | 1603.46                         | 0.95  |
| 341.08 | 1625.98                         | 0.96  |
| 402.88 | 1606.45                         | 0.95  |
| 461.47 | 1612.76                         | 0.95  |
| 524.08 | 1639.96                         | 0.97  |
| 586.68 | 1655.88                         | 0.98  |
| 627.61 | 1634.08                         | 0.96  |
| 687.00 | 1609.69                         | 0.95  |
| 746.40 | 1667.05                         | 0.98  |
| 805.79 | 1693.62                         | 1.00  |
| 864.38 | 1591.51                         | 0.94  |
| 902.10 | 1619.04                         | 0.96  |
| 962.30 | 1671.35                         | 0.99  |
| 1017.67| 1675.43                         | 0.99  |
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Table 4
Detailed locations of the sampling sites along Brantas River.

| Sample ID | Geographic Coordinate | Location                                      |
|-----------|-----------------------|-----------------------------------------------|
| B1        | 7°54′28.627″          | 112°34′45.423″, Kel. Pendem, Kec. Junrejo, Kota Batu city |
| B2        | 7°57′23.127″          | 112°37′28.957″, Kel. Samaan, Kec. Klojen, Malang city |
| B3        | 8°3′37.406″           | 112°37′52.521″, Ds. Tambaksari, Kec. Tajinan, Malang regency |
| B4        | 8°8′24.986″           | 112°35′10.442″, Ds. Sukorejo, Kec. Gondanglegi, Malang regency |
| B5        | 8°8′21.557″           | 112°27′52.688″, Ds. Sumber Pucung, Kec. Sumber Pucung, Malang regency |
| B6        | 8°9′41.870″           | 112°24′26.225″, Ds. Sukoanyar, Kec. Kesamben, Blitar regency |
| B7        | 8°9′55.677″           | 112°18′28.019″, Ds. Pakel, Kec. Selopuro, Blitar regency |
| B8        | 8°9′10.916″           | 112°13′3.335″, Ds. Satreyan, Kec. Kanigoro, Blitar regency |
| B9        | 8°6′57.174″           | 112°6′11.735″, Ds. Rejotangan, Kec. Rejotangan, Tulungagung regency |
| B10       | 8°5′46.375″           | 112°0′13.735″, Ds. Pulosari, Kec. Nganjuk, Tulungagung regency |
| B11       | 8°1′6.535″            | 111°55′32.419″, Ds. Tapan, Kec. Kedungwaru, Tulungagung regency |
| B12       | 7°56′13.181″          | 112°52′27.676″, Ds. Kras, Kec. Kras, Kediri regency |
| B13       | 7°51′2.207″           | 111°59′56.087″, Kel. Manisrenggo, Kec. Kediri, Kediri city |
| B14       | 7°44′46.756″          | 112°1′14.538″, Ds. Gondanglegi, Kec. Prambon, Nganjuk regency |
| B15       | 7°40′37.783″          | 112°4′37.740″, Ds. Papar, Kec. Papar, Kediri regency |
| B16       | 7°34′48.551″          | 112°6′51.674″, Ds. Lestari, Kec. Patiamrowo, Nganjuk regency |
| B17       | 7°29′30.970″          | 112°10′3.461″, Ds. Munung, Kec. Jatikalen, Nganjuk regency |
| B18       | 7°26′44.020″          | 112°15′23.150″, Ds. Ngares Kidul, Kec. Gedeg, Mojokerto regency |
| B19       | 7°27′23.296″          | 112°21′22.897″, Ds. Ngares Kidul, Kec. Gedeg, Mojokerto regency |
| B20       | 7°26′46.620″          | 112°27′22.420″, Ds. Milirip, Kec. Jetis, Mojokerto regency |

Fig. 2. IRM saturation curve for typical bulk surface sediment sample (modified after [1]).
Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104092.

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