Data Article

Groundwater table and soil-hydrological properties datasets of Indonesian peatlands

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A B S T R A C T

This article describes daily groundwater depth data of peatlands in Indonesia. The data were recorded from eight in-situ stations spread over two peatland regions in Indonesia, namely Batanghari and Kubu Raya in Sumatra and Kalimantan. This article also presents experimental data describing soil water retention in the region. Water retention of peats determines the groundwater table’s contribution to rewetting the soil surface. The datasets represent peatlands utilized for agriculture. Furthermore, the groundwater table of peatlands is a key variable controlling peat fire vulnerability, as described in the research article entitled ‘An improved drought-fire assessment for managing fire risks in tropical peatlands’ Taufik et al. (2022) and assessing the success of peat restoration projects. The groundwater datasets can be used as a benchmark for studies on modeling of hydrology and peat fire mitigation action.

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Specifications Table

| Subject | Environmental Sciences, Earth and Planetary Sciences |
|---------|-------------------------------------------------------|
| Specific subject area | Hydrology, Atmospheric Science. |
| Type of data | Figure, Table |
| How the data were acquired | Station measurement, field sampling |
| Data format | Raw, Analysed |
| Description of data collection | Groundwater tables were taken in eight field stations in two peatland regions in Indonesia using automatic measurement. Peat samples were taken out using metal cylinders at two soil depths representing topsoil and subsoil layers. |
| Data source location | Batanghari peatland  
City/Province: Muaro Jambi, Jambi Province  
Country: Indonesia  
Kubu Raya peatland  
City/Province: Kubu Raya, West Kalimantan  
Country: Indonesia |
| Data accessibility | Data available within the article and within Supplementary files |
| Related research article | M. Taufik, M.T. Widyastuti, A. Sulaiman, D. Murdiyarso, I.P. Santikayasa, B. Minasny, An improved drought-fire assessment for managing fire risks in tropical peatlands, Agricultural and Forest Meteorology. 312 (2022) 108738. https://doi.org/10.1016/j.agrformet.2021.108738. |

Value of the Data

- Groundwater tables in tropical peatlands control CO₂ emissions and determine their vulnerability to fire [2]. However, public datasets on daily levels are rare.
- Hydrologists and environmentalists can use the datasets as a benchmark in modelling tropical peatlands. In addition, the datasets provide a unique insight into groundwater dynamics of degraded peatland as affected by human activities and meteorological variables.
- The knowledge generated from this dataset can help to improve restoration project activities in tropical peatlands.
- The dataset could also be used for drought-fire modeling in tropical peatland [1], and for supporting the development of database on Indonesian’s peat physical properties, especially water retention [3], and validating global wetland models.

1. Data Description

This paper reports unique datasets of groundwater table dynamics and peat water retention used to model and understand the drought-fire hazard in Indonesian peatlands. Taufik et al. developed the Peat Fire Vulnerability Index (PFVI) to assess drought-fire hazards in tropical peatland Indonesia [1]. Fig. 1 presents two main peatland regions in Sumatra and Kalimantan, Indonesia, namely Batanghari and Kubu Raya peatlands, respectively, where our study was carried out. Batanghari is located in the eastern part of Sumatra, while Kubu Raya is in western part of Kalimantan. Locations of the observation stations are shown in Fig. 1, where each region has four groundwater table monitoring stations.

The dataset is stored in an excel file table format, called dib_data.xlsx. It contains two sheets, i.e. ‘gwt’ for groundwater table data, and ‘wrc’ for water retention data. In ‘gwt’ sheet, there
are four columns, which are daily data groundwater table (m) for each station. The value of groundwater data are in negative as they were measured below the soil surface. Groundwater table dynamics at daily resolution are then presented in Fig. 2. The values of groundwater tables were used to calculate the water table factor [4], as an important variable to calculate peat fire vulnerability.

The second sheet ('wrc') provides modelled water retention for stations of BRG6 and BRG18 based on Van Genuchten approach [5]. The water retention curve shows the relationship between water content (θ) at top- and sub-soils and the soil matric potential (as represented by pF and h in the dataset). The retention was calculated for each location of peat sampling (LK) at different BRG stations. BRG stands for Badan Restorasi Gambut, Indonesian peat restoration agency, and now is called BRGM. An overview of the physical peat water retention curve in the 'wrc' sheet is presented in line graph (Fig. 3). In a fire-drought model, water retention determines the contribution of groundwater table to moist soil surface [1,3].

2. Experimental Design, Materials and Methods

In August 2018, we carried out a field survey at the Kubu Raya peatland to collect peat samples of BRG18 station. The samples were taken in duplicate for two depths using 105 cm³ metal cylinders, representing the top-layer (0–30 cm) and sub-layer (40–70 cm). For Batanghari peatland, we collected peat samples in triplicate in August 2019 at BRG6 station.

Each sample was analysed in the laboratory to derive water retention based on a pressure membrane apparatus [6]. Four matric potentials were measured, pF 1, pF 2, pF 2.4, and pF 4.2, and volumetric water content (cm³/cm³) corresponding to each pF was calculated. Then we
modelled the water retention curve according to the van Genuchten equation [5] as follows;

$$\theta(h) = 1 + \left(\frac{h}{\alpha}\right)^n - m$$

where $\theta(h)$ is the function of capillary rise presenting soil moisture content at $z = -h$, $h$ is daily groundwater level in meter, $\alpha$ fitting parameter representing air entrance, $n$ and $m$ fitting parameter for water retention curve. We parametrized van Genuchten parameters, namely $n$ (shape parameter), $m$, and alpha, by fitting the equation to the data in Microsoft Excel Solver [7] to minimize the error between the calculated water content and the observed water content.

At each station, the groundwater table was measured using a slotted PVC with a diameter of 2 inches (~5 cm). The change in groundwater table levels was automatically recorded with an ATM.1ST-N (STS, Switzerland) sensor with a 10 min resolution. Once in 3-months, the sensor was recalibrated using manual measurement on the groundwater table.

We processed the groundwater table data collected every 10 min to a daily resolution using R statistical software [8]. For each day, we averaged the groundwater table values using the package tidyverse [9]. For missing data less than 5-consecutive days, we interpolated the values using the package zoo [10] in R.

**Fig. 2.** Dynamics of groundwater table (in cm) during filed campaign in Batanghari and Kubu Raya peatlands region. There were four groundwater table monitoring stations each. Negative denotes that the value were measured below soil surface.
Fig. 3. Water retention curves for top- and sub-soils of peats at BRG6 (in Batanghari peatland, Jambi) and BRG18 (in Kubu Raya peatland, West Kalimantan).

Ethics Statements

NA.

Declaration of Competing 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.

CRediT Author Statement

Muh Taufik: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft; Mariiana TW: Data curation, Writing – original draft; Awaluddin: Conceptualization, Methodology, Investigation; Abdul Karim Mukharomah: Conceptualization, Methodology, Investigation; Budiman Minasny: Writing – review & editing.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi: 10.1016/j.dib.2022.107903.

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