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Data Article

Field dataset of punctual observations of soil properties and vegetation types distributed along soil moisture gradients in France



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ABSTRACT

The interface between wetlands and uplands is characterized by gradients in hydrological, soil and biological components. Consequently, the exact spatial distribution of this transitional area is not well known because it often occurs as a fuzzy moisture gradient. However, ecological assessment and conservation require mapping and characterizing this interface to better understand and model biotic and abiotic interactions between wetlands and uplands. To this end, in 2021 and 2022, we observed soil properties and vegetation types along soil moisture gradients throughout the Atlantic, Continental, Mediterranean and Alpine biogeographic regions of France. The dataset contains 2 236 georeferenced plots (accuracy ± 5 m) distributed along 1 088 transects placed along the slope at 377 sites. Each plot in the database is characterized by 21 fields that describe the vegetation habitat type based on the European Nature Information System (EUNIS) and soil properties (i.e. depth of appearance and thickness of redoximorphic features in the soil profile, moisture). These data are useful for researchers and engineers in a variety of

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disciplines (e.g. Earth and life sciences) to calibrate and validate models to predict the spatial distribution of habitats or to analyze flows.

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Specifications Table

| | |
|--------------------------------|---|
| Subject | Soil Science, Ecology, Environmental Engineering, Nature and Landscape Conservation |
| Specific subject area | Nature and Landscape |
| Type of data | Geolocalized point data |
| How the data were acquired | The data were collected in the field and characterized by observation of plant species and hand-auger drilling of soils. The geographical coordinates of each plot were recorded using a GPS with a horizontal precision of ± 5 m. |
| Data format | Raw |
| Description of data collection | 2 236 plots were sampled in 2021 and 2022 along 1 088 transects at the interface between wetlands and uplands across mainland France and Corsica. For each plot, the vegetation habitat type was classified according to EUNIS based on the observed plant species and local environmental conditions. Soil properties include the depth of redoximorphic features in the soil profile, their thickness observed in the soil core down to a depth of 120 cm and moisture observed in the soil core down to a depth of 120 cm. |
| Data source location | <ul style="list-style-type: none"> City/Town/Region: all over biogeographical regions of France [1] Country: mainland France |
| Data accessibility | <p>Name of the repository: Dryad</p> <p>Title of the dataset: dataset of punctual observations along soil moisture gradients in France</p> <p>Direct (URL) link to the dataset: https://datadryad.org/stash/dataset/doi:10.5061/dryad.gb5mkkwsd</p> <p>Data identification number associated with this dataset: doi:10.5061/dryad.gb5mkkwsd.</p> |
| Related research article | No related article has been published to date |

Value of the Data

- These data are useful to describe soil moisture gradients at a fine spatial scale in a wide variety of geomorphological contexts.
- The dataset can be used to calibrate and validate spatial distribution or flow-analysis models.
- The dataset can benefit researchers and engineers involved in Earth and life sciences.

Data Description

The dataset is a table in CSV format that contains 21 attribute fields related to plot identification, geographical coordinates, vegetation type and soil properties (Table 1). The spatial distribution of the data and photographs that illustrate the surveys are shown in Fig. 1. In detail, 794 plots were sampled in the Atlantic biogeographical region, 1 052 in the Continental region, 211 in the Alpine region and 179 in the Mediterranean region of France. Fig. 1b represents three transects at one site. Transect 1 was 50 m long and had a difference in elevation of 3 m. It was located in the Continental biogeographical region: the lowest plot (ID 1.1) contained moist or wet oligotrophic grassland (EUNIS code E3.5) with a Histosol soil [2] with peat horizons 0–0.8 m deep, while the highest plot (ID 1.2) contained highly artificial conifer plantations (EUNIS code G3.F) and well-drained soil. Fig. 1d highlights an auger soil profile with distinct redoximorphic

Table 1

Name and description of the 21 attribute fields in the dataset. The notation 'ntr' and 'na' in the dataset means 'nothing to report' and 'not available', respectively.

| Field name | Description |
|------------------------------|---|
| id | unique identifier for each field observation. |
| site | unique site name. |
| transect_num | transect number at a given site. |
| plot_num | plot number along a given transect. |
| X | longitude coordinates in degrees (WGS 84 coordinate system, EPSG 4326). |
| Y | latitude coordinates in degrees (WGS 84 coordinate system, EPSG 4326). |
| GPS_acc | accuracy of geographical coordinates (in m). |
| HGM | 'dep' indicates that the plot was georeferenced using aerial photographs due to field-accessibility issues (e.g. ledge, swamp). |
| habitat_code | hydrogeomorphic type from Brinson (1993), expressed in five categories: 'riverine or estuarine fringe', 'depressional', 'slope', 'lacustrine fringe', 'flat'. Brinson, M., 1993. A Hydrogeomorphic Classification for Wetlands (Wetlands Research Program Technical Report No. WRP-DE-4). US Army Corps of Engineers. |
| habitat_name | Code of habitat type according to the EUNIS classification system (Davies et al. 2004). 'INV' indicates that vegetation entirely consists of invasive plant species. |
| habitat_min_radius | Davies, C.E., Moss, D., Hill, M.O., 2004. EUNIS habitat classification revised 2004. Rep. Eur. Environ. Agency-Eur. Top. Cent. Nat. Prot. Biodivers. 127–143. |
| soil_depth | Name of habitat type according to the EUNIS classification system. |
| soil_redux_depth | minimum radius of the vegetation patch (in m). |
| soil_redux_thickness | depth of the soil profile (in cm). |
| soil_reduced_depth | depth of occurrence of redox features that covered 5% or more of the soil aggregates (in cm). |
| soil_reduced_thick soil_ness | thickness of redox features that covered 5% or more of the soil aggregates (in cm). |
| soil_histic_depth | depth of the occurrence of soil horizons with a reduced matrix that covered 95% or more of the soil aggregates (in cm). |
| soil_histic_thickness | thickness of soil horizons with a reduced matrix that covered 95% or more of the soil aggregates (in cm). |
| soil_organic_thickness | depth of the occurrence of histic features in the soil profile (in cm). |
| soil_moist_0_50 | thickness of histic features in the soil profile (in cm). |
| soil_moist_50_120 | thickness of the organo-mineral horizon in the soil profile (in cm). |
| | soil moisture at a depth of 0-50 cm. Expressed in ordinal categories: '1_dry', '2_fresh', '3_moist', '4_damp' or '5_waterlogged'. |
| | soil moisture at a depth of 50-120 cm. Expressed in ordinal categories: '1_dry', '2_fresh', '3_moist', '4_damp' or '5_waterlogged'. |

mottles 40 cm deep (redox features in red from 40 to 95 cm, soil horizons with reduced matrix in gray from 95 to 120 cm).

Experimental Design, Materials and Methods

Wetland maps were used to select 377 sites throughout mainland France and Corsica from a variety of hydrogeomorphic systems, including 'riverine or estuarine fringe', 'depressional', 'slope', 'lacustrine fringe' and 'flat' [4]. Sites with damaged or artificially created wetlands were excluded. At each site, three transects were pre-located along an expected topographic moisture gradient using GIS based on 1:50,000 scale national geological maps (BRGM), 1:25,000 scale national hydrological and topographical maps (SCAN 25® from IGN), aerial photographs (BD ORTHO® from IGN) and, when available, regional wetland inventories. The distance between transects ranged from 100 to 200 m. Along each transect, the distance between successive plots ranged from 30–100 m. The distances were increased or decreased depending on practical access conditions in the field. Along each transect, at least one plot was sampled inside the wetland, and one plot was sampled outside the wetland. The number of plots per transect depended on the difficulty in identifying wetland boundaries in the field.

The geographical coordinates of each plot were recorded using GPS. Using a handbook, each plot was assigned to a natural habitat according to the European Nature Information System (EU-

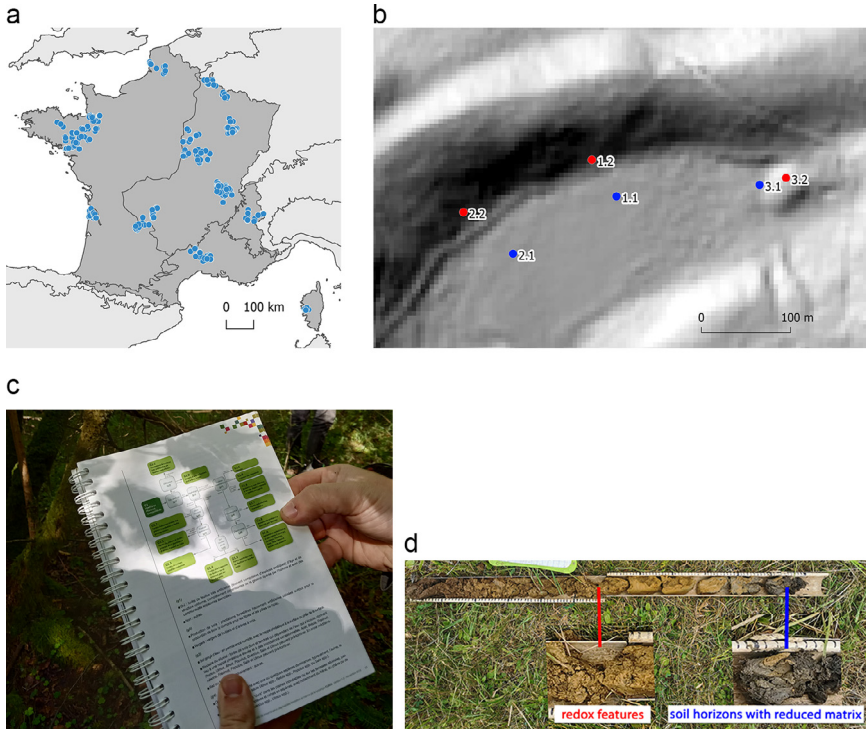


Fig. 1. Distribution of survey sites (points) in the four biogeographic regions of France (a) and overview of survey plots at one site (b, blue points: wetlands, red points: non-wetlands). A handbook was used to identify the habitat [3] (c) and soil was described after sampling it (d) in each survey plot.

NIS) [5] based on observed plant species and local environmental conditions [3]. Since redoximorphic features are indicators of wetland occurrence [6], the soil was sampled with a hand auger to determine the depth of occurrence and thickness of redox features (i.e. mottles that represented 5% or more of a given horizon), horizons with reduced matrix (grayish, bluish or greenish colors that covered 95% or more of a given horizon) and histic features (peaty materials). The sampling depth depended on the depth of occurrence of redoximorphic features: less than 50 cm deep if no redoximorphic features were observed, down to 80 cm if redoximorphic features occurred above 25 cm and down to 120 cm if redoximorphic features occurred only below 25 cm. The sampling depth depended also on possible obstacles existed (e.g. stones). The thickness of the organo-mineral horizon was measured, and soil moisture at depths of 0–50 cm and 50–120 cm was categorized in five ordinal categories.

Ethics Statements

The authors declare that there are no ethical issues with the data presented.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that influenced the work described in this article.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests.

Data Availability

Dataset of punctual observations along soil moisture gradients in France (Original data) (Dryad).

CRediT Author Statement

Guillaume Gayet: Conceptualization, Methodology, Validation, Investigation, Writing – original draft, Writing – review & editing; **François Botcazou:** Investigation; **Jean-Manuel Gibeault-Rousseau:** Investigation; **Laurence Hubert-Moy:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing; **Sébastien Rapinel:** Conceptualization, Methodology, Writing – original draft; **Blandine Lemercier:** Conceptualization, Methodology, Validation, Investigation, Writing – review & editing.

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References

- [1] Biogeographical regions in Europe – European Environment Agency, (2016). <https://www.eea.europa.eu/data-and-maps/figures/biogeographical-regions-in-europe-2>. Accessed July 7, 2022.
- [2] USS Working Group WRB, International Soil Classification System for Naming soils and Creating Legends for soil Maps, IUSS/ISRIC/FAO, Rome, 2014 <https://www.fao.org/3/i3794en/i3794en.pdf>.
- [3] G. Gayet, F. Baptist, L. Maciejewski, R. Poncet, F. Bensettiti, Guide de Détermination des Habitats terrestres et Marins de la Typologie EUNIS - version 1.0, Guides et Protocoles, AFB, 2018.
- [4] M. Brinson, The United States HGM (Hydrogeomorphic) approach, in: *The Wetlands Handbook*, Wiley-Blackwell, Edward Maltby & Tom Barker, Oxford, 2009, pp. 486–512.
- [5] C.E. Davies, D. Moss, M.O. Hill, EUNIS habitat classification revised 2004, Rep. Eur. Environ. Agency Eur. Top. Cent. Nat. Prot. Biodivers. (2004) 127–143.
- [6] C.B. Craft, M.J. Vepraskas, *Wetland Soils: Genesis, Hydrology, Landscapes, and Classification*, Taylor & Francis, 2016.