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DATA PAPER

Paleoecological and Sedimentological Data from: "A Classification for Macroscopic Charcoal Morphologies Found in Holocene Lacustrine Sediments"

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This dataset contains sedimentological and paleoenvironmental measurements from a 351.5 cm sediment core that was collected from Pyatts Lake, south-east British Columbia, Canada. Sedimentological data include: radiocarbon dates and age-depth model, magnetic susceptibility, loss-on-ignition values, and particle size distributions. Palaeoecological data include: macroscopic charcoal (>150 µm), charcoal morphotypes; aquatic macroremains; pollen spectra, conifer stomata, microscopic charcoal and total fungal spores. These data were used to investigate the potential for charcoal morphotype assemblages for paleoenvironmental interpretations in montane mixed conifer forests. These data were collected from analytical laboratory and optical microscopy analyses. Data are presented in a multiple tabbed spreadsheet. These data can be used for direct comparison with other sedimentological, vegetation, and disturbance histories during the Holocene and may be compared to prior geologic time periods in an analogue context. The charcoal data can be applied to syntheses of biomass burning from local to global scales and pollen data can be combined into pollen database analyses.

Keywords: anthracology; biomass burning; charcoal analysis; disturbance; fire; lake sediments; morphology; morphotypes; paleobotany; paleoecology; paleofire; Quaternary; sedimentology; wildfire
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(1) Overview

Context

Spatial coverage

Description: Pyatts Lake, British Columbia, Canada
Northern boundary: +49.469648/-115.769720
Southern boundary: +49.469648/-115.769720
Eastern boundary: +49.469648/-115.769720
Western boundary: +49.469648/-115.769720

Temporal coverage

6890 to -60 calibrated years BP (before 1950 Common Era).

(2) Methods

Steps

1. Gravity coring of the uppermost sediments collected the top 41 cm with an intact water-sediment interface (Glew, Smol and Last 2001). Deeper sediments were cored with a Livingstone piston corer (Wright, Mann and Glaser 1984) that collected 348 cm in ≤100 cm segments. Cores were wrapped in plastic and aluminium foil then shipped to refrigerators at Carleton University, Ottawa, Canada.

2. Cores were aligned using visual inspection, magnetic susceptibility, and loss-on-ignition data to create a continuous 351.5 cm stratigraphy.
3. An age-depth model was created using BACON (Blaauw and Christen 2011) and radiocarbon dating results from 4 bulk sediment and 2 wood samples. Samples were dated at Direct AMS (Bothell, WA, USA) and calibrated with the IntCal09 curve (Reimer, et al 2009). BACON parameterization was presented in the paper (Courtney Mustaphi and Pisaric 2014). BACON parametrizations: d.min=0, d.max=351.5, acc.shape=2, acc.mean=10, mem. strength=4, mem.mean=0.7, d.by=0.5, unit="cm".
4. Bartington Systems MS2B and MS2E sensors were used for magnetic susceptibility at contiguous 0.5 cm intervals. Measurements were air-measure corrected after each measurement.
5. Loss-on-ignition analysis (Dean 1974): 1 cm^3 subsamples at contiguous 0.5–5 cm intervals down core. Dried at 105 °C for 24 hours. Burned at 550 °C for 4 hours to estimate organic content. Reburned at 950 °C for 2 hours to estimate carbonate content.
6. At 10 cm intervals, particle size distributions were measured from 1 cm^3. Organics digested with 30% hydrogen peroxide (H_2O_2) in a water bath (~75 °C). 5 mL of 50 g L^{-1} sodium hexametaphosphate ($Na_6P_6O_{18}$) added. Triplicated measurement runs of 60 s, at 10±2% obscuration using Beckman Coulter LS 13 320 laser diffraction particle size analyser.
7. Pollen preparations (Fægri and Iversen 1989): 2 exotic Lycopodium tablets added (detail in data file; (Stockmarr 1971) to 1 cm^3 subsamples taken at 10–20 cm resolution.
8. Charcoal morphotypes (Courtney Mustaphi and Pisaric 2014) were counted under a stereomicroscope from contiguous subsamples of 1–2 cm^3, deflocculated in a sodium hexametaphosphate solution, wet sieved through 150 μm mesh. No bleaching with hydrogen peroxide (Schlachter and Horn 2010) was performed on these samples as the organic detritus was readily distinguishable.

Sampling strategy
Centre of lake targeted for coring. Magnetic susceptibility and macroscopic charcoal analysis were performed at contiguous high-resolution intervals. Other sedimentological and paleoecological measurements were performed at lower (decimetre) resolution down core. Subsampling volumes, procedures and treatments are presented in detail in the study (Courtney Mustaphi and Pisaric 2014).

Quality Control
Particle size distributions were run in triplicate then averaged and a laboratory standard was run at the start of each day of use to track any machine drift.

Constraints
Few attempts at replication were conducted so data have no associated error bars.

(3) Dataset description
Object name
'Pyatts Lake PiPG 2014.zip' contains all of the files listed below:

'Pyatts Lake data - PiPG 2014 version002.xls' contains spreadsheets of each dataset. Each spreadsheet has also been provided as a .csv file as listed below:

1. Readme.csv
2. Site metadata.csv
3. Dating determinations.csv
4. BACON age-depth model.csv
5. Magentic susceptibility.csv
6. LOI.csv
7. Aquatic Fossils.csv
8. Ostracod Assemblages.csv
9. PSDs.csv
10. PSD-Gradistat.csv
11. Pollen Counts.csv
12. Macroscopic Charcoal.csv

'PyattsLake-charanalysis.zip' contains files from the input and output of CharAnalysis v1.1.

'Pyatts Lake.kmz' contains geospatial location of the site for use in GIS or Google Earth software.

Data type
Primary data.

Format names and versions
Microsoft Office Professional Plus 2010 Excel (version 14.0.7125.5000 (32-bit)) spreadsheet. CharAnalysis v1.1 inputs and outputs (Higuera, Brubaker, Anderson, Hu and Brown 2009) were included for reproducibility. The KMZ file was produced using Google Earth.

Creation dates
10/12/2014

Dataset Creators
Colin J. Courtney Mustaphi.

Language
English.

License
Open license (CC0).

Repository location
Open Quaternary Harvard Dataverse http://dx.doi.org/10.7910/DVN/ZNJTS (Mustaphi, 2015)

Total macroscopic charcoal data from the Pyatts Lake sediment core has also been submitted to the Global Charcoal Database version 4 (PAGES Global Paleofire Working Group). http://www.gpwg.org/

Publication date
04 June 2015

(4) Reuse potential

Comparison with new local or distant records would be useful for examining spatiotemporal trends in pollen-inferred vegetation cover and biomass burning trends (Blarquez, et al 2014). These morphological results may be subjected to further multivariate analyses alongside additional high resolution proxy data from this site to understand the relationships between vegetation cover, fire, climate and taphonomy with charcoal products. Land cover and land use change analyses using remote sensing products, such as air and satellite imagery, coupled with these high resolution lake sediment data (Aleman, et al 2013) would provide insight on recent changes during twentieth century land development and fire suppression.

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