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.
Cores were aligned using visual inspection, magnetic susceptibility, and loss-on-ignition data to create a continuous 351.5 cm stratigraphy.

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".

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.

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.

At 10 cm intervals, particle size distributions were measured from 1 cm$^3$. Organics digested with 30% hydrogen peroxide ($\text{H}_2\text{O}_2$) in a water bath (~75 °C). 5 mL of 50 g L$^{-1}$ sodium hexametaphosphate ($\text{Na}_6\text{P}_6\text{O}_{18}$) added. Triplicated measurement runs of 60 s, at 10±2% obscuration using Beckman Coulter LS 13 320 laser diffraction particle size analyser.

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.

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.
(4) Reuse potential
Comparison with new local or distant records would be
useful for examining spatiotemporal trends in pollen-
ferred vegetation 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, cou-
pled 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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