Environmental Chemistry Facility Instrumentation

https://sites.brown.edu/deeps-environmental-chemistry-facility/
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INNOV-X Systems Alpha 4000 and Olympus Delta Handheld XRF (with use coordinated by Marcelo Alexandre and Jamie Pahigian):

Non-destructive elemental analysis on a variety sample types for concentrations of some metals ranging from about 20 ppm to 10% (Alpha) and >10 ppm (Delta).
Sample type: most items with a surface ~1 cm diameter, highest precision and accuracy on dried, ground, and homogenized samples
Sample amount: ~1 cm diameter and 1 mm thick
Detection: >10 ppm for a suite of elements including Pb, Zn, Cu, Cr, Mn, Fe, Zr, Sr, Ti, K, and Ca; some more accurate than others
Time: 2 minutes per sample, ~30 minutes to set up, calibrate, and to put away instrument
Cost: Please, contact Dr. Marcelo Alexandre

Milestone DMA80 Mercury Analyzer (MacMillan 109B, with use coordinated by Marcelo Alexandre and Joe Orchardo):

Analysis of mercury in solid or liquid samples
Sample type: solids should be ground and homogenized
Sample amount: 50-400 mg- depending on concentration
Detection: 0.1 ng Hg
Time: prepare and weigh samples, calibrate analyzer (2-3 standards), analysis: 7 minutes per sample, 40 position autosampler.
Cost: Please, contact Dr. Marcelo Alexandre

Thermo Scientific iCAP 7400 Duo Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES, MacMillan 221):

Analysis of most elements with atomic weights above 10.
Sample type: filtered liquid, either natural waters or digested soil and plant material in an acid matrix (2-10%).
Sample amount: 10 ml, 40-500 mg depending on sample preparation and concentrations of elements of interest
Detection: 10-20 ppb radial depending on element, 0.5-1 ppb axial, note that digested soils and plants are diluted by at least 140x before analysis.
Time: dry, grind, and homogenize samples, digest samples (6 hrs/10 samples), calibrate analyzer (30 minutes), analysis: 2-5 minutes per sample depending on number of elements up to 12 elements, 240 position autosampler
Cost: $4-$6/sample with minimum charge of $25.

Perkin Elmer AAnalyst 600 Graphite Furnace-Atomic Absorption Spectrometer (AAS-GF) (MacMillan 221):

Analysis of metals in liquids
Sample type: filtered liquid, either natural waters or digested soil and plant material in an acid matrix (2-10%)
Sample amount: 2 ml, 40-500 mg depending on sample preparation and concentrations of

elements of interest
Detection: 1-4 ppb, concentrations need to be below 100 ppb
Time: dry, grind, and homogenize samples, digest samples (4 hrs/10-12 samples), calibrate analyzer (1 hr), analysis: 5 minutes/sample, 80 position autosampler
Cost: $5/sample

Thermo Scientific X-series-2 Inductively Coupled Plasma Mass Spectrometer (GeoChem 040, use coordinated by Marcelo Alexandre and Soumen Mallick)

Analysis of trace elements in liquid samples
Sample type: filtered liquid, either natural waters or digested soil and plant material in an acid matrix (2-10%) - use distilled metal free acids and samples need to be low in total dissolved solids)
Sample amount: 2-5 ml, 40-500 mg depending on sample preparation and concentrations of elements of interest
Detection: 0.25 ppb, concentrations need to be below 10 ppb
Time: dry, grind, and homogenize samples, digest samples (4 hrs/10-12 samples, include blanks and reference standards), calibrate analyzer (1 hr), analysis: 5 minutes/sample
Cost: Please, contact Dr. Marcelo Alexandre

UIC, INC Inorganic Carbon Analyzer (MacMillan 221, Use coordinated by Marcelo Alexandre and Joe Orchardo):

Analysis of inorganic carbon in solid samples
Sample type: ground sediments, soils, or other solids
Sample amount: 10-50 mg
Detection: 5 µg
Time: dry, grind, and homogenize samples, weigh out standards and samples, 5 standards, analysis: 15-35 minutes per sample, 45 position autosampler.
Cost: Please, contact Dr. Marcelo Alexandre

Sample preparation

Drying Ovens (MacMillan 010): mechanical and gravity convection, dry overnight
Drying racks (MacMillan 010): for air-drying samples
Large chest freezers (MacMillan 010): two for storing samples
Cold room (MacMillan 010): 4°C room for storing samples
Freeze Dryer (MacMillan 010): used to dry samples, freeze overnight, then minimum 48 hrs to dry
Wiley Mill (MacMillan 011B): used to grind plant material into a fine powder
Mixer Mill (MacMillan 011A): used to grind soils and rock material into a fine powder
Mortar and Pestle: used to grind plants and soils into a coarse powder
Flux Fusion (MacMillan 313): used to digest solid material for trace elements analysis using lithium metaborate flux at high temperature. Cost: $4.80/sample
Milestone Ultrawave Microwave digestion (MacMillan 313): used to digest solid material in concentrated acid, 3-4 hr continuous process, 15-sample holder, 10-12 samples per run, then at least 24 hr drydown, Cost: $5/sample
Dionex Accelerated Solvent Extractor (ASE) (Available in Yongsong Huang's lab – GeoChem 148, with use coordinated by Marcelo Alexandre and Ewerton Santos): used to extract organic compounds from solid samples, 3 hours load time for up to 24 samples, 40 minutes/sample for extraction, 4 hours to unload samples and clean up cells.
Cost: Please, contact Dr. Marcelo Alexandre