



NEWSLETTER 4

North American Soil Geochemical Landscapes Project Canadian Project Update, April 2008

Briefly.....

- NASGLP Workshop II held in Ottawa on February 27-28 in Ottawa was a big success. New data from the 2007 “core” sampling in the Maritimes and value-added research, including the soil gas radon study, were presented. Ways for expanding the use of Tri-national data were explored through a round table discussion with participants from Health Canada, Environment Canada, Agriculture and Agri-Food Canada and NRCan-National Forest Inventory. A big thank you to the scientists from the provincial surveys who plan to work with Peter Friske to undertake the trans-Canada sampling swath in 2008.
- Preparation of splits of Tri-national samples is in full swing at GSC and sample analysis is ongoing at the GSC and in commercial laboratories.
- Presently there are no consistent national or international protocols for analyzing soil samples, though many require the use of aqua regia or its variants. Over the winter, 5 digestion procedures were tested to determine whether an aqua regia, or some other hot acid, digestion would be used for samples from the Tri-national survey. After reviewing test results, geochemists at GSC have decided to use the US-EPA 3050B aqua regia variant. An analytical protocol has been prepared and is available upon request.
- One of the major aims of the Tri-national Project is to develop and use consistent field and laboratory protocols. A first version of the manual is being compiled and will be available (upon request) by summer.
- A special session related to regional- to continental-scale databases is to be held at the GSA meeting in Houston, October, 2008.

*Proposed NASGLP sampling swath for 2008.
Work will be undertaken in partnership between
GSC and the provincial/territorial surveys.*





MORE DETAILS.....

NASGLP WORKSHOP II - Canadian Initiative

Workshop II was held at Sala San Marco Banquet Hall in Ottawa on February 27-28. It was set up as a working meeting and participants were invited based on their expertise or function within their government organization. It was a very stimulating and fruitful two days, the results of which have set the project course for 2008 and beyond.

The Workshop was divided into 4 components. In the first we reviewed activities from 2007. Toon Pronk, Terry Goodwin, and Mike Parkhill provided insights and lessons learned from the successfully completed Maritime survey. We also heard about the complexities of the lab procedures, the aqua regia test research, and the development work on field and laboratory protocols. Eric Grunsky presented some first-stage results of statistical analyses of new data available for the C-horizon samples from the Maritimes.



*Back row (l to r): Rick McNeil (GSC), Laurel Woodruff (USGS), Richard Laframboise (GSC), Bert VandenBygaart (AAFC), Ross Kelly (OGS), Ken Ford (GSC), Marty McCurdy (GSC);
3rd row (l to r) John Buckle (GSC), Toon Pronk (NBDNR), Janet Campbell (Sask Energy and Resources), Karen McKendry (HC), Sarah Hall (HC), Eric Grunsky (GSC), Bob Garrett (GSC), Ray Lett (BCGS), Mike Parkhill (NBDNR), Terry Goodwin (NBDNR);
2nd row (l to r) Dave Kroetsch (AAFC), Jains Pritam (Saskatchewan MOE), Len Kozak (AAFC), Rick Scroggins (EC), Chris Alloway (EC), Juliska Princz (EC), Glenda Rosso (NRCAN- NFI), Heather Groom (Manitoba GS), Rita Mroz (EC), Peter Friske (GSC);
Front row (l to r) John Johnson (OMNR), Andy Rencz (NRCAN), Yves Couillard (EC), Inez Kettles (GSC), Rod Klassen (GSC). Absent: Scott Cairns (NWT GS), Jing Chen (HC), Scott Smith (AAFC), and Geneviève Béchard (NRCAN).*



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In the second component the following partners described their “add-on” research projects: Ken Ford (GSC) with Jing Chen (Health Canada- Radiation Protection Branch) on measuring soil gas radon ; Rita Mroz (Environment Canada) on studies on the organic layer (0-30 cm); Rick Scroggins and

Juliska Princz (Environment Canada) on developing biomethods for assessing soil toxicity; Sarah Hall and Karen McKendry (Health Canada) on bioaccessibility and selected organic components, and Rick McNeil (GSC) on integrating sampling of stream sediments and waters with tri-national sampling in New Brunswick. Dave Kroetsch (AAFC) suggested that we refer in future to these efforts as “value-added research” and we agree!

For the third part we focused on determining how we can work with geochemical data users more effectively. Remarks from Sarah Hall (HC- Contaminated Sites), Glenda Russo (NRCan-CFS), Dave Kroetsch (AAFC), Chris Allaway (EC- National Guidelines and Standards Office), and Yves Couillard (EC- Existing Substances) were followed by a discussion period. We explored ways to make the data and interpretations more user-friendly and relevant to the work on health protection and the environment ongoing in various government departments.

In the final component we heard from the provinces and worked on planning the Tri-national effort for 2008. Tri-national work will focus on the trans-Canada sampling swath shown at the beginning of this Newsletter. We learned about field activities planned in the provinces and one territory from Ross Kelly (Ontario Geological Survey,) Heather Groom (Manitoba Geological Survey), Janet Campbell (Saskatchewan Energy and Resources), Ray Lett (British Columbia Geological Survey), and Scott Cairns (Northwest Territories Geological Survey). We have learned since the Workshop through Glen Prior that the Alberta Geological Survey is planning to partner.



*Top - Terry Goodwin (NSDNR) and Scott Cairns (NWT GS reviewing posters.
Centre - Geneviève Béchard (NRCan) meets with John Johnson (OMNR).
Bottom - Scott Smith (AAFC) and Juliska Princz (EC) at the Workshop.*



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LABORATORY OPERATION AT NRCAN-GSC

We all realized from the start that the Canadian scheme for sampling, laboratory analysis, and data archiving is a complex process requiring an enormous amount of organization. This has become increasingly apparent to the GSC participants (minus Peter Friske, Isabelle Girard, and Alain Grenier who have been keeping track of it). Work on the detailed documentation of the core and additional research protocols is currently ongoing.

Overview of Sampling and Laboratory Protocols from 2007

Note: Intervals or horizons for sampling at the “core” sites are 0-5 cm “public health” layer and A-, B-, C-horizons. Size fractions of samples to be analyzed are the <2.00 mm fraction for all analyses and the <0.063 mm for selected analyses (carbon, 4-acid, and aqua regia variant (US-EPA 3050B)).

Core” determinations on tri-national soil samples

- ICP-MS/OES analysis (42 elements) after US-EPA 3050B digestion (0-5 cm, A, B, C)
- ICP-MS/OES analysis (42 elements) after 4-acid near total digestion (0-5 cm, A, B, C)
- ICP-MS/OES analysis after water leach (0-5 cm, A and C)
- Carbon – Organic and inorganic content (0-5 cm, A, B, C)
- pH (0-5 cm, A, B, C)
- Munsell colour (0-5 cm, A, B, C)
- Particle size analysis
- Loss-on-ignition (0-5 cm, A, B, C)
- Moisture content (0-5 cm, A, B, C)
- Bulk density (0-5 cm, A, B, C)
- Electrical conductivity (0-5 cm, A, B, C)
- Cation exchange capacity (CEC) (A, C)



Value-added determinations on splits from core tri-national samples

- N, P (0-5 cm, A, B, C)
- Gastric leach procedures followed by ICP-MS/OES or AAS (0-5 cm and C; <0.063 mm only)
- Perchlorates (0-5 cm, C)
- Biological methods for determining soil toxicity (A, B)
- X-ray diffraction (A, B, C)
- Radiometric test (laboratory testing) (0-5 cm, A, B, C)



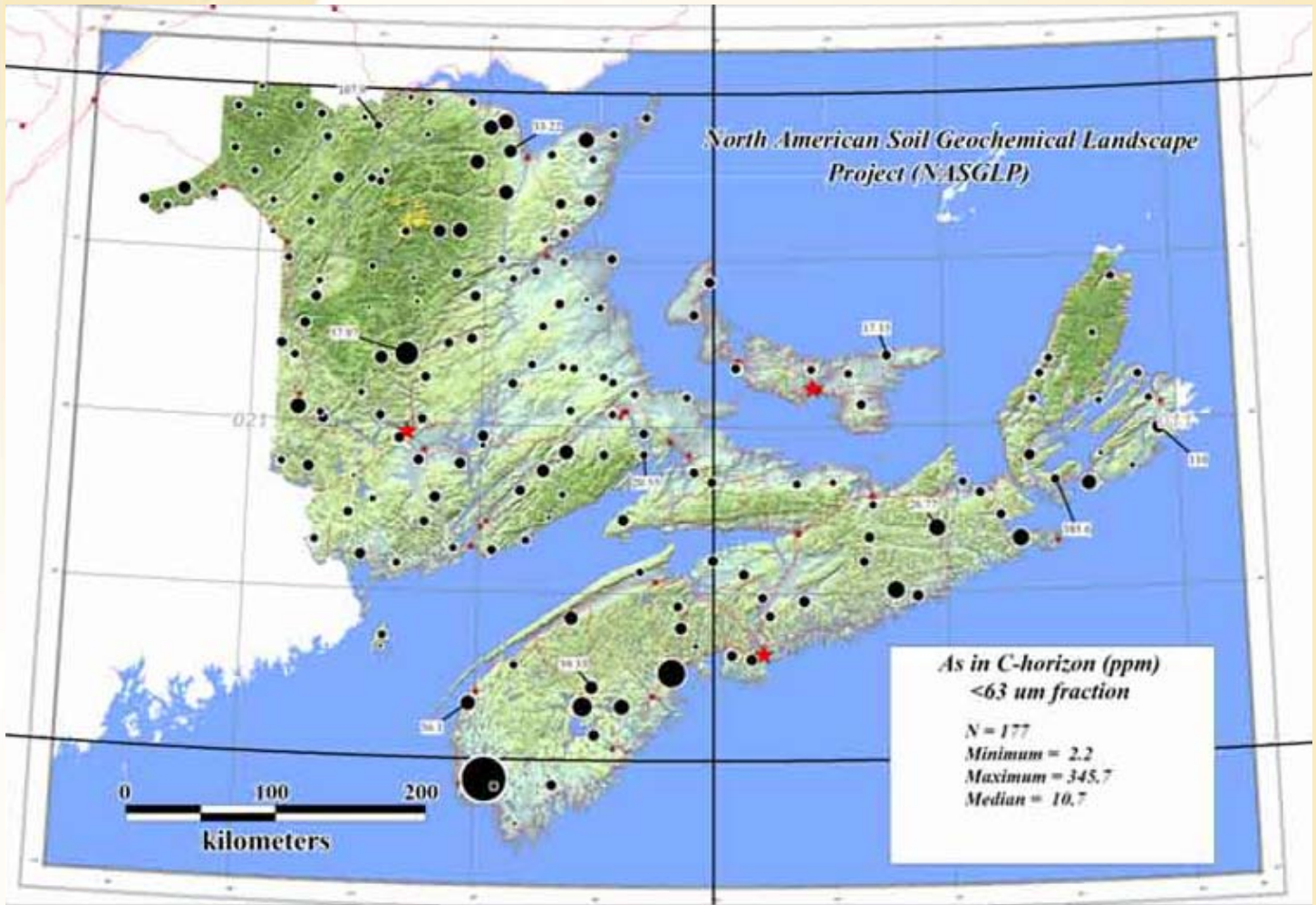
Value-added determinations on additional samples collected at tri-national or other sites

- Radon analysis (tri-national site)
- Radiometric tests (tri-national site)
- Anthrax (whole sample size fraction)
- Studies on the 0-30 cm interval (tri-national site)
- Stream waters and sediments analysis
- Collaborative sample and data collection for National Forest Inventory

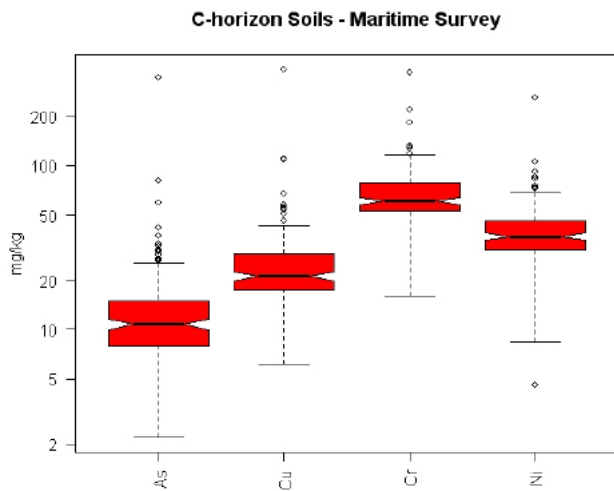


FIRST SURVEY RESULTS FROM 2007

Core Sampling in the Maritimes



Samples from 2007 are now being analyzed. Some geochemical data for the C-horizon samples from Tri-national sites in the Maritimes are available.



Above - Map shows the distribution of arsenic in the <63 μ m fraction (silt plus clay-sized material) of the C-horizon soil samples. Arsenic levels range from a low of 2 ppm to a high of 346 ppm.

Opposite - Tukey box plots show the range of concentrations of four elements on a log scale - arsenic, copper, chromium and nickel - in samples collected from the C-horizon of soils at Tri-national sites in the Maritimes.



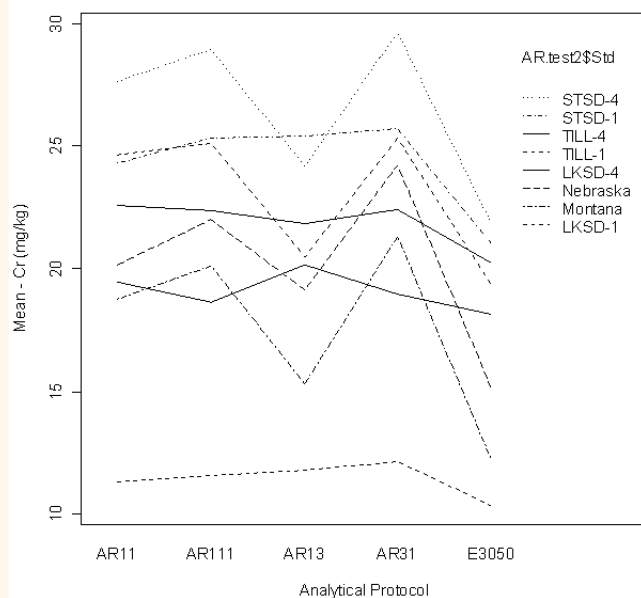
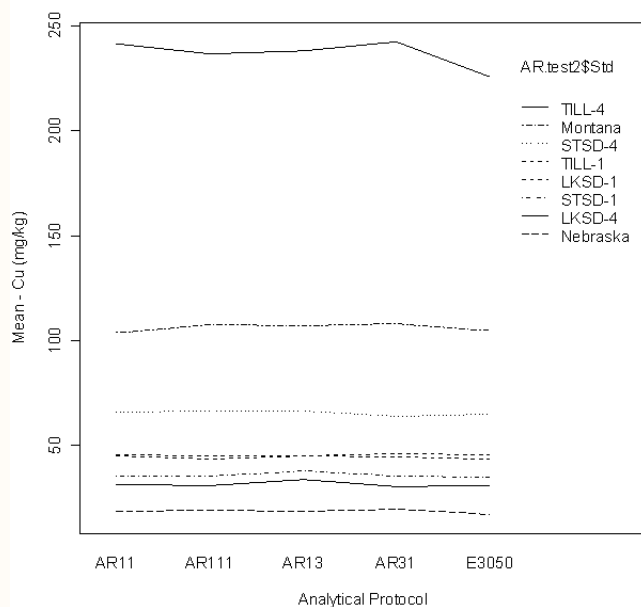


Tests Research on Aqua Regia and Its Variants

Bob Garrett, Peter Friske, Eric Grunsky, and Marty McCurdy have been undertaking a study on aqua regia and its variants. Currently a variety of different analytical protocols are used by environmental agencies in North America. There are no consistent national or international protocols, though many require use of aqua regia, or a relatively similar digestion procedure. In order to determine

whether aqua regia, or some other hot acid, digestion would be used to determine near-total metal and metalloid levels in soil materials from the Tri-National survey they set up an experiment to compare five different digestion protocols: aqua regia, Lefort (reverse aqua regia), 1:1 HCl-HNO₃, 1:1:1 HCl-HNO₃-H₂O, and the HNO₃-H₂O₂ variant of US-EPA 3050B. Eight control reference materials, two each of soils, tills, stream sediments and lake sediments, were analysed in triplicate. Both the digestion steps and final ICP-OES and -MS determinations were undertaken following randomization so any systematic temporal or other variability would be distributed as random 'noise'. The data from this experimental design was subjected to an Analysis of Variance to determine which analytical protocols yielded similar data to each other. The ANOVA results indicate that the HNO₃-H₂O₂ variant of US-EPA 3050b generally extracts significantly less metals and metalloids than aqua regia and the aqua regia-like digestions. Notable exceptions are Hf, Nb, Th and Zr. For the remaining four analytical protocols, aqua regia and three HCl-HNO₃ variants, the results are very similar, if not identical.

On the basis of this work a decision was made to recommend and use the US-EPA 3050B aqua regia variant digestion. This procedure used a 4:1 HCl-HNO₃ mix rather than the 3:1 of "classical" aqua regia. Gwendy Hall at GSC has prepared a protocol document defining the procedures to be used for Tri-National analyses. These include the choices of 1 g (<63 μm) or 10 g (<2 mm) aliquots and a 1:12.5 solid:reagent ratio. If you would like a copy of this document, please contact us.



Diagrams show interaction plots for copper and chromium based on analyses of selected reference materials using aqua regia and the variants described above.





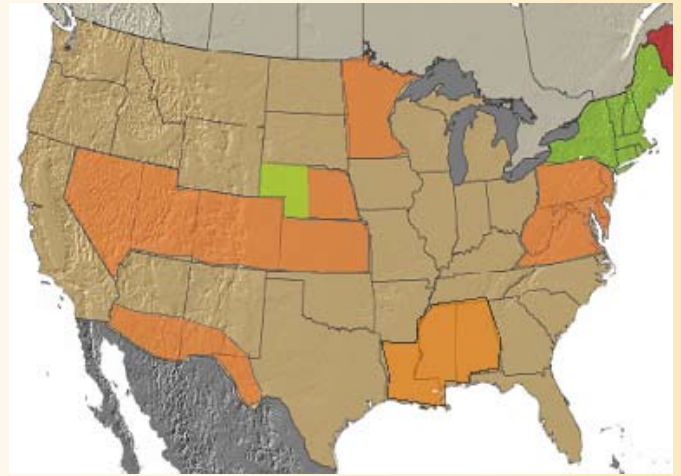
NEWS FROM OUR INTERNATIONAL PARTNERS

United States

Work on the Tri-national is also moving forward south of our border. Laurel Woodruff from the United States Geological Survey attended Workshop II and reported on accomplishments from 2007 and plans for 2008.

Laurel will return to Ottawa in late May to work with GSC and AAFC staff on developing sampling protocols for organic soils.

Map shows areas of mainland United States where sampling work is completed (green) and planned for 2008 (orange). In addition, 180 samples were collected in 2007 along a north-south transect of 1022 km (635 mile) through Alaska to develop field protocols for permafrost - cold regions.



OTHER NEWS

Upcoming Special Session at GSA

A request from Dave Smith (USGS) for a GSA Topical Session entitled “Soil Geochemistry: Databases and Applications at Regional to Continental Scales” has been accepted. This is a special joint annual meeting of the Geological Society of America (GSA), Soil Science Society of America (SSSA), American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and the Gulf Coast Association of Geological Societies with the Gulf Coast Section of SEPM (GCAGS). The joint meeting was organized to celebrate the International Year of Planet Earth. Plans are being made as to the contributions from the Canadian side of the Tri-national project.

For More Information or To Make Submissions to the Next Newsletter

To request information or send comments or activity updates, please contact us:

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