

Some plans from the GEOTRACES International Particle Intercalibration (IC) #2

Planning Meeting

Held Marine Sciences Building, Rm 315,
University of Hawaii, Honolulu, HI
Sunday 03/24/13—Monday 03/25/13

In person Attendance:

Andrew Bowie—University of Tasmania, Australia

Martin Fleisher—Lamont Doherty Earth Observatory, USA

Tung-Yuan Ho—Academia Sinica, Taiwan

Phoebe Lam—WHOI, USA

Maeve Lohan—University of Plymouth, UK

Simone Metz—NSF, USA (Monday only)

Brad Moran—NSF, USA (Monday AM only)

Peter Morton—Florida State University, USA

Torben Stichel—University of Hawaii, USA (Sunday only)

Remote Attendance:

Via Skype: Rob Sherrell—Rutgers University, USA

Via GoToMeeting: Ben Twining—Bigelow Laboratory for Ocean Sciences, USAs

Prepared by Phoebe Lam

Previous particle IC's to date

- Rob Sherrell organized the first few rounds of IC as part of the 2008 GT IC1 and 2009 GT IC2 cruises. Final round total digest IC, 5 labs reporting (3 USA, 1 Australia, 1 Spain):
 - Digest solutions: %RSD<20% for some elements; <50% for all elements
 - Filter punches: interlab agreement actually quite good for high SBB sample (%RSD=5-15% for many elements; 25% for P; 40% for Zn), but significantly worse for low SAFe sample (typical %RSD=25-55%)
- Phoebe Lam organized a US-only particle IC in anticipation of US GT NAZT (GA03)—4 US labs participating, filter punches only
 - RSD \leq 15% for Al, Ba, Cd, Fe, Mn, Sr;
 - RSD 16-21% for Co, Cu, Mo, Ni, P, Th, Ti, V
 - RSD 34-46% Cr, Pb, Zn
- Need for another round of international particle IC

Interest in particle intercalibration

- Solicitation of interest sent out by IPO in early April 2013 for 3 intercalibration activities:
 1. Total digest of trace elements: N=42
 2. Major particle composition (POM, CaCO₃, opal, lithogenics) and mass: N=17
 3. Weak acid leaches for trace elements: N=29
- Responses from 17 countries, #s exceeded expectations:
 - USA, Taiwan, Slovenia, Colombia, Germany, Argentina, India, Ireland, Greece, Russia, UK, Spain, France, Brazil, Australia, Canada, Croatia (no Japan or China—target?)
- Available filter sample sets limit on number of participants to ~30; will need to set prerequisites for participation to reduce number
 - eg. ability to make measurements at expected particle loading (<0.3mg) will eliminate several; may need other prerequisites: ability to recover CRM values? Multi-element?

Filter type requirements for different IC activities

- Important to conduct IC on particles on a filter substrate, as GT samples to come this way
- Will focus initially on total digest IC; attempt to run major particle composition IC in parallel; weak acid leach IC to be second-round activity
- 3 Different IC activities will require samples on two filter types:
 - plastic filter type (eg. polyethersulfone=PES=Supor) for total digests for trace elements (lithogenic particles) and biogenic silica (CaCO_3 ; weak acid leach ok)
 - Precombusted quartz (QMA) or glass fiber filters (GFF) for POM (CaCO_3 , weak acid leach ok)
- Need to identify adequate sample on the right filter types to conduct these IC's
- Would like to distribute samples from different regimes/loading levels (optimize for total digest of trace elements)

Sample collection details

- High level of interest in IC requires a large filter sample for distribution, preferably 293mm
 1. Highly loaded sample (coastal, surface--high biogenic, high TMs)
 - Option 1: Rijkenberg, chief sci—offered to collect samples for particle IC (500€) from 1 deployment of 3 SAPS pumps on Black Sea leg of Dutch Mediterranean cruise (GA04) in July 2013; target oxic euphotic zone for all three pumps
 - SAPS 1: 293mm Supor for total digest of trace elements
 - SAPS 2: 293mm Supor for biogenic silica
 - SAPS 3: 293mm QMA for POM
 - Option 2: Jim Bishop's archived 293mm MULVFS samples from the US IC2 (Santa Barbara Basin)—Phoebe Lam to be in Berkeley Friday May 3 and will check for sample availability on Supor and QMA
 2. Oligotrophic surface sample (low TMs)
 - Jim Bishop's archived 293mm MULVFS samples from the US IC2 (SAFe)?
 3. High lithogenic material (coastal, deep)
 - Option 1: Jim Bishop's archived MULVFS samples from US IC2 (Santa Barbara Basin)?
 - Option 2: new samples from Maeve Lohan's 2014 Celtic Shelf cruises

Total digest of trace elements-1

- Sample
 - Distribute filter subsamples from different 3 regions: high/low lithogenic/biogenic and dipped blank filters
 - Distribute triplicate subsamples; request reporting of mean and standard deviation of triplicates
 - Distribute a pre-mixed solution of ICP-MS standards to separate instrumental from digestion issues
- Digestion Method
 - Do not specify method, but require use of HF for total digest if wet digestion (eg. vs XRF), heat (eg. hotplate vs microwave), and sealed vials (eg. vs open vials)
- Certified reference materials
 - Recommend that everyone digests and runs BCR414 (plankton)
 - Would like to purchase and distribute NIST2703 (\$613 for 5 g—Baltimore Harbor marine sediments, certified for <10mg sample sizes)
 - Possibility of a few grams of freeze dried diatom-rich material from continuous centrifugation to use as marine SPM reference material (Geibert/Rutgers van der Loeff)

Total digest of trace elements-2

- Other Instructions to participants
 - Recommend use of ultra high purity acids
 - Require use of internal standard (eg. In115) if doing ICP-MS
 - Action item for organizers: cookbook update with suggested digestion methods?
- What to report
 - Acid blanks, vial digestion blanks, filter dipped blanks, samples for predetermined key and other TEIs of interest
 - Final dilution level (assess matrix effects)
 - Instrument used (quadrupole vs high res vs non ICP-MS)
 - Sample introduction system for ICP-MS (desolvating systems vs quartz spray chamber?)
 - Digestion method details
 - Internal standard
 - Report whether filter completely dissolved
 - Action item for organizers: provide data reporting template

Major particle composition

- Sample
 - Distribute Supor and QMA filter subsamples from 2 regions: ideally biogenic silica-dominated (coastal surface?) vs lithogenic-silica dominated (coastal deep)
- Report: POC, CaCO₃, biogenic silica (opal), lithogenic particles, particle mass
- Analytical Methods
 - Link to Forum Discussion on GEOTRACES webpage for overview of methods

Weak acid leach for trace elements

- Sample
 - To come from Maeve's Celtic cruise 2014?
- Leach still to be determined
 - Berger et al. 2008 (HAc plus hydroxylamine hydrochloride current favourite)