

## Alicia Mullins

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**From:** Larry Mack [b.sambuco@mail.utexas.edu]  
**Sent:** Friday, April 19, 2002 3:47 PM  
**To:** David Pickett  
**Subject:** RE: uncertainty  
**Attachments:** Age\_data.xls

David

For delta 234s, based on 40 analyses of our U std (NBL 112a), we're getting 1 st dev = 1.5 per mil, so +/- 2 sigma = +/- 3 per mil .

That is what I would quote as uncertainty on a delta 234 value, not the measurement uncertainty, which is smaller. FYI, our mean value on 112a is -36.8 per mil with 95% conf. limits on the mean of +/- 0.5 per mil.

LM

>One more bit of information seems to be missing: uncertainties on  
>delta234U for total rock samples, i.e., the older data. And am I  
>correct that the 2-sigma uncertainties on the leachate delta234U are  
>less than 0.1%, except for n99-28 leach? I guess the progress of the  
>last seven years shouldn't surprise me.

>

>By the way, I use (234/238) in my calculations (I'm old-fashioned that  
>way), and I'm calculating it directly from your delta numbers, rather  
>than using the values in the table--which appear to be calculated from  
>(230/238) and (230/234). I know the difference is small. I can't see a  
>problem with doing this.

>

>David

>

>-----Original Message-----

>From: Larry Mack [mailto:b.sambuco@mail.utexas.edu]  
>Sent: Tuesday, April 16, 2002 2:34 PM  
>To: dpickett@cnwra.swri.edu  
>Subject: uncertainty

>

>

>David

>

>% insoluble residue also made it onto this iteration.

>

>Larry

Properties Page

Return-path: <b.sambuco@mail.utexas.edu>  
Received: from mail.cnwra.swri.edu (mail.cnwra.swri.edu [129.162.205.6])  
by rogain.cnwra.swri.edu (iPlanet Messaging Server 5.1 (built May 7 2001))  
with ESMTP id <0GUT00MMEYSDUF@rogain.cnwra.swri.edu> for  
dpickett@ims-ms-daemon (ORCPT dpickett@rogain.cnwra.swri.edu); Fri,  
19 Apr 2002 14:43:25 -0500 (CDT)  
Received: from viruswall.ccf.swri.edu (localhost [127.0.0.1])  
by mail.cnwra.swri.edu (8.9.3+Sun/8.9.3) with ESMTP id FAA20575 for  
<dpickett@cnwra.swri.edu>; Fri, 19 Apr 2002 05:03:05 -0500 (CDT)  
Received: from mailhub.ccf.swri.edu (localhost [127.0.0.1])  
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for  
<dpickett@cnwra.swri.edu>; Fri, 19 Apr 2002 14:47:10 -0500 (CDT)  
Received: from mail.utexas.edu (wb2-a.mail.utexas.edu [128.83.126.136])  
by mailhub.ccf.swri.edu (8.11.2/8.11.2) with SMTP id g3JJi9003533 for  
<dpickett@cnwra.swri.edu>; Fri, 19 Apr 2002 14:47:09 -0500 (CDT)  
Received: (qmail 16401 invoked by uid 0); Fri, 19 Apr 2002 19:47:08 +0000  
Received: from isochem.geo.utexas.edu (HELO ?146.6.132.155?) (146.6.132.155)  
by umbs-smtp-2 with SMTP; Fri, 19 Apr 2002 19:47:08 +0000  
Date: Fri, 19 Apr 2002 14:46:49 -0500  
From: Larry Mack <b.sambuco@mail.utexas.edu>  
Subject: RE: uncertainty  
In-reply-to: <005101c1e590\$41409f50\$24c8a281@syreen.cnwra.swri.edu>  
To: dpickett@cnwra.swri.edu  
Message-id: <v04205516b8e6221ed99d@[146.6.132.155]>  
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References: <005101c1e590\$41409f50\$24c8a281@syreen.cnwra.swri.edu>

Sample	Delta 234 U ‰ (today)	238 U ppm	232 Th ppb	232/238 atomic	230/238 atomic	230/234 atomic	232/238 activity	230/238 activity	230/234 activity	234/238 activity	230/232 activity
n99-1	4.0 ± 1.0	48.2	1860	0.0395	0.0000172	0.312	0.0126 ± 9.2E-5	1.016 ± .0039	1.012 ± .0040		1.004 80.63 ± .65
n99-4	227 ± 1.4	17.2	193	0.0116	0.0000214	0.318	0.00369 ± 1.9E-5	1.263 ± .0062	1.030 ± .0052		1.226 342.3 ± 2.2
n99-5	-0.6 ± 1.1	30.2	964	0.0327	0.0000173	0.315	0.0104 ± 6.4E-5	1.021 ± .0066	1.022 ± .0067		0.999 98.17 ± .76
n99-11	551 ± 1.6	25.7	1173	0.0468	0.0000245	0.288	0.0149 ± 7.8E-5	1.449 ± .0076	0.934 ± .0050		1.551 97.25 ± .66
n99-16	222 ± 1.3	19.4	497	0.0263	0.0000216	0.321	0.00839 ± 3.9E-5	1.273 ± .0060	1.041 ± .0051		1.223 151.7 ± .9
n99-18	670 ± 1.7	47.4	3430	0.0743	0.0000138	0.150	0.0237 ± 1.7 E-4	0.813 ± .0055	0.487 ± .0033		1.669 34.30 ± .30
n99-26	1066 ± 1.7	86.1	334	0.00398	0.0000097	0.0853	0.00127 ± 5.5E-6	0.571 ± .0021	0.276 ± .0010		2.069 449.6 ± 2.3
n99-28	233 ± 1.1	186	289	0.00160	0.0000076	0.112	0.000509 ± 2.2E-6	0.446 ± .0020	0.362 ± .0017		1.232 876.2 ± 4.7
n99-29	207 ± 1.1	278	256	0.000946	0.0000070	0.105	0.000302 ± 1.8E-6	0.412 ± .0024	0.341 ± .0020		1.208 1364.2 ± 9.2
n99-30	209 ± 1.1	265	458	0.00178	0.0000072	0.108	0.000566 ± 3.3E-6	0.423 ± .0025	0.350 ± .0021		1.209 747.3 ± 4.9
n99-32	237 ± 1.1	436	527	0.00124	0.0000154	0.227	0.000396 ± 2.5E-6	0.910 ± .0056	0.736 ± .0046		1.236 2298 ± 16
n99-33	109 ± 1.0	144	4300	0.0305	0.0000030	0.0499	0.00973 ± 8.2E-5	0.179 ± .0014	0.162 ± .0013		1.105 18.39 ± .19
n99-35	-8.0 ± 1.0	109	7865	0.0740	0.0000176	0.323	0.0236 ± 2.3E-4	1.037 ± .0060	1.045 ± .0062		0.992 43.9 ± .47
** Assumed initial 230/232 Th = 4.4 ppm.											
U Standard (NBL 112a) (Nominal value)	-36.7 1 sd = 1.4 -36.9	n = 6	(Standards run during the time interval of the analyses of these samples.)								
Blanks:	3.9 pg	1.6 pg									
Samples run the last half of 2001											
n99-11 leach *	891.9 ± 1.6	13.55	710.9	0.0538	0.0000258	0.249	.0172 ± 9E-5	1.526 ± .006	0.806 ± .003		1.893 88.9 ± .6
n99-18 leach *	671.3 ± 1.4	30.3	1450	0.0490	0.0000127	0.1383	.0156 ± 9E-5	0.749 ± .003	.448 ± .002		1.672 48.0 ± .3
n99-26 leach *	953 ± 1.8	56.5	153	0.00277	0.0000092	0.0859	8.84E-4 ± 3.9E-6	0.544 ± .0026	0.278 ± .0014		1.957 615 ± 3.0
n99-26 leach **	996 ± 2.0	52.7	123	0.00239	0.0000085	0.0780	7.64E-4 ± 3.4E-6	0.504 ± .0025	0.253 ± .0013		1.992 660 ± 3.3
n99-28 leach *	228.9 ± 2.2	150.0	137.4	0.000939	0.0000070	0.1040	.000300 ± 1E-6	.414 ± .002	.337 ± .001		1.228 1382 ± 5
n99-29 leach *	213.4 ± 1.0	162.1	122.2	0.000773	0.0000064	0.0954	.000247 ± 9E-7	.375 ± .001	.309 ± .001		1.214 1521 ± 6
n99-30 leach *	209.9 ± 1.0	147.9	206.0	0.00143	0.0000073	0.1095	.000456 ± 2E-6	.429 ± .001	.355 ± .001		1.208 942 ± 4
n99-32 leach *	242.4 ± 1.1	214.0	225.0	0.00108	0.0000163	0.240	.000344 ± 1.3E-6	.965 ± .003	.776 ± .003		1.244 2804 ± 12
n99-33 leach *	113.7 ± 1.0	131.8	2660	0.0207	0.0000028	0.0451	.00660 ± .00005	.1626 ± .0009	.1460 ± .0008		1.114 24.6 ± .2
opal 1	3.0 ± 0.9	8830	7.0	0.000001	0.0000169	0.307	2.60E-7 ± 1.3E-7	0.999 ± .0025	0.996 ± .0026		1.003 3845000 ± 1860000
opal 2	1.7 ± 1.2	122800	280	0.000002	0.0000169	0.308	7.55E-7 ± 1.0 E-7	1.000 ± .0026	0.998 ± .0029		1.002 1325000 ± 174000
opal 3	16.1 ± 1.0	7970	60	0.000008	0.0000173	0.310	2.47E-6 ± 1.1E-7	1.020 ± .0025	1.003 ± .0027		1.017 413000 ± 18000
uranophane	9.2 ± 0.9	107200	97	0.000001	0.0000164	0.296	2.96E-7 ± 6.1E-7	0.968 ± .0023	0.960 ± .0024		1.008 3267000 ± 6705000

\* Spike added prior to leaching

\*\* Spike added following leach

U Standard  
(NBL 112a)  
(Nominal value)

Blanks: w/ opals 8 pg 1.1 pg  
w/ acid sol. 2.2 pg 0.9 pg

### Acid-insoluble in 0.1 N HNO3. Recovery of insoluble material not 100%.

Age ** (Ky)	original sample wt. for leachates	wt. of insol. residue ###	acid-insol. wt. %
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too old  
 370 ± 13 ??  
 too old  
 213 ± 3  
 406 ± 18 ??  
 68.1 ± 1.3  
 34.3 ± 0.2  
 48.2 ± 0.3  
 45.0 ± 0.3  
 46.3 ± 0.3  
 136.1 ± 1.6  
 18.4 ± 0.8  
 too old

147.2 ± 1.3	0.0643	0.0115	18
61.3 ± .9	0.0386	0.0097	25
34.6 ± 0.2	0.0189	0.0117	62
31.0 ± 0.2	0.0181	0.0111	61
44.2 ± .2	0.0399	0.016	40
39.9 ± .15	0.0473	0.0268	57
47.2 ± .2	0.0429	0.0184	43
150.9 ± 1.0	0.0464	0.0249	54
16.7 ± .5	0.0273	0.0071	26

579 ± 80 ??  
 655 ± ??  
 626 ± ??  
 343 ± 6 ??