
AbSciCon
2019

1
00:00:00,790 --> 00:00:07,320
[Music]

2
00:00:11,670 --> 00:00:09,380
[Applause]

3
00:00:15,330 --> 00:00:11,680
thank you for the introduction and I'm

4
00:00:18,240 --> 00:00:15,340
very sorry for this such a table boys so

5
00:00:21,570 --> 00:00:18,250
I hope you can understand my babe you

6
00:00:23,820 --> 00:00:21,580
have not my not my talk itself okay I'm

7
00:00:27,180 --> 00:00:23,830
Cosima Gucci from top in the city in

8
00:00:29,279 --> 00:00:27,190
Japan and I'm talking about the result

9
00:00:34,670 --> 00:00:29,289
of the geochemical analysis of the

10
00:00:38,549 --> 00:00:34,680
samples from Ghana okay why do we are we

11
00:00:39,240 --> 00:00:38,559
interested in 2.2 GA a period of 2.2

12
00:00:42,420 --> 00:00:39,250
billion years ago

13
00:00:45,660 --> 00:00:42,430

well this figure is from anions at all

14
00:00:47,880 --> 00:00:45,670
2014 which has been frequently used in

15
00:00:51,000 --> 00:00:47,890
this kind of talk and then until point

16
00:00:53,400 --> 00:00:51,010
to g8 here Saudi to point to GA is just

17
00:00:56,639 --> 00:00:53,410
before the just after the right after

18
00:00:57,209 --> 00:00:56,649
the infant lies of oxygen in the

19
00:01:00,840 --> 00:00:57,219
atmosphere

20
00:01:04,740 --> 00:01:00,850
goe great oxidation event at around 2.4

21
00:01:07,290 --> 00:01:04,750
to 2.2 GA and by the time atmosphere

22
00:01:11,370 --> 00:01:07,300
could have been oxygenated ensure ocean

23
00:01:14,310 --> 00:01:11,380
- but how about the deep ocean so so far

24
00:01:16,469 --> 00:01:14,320
a few studies of non sterile environment

25
00:01:19,560 --> 00:01:16,479
which is deep deep employment at the

26
00:01:22,020 --> 00:01:19,570
point GA has been done so please

27
00:01:24,510 --> 00:01:22,030
remember that a monthly super group in

28
00:01:26,880 --> 00:01:24,520
Austria and the transport super group in

29
00:01:30,149 --> 00:01:26,890
South Africa and also Huron Ian super

30
00:01:35,370 --> 00:01:30,159
group in Canada or all of these Imperial

31
00:01:41,899 --> 00:01:35,380
important jurist record have mainly

32
00:01:45,450 --> 00:01:41,909
shower rocks in the upper portion okay

33
00:01:47,070 --> 00:01:45,460
so here is the step wise in model of the

34
00:01:50,130 --> 00:01:47,080
step by rock sedation of the Artemis the

35
00:01:55,679 --> 00:01:50,140
ocean system this is originally from a

36
00:01:58,170 --> 00:01:55,689
casting to 1993 and then 1997 so the

37
00:02:00,780 --> 00:01:58,180
front step stage 1 to stage 4 the time

38
00:02:02,999 --> 00:02:00,790

is from left to right we have no oxygen

39
00:02:07,289 --> 00:02:03,009
in the atmosphere no in this erosion one

40
00:02:11,940 --> 00:02:07,299
no in no no action in the deep ocean but

41
00:02:15,270 --> 00:02:11,950
with time we at most oxygen is invading

42
00:02:18,390 --> 00:02:15,280
indeed port so we have may we may we may

43
00:02:21,770 --> 00:02:18,400
have had a goe for the transition from

44
00:02:26,350 --> 00:02:21,780
stage 2 to stage stage 3 okay

45
00:02:28,790 --> 00:02:26,360
the timing insisted controversial but my

46
00:02:31,460 --> 00:02:28,800
interest is here how long did it take

47
00:02:35,960 --> 00:02:31,470
for the deep ocean to be fully ocean

48
00:02:38,180 --> 00:02:35,970
aided quite soon or we have a time lag

49
00:02:44,090 --> 00:02:38,190
but this is just the motivation of both

50
00:02:46,190 --> 00:02:44,100
of my lab study ok so I looked for the I

51
00:02:48,950 --> 00:02:46,200
dropped a tear geologic map and to look

52
00:02:51,410 --> 00:02:48,960
for deep samples throughout the world

53
00:02:53,540 --> 00:02:51,420
and then I found that theater is a

54
00:02:57,560 --> 00:02:53,550
greenstone belt in Ghana

55
00:02:59,660 --> 00:02:57,570
if whose age is about 2.2 GA and then

56
00:03:02,930 --> 00:02:59,670
about 10 years ago I first went to Ghana

57
00:03:06,680 --> 00:03:02,940
to do a preliminary work then I decided

58
00:03:09,920 --> 00:03:06,690
that I realized that this is a very good

59
00:03:12,890 --> 00:03:09,930
place perfect place to do drink to

60
00:03:17,620 --> 00:03:12,900
obtain a deep faces samples from 2.2 G

61
00:03:22,220 --> 00:03:17,630
period and then luckily enough I could

62
00:03:23,000 --> 00:03:22,230
obtain funding to do to realize the

63
00:03:26,360 --> 00:03:23,010

continent

64
00:03:29,270 --> 00:03:26,370
drink in Ghana and that was that

65
00:03:34,729 --> 00:03:29,280
happened in fall 2015

66
00:03:38,540 --> 00:03:34,739
in the in this area sauce fish sauce

67
00:03:41,120 --> 00:03:38,550
with Ghana and then we obtained 160

68
00:03:42,430 --> 00:03:41,130
meter wrong 2.2 GA deep faces

69
00:03:45,290 --> 00:03:42,440
sedimentary rocks

70
00:03:50,500 --> 00:03:45,300
these are least altered and then we got

71
00:03:52,940 --> 00:03:50,510
a 100% recovery so this is based on

72
00:03:56,300 --> 00:03:52,950
alternation of shales and volcanic

73
00:04:00,530 --> 00:03:56,310
stones and sand stones some kosa grains

74
00:04:03,530 --> 00:04:00,540
and for this study samples are from the

75
00:04:06,110 --> 00:04:03,540
uppermost 20 meter unit so if we assume

76
00:04:08,900 --> 00:04:06,120
the we denote segmentation rate but we

77
00:04:11,539 --> 00:04:08,910
assume 5 millimeter per thousand year

78
00:04:15,470 --> 00:04:11,549
then this 20 meter section represent a

79
00:04:17,900 --> 00:04:15,480
for me only 4 million year period ok ok

80
00:04:21,590 --> 00:04:17,910
this is a volcanic sandstone cosa grains

81
00:04:22,520 --> 00:04:21,600
and greenish volcanic suta stones and

82
00:04:25,159 --> 00:04:22,530
then black shales

83
00:04:29,000 --> 00:04:25,169
but this presentation is only for this

84
00:04:32,870 --> 00:04:29,010
the up the uppermost section and here's

85
00:04:34,810 --> 00:04:32,880
the photo of the actual core and which

86
00:04:38,960 --> 00:04:34,820
will be

87
00:04:41,629 --> 00:04:38,970
expanded in next ride so here is the

88
00:04:44,840 --> 00:04:41,639

just representative photo of the doing

89
00:04:47,570 --> 00:04:44,850
activity in Ghana there were lots of

90
00:04:51,590 --> 00:04:47,580
there were lots of lots of dust coming

91
00:04:55,999 --> 00:04:51,600
from sovereign desert and also mist from

92
00:04:59,689 --> 00:04:56,009
the nearby ocean and then kids during

93
00:05:02,719 --> 00:04:59,699
activity was always observed by tens of

94
00:05:04,249 --> 00:05:02,729
kids attentions of curious kids okay so

95
00:05:10,189 --> 00:05:04,259
anyway I could obtain this kind of

96
00:05:11,870 --> 00:05:10,199
really beautiful durable samples okay so

97
00:05:14,180 --> 00:05:11,880
first I would like to show you the

98
00:05:16,969 --> 00:05:14,190
result of the ion speciation analysis

99
00:05:19,159 --> 00:05:16,979
here are the profiles of a young

100
00:05:21,350 --> 00:05:19,169
speciation from left to right onion pie

101
00:05:24,350 --> 00:05:21,360
right pirate bond onion and iron

102
00:05:27,560 --> 00:05:24,360
carbonate onion magnetite magnetite bond

103
00:05:31,760 --> 00:05:27,570
iron and iron oxide and then total iron

104
00:05:35,390 --> 00:05:31,770
Fe T was Sigma T what Ryan and on this

105
00:05:37,939 --> 00:05:35,400
in this dips profile LED dashed line

106
00:05:42,290 --> 00:05:37,949
represents the average the iron content

107
00:05:47,480 --> 00:05:42,300
elaborate shell over pas by from Tara &

108
00:05:51,469 --> 00:05:47,490
McLennan 1985 textbook then I like to I

109
00:05:55,930 --> 00:05:51,479
would like you to look at if Dan's right

110
00:05:59,560 --> 00:05:55,940
I am pirate pirate aliens

111
00:06:03,439 --> 00:05:59,570
we divided the samples into three units

112
00:06:06,290 --> 00:06:03,449
pirate pour over samples here and pilot

113
00:06:08,930 --> 00:06:06,300

for a Poisson process here in open

114
00:06:19,310 --> 00:06:08,940
symbols and then pirate rich samples

115
00:06:21,860 --> 00:06:19,320
with fuel chuckles okay then then I drag

116
00:06:26,029 --> 00:06:21,870
to show you the this kind of a a

117
00:06:29,300 --> 00:06:26,039
speciation plot the y axis is a onion

118
00:06:33,920 --> 00:06:29,310
pirate onion / a highly active onion and

119
00:06:37,960 --> 00:06:33,930
the holy x-axis oesn't axis this is ion

120
00:06:43,040 --> 00:06:37,970
highly reactive to iron Toto Toto Ryan

121
00:06:45,830 --> 00:06:43,050
so obviously many of the samples with

122
00:06:48,980 --> 00:06:45,840
no pirate pirate pro samples are plotted

123
00:06:51,830 --> 00:06:48,990
in this object domain here and then

124
00:06:54,650 --> 00:06:51,840
pirate each samples profit in this new

125
00:06:57,230 --> 00:06:54,660
clinic region this feature is also

126
00:07:00,770 --> 00:06:57,240
evident in this sulfur carbon prot

127
00:07:03,980 --> 00:07:00,780
sulphur pirate bond sulfur and Owen

128
00:07:05,990 --> 00:07:03,990
carbon content open symbols pirate press

129
00:07:09,020 --> 00:07:06,000
improves up rotate on the trend of

130
00:07:10,879 --> 00:07:09,030
normal marine this is a representative

131
00:07:15,620 --> 00:07:10,889
slope for the phanerozoic a typical

132
00:07:18,290 --> 00:07:15,630
known surf Enoch black shales normal

133
00:07:22,310 --> 00:07:18,300
shells I should say and then reads

134
00:07:25,730 --> 00:07:22,320
pirate beach samples also Proteus in

135
00:07:28,400 --> 00:07:25,740
this region suggesting nukes any

136
00:07:32,360 --> 00:07:28,410
conditions or seen genetic pirate

137
00:07:36,560 --> 00:07:32,370
formations in the water crime okay so

138
00:07:39,950 --> 00:07:36,570

the environment was essentially oxic but

139
00:07:43,370 --> 00:07:39,960
with sporadic development of anoxic or

140
00:07:46,270 --> 00:07:43,380
York City conditions with time then I

141
00:07:49,249 --> 00:07:46,280
would like to show you the new element

142
00:07:52,399 --> 00:07:49,259
concentrations for samples the

143
00:07:55,370 --> 00:07:52,409
concentrations are normalized by a pas

144
00:08:00,260 --> 00:07:55,380
post alkane australian average sale okay

145
00:08:03,589 --> 00:08:00,270
again Brock Ryan's present pirate which

146
00:08:07,520 --> 00:08:03,599
samples upper samples and Gen Z's blue

147
00:08:13,240 --> 00:08:07,530
and orange rinds pilot Pro samples okay

148
00:08:18,020 --> 00:08:13,250
and we we seems to have some positive

149
00:08:19,550 --> 00:08:18,030
same anomaly right they exist but no

150
00:08:23,480 --> 00:08:19,560
European man normally right this is

151
00:08:24,649 --> 00:08:23,490
based normalized to a pas right so

152
00:08:27,140 --> 00:08:24,659
basaltic

153
00:08:29,779 --> 00:08:27,150
segmental rocks should have slightly

154
00:08:32,000 --> 00:08:29,789
higher elevated European concentration

155
00:08:35,449 --> 00:08:32,010
on this kind of rot so this is not the

156
00:08:38,409 --> 00:08:35,459
European anomaly right so pyrite Pro

157
00:08:41,360 --> 00:08:38,419
samples have more rustic basalt rock

158
00:08:43,370 --> 00:08:41,370
signature right flat pattern with some

159
00:08:46,060 --> 00:08:43,380
depleted in right where sediment

160
00:08:50,329 --> 00:08:46,070
concentrations right and then while

161
00:08:54,829 --> 00:08:50,339
pyrite reached samples here so modern

162
00:08:55,960 --> 00:08:54,839
seawater reich lightest element is

163
00:08:58,450 --> 00:08:55,970

smaller than heavier

164
00:09:03,720 --> 00:08:58,460
rare earth elements a signature with

165
00:09:06,190 --> 00:09:03,730
more educated total health content okay

166
00:09:08,260 --> 00:09:06,200
so actually this is quite consistent

167
00:09:11,050 --> 00:09:08,270
with the Yuke's knee conditions for

168
00:09:13,210 --> 00:09:11,060
pilot formation impaired examples this

169
00:09:15,130 --> 00:09:13,220
kind of rare earth element pattern is

170
00:09:17,530 --> 00:09:15,140
quite common for the anoxic water

171
00:09:20,460 --> 00:09:17,540
crammed in modern-day environment this

172
00:09:24,130 --> 00:09:20,470
is due to a reductive dissolution of

173
00:09:27,690 --> 00:09:24,140
release of a serum from sediment to the

174
00:09:30,130 --> 00:09:27,700
opening water crown okay

175
00:09:34,030 --> 00:09:30,140
the new experimental cinema normally

176
00:09:36,490 --> 00:09:34,040
then I operated this ratio City mobile

177
00:09:38,800 --> 00:09:36,500
serum stove values so this is just you

178
00:09:40,240 --> 00:09:38,810
know sodium concentration divided by c/d

179
00:09:42,370 --> 00:09:40,250
monster bad news is it's a hypothetical

180
00:09:42,880 --> 00:09:42,380
value between lance demand Presidium

181
00:09:45,640 --> 00:09:42,890
here

182
00:09:47,830 --> 00:09:45,650
right then in the robot sections we have

183
00:09:52,290 --> 00:09:47,840
limited very limited range for the same

184
00:09:55,600 --> 00:09:52,300
same stuff are used but for pirate poor

185
00:09:57,880 --> 00:09:55,610
upper part we have slight increase in

186
00:10:00,250 --> 00:09:57,890
the range and Beaufort the pirate each

187
00:10:04,470 --> 00:10:00,260
samples only due to date and points or

188
00:10:09,190 --> 00:10:07,030

spectacular but we have a increase in

189
00:10:14,440 --> 00:10:09,200
range of this area mobile City monster

190
00:10:16,780 --> 00:10:14,450
like ratios okay again parentage samples

191
00:10:19,270 --> 00:10:16,790
have wider range of same over cm star

192
00:10:20,950 --> 00:10:19,280
ratios and this may represent the

193
00:10:23,280 --> 00:10:20,960
changes in the dock state with time

194
00:10:25,510 --> 00:10:23,290
right sporadic

195
00:10:29,050 --> 00:10:25,520
development of York's in equinoxes water

196
00:10:31,500 --> 00:10:29,060
cram and to form pyrite and two more to

197
00:10:37,020 --> 00:10:31,510
have more increased concentration of a

198
00:10:40,840 --> 00:10:37,030
cerium interval in the water from okay

199
00:10:42,910 --> 00:10:40,850
then I would like you to look at the

200
00:10:46,210 --> 00:10:42,920
trace metal concentrations for these

201
00:10:50,590 --> 00:10:46,220
samples okay and then

202
00:10:52,780 --> 00:10:50,600
x-axis for these four plots or terrible

203
00:10:56,520 --> 00:10:52,790
amoxil it should be it weight percent

204
00:11:00,400 --> 00:10:56,530
and versus four kinds of transition

205
00:11:06,210 --> 00:11:00,410
narrows chromium molybdenum nickel and

206
00:11:09,230 --> 00:11:06,220
copper and only parity samples here

207
00:11:11,810 --> 00:11:09,240
filled circle have right

208
00:11:14,660 --> 00:11:11,820
positive correlations with aluminum

209
00:11:18,170 --> 00:11:14,670
oxide content our T value is 0.6 five

210
00:11:21,800 --> 00:11:18,180
seven zero two zero and five and fifty

211
00:11:25,910 --> 00:11:21,810
five this is quite small so this may

212
00:11:28,579 --> 00:11:25,920
suggest that we may have had increased

213
00:11:31,100 --> 00:11:28,589

content of measuring first I thought

214
00:11:32,750 --> 00:11:31,110
that these metals could have been

215
00:11:37,460 --> 00:11:32,760
provided to the sedimentary environment

216
00:11:39,740 --> 00:11:37,470
by hydro solar input but this net metals

217
00:11:46,130 --> 00:11:39,750
have more weaker correlation with iron

218
00:11:50,060 --> 00:11:46,140
content so I then thought that these are

219
00:11:54,050 --> 00:11:50,070
due to enhanced continental measuring or

220
00:11:59,329 --> 00:11:54,060
changing simply mythology more Coco sir

221
00:12:01,490 --> 00:11:59,339
grains okay then I would like to I'd

222
00:12:05,090 --> 00:12:01,500
like you to look at a lower peridot

223
00:12:07,040 --> 00:12:05,100
samples here okay so para trás samples

224
00:12:09,410 --> 00:12:07,050
in the roba sections have V correlation

225
00:12:11,540 --> 00:12:09,420
between organic carbon content and iron

226
00:12:12,850 --> 00:12:11,550
comrade content that is shown in the

227
00:12:18,230 --> 00:12:12,860
next slide

228
00:12:22,210 --> 00:12:18,240
okay well so pilot resorts in the rural

229
00:12:25,220 --> 00:12:22,220
sections have this kind of correlations

230
00:12:27,050 --> 00:12:25,230
suggesting that Pharaoh Sonia informed

231
00:12:30,260 --> 00:12:27,060
by a biological physical reduction

232
00:12:32,750 --> 00:12:30,270
combined with but bicarbonate ion to

233
00:12:34,579 --> 00:12:32,760
form iron carbonate eventually and

234
00:12:36,650 --> 00:12:34,589
Pyrrha didn't form effectively because

235
00:12:40,190 --> 00:12:36,660
the biogenic sulfide was not available

236
00:12:42,710 --> 00:12:40,200
in this toxic environment so iron

237
00:12:50,120 --> 00:12:42,720
two-plus combined with bicarbonate not

238
00:12:52,250 --> 00:12:50,130

with sulfide okay then this kind of this

239
00:12:54,199 --> 00:12:52,260
is just a don type of us right so I

240
00:12:57,110 --> 00:12:54,209
measure the converse of composition but

241
00:13:00,650 --> 00:12:57,120
Owen carbon and they are mostly around

242
00:13:03,650 --> 00:13:00,660
-25 formula which is not so special okay

243
00:13:07,580 --> 00:13:03,660
so this is just

244
00:13:11,570 --> 00:13:07,590
showing the origin of when carbon in the

245
00:13:15,220 --> 00:13:11,580
samples which may be photosynthetic

246
00:13:19,400 --> 00:13:15,230
activity in the upper oceans so

247
00:13:23,000 --> 00:13:19,410
conclusions geochemical and I stopped

248
00:13:27,410 --> 00:13:23,010
analysis of 2.2 Gao samples in Ghana

249
00:13:32,210 --> 00:13:27,420
suggests of the drawings essentially oxy

250
00:13:34,400 --> 00:13:32,220
deep ocean and coma carbon is provided

251
00:13:36,380 --> 00:13:34,410
to deep ocean from the soft ocean and

252
00:13:38,930 --> 00:13:36,390
then iron reduction could have occurred

253
00:13:43,010 --> 00:13:38,940
and then spot the development of anoxic

254
00:13:45,800 --> 00:13:43,020
luke scenic water crown right leading to

255
00:13:47,480 --> 00:13:45,810
us in genetic malformations so this is a

256
00:13:49,910 --> 00:13:47,490
major conclusion it didn't take long for

257
00:13:52,820 --> 00:13:49,920
the deep ocean to the commode sick right

258
00:13:56,000 --> 00:13:52,830
after the infra goe at around 2.4 to 2.2

259
00:13:57,710 --> 00:13:56,010
GA and this study has implications for

260
00:14:01,630 --> 00:13:57,720
the redox evolution of the atmosphere

261
00:14:04,640 --> 00:14:01,640
ocean system in the early Earth and

262
00:14:07,970 --> 00:14:04,650
future work would be to measure surface

263
00:14:10,010 --> 00:14:07,980

of competitions and Ayana stops but for

264
00:14:12,590 --> 00:14:10,020
multiple Nam and chromium isotopes I

265
00:14:14,810 --> 00:14:12,600
would like to have your help need

266
00:14:16,250 --> 00:14:14,820
collaborations the samples the samples

267
00:14:26,330 --> 00:14:16,260
can be shared upon request

268
00:14:27,560 --> 00:14:26,340
ok so thank you for your attention maybe

269
00:14:31,970 --> 00:14:27,570
one quick question while we're

270
00:14:42,890 --> 00:14:31,980
transferring speakers in please the last

271
00:14:44,530 --> 00:14:42,900
speaker come to the front okay thank you