
AbSciCon
2019

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

2
00:00:13,150 --> 00:00:09,330
[Applause]

3
00:00:15,280 --> 00:00:13,160
alright thanks and Katie really wanted

4
00:00:16,900 --> 00:00:15,290
to come but she's in a wedding tomorrow

5
00:00:18,790 --> 00:00:16,910
so this was the only day she couldn't

6
00:00:22,750 --> 00:00:18,800
make it so of course I got got scheduled

7
00:00:25,419 --> 00:00:22,760
here so uh so I'm filling in so it's

8
00:00:27,519 --> 00:00:25,429
just a long the last two talks we pretty

9
00:00:29,230 --> 00:00:27,529
much have the same ideas I think can

10
00:00:31,120 --> 00:00:29,240
habitable Bryan's occur on Mars today

11
00:00:34,120 --> 00:00:31,130
and I believe you already know the

12
00:00:36,310 --> 00:00:34,130
answer that so before you can have a

13
00:00:37,360 --> 00:00:36,320

bride you got to have salt and so

14
00:00:38,860 --> 00:00:37,370
everyone's excited about these

15
00:00:41,620 --> 00:00:38,870
perchlorate salts on there at every

16
00:00:43,930 --> 00:00:41,630
landing site they allow to these very

17
00:00:45,370 --> 00:00:43,940
cold temperatures and they can absorb

18
00:00:47,140 --> 00:00:45,380
water right out of the atmosphere just

19
00:00:49,030 --> 00:00:47,150
as this as we've been seeing in this

20
00:00:52,360 --> 00:00:49,040
picture we think we might have actually

21
00:00:54,580 --> 00:00:52,370
seen this at the Phoenix landing site so

22
00:00:57,130 --> 00:00:54,590
how do we calculate how much and when

23
00:00:59,050 --> 00:00:57,140
Brian forms from assault so we use these

24
00:01:01,870 --> 00:00:59,060
phase diagrams as everyone's explained

25
00:01:04,780 --> 00:01:01,880
before so this was the phase diagram I

26
00:01:06,730 --> 00:01:04,790
was used to using before Katie and I

27
00:01:08,140 --> 00:01:06,740
started working together this is one of

28
00:01:09,999 --> 00:01:08,150
the melting one that her mom talked

29
00:01:12,040 --> 00:01:10,009
about where you have the the weight

30
00:01:13,750 --> 00:01:12,050
concentration of the salt going down and

31
00:01:15,370 --> 00:01:13,760
you've got different phases where you'd

32
00:01:17,320 --> 00:01:15,380
have liquid and liquid plus ice and

33
00:01:19,420 --> 00:01:17,330
different things and then when Katie

34
00:01:21,250 --> 00:01:19,430
started working with me we started using

35
00:01:22,840 --> 00:01:21,260
this relative humidity water activity

36
00:01:24,910 --> 00:01:22,850
versus temperature and how the how these

37
00:01:27,040 --> 00:01:24,920
two combined is very interesting so

38
00:01:29,140 --> 00:01:27,050

here's your DRH again so as you increase

39
00:01:30,460 --> 00:01:29,150
so so we're using Katy's favorite salt

40
00:01:32,920 --> 00:01:30,470
here sorry this is a magnesium

41
00:01:35,170 --> 00:01:32,930
perchlorate instead of the the previous

42
00:01:36,850 --> 00:01:35,180
ones for calcium perchlorate so as you

43
00:01:39,000 --> 00:01:36,860
increase your relative humidity you get

44
00:01:41,380 --> 00:01:39,010
liquid and then you get this

45
00:01:43,719 --> 00:01:41,390
efflorescence relative humidity over

46
00:01:44,980 --> 00:01:43,729
here which for magnesium perchlorate is

47
00:01:48,820 --> 00:01:44,990
not temperature dependent while the

48
00:01:49,990 --> 00:01:48,830
relative age actually is and so so what

49
00:01:51,730 --> 00:01:50,000
we've been trying to do is actually

50
00:01:53,110 --> 00:01:51,740
combine these two models to figure out

51
00:01:55,780 --> 00:01:53,120
what's going to happen in the subsurface

52
00:01:57,070 --> 00:01:55,790
um so when if you actually had that but

53
00:01:58,660 --> 00:01:57,080
chloride down there and it starts at

54
00:02:02,200 --> 00:01:58,670
Zoar bring water it's going to start

55
00:02:04,840 --> 00:02:02,210
moving to be to have a lower lower

56
00:02:06,130 --> 00:02:04,850
weight concentration and we're also

57
00:02:08,320 --> 00:02:06,140
trying to look at the kinetics of this

58
00:02:10,719 --> 00:02:08,330
in the lab which is not going to be

59
00:02:13,360 --> 00:02:10,729
presented today but will at another time

60
00:02:15,339 --> 00:02:13,370
um so so this is just another way of

61
00:02:17,760 --> 00:02:15,349
looking at this phase diagram so this is

62
00:02:20,190 --> 00:02:17,770
just showing how much a volume of

63
00:02:21,780 --> 00:02:20,200

of brine that we have so if you're in

64
00:02:23,490 --> 00:02:21,790
this area you have a hundred percent if

65
00:02:26,010 --> 00:02:23,500
you're mixed in these other two areas

66
00:02:30,480 --> 00:02:26,020
and then if you're you're out of the the

67
00:02:33,270 --> 00:02:30,490
brine zone you have hydrate instead and

68
00:02:36,120 --> 00:02:33,280
then so what we can do there is is then

69
00:02:39,150 --> 00:02:36,130
look at the the the water activity

70
00:02:42,330 --> 00:02:39,160
based on these same parameters in the

71
00:02:43,560 --> 00:02:42,340
phase diagram and then we do the same

72
00:02:46,530 --> 00:02:43,570
thing so we were actually using the

73
00:02:48,180 --> 00:02:46,540
coast bar definitions just because they

74
00:02:49,920 --> 00:02:48,190
were a little more liberal they were

75
00:02:51,840 --> 00:02:49,930
going all the way up to 0.5 water

76
00:02:55,200 --> 00:02:51,850
activities and any temperature greater

77
00:02:58,230 --> 00:02:55,210
than 248 K just to try to get some sort

78
00:03:00,570 --> 00:02:58,240
of habitability in here and then just

79
00:03:03,030 --> 00:03:00,580
going back what we did is we just we

80
00:03:05,250 --> 00:03:03,040
just use this water activity uh-huh

81
00:03:07,860 --> 00:03:05,260
that that's right here and then just

82
00:03:09,990 --> 00:03:07,870
kind of went with what the volume

83
00:03:12,840 --> 00:03:10,000
percent is and and that way we can

84
00:03:15,120 --> 00:03:12,850
actually make this daily questons phase

85
00:03:17,010 --> 00:03:15,130
diagram kind of the same way and so here

86
00:03:19,080 --> 00:03:17,020
you know it's just it's just showing the

87
00:03:20,700 --> 00:03:19,090
same thing that the model works this is

88
00:03:22,830 --> 00:03:20,710

just kind of numerical errors in here

89
00:03:24,360 --> 00:03:22,840
but this is this is the the model that

90
00:03:26,820 --> 00:03:24,370
we're going to be using to figure out

91
00:03:30,240 --> 00:03:26,830
how how long this brine is actually

92
00:03:32,100 --> 00:03:30,250
stable anywhere in the subsurface so so

93
00:03:34,980 --> 00:03:32,110
we're using this model we have to pick a

94
00:03:36,270 --> 00:03:34,990
place on Mars to use it so naturally I

95
00:03:38,940 --> 00:03:36,280
just picked palak your crater because

96
00:03:41,060 --> 00:03:38,950
it's got a ton of significant RSL

97
00:03:43,650 --> 00:03:41,070
activity I'm kind of an Arsenal guy and

98
00:03:48,449 --> 00:03:43,660
tourism might have found perchlorate

99
00:03:50,190 --> 00:03:48,459
here others would disagree with that so

100
00:03:52,470 --> 00:03:50,200
what we did was we use Mars flow

101
00:03:54,390 --> 00:03:52,480
modeling and you know while we're trying

102
00:03:56,400 --> 00:03:54,400
to get daily quests and efflorescence to

103
00:03:58,170 --> 00:03:56,410
happen in Mars flow it's not quite there

104
00:04:00,390 --> 00:03:58,180
yes we had to do some post-processing on

105
00:04:02,250 --> 00:04:00,400
that so Mars flow right now is the

106
00:04:04,770 --> 00:04:02,260
version we're using is his three-phase

107
00:04:07,560 --> 00:04:04,780
simulator for water migration in

108
00:04:10,590 --> 00:04:07,570
partially frozen media it does not do

109
00:04:12,690 --> 00:04:10,600
salts so if there were any phase changes

110
00:04:15,840 --> 00:04:12,700
that just they happen at the at pure

111
00:04:18,449 --> 00:04:15,850
water like at 273 K and what we're

112
00:04:21,780 --> 00:04:18,459
outputting here among other things is

113
00:04:23,670 --> 00:04:21,790

temperature RH versus time and the time

114
00:04:26,640 --> 00:04:23,680
interval that we say that is this 10

115
00:04:28,680 --> 00:04:26,650
minutes we do this we do a 1d model on

116
00:04:30,540 --> 00:04:28,690
west facing slopes on at 30 degrees

117
00:04:33,450 --> 00:04:30,550
because we're trying to get at

118
00:04:35,580 --> 00:04:33,460
these RSL are occurring at pellicer

119
00:04:37,980 --> 00:04:35,590
crater here we have 24 different layers

120
00:04:40,110 --> 00:04:37,990
into the subsurface from 0 to 10

121
00:04:41,970 --> 00:04:40,120
centimeters and then in that we have

122
00:04:44,520 --> 00:04:41,980
different geologic zones where we have

123
00:04:46,530 --> 00:04:44,530
like a silty dry unit on top a sandy dry

124
00:04:48,960 --> 00:04:46,540
unit and then a bedrock that would be

125
00:04:50,640 --> 00:04:48,970
saturated with ice below that which

126
00:04:53,700 --> 00:04:50,650
which purview provides a lot of water

127
00:04:55,650 --> 00:04:53,710
vapor there and then afterwards after

128
00:04:57,120 --> 00:04:55,660
after we output all this then we go into

129
00:04:58,680 --> 00:04:57,130
this post-processing where we use the

130
00:05:00,390 --> 00:04:58,690
daily quest since in efflorescence to

131
00:05:02,280 --> 00:05:00,400
actually calculate how much Brian would

132
00:05:04,710 --> 00:05:02,290
actually be there and so by doing this

133
00:05:06,390 --> 00:05:04,720
and not having it all coupled we were

134
00:05:08,100 --> 00:05:06,400
not accounting for any latent heat

135
00:05:09,720 --> 00:05:08,110
effects when when you actually form this

136
00:05:10,830 --> 00:05:09,730
liquid there's there's no changes of

137
00:05:13,050 --> 00:05:10,840
thermal connectivity when you have a

138
00:05:15,030 --> 00:05:13,060

Brian compared to just a dry salt and

139
00:05:19,050 --> 00:05:15,040
there's a there's really no vapor

140
00:05:22,050 --> 00:05:19,060
diffusion either so just going towards

141
00:05:23,910 --> 00:05:22,060
temperature so so this is a bit of bit

142
00:05:26,400 --> 00:05:23,920
complicated so this is seasonality this

143
00:05:28,890 --> 00:05:26,410
is a solar longitude up here or start at

144
00:05:30,930 --> 00:05:28,900
10 so so we're just moving over the

145
00:05:32,250 --> 00:05:30,940
entire season and then this is the

146
00:05:34,500 --> 00:05:32,260
temperature and then this is going to be

147
00:05:36,000 --> 00:05:34,510
the maximum temperature at every Sall

148
00:05:38,730 --> 00:05:36,010
and the minimum temperature at every saw

149
00:05:40,500 --> 00:05:38,740
so they're color coded the color the the

150
00:05:42,420 --> 00:05:40,510
legend is kind of over here we're o

151
00:05:46,200 --> 00:05:42,430
being at the surface and then this blue

152
00:05:48,960 --> 00:05:46,210
being our deepest layer 9.5 centimeters

153
00:05:51,690 --> 00:05:48,970
and so so you can see as you go down you

154
00:05:52,620 --> 00:05:51,700
don't you get less temperature variation

155
00:05:54,960 --> 00:05:52,630
that the surface you get a lot of

156
00:05:56,790 --> 00:05:54,970
temperature variation and so clearly

157
00:05:59,070 --> 00:05:56,800
there's no way we're gonna have brines

158
00:06:00,300 --> 00:05:59,080
in the wintertime because our maximum

159
00:06:01,830 --> 00:06:00,310
temperatures aren't even getting above

160
00:06:04,560 --> 00:06:01,840
the eutectic which is what we need for

161
00:06:08,720 --> 00:06:04,570
for Brian formation so now we're gonna

162
00:06:12,720 --> 00:06:08,730
look at relative humidity versus

163
00:06:14,190 --> 00:06:12,730

seasonality as well and so so this DRH

164
00:06:16,830 --> 00:06:14,200
we actually have two lines here

165
00:06:18,810 --> 00:06:16,840
representing the DRH because at colder

166
00:06:20,430 --> 00:06:18,820
temperatures it's going to be around

167
00:06:23,610 --> 00:06:20,440
this value and that warmer temperature

168
00:06:26,640 --> 00:06:23,620
it goes lower so during the wintertime

169
00:06:28,470 --> 00:06:26,650
we have a very high DRH and and this is

170
00:06:30,870 --> 00:06:28,480
because there's you know it's colder on

171
00:06:32,940 --> 00:06:30,880
Mars there's no there's a lot of ice in

172
00:06:34,620 --> 00:06:32,950
the system with this this icy bedrock

173
00:06:38,100 --> 00:06:34,630
and so that's actually keeping the the

174
00:06:39,960 --> 00:06:38,110
relative humidity high during the

175
00:06:41,640 --> 00:06:39,970
wintertime but then during the the

176
00:06:43,500 --> 00:06:41,650
summertime we get very low relative

177
00:06:44,370 --> 00:06:43,510
humidities and you can see this distinct

178
00:06:46,230 --> 00:06:44,380
jump that's happening

179
00:06:48,150 --> 00:06:46,240
right here and so what actually happens

180
00:06:49,920 --> 00:06:48,160
here is in the wintertime when we look

181
00:06:51,690 --> 00:06:49,930
at this data in a different way we can

182
00:06:53,370 --> 00:06:51,700
actually see all sorts of cold trapping

183
00:06:55,470 --> 00:06:53,380
that's happening in these upper surface

184
00:06:57,630 --> 00:06:55,480
layers during the winter time so we're

185
00:06:59,400 --> 00:06:57,640
getting ice forming in there and then

186
00:07:02,610 --> 00:06:59,410
right around this Elsa vest right here

187
00:07:04,350 --> 00:07:02,620
at the surface all of that ice that had

188
00:07:06,420 --> 00:07:04,360

been trapped during the winter goes away

189
00:07:08,490 --> 00:07:06,430
it sublimates away and so now we're

190
00:07:12,450 --> 00:07:08,500
dropping to these very very low minimum

191
00:07:14,010 --> 00:07:12,460
humidities and then just to lastly to

192
00:07:15,780 --> 00:07:14,020
say on this slide is that you know

193
00:07:17,760 --> 00:07:15,790
obviously during the the summer time

194
00:07:19,670 --> 00:07:17,770
when we would have our SL it's it's get

195
00:07:21,780 --> 00:07:19,680
definitely going to be too dry for any

196
00:07:23,820 --> 00:07:21,790
magnesium perchlorate Brian's to form

197
00:07:27,030 --> 00:07:23,830
because the this RHS is never going to

198
00:07:29,400 --> 00:07:27,040
get to the DRH and then just to make

199
00:07:32,430 --> 00:07:29,410
this plot very complicated I'm just

200
00:07:35,520 --> 00:07:32,440
gonna add three more of these layers in

201
00:07:37,020 --> 00:07:35,530
and and just kind of why I'm showing

202
00:07:38,760 --> 00:07:37,030
that's taking the risk of show on this

203
00:07:41,040 --> 00:07:38,770
is it's just it's interesting to see

204
00:07:42,810 --> 00:07:41,050
where that cold trapping that ice goes

205
00:07:45,150 --> 00:07:42,820
away so as you get deeper and deeper you

206
00:07:47,850 --> 00:07:45,160
can hold on to that cold trapped ice a

207
00:07:49,830 --> 00:07:47,860
little bit longer every year but then

208
00:07:51,540 --> 00:07:49,840
that goes away and then you can also see

209
00:07:52,800 --> 00:07:51,550
these these little blips right here

210
00:07:54,360 --> 00:07:52,810
which we're on what the heck are these

211
00:07:56,640 --> 00:07:54,370
and this is actually where you get a

212
00:07:59,730 --> 00:07:56,650
little bit of cold trapping even after

213
00:08:02,490 --> 00:07:59,740

that's after the summer peak is has has

214
00:08:04,290 --> 00:08:02,500
occurred and so this will this will have

215
00:08:05,850 --> 00:08:04,300
a little bit of a cold trap a little bit

216
00:08:08,070 --> 00:08:05,860
of ice which will increase the relative

217
00:08:09,930 --> 00:08:08,080
humidity there in the subsurface and

218
00:08:11,550 --> 00:08:09,940
then the next day it will sublimate away

219
00:08:15,810 --> 00:08:11,560
and and you'll go back down to kind of

220
00:08:17,700 --> 00:08:15,820
at the trend there so yeah so then what

221
00:08:19,260 --> 00:08:17,710
we did I'm just kind of like when Ed and

222
00:08:21,540 --> 00:08:19,270
Vince had been talking about before is

223
00:08:23,100 --> 00:08:21,550
we were looking at combining the the

224
00:08:25,770 --> 00:08:23,110
temperature and the relative humidity

225
00:08:27,780 --> 00:08:25,780
just to see where we would actually get

226
00:08:29,790 --> 00:08:27,790
into that DRH range where where we'd

227
00:08:33,300 --> 00:08:29,800
actually have brine and then if it was

228
00:08:34,920 --> 00:08:33,310
brine then then we we looked to see when

229
00:08:37,350 --> 00:08:34,930
it would go away and that we'd use the

230
00:08:39,150 --> 00:08:37,360
erh for that so we had that medicine

231
00:08:45,900 --> 00:08:39,160
that kind of medicine in here

232
00:08:50,700 --> 00:08:45,910
and so you can see that yeah I'm doing

233
00:08:51,660 --> 00:08:50,710
it - all right so at the at the the very

234
00:08:54,360 --> 00:08:51,670
deep

235
00:08:56,280 --> 00:08:54,370
unit here so I'm just showing the the

236
00:08:58,770 --> 00:08:56,290
bottom unit in the top unit at the

237
00:09:00,420 --> 00:08:58,780
bottom unit where we have I

238
00:09:02,610 --> 00:09:00,430

and then we also put perchlorate in

239
00:09:04,500 --> 00:09:02,620
there you're gonna have brines all the

240
00:09:05,820 --> 00:09:04,510
time anytime it's above the eutectic

241
00:09:07,260 --> 00:09:05,830
temperature so this is just a melting

242
00:09:08,790 --> 00:09:07,270
effect this is where the Bryan's are

243
00:09:10,620 --> 00:09:08,800
going to be between the ice grains a

244
00:09:13,200 --> 00:09:10,630
triple Junction affects things like that

245
00:09:15,720 --> 00:09:13,210
and then the surface you know you're

246
00:09:17,640 --> 00:09:15,730
gonna be way too cold during the winter

247
00:09:19,050 --> 00:09:17,650
time and you're gonna be too trunk dry

248
00:09:20,940 --> 00:09:19,060
during the summertime but in these

249
00:09:22,920 --> 00:09:20,950
transition phases in the spring the

250
00:09:24,990 --> 00:09:22,930
summer you're actually gonna have enough

251
00:09:27,090 --> 00:09:25,000
humidity and temperature to actually

252
00:09:29,700 --> 00:09:27,100
have brines there for a significant part

253
00:09:30,960 --> 00:09:29,710
of the day again and then just to

254
00:09:33,990 --> 00:09:30,970
complicate things showing everything

255
00:09:35,790 --> 00:09:34,000
else you know I'm just showing this

256
00:09:37,230 --> 00:09:35,800
because it's like five point one

257
00:09:40,200 --> 00:09:37,240
centimeters you can actually have Brian

258
00:09:41,730 --> 00:09:40,210
there for an entire Seoul again and and

259
00:09:43,290 --> 00:09:41,740
even up to three centimeters there are

260
00:09:45,870 --> 00:09:43,300
times where you get enough coal trapping

261
00:09:47,670 --> 00:09:45,880
occurring in that that hasn't sublimated

262
00:09:49,500 --> 00:09:47,680
gone away yet that you could actually

263
00:09:52,530 --> 00:09:49,510

have Brian there for a very long period

264
00:09:54,830 --> 00:09:52,540
of time and then just a instead of

265
00:09:57,660 --> 00:09:54,840
showing the the nun plot like Vince day

266
00:09:59,130 --> 00:09:57,670
yeah the Brian is isn't is never

267
00:10:01,080 --> 00:09:59,140
habitable even according to the East

268
00:10:06,360 --> 00:10:01,090
Coast bar deadline Coast bar deadlines

269
00:10:08,220 --> 00:10:06,370
guidelines so yeah so the the water

270
00:10:10,890 --> 00:10:08,230
activity is never greater than 0.5 or

271
00:10:12,630 --> 00:10:10,900
and if it was greater than 0.5 then the

272
00:10:17,070 --> 00:10:12,640
temperature is never greater than 248

273
00:10:19,410 --> 00:10:17,080
yeah so you know so we can try different

274
00:10:21,600 --> 00:10:19,420
places trying different obliquity too

275
00:10:23,460 --> 00:10:21,610
and then just to kind of show what's

276
00:10:26,880 --> 00:10:23,470
happening on a diurnal scale we're gonna

277
00:10:28,440 --> 00:10:26,890
look right here at 206 K and so that's

278
00:10:30,360 --> 00:10:28,450
that's what's shown here so again for

279
00:10:31,560 --> 00:10:30,370
paliku carry there 206 and and instead

280
00:10:33,660 --> 00:10:31,570
of being at the surface we're gonna be

281
00:10:36,810 --> 00:10:33,670
right under the surface so at half a

282
00:10:39,240 --> 00:10:36,820
millimeter just to have pores in there

283
00:10:41,550 --> 00:10:39,250
instead of just degassing out to the

284
00:10:43,110 --> 00:10:41,560
atmosphere this is our temperature it's

285
00:10:44,520 --> 00:10:43,120
going to be on the Left plot and then

286
00:10:45,750 --> 00:10:44,530
this is going to be a relative humidity

287
00:10:48,720 --> 00:10:45,760
or water activity that's going to be

288
00:10:50,070 --> 00:10:48,730

shown here on the right and then we

289
00:10:52,530 --> 00:10:50,080
should show the eutectic temperature on

290
00:10:54,570 --> 00:10:52,540
there the erh the DRH was just

291
00:10:56,250 --> 00:10:54,580
temperature dependent again and then

292
00:10:58,080 --> 00:10:56,260
what we do is this is this

293
00:11:01,380 --> 00:10:58,090
post-processing that we're doing we're

294
00:11:03,420 --> 00:11:01,390
taking this initial RH or water activity

295
00:11:06,480 --> 00:11:03,430
and then we're going to decrease it to

296
00:11:08,040 --> 00:11:06,490
the DRH so if it's above this it should

297
00:11:09,530 --> 00:11:08,050
be daily questing out so it's going to

298
00:11:10,910 --> 00:11:09,540
be pulling water out of the APUs

299
00:11:12,530 --> 00:11:10,920
and we're gonna add that to the

300
00:11:14,960 --> 00:11:12,540
condensed face how much is in that

301
00:11:16,430 --> 00:11:14,970
condensed face and then likewise we're

302
00:11:18,519 --> 00:11:16,440
gonna do the same when it gets below the

303
00:11:21,050 --> 00:11:18,529
erh so it's if it's too low in humidity

304
00:11:23,629 --> 00:11:21,060
we're gonna take that condensed phase

305
00:11:26,120 --> 00:11:23,639
out and actually sublimate it away so

306
00:11:29,660 --> 00:11:26,130
it's it provides a more humid

307
00:11:32,809 --> 00:11:29,670
environment and when we do that we can

308
00:11:34,069 --> 00:11:32,819
calculate the volume of different

309
00:11:36,410 --> 00:11:34,079
mixtures I would get so when it's below

310
00:11:39,590 --> 00:11:36,420
two of when it's below the eutectic

311
00:11:42,019 --> 00:11:39,600
temperature like yeah before like 9:00

312
00:11:43,790 --> 00:11:42,029
a.m. here we're not gonna have any

313
00:11:45,350 --> 00:11:43,800

brines but then after that we can

314
00:11:48,309 --> 00:11:45,360
actually start having brines and these

315
00:11:52,400 --> 00:11:48,319
brines are going to exist even through

316
00:11:54,350 --> 00:11:52,410
where the erh s and and so I'll explain

317
00:11:56,240 --> 00:11:54,360
that more kind of in the conclusions

318
00:11:57,980 --> 00:11:56,250
here but first the assumption so so to

319
00:12:00,079 --> 00:11:57,990
get get these volumes we needed to

320
00:12:01,910 --> 00:12:00,089
assume how much h2o was there and how

321
00:12:03,290 --> 00:12:01,920
much per chlorate was there so we just

322
00:12:05,840 --> 00:12:03,300
used these assumptions this is just

323
00:12:07,970 --> 00:12:05,850
based on on the neutron data at Pala

324
00:12:10,699 --> 00:12:07,980
care crater and this based on Phoenix

325
00:12:12,410 --> 00:12:10,709
and so just kind of to conclude here is

326
00:12:13,850 --> 00:12:12,420
that these brines are not going to be

327
00:12:16,280 --> 00:12:13,860
habitable even though it looks like they

328
00:12:18,610 --> 00:12:16,290
can form under this this situation that

329
00:12:21,410 --> 00:12:18,620
we showed which is very favorable

330
00:12:22,460 --> 00:12:21,420
temperature seems to dominate here so we

331
00:12:24,620 --> 00:12:22,470
have a lot of brines

332
00:12:26,689 --> 00:12:24,630
occurring in here and this is just

333
00:12:29,990 --> 00:12:26,699
really as the temperature increases more

334
00:12:32,059 --> 00:12:30,000
this ice starts melting away and and in

335
00:12:33,800 --> 00:12:32,069
a is able to form the brine and then

336
00:12:35,930 --> 00:12:33,810
even through efflorescence when we're

337
00:12:39,680 --> 00:12:35,940
below efflorescence would predict we can

338
00:12:41,689 --> 00:12:39,690

actually sublimate or evaporate enough

339
00:12:43,670 --> 00:12:41,699
of that condensed material to increase

340
00:12:47,389 --> 00:12:43,680
the relative humidity here and and keep

341
00:12:48,949 --> 00:12:47,399
that brine stable there now we need to

342
00:12:51,800 --> 00:12:48,959
do better modeling with this to figure

343
00:12:53,480 --> 00:12:51,810
out you know so this is a nap or so so

344
00:12:56,449 --> 00:12:53,490
that is you know it's eventually going

345
00:12:58,309 --> 00:12:56,459
to vapour diffuse out but you know we're

346
00:12:59,600 --> 00:12:58,319
gonna do that modeling next and so

347
00:13:01,519 --> 00:12:59,610
that's part of this future work where

348
00:13:03,559 --> 00:13:01,529
we're looking at in the laboratory with

349
00:13:06,019 --> 00:13:03,569
macroscopic more daily quests type

350
00:13:07,730 --> 00:13:06,029
measurements to really look at the the

351
00:13:09,499 --> 00:13:07,740
kinetics that are going on and then

352
00:13:11,809 --> 00:13:09,509
we're we're we're trying hard everyday

353
00:13:13,460 --> 00:13:11,819
trying to get this Marsh flow salt model

354
00:13:15,379 --> 00:13:13,470
to work where we can actually add salt

355
00:13:17,179 --> 00:13:15,389
and and do all this all in one model so

356
00:13:19,610 --> 00:13:17,189
will presenting that at a poster ninth

357
00:13:21,800 --> 00:13:19,620
Mars on under kati's Katie will lead

358
00:13:23,120 --> 00:13:21,810
that so with that I take any questions

359
00:13:26,020 --> 00:13:23,130
thanks

360
00:13:28,340 --> 00:13:26,030
[Applause]

361
00:13:30,500 --> 00:13:28,350
we have time just for one quick question

362
00:13:31,850 --> 00:13:30,510
okay it's more of a comment Andy sure

363
00:13:33,770 --> 00:13:31,860

from the University of Florida

364
00:13:36,470 --> 00:13:33,780
I've just finished I've got a Marche

365
00:13:39,320 --> 00:13:36,480
chamber in my lab a real highly capable

366
00:13:41,750 --> 00:13:39,330
system and I've just completed a series

367
00:13:45,560 --> 00:13:41,760
of experiments where I've taken rocks of

368
00:13:48,350 --> 00:13:45,570
different geochemical composition and

369
00:13:50,630 --> 00:13:48,360
figured out a way to put all frost

370
00:13:52,730 --> 00:13:50,640
layers on it up to a centimeter thick

371
00:13:54,980 --> 00:13:52,740
and then heating that up by either

372
00:13:56,960 --> 00:13:54,990
turning on the UV visible and near

373
00:14:01,310 --> 00:13:56,970
infrared illumination system or heating

374
00:14:03,980 --> 00:14:01,320
from below and the classic Haverly at

375
00:14:06,170 --> 00:14:03,990
all paper in 2001 predicted this really

376
00:14:08,960 --> 00:14:06,180
tight window around the triple point of

377
00:14:14,860 --> 00:14:08,970
water of liquid a triple point for water

378
00:14:18,410 --> 00:14:14,870
on Mars and I can see clearly pure water

379
00:14:21,320 --> 00:14:18,420
flowing off the ice and into the rock

380
00:14:23,990 --> 00:14:21,330
and hydrating the rock not a salty brine

381
00:14:26,060 --> 00:14:24,000
at a depressed temperature but liquid

382
00:14:28,790 --> 00:14:26,070
water flowing off the rock at seven

383
00:14:31,670 --> 00:14:28,800
millibars in a Mars atmosphere between

384
00:14:33,500 --> 00:14:31,680
zero and four degrees centigrade so this

385
00:14:36,380 --> 00:14:33,510
has been really interesting Lester talks

386
00:14:38,210 --> 00:14:36,390
but I would say that where that niche

387
00:14:40,580 --> 00:14:38,220
that you you may not have considered yet

388
00:14:43,400 --> 00:14:40,590

would be underneath underneath frost

389
00:14:45,290 --> 00:14:43,410
layers at the places where that might

390
00:14:47,000 --> 00:14:45,300
occur it might not be something that

391
00:14:49,040 --> 00:14:47,010
happens generically out on the open

392
00:14:51,140 --> 00:14:49,050
terrain as you're cycling through

393
00:14:53,510 --> 00:14:51,150
diurnal temperature swings but there