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Meteorological variables and concentrations of helium, carbon dioxide, and oxygen in soil gases collected regularly at a single site for more than a year

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ABSTRACT

Concentrations of helium, carbon dioxide, and oxygen were measured over a period of more than a year at a single site. Samples of soil gases were collected from a hollow probe emplaced at 0.75-m depth and from a hemisphere on the ground surface. Soil temperature, air temperature, percent humidity, barometric pressure, rain, and snowfall were also measured. Sampling and analysis of the soil gases are described and gas and meteorological measurements are listed.

INTRODUCTION

Measurement of volatile species in soil gases is often used in geochemical exploration for buried or blind ore deposits. Anomalies in concentrations of various volatile species detected in surficial soil gases may result from chemical reactions that occur during the process of weathering of ore and gangue minerals. However, interpretation of these anomalies is not always straightforward. For example, soil moisture and high concentrations of carbon dioxide in a soil gas sample may affect the concentrations of helium measured (Hinkle and Ryder, 1987). Meteorological changes also affect the concentrations of gases measured (Reimer, 1979; McCarthy and Reimer, 1986). The purpose of this study was to determine which meteorological conditions affect concentrations of helium, carbon dioxide, and oxygen in soil gases in a nonmineralized area. The study was conducted in a grassy location adjacent to the U.S. Geological Survey building near Golden, Colorado, from March 28, 1986, to June 5, 1987.

Samples were collected (1) from a hollow probe driven 0.75 m into the ground, and (2) from a clear plastic hemisphere emplaced on the ground surface adjacent to the probe. The hollow probe used in this study was described by Reimer and Bowles (1979) and has been used widely in collecting soil gas samples. Use of the clear plastic hemisphere was described by McCarthy (1972). Gas samples were collected from the hemisphere for two reasons: (1) to obtain gas samples approximating those obtained by desorption of surficial soil samples, as used for geochemical exploration (Hinkle and Dilbert, 1984; Hinkle, 1986), and (2) to determine if a gas concentration flux could be detected by comparing concentrations of gases in the soil gas samples taken from the surface and from 0.75-m depth.

A hollow probe was driven 0.75 m into the ground by means of a sliding hammer attached to the shaft of the probe. After it was driven into the ground, the probe was fitted with an airtight cap and septum for withdrawal of the soil gas sample. A PVC pipe was placed over the probe and cap, and the pipe was covered with an inverted plastic beaker to protect the probe from the weather. A small plastic tube about 5 mm in diameter was implanted in the top of the hemisphere for removal of the soil gas sample, and a plastic beaker was placed over the top of the tube to prevent rain and snow from entering it. Soil was packed around the base of the hemisphere. The air in the hemisphere was primarily surficial soil gas, but also contained atmospheric air which entered through the 5-mm open tube. Both the probe and the hemisphere were left in place for the duration of the study.

Before removal of the first sample, 20 ml of air were withdrawn from the probe to remove air introduced when the probe was emplaced in the ground; 20 ml of air were also removed from the probe whenever the rubber septum was changed, approximately every 4 to 6 weeks, to remove air introduced during this operation. All soil gas samples had equilibrated for a minimum of 24 hours before collection. Samples were collected from the hollow probe by inserting the needle of a syringe through the septum in the cap and withdrawing 10 cc of the soil gas. Samples were collected from the hemisphere by withdrawing 10 cc of the surficial soil gas through the hollow tube in the top of the hemisphere into the syringe. The soil gas samples were transferred to evacuated blood sampling tubes for storage, by inserting the needle of the syringe containing the gas sample through the rubber cap of the evacuated tube and allowing the sample in the syringe to be drawn inside. The needle hole was covered with silicone glue. Soil gas samples can be stored in these evacuated tubes for as long as 2 months without leakage (Hinkle and Kilburn, 1979).

Samples were collected daily for more than 14 months, excluding weekends and holidays. Replicate soil gas samples were collected twice daily from the probe and hemisphere during the first 11 weeks of the study; replicate sampling was discontinued as a result of analysis-of-variation studies, which indicated that more variations in sample concentration occurred among the daily samples than between the replicate samples. Sampling twice a day was discontinued after 13 weeks because long-term trends in gas concentrations could be observed in samples collected only once a day.

Barometric pressure was measured continuously by a recording barometer located inside the adjacent building. Air temperature and relative humidity were measured continuously by a portable recording hydrothermograph located near the probe and hemisphere. Soil temperature was measured by a metal dial-type thermometer, with the tip of the thermometer stem buried at 20-cm depth in the ground adjacent to the probe. Soil moisture was measured only indirectly, as amounts of rain and snowfall. Rainfall was measured by a rain gauge attached to the plastic pipe protecting the probe. The depth of snow lying on the ground was measured with a ruler.

ANALYSES

Gas in the vials was removed by injecting a volume of air equal to the volume of the vial into the vial and removing the mixture of air and soil gas. The samples were analyzed for helium using mass spectrometry (Reimer and Denton, 1978). Standard samples of air containing known concentrations of helium were run several times per day to insure stability of the instrument. Concentrations of helium were reported as differences compared to the concentration of helium in air; these differences were positive or negative, depending on whether the measured concentration was above or below the concentration of helium in air (5,240 parts per billion) (Glueckhauf, 1946; Oliver and others, 1984). The reproducibility of determination ranged from 30 ppb to 100 ppb above or below the concentration of helium in air. The tubes used for sample storage were approximately 80% evacuated. They contained a residual concentration of helium, introduced during the manufacturing process, that was the same for all the tubes in each lot produced by the manufacturer. This residual helium concentration was measured and subtracted from the raw measurement of helium in soil gas.

Samples were analyzed for carbon dioxide and oxygen using gas chromatography; operating conditions for the gas chromatograph are shown in table 1. Concentrations of carbon dioxide and oxygen were measured compared to standard curves, and are reported as volume percents of the total gas sample. Standard samples containing known concentrations of CO_2 and O_2 were analyzed several times per day to insure stability of the instrument.

DESCRIPTION OF DATA TABLES

Data from the analyses were entered into an IBM personal computer and stored on disks, using STATPAC programs developed for personal computers by the U.S. Geological Survey (1986). Data for all measurements obtained during the study are listed in table 2.

Data listed in table 2 include: date of sample collection, time of day (standard time), soil temperature (°C), air temperature (°F), percent humidity, rainfall (inches), depth of snow on the ground (inches), barometric pressure (inches), percent CO_2 (probe), percent O_2 (probe), parts per billion helium (above or below the concentration of helium in air--for probe samples), percent CO_2 (hemisphere), percent O_2 (hemisphere), and ppb helium (above or below the concentration of helium in air--for hemisphere samples). Because of the formatting used in the computer program that produced table 2, the data listed carry two to four nonsignificant digits to the right of the significant digits; these data were not determined to the accuracy suggested by the extra zeros. Concentrations of CO_2, O_2, and helium listed for the first 71 samples are averages of replicates collected during the first 11 weeks of the study. The letter B following four zeros in the data indicates that no analysis was performed for that particular parameter.

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TABLE 1.--Operating conditions for the gas chromatograph

Type of gas chromatograph	Carle AGC-100
Detector	thermister detector
Lower limit of detection	0.03% CO_2/0.1% O_2 (vol/vol)
Reproducibility	+/-10%
Column	concentric stainless steel, outer column 72 in x 1/4 in molecular sieve inner column 72 in x 1/8 in porapak mixture (Alltech Associates, Deerfield, IL)
Carrier gas	helium at 90 mL/minute
Temperature	column: 70°C detector: "low" mode

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In barom	%CO2(p)	%O2(p)
1 1	32886.0000	1322.0000	6.0000	68.0000	10.0000	.0000	.0000	30.1600	.2500	18.2200
2 2	33186.0000	1042.0000	9.0000	56.0000	30.0000	.0000	.0000	30.0000	.2400	18.0500
3 3	33186.0000	1615.0000	9.0000	48.0000	40.0000	.0000	.0000	30.1300	.2600	18.6000
4 4	40186.0000	1045.0000	8.0000	41.0000	48.0000	.1000	.0000	30.1200	.2400	18.5800
5 5	40186.0000	1537.0000	8.0000	50.0000	38.0000	.0000	.0000	29.9000	.2600	17.9600
6 6	40286.0000	1000.0000	8.0000	44.0000	53.0000	.0000	.0000	29.6300	.2400	17.9700
7 7	40286.0000	1350.0000	8.0000	54.0000	38.0000	.0000	.0000	29.5800	.2400	18.0000
8 8	40386.0000	700.0000	6.0000	27.0000	90.0000	1.0000	8.5000	29.7500	.2500	18.0900
9 9	40486.0000	700.0000	4.0000	21.0000	76.0000	1.2500	18.0000	29.9000	.2500	17.6400
10 10	40486.0000	1225.0000	4.0000	30.0000	78.0000	.0000	18.0000	29.8300	.2500	18.1800
11 11	40786.0000	700.0000	2.0000	38.0000	60.0000	.2000	.0000	30.0400	.2500	18.0600
12 12	40786.0000	1355.0000	3.0000	53.0000	35.0000	.0000	.0000	30.0100	.2300	18.2600
13 13	40886.0000	645.0000	4.0000	38.0000	85.0000	.0000	.0500	30.2500	.2300	18.1000
14 14	40886.0000	1345.0000	5.0000	42.0000	75.0000	.0500	.0500	30.1700	.6300	18.9000
15 15	40986.0000	645.0000	5.0000	35.0000	88.0000	.1000	.1000	30.0900	.2400	18.5100
16 16	40986.0000	1400.0000	5.0000	48.0000	54.0000	.0000	.1000	30.0000	.2400	18.5000
17 17	41086.0000	700.0000	6.0000	35.0000	92.0000	.2000	.0000	29.9500	.2400	19.5000
18 18	41086.0000	1415.0000	6.0000	55.0000	28.0000	.0000	.0000	29.8700	.2600	18.5800
19 19	41186.0000	645.0000	5.0000	35.0000	60.0000	.0000	.0000	29.8400	.2400	18.5700
20 20	41186.0000	1410.0000	6.0000	57.0000	24.0000	.0000	.0000	30.0000	.2400	18.7000
21 21	41486.0000	700.0000	4.0000	31.0000	40.0000	.1500	.0000	29.9500	.2200	18.4400
22 22	41486.0000	1340.0000	4.0000	52.0000	20.0000	.0000	.0000	30.0000	.2500	18.6000
23 23	41586.0000	645.0000	3.0000	28.0000	64.0000	.0000	.0000	30.1500	.2500	18.4600
24 24	41586.0000	1350.0000	4.0000	52.0000	32.0000	.0000	.0000	30.0800	.2400	18.4300
25 25	41686.0000	645.0000	4.0000	37.0000	65.0000	.0000	.0000	29.9500	.2400	18.6800
26 26	41686.0000	1510.0000	5.0000	53.0000	54.0000	.0000	.0000	29.7700	.2700	18.5200
27 27	41786.0000	645.0000	6.0000	40.0000	85.0000	.0000	.0000	29.7000	.2500	18.5300
28 28	41786.0000	1345.0000	6.0000	38.0000	86.0000	.3000	.0000	29.6700	.2400	18.2000
29 29	41886.0000	700.0000	5.0000	33.0000	80.0000	.0000	.0000	29.9000	.2600	18.5600
30 30	41886.0000	1340.0000	5.0000	48.0000	33.0000	.0000	.0000	29.9800	.2600	19.2500
31 31	42186.0000	645.0000	7.0000	42.0000	89.0000	.0000	.0000	30.1000	.2400	19.4800
32 32	42186.0000	1340.0000	7.0000	61.0000	42.0000	.0000	.0000	30.0800	.2600	19.5300
33 33	42286.0000	645.0000	8.0000	44.0000	72.0000	.0000	.0000	30.0000	.2700	19.5100
34 34	42286.0000	1445.0000	9.0000	72.0000	23.0000	.0000	.0000	29.8700	.2400	19.5400
35 35	42386.0000	645.0000	9.0000	51.0000	51.0000	.0000	.0000	29.8400	.2600	19.5500
36 36	42386.0000	1415.0000	10.0000	68.0000	26.0000	.0000	.0000	29.8000	.2200	19.6600
37 37	42486.0000	700.0000	10.0000	47.0000	80.0000	.0000	.0000	30.0000	.2600	19.5400
38 38	42486.0000	1400.0000	10.0000	61.0000	52.0000	.0000	.0000	29.8500	.2600	19.8600
39 39	42586.0000	700.0000	10.0000	45.0000	48.0000	.0000	.0000	29.8000	.2400	19.6400
40 40	42586.0000	1315.0000	10.0000	61.0000	18.0000	.0000	.0000	29.7000	.2600	19.4000
41 41	42886.0000	545.0000	8.0000	46.0000	50.0000	.2000	.0000	29.9000	.2600	19.4000
42 42	42886.0000	1440.0000	8.0000	65.0000	32.0000	.0000	.0000	29.8200	.2800	19.4800
43 43	42986.0000	545.0000	9.0000	41.0000	67.0000	.0000	.0000	29.8500	.2800	20.1700
44 44	42986.0000	1515.0000	9.0000	68.0000	32.0000	.0000	.0000	29.7200	.2600	20.0600
45 45	43086.0000	720.0000	10.0000	48.0000	60.0000	.0000	.0000	30.0000	.2800	19.6300
46 46	43086.0000	1340.0000	10.0000	65.0000	39.0000	.0000	.0000	29.9900	.2700	19.7000
47 47	50186.0000	545.0000	10.0000	40.0000	70.0000	.0000	.0000	30.1500	.2700	20.0400
48 48	50186.0000	1240.0000	10.0000	60.0000	44.0000	.0000	.0000	30.2600	.2800	20.1900
49 49	50286.0000	545.0000	10.0000	45.0000	76.0000	.0000	.0000	30.1000	.2600	20.2600
50 50	50286.0000	1515.0000	11.0000	73.0000	26.0000	.0000	.0000	30.0400	.2800	20.0400

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In baron	%CO2(p)	%O2(p)
51 51	50586.0000	545.0000	12.0000	43.0000	31.0000	.0000	.0000	29.7200	.2800	20.2200
52 52	50586.0000	1420.0000	12.0000	67.0000	20.0000	.0000	.0000	29.6900	.2800	20.4700
53 53	50686.0000	530.0000	12.0000	41.0000	48.0000	.0000	.0000	29.8000	.2800	20.4500
54 54	50686.0000	1310.0000	11.0000	66.0000	26.0000	.0000	.0000	29.7000	.2800	20.4900
55 55	50786.0000	545.0000	12.0000	44.0000	75.0000	.0000	.0000	29.7000	.2800	20.8300
56 56	50786.0000	1340.0000	11.0000	52.0000	60.0000	.0000	.0000	29.6900	.2800	20.6600
57 57	50886.0000	545.0000	11.0000	37.0000	96.0000	.4000	.0000	29.7500	.2800	20.6200
58 58	50886.0000	1435.0000	10.0000	39.0000	86.0000	.1000	.0000	29.7200	.3000	20.7100
59 59	50986.0000	600.0000	9.0000	34.0000	91.0000	.0000	.0000	29.7400	.2800	20.6600
60 60	50986.0000	1325.0000	9.0000	52.0000	46.0000	.0000	.0000	29.7000	.2800	20.6400
61 61	51286.0000	545.0000	10.0000	43.0000	58.0000	.0000	.0000	29.9300	.2800	20.4800
62 62	51286.0000	1310.0000	10.0000	58.0000	42.0000	.0000	.0000	29.9500	.2800	19.8200
63 63	51386.0000	600.0000	10.0000	39.0000	92.0000	.1000	.0000	29.9800	.2800	20.5800
64 64	51386.0000	1330.0000	11.0000	63.0000	35.0000	.0000	.0000	29.8500	.2700	20.5600
65 65	51486.0000	545.0000	11.0000	47.0000	45.0000	.0000	.0000	29.7600	.2700	19.9100
66 66	51486.0000	1300.0000	10.0000	65.0000	32.0000	.0000	.0000	29.7100	.2800	20.4000
67 67	51586.0000	700.0000	11.0000	42.0000	85.0000	.0000	.0000	29.8300	.2800	20.4000
68 68	51586.0000	1250.0000	11.0000	58.0000	60.0000	.0000	.0000	29.8100	.2900	20.5200
69 69	51686.0000	545.0000	10.0000	39.0000	100.0000	.9500	.0000	29.9300	.2800	20.5400
70 70	51686.0000	1245.0000	9.0000	39.0000	92.0000	.3000	.0000	30.0400	.2800	20.5200
71 71	51986.0000	530.0000	10.0000	44.0000	66.0000	.4000	.0000	30.0600	.2800	20.4200
72 72	51986.0000	1245.0000	10.5000	65.0000	43.0000	.0000	.0000	30.0400	.2800	20.6300
73 73	52086.0000	530.0000	11.0000	47.0000	63.0000	.0000	.0000	29.9800	.2800	20.9200
74 74	52086.0000	1230.0000	12.0000	74.0000	27.0000	.0000	.0000	29.9400	.3000	20.6600
75 75	52186.0000	545.0000	12.0000	49.0000	63.0000	.0000	.0000	29.8500	.2900	20.6200
76 76	52186.0000	1335.0000	13.0000	77.0000	20.0000	.0000	.0000	29.7500	.3000	20.7300
77 77	52286.0000	545.0000	13.0000	49.0000	42.0000	.0000	.0000	29.7400	.3000	20.6800
78 78	52286.0000	1250.0000	13.0000	66.0000	40.0000	.0000	.0000	29.7800	.3100	20.7500
79 79	52386.0000	545.0000	12.0000	38.0000	51.0000	.0000	.0000	29.9900	.3000	20.7700
80 80	52386.0000	1230.0000	12.0000	59.0000	35.0000	.0000	.0000	29.9500	.3000	20.8600
81 81	52786.0000	645.0000	13.0000	44.0000	83.0000	.0000	.0000	30.1000	.3100	20.0800
82 82	52786.0000	1245.0000	13.0000	59.0000	54.0000	.0000	.0000	30.1000	.3600	19.7500
83 83	52886.0000	5.5500	13.0000	48.0000	82.0000	.0000	.0000	30.0900	.3800	19.7700
84 84	52886.0000	1300.0000	13.0000	62.0000	48.0000	.0000	.0000	30.0400	.3500	19.7900
85 85	52986.0000	545.0000	12.5000	44.0000	96.0000	.5000	.0000	30.0900	.3600	19.8200
86 86	52986.0000	1445.0000	12.0000	55.0000	52.0000	.0000	.0000	30.1000	.4700	20.6000
87 87	53086.0000	600.0000	12.0000	42.0000	80.0000	.0000	.0000	30.1000	.3700	20.6000
88 88	53086.0000	1215.0000	12.0000	61.0000	42.0000	.0000	.0000	30.0800	.4100	20.6000
89 89	60286.0000	545.0000	13.5000	52.0000	88.0000	.1000	.0000	30.0500	.4100	20.4000
90 90	60286.0000	1330.0000	14.0000	66.0000	51.0000	.0500	.0000	30.0200	.4200	20.6000
91 91	60386.0000	545.0000	14.5000	51.0000	80.0000	.0000	.0000	29.9300	.3700	20.5000
92 92	60486.0000	545.0000	15.0000	55.0000	70.0000	.0000	.0000	29.9800	.4900	20.6000
93 93	60586.0000	545.0000	14.5000	51.0000	93.0000	.1000	.0000	29.9600	.3200	20.8000
94 94	60686.0000	545.0000	15.0000	53.0000	79.0000	.0000	.0000	29.8800	.3200	20.7000
95 95	60986.0000	550.0000	16.0000	54.0000	80.0000	.1000	.0000	29.8000	.4300	20.5000
96 96	61086.0000	550.0000	15.0000	48.0000	100.0000	.3500	.0000	29.9500	.4300	20.6000
97 97	61186.0000	550.0000	14.0000	43.0000	62.0000	.2500	.0000	30.1100	.4600	20.5000
98 98	61286.0000	600.0000	14.5000	54.0000	50.0000	.0000	.0000	30.0400	.4600	20.5000
99 99	61386.0000	535.0000	15.5000	54.0000	82.0000	.0000	.0000	30.0500	.5100	20.3000
100 100	61686.0000	535.0000	17.0000	60.0000	44.0000	.0000	.0000	29.9800	.4700	20.4000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In barom	%CO2(p)	%O2(p)
101 101	61786.0000	540.0000	18.0000	60.0000	52.0000	.0000	.0000	30.0800	.4400	20.6000
102 102	61886.0000	550.0000	18.0000	54.0000	64.0000	.0000	.0000	30.0000	.5200	20.5000
103 103	61986.0000	545.0000	18.0000	57.0000	63.0000	.0000	.0000	29.9300	.5800	20.6000
104 104	62086.0000	545.0000	18.0000	55.0000	76.0000	.0000	.0000	30.0400	.5400	20.7000
105 105	62386.0000	540.0000	19.0000	58.0000	60.0000	.0000	.0000	30.1200	.5800	20.6000
106 106	62486.0000	545.0000	19.0000	58.0000	76.0000	.0000	.0000	30.1500	.6500	20.8000
107 107	62586.0000	555.0000	20.0000	60.0000	60.0000	.0000	.0000	30.0000	.5500	20.8000
108 108	62786.0000	545.0000	20.0000	58.0000	60.0000	.0000	.0000	30.1200	.5600	20.7000
109 109	63086.0000	540.0000	21.0000	61.0000	56.0000	.0000	.0000	29.9100	.5600	20.7000
110 110	70186.0000	550.0000	20.5000	56.0000	76.0000	.0000	.0000	30.0600	.5600	20.9000
111 111	70286.0000	540.0000	21.0000	60.0000	47.0000	.0000	.0000	30.1000	.0000	21.3000
112 112	70386.0000	550.0000	21.5000	63.0000	46.0000	.0000	.0000	29.9800	.6400	20.7000
113 113	70786.0000	555.0000	20.5000	57.0000	80.0000	.0000	.0000	30.1000	.6000	20.4000
114 114	70886.0000	555.0000	20.0000	55.0000	70.0000	.0000	.0000	30.1000	.5500	20.6000
115 115	70986.0000	540.0000	20.0000	55.0000	65.0000	.0000	.0000	30.0000	.6400	20.5000
116 116	71086.0000	550.0000	20.0000	56.0000	65.0000	.0000	.0000	29.9700	.6700	20.5000
117 117	71186.0000	600.0000	19.5000	56.0000	72.0000	.0000	.0000	29.9200	.6500	20.6000
118 118	71486.0000	540.0000	21.0000	64.0000	53.0000	.0000	.0000	30.0400	.6900	20.3000
119 119	71586.0000	610.0000	21.0000	60.0000	54.0000	.0000	.0000	30.0000	.6500	20.5000
120 120	71686.0000	545.0000	21.5000	60.0000	69.0000	.0000	.0000	29.9100	.6900	20.6000
121 121	71786.0000	605.0000	21.0000	57.0000	70.0000	.0000	.0000	29.9500	.6100	20.5000
122 122	71886.0000	610.0000	20.5000	58.0000	89.0000	.0500	.0000	30.0500	.6100	20.4000
123 123	72186.0000	550.0000	18.0000	51.0000	99.0000	.5000	.0000	30.1000	.6000	20.3000
124 124	72286.0000	550.0000	18.5000	58.0000	76.0000	.0000	.0000	30.0600	.7100	20.5000
125 125	72386.0000	550.0000	18.0000	54.0000	83.0000	.3000	.0000	30.0000	.7200	20.4000
126 126	72486.0000	600.0000	19.0000	60.0000	57.0000	.0000	.0000	30.0000	.6300	20.3000
127 127	72586.0000	550.0000	18.5000	54.0000	71.0000	.0500	.0000	30.0900	.6600	20.2000
128 128	72886.0000	550.0000	18.5000	57.0000	41.0000	.0000	.0000	30.0300	.7400	20.0000
129 129	72986.0000	630.0000	18.5000	60.0000	41.0000	.0000	.0000	30.0500	.8100	20.2000
130 130	73086.0000	545.0000	19.0000	57.0000	52.0000	.0000	.0000	30.1000	.7400	20.3000
131 131	73186.0000	605.0000	19.5000	58.0000	63.0000	.0000	.0000	30.1400	.8700	19.9000
132 132	80186.0000	600.0000	19.5000	58.0000	84.0000	.0000	.0000	30.0200	.9600	20.0000
133 133	80486.0000	950.0000	19.5000	73.0000	45.0000	.0000	.0000	29.9500	.8000	20.0000
134 134	80586.0000	625.0000	19.5000	56.0000	78.0000	.0000	.0000	30.0400	.8300	20.3000
135 135	80686.0000	1040.0000	19.5000	79.0000	33.0000	.0000	.0000	29.9800	.9700	20.2000
136 136	80786.0000	820.0000	20.0000	75.0000	36.0000	.0000	.0000	30.1000	.9300	20.4000
137 137	80886.0000	1215.0000	20.0000	71.0000	38.0000	.0000	.0000	29.9700	.6300	20.0000
138 138	81186.0000	620.0000	19.0000	52.0000	56.0000	.0000	.0000	30.0200	.5800	20.0000
139 139	81286.0000	600.0000	20.0000	55.0000	52.0000	.0000	.0000	30.0000	.7300	20.0000
140 140	81386.0000	550.0000	19.5000	53.0000	59.0000	.0000	.0000	29.9000	.6600	20.1000
141 141	81486.0000	600.0000	19.5000	52.0000	81.0000	.0000	.0000	29.9900	.7100	20.1100
142 142	81586.0000	550.0000	18.5000	49.0000	60.0000	.0000	.0000	29.9500	.6900	20.1900
143 143	81886.0000	605.0000	20.0000	56.0000	73.0000	.0000	.0000	30.1000	.3800	21.0600
144 144	81986.0000	910.0000	20.5000	76.0000	42.0000	.0000	.0000	30.1300	.6400	21.2600
145 145	82086.0000	630.0000	20.0000	56.0000	66.0000	.0000	.0000	30.1600	.6300	20.9300
146 146	82186.0000	615.0000	19.5000	49.0000	98.0000	.0000	.0000	30.2200	.5700	20.9800
147 147	82286.0000	600.0000	19.0000	53.0000	67.0000	.0000	.0000	30.1400	.5400	21.2100
148 148	82586.0000	545.0000	18.0000	55.0000	65.0000	.7500	.0000	29.9700	.5000	20.9600
149 149	82686.0000	805.0000	18.0000	55.0000	74.0000	.0000	.0000	30.1800	.5200	21.3400
150 150	82786.0000	550.0000	17.5000	48.0000	92.0000	.0000	.0000	30.1800	.4800	20.1800

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In baron	%CO2(p)	%O2(p)
151 151	82886.0000	550.0000	17.5000	49.0000	77.0000	.0000	.0000	30.1300	.5400	21.0100
152 152	82986.0000	545.0000	18.0000	52.0000	59.0000	.0000	.0000	29.9800	.5300	21.0300
153 153	90286.0000	540.0000	16.5000	44.0000	83.0000	.0000	.0000	29.9100	.5000	21.0800
154 154	90386.0000	545.0000	16.5000	44.0000	77.0000	.0000	.0000	29.9900	.5200	21.2000
155 155	90486.0000	550.0000	16.5000	47.0000	75.0000	.0000	.0000	30.1500	.4900	21.0700
156 156	90586.0000	600.0000	16.0000	50.0000	60.0000	.0000	.0000	30.0100	.5100	21.6200
157 157	90886.0000	545.0000	14.0000	47.0000	68.0000	.4000	.0000	29.9500	.4300	21.2000
158 158	90986.0000	700.0000	15.0000	51.0000	54.0000	.0000	.0000	29.8200	.4500	21.7000
159 159	91086.0000	710.0000	15.0000	48.0000	62.0000	.0000	.0000	29.7900	.5100	21.4700
160 160	91186.0000	725.0000	15.0000	46.0000	47.0000	.0000	.0000	30.0000	.5900	21.0800
161 161	91286.0000	625.0000	14.0000	42.0000	52.0000	.0000	.0000	30.0000	.3700	21.2900
162 162	91586.0000	610.0000	14.5000	45.0000	70.0000	.0000	.0000	30.0500	.4100	21.3500
163 163	91686.0000	740.0000	15.0000	49.0000	85.0000	.0000	.0000	29.8000	.4800	21.3300
164 164	91786.0000	800.0000	15.0000	70.0000	24.0000	.0000	.0000	29.9700	.4800	21.7200
165 165	91886.0000	720.0000	15.0000	44.0000	52.0000	.0000	.0000	29.9200	.4200	21.0200
166 166	91986.0000	820.0000	14.5000	60.0000	45.0000	.0000	.0000	29.9600	.4100	22.1000
167 167	92286.0000	550.0000	14.5000	45.0000	96.0000	.0000	.0000	29.9800	.4300	21.1900
168 168	92386.0000	630.0000	14.5000	43.0000	100.0000	.0000	.0000	29.8900	.3900	21.8200
169 169	92486.0000	1000.0000	14.0000	52.0000	75.0000	.0000	.0000	29.4000	.4200	21.1600
170 170	92586.0000	645.0000	13.0000	40.0000	45.0000	.0000	.0000	29.5500	.3700	21.4600
171 171	92686.0000	630.0000	13.0000	35.0000	64.0000	.0000	.0000	29.7500	.3700	22.1700
172 172	92986.0000	530.0000	12.0000	38.0000	60.0000	.0000	.0000	29.9500	.4100	21.4400
173 173	93086.0000	550.0000	11.5000	33.0000	87.0000	.0000	.0000	29.9200	.3800	21.4100
174 174	100186.0000	710.0000	11.0000	32.0000	79.0000	.0000	.0000	29.8800	.4200	21.4100
175 175	100286.0000	610.0000	11.0000	34.0000	82.0000	.0000	.0000	29.7200	.4300	21.3600
176 176	100386.0000	900.0000	11.0000	32.0000	98.0000	.2000	.0000	29.9000	.3200	21.5200
177 177	100686.0000	800.0000	9.5000	50.0000	52.0000	.4000	.0000	30.1200	.3200	21.7100
178 178	100786.0000	900.0000	9.5000	47.0000	59.0000	.0000	.0000	30.0000	.3700	21.3600
179 179	100886.0000	740.0000	9.5000	47.0000	58.0000	.0000	.0000	29.9900	.2900	21.3100
180 180	100986.0000	735.0000	10.0000	38.0000	95.0000	.2000	.0000	30.2000	.3100	21.4200
181 181	101086.0000	708.0000	10.0000	42.0000	54.0000	.0000	.0000	29.9100	.2500	20.5200
182 182	101486.0000	750.0000	5.5000	44.0000	50.0000	.7000	.0000	30.0800	.2300	20.5900
183 183	101586.0000	715.0000	5.5000	32.0000	72.0000	.0000	.0000	30.1000	.0000B	.0000B
184 184	101686.0000	740.0000	6.0000	36.0000	54.0000	.0000	.0000	30.1800	.2400	20.5200
185 185	101786.0000	640.0000	5.5000	36.0000	46.0000	.0000	.0000	29.9800	.2300	20.4900
186 186	102086.0000	1010.0000	8.0000	40.0000	100.0000	.1000	.0000	30.1900	.2500	20.7000
187 187	102186.0000	710.0000	8.0000	38.0000	100.0000	.0000	.0000	29.9500	.2700	20.7100
188 188	102286.0000	700.0000	8.0000	30.0000	95.0000	.0000	.0000	29.9000	.2800	20.5200
189 189	102386.0000	700.0000	8.0000	36.0000	88.0000	.0000	.0000	30.1300	.2700	20.5000
190 190	102486.0000	745.0000	7.5000	30.0000	98.0000	.0000	.0000	30.1500	.2500	20.5400
191 191	102786.0000	1300.0000	7.5000	53.0000	37.0000	.0000	.0000	29.9800	.2700	20.7700
192 192	102886.0000	835.0000	7.5000	40.0000	60.0000	.0000	.0000	30.2000	.2300	20.8500
193 193	102986.0000	815.0000	7.5000	35.0000	76.0000	.0000	.0000	30.2000	.2700	20.8400
194 194	103086.0000	815.0000	7.5000	40.0000	50.0000	.0000	.0000	29.9900	.2100	20.8700
195 195	103186.0000	815.0000	7.5000	32.0000	88.0000	.1000	.0000	30.1000	.2500	20.8500
196 196	110386.0000	645.0000	5.0000	26.0000	88.0000	1.0500	6.0000	30.1000	.2400	20.9100
197 197	110486.0000	745.0000	4.5000	31.0000	100.0000	.2000	.0000	30.0800	.2300	21.0000
198 198	110586.0000	1130.0000	5.0000	42.0000	54.0000	.0000	.0000	29.9900	.2400	20.9000
199 199	110686.0000	700.0000	5.0000	32.0000	62.0000	.0000	.0000	29.6900	.2600	20.7700
200 200	110786.0000	700.0000	5.0000	22.0000	98.0000	.1500	2.5000	29.6100	.2500	20.7900

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In baron	%CO2(p)	%O2(p)
201 201	111086.0000	700.0000	2.5000	5.0000	83.0000	.1500	.5000	30.1500	.2000	20.8400
202 202	111286.0000	700.0000	1.5000	9.0000	90.0000	.1500	.7500	30.3000	.2000	21.0400
203 203	111386.0000	700.0000	1.5000	8.0000	75.0000	.0000	1.0000	30.1800	.1800	21.1000
204 204	111486.0000	700.0000	1.5000	30.0000	58.0000	.0000	1.0000	29.9000	.1800	21.1200
205 205	111886.0000	640.0000	2.5000	28.0000	66.0000	.0000	.0000	29.7200	.1400	21.1300
206 206	111886.0000	645.0000	3.0000	24.0000	84.0000	.0000	.0000	30.0500	.1700	20.9200
207 207	111986.0000	700.0000	3.0000	40.0000	61.0000	.0000	.0000	29.6100	.1900	21.0900
208 208	112086.0000	645.0000	3.0000	22.0000	85.0000	.0000	.0000	29.9900	.1900	21.1000
209 209	112186.0000	650.0000	3.5000	34.0000	46.0000	.0000	.0000	29.8400	.1700	21.0000
210 210	112486.0000	820.0000	3.0000	26.0000	80.0000	.0000	.0000	29.9800	.2100	20.6000
211 211	112586.0000	710.0000	3.5000	31.0000	64.0000	.0000	.0000	29.8500	.1800	21.1000
212 212	112686.0000	645.0000	3.0000	23.0000	93.0000	.0000	.0000	30.0300	.1800	20.6000
213 213	112886.0000	730.0000	3.0000	38.0000	44.0000	.0000	.0000	30.0200	.2000	20.6000
214 214	120186.0000	700.0000	3.0000	20.0000	98.0000	.2000	9.0000	30.0500	.2000	20.9000
215 215	120286.0000	650.0000	3.0000	26.0000	74.0000	.0000	7.0000	30.0100	.2100	20.8000
216 216	120386.0000	650.0000	3.0000	15.0000	88.0000	.0000	6.0000	30.0100	.1800	20.7000
217 217	120486.0000	655.0000	2.5000	14.0000	94.0000	.0000	6.0000	30.1700	.2200	20.5000
218 218	120586.0000	750.0000	2.5000	25.0000	92.0000	.0000	5.0000	29.9800	.2100	20.9000
219 219	120886.0000	820.0000	1.5000	17.0000	98.0000	.0000	3.5000	29.9000	.2100	20.0000
220 220	120986.0000	650.0000	1.5000	13.0000	98.0000	.4000	6.0000	30.0000	.1700	20.0000
221 221	121086.0000	745.0000	1.5000	2.0000	84.0000	.0000	6.0000	29.9000	.1700	20.8000
222 222	121186.0000	850.0000	1.5000	18.0000	81.0000	.0000	5.5000	29.9000	.1800	21.0000
223 223	121286.0000	740.0000	1.5000	18.0000	72.0000	.0000	5.0000	29.9700	.1900	20.7000
224 224	121586.0000	715.0000	1.5000	21.0000	58.0000	.0000	4.5000	30.0000	.1700	20.5000
225 225	121686.0000	730.0000	1.5000	21.0000	70.0000	.0000	4.0000	30.0000	.1600	20.6000
226 226	121786.0000	650.0000	1.5000	19.0000	86.0000	.0000	3.5000	30.1500	.1800	20.0000
227 227	121886.0000	1030.0000	1.0000	20.0000	62.0000	.0000	3.5000	29.9600	.1400	20.5000
228 228	121986.0000	705.0000	1.0000	22.0000	70.0000	.0000	3.0000	29.9000	.1600	20.7000
229 229	10287.0000	830.0000	.0000	35.0000	24.0000	.0000	2.0000	29.6500	.1200	20.6000
230 230	10587.0000	715.0000	.0000	28.0000	58.0000	.0000	.5000	29.6900	.1100	20.7000
231 231	10687.0000	835.0000	.0000	23.0000	98.0000	.0000	.0000	29.9000	.1200	20.7000
232 232	10787.0000	720.0000	.0000	20.0000	98.0000	.0000	1.5000	30.0000	.1300	20.6000
233 233	10887.0000	810.0000	.0000	20.0000	98.0000	.0000	2.0000	29.9300	.1300	20.7000
234 234	10987.0000	730.0000	.0000	16.0000	70.0000	.0000	2.0000	29.9000	.1400	20.7000
235 235	11287.0000	820.0000	.5000	27.0000	58.0000	.0000	1.5000	30.0900	.1100	20.7000
236 236	11387.0000	715.0000	.5000	27.0000	46.0000	.0000	.7500	29.8500	.1100	20.7000
237 237	11487.0000	750.0000	.5000	20.0000	70.0000	.0000	.0000	29.8900	.1300	20.7000
238 238	11587.0000	800.0000	.5000	12.0000	97.0000	.0000	10.0000	29.9400	.1100	20.8000
239 239	11687.0000	940.0000	.0000	4.0000	87.0000	.0000	7.0000	29.9400	.1000	20.8000
240 240	12087.0000	810.0000	.0000	6.0000	88.0000	.0000	6.0000	30.0400	.1200	20.8000
241 241	12187.0000	800.0000	.0000	14.0000	80.0000	.0000	8.0000	28.9000	.1400	20.7000
242 242	12287.0000	840.0000	.0000	17.0000	77.0000	.0000	7.5000	29.9000	.1000	20.8000
243 243	12387.0000	835.0000	.0000	22.0000	76.0000	.0000	6.7500	29.7000	.1200	20.8000
244 244	12687.0000	840.0000	.0000	33.0000	62.0000	.0000	4.0000	30.0500	.1500	20.8000
245 245	12787.0000	710.0000	.5000	34.0000	40.0000	.0000	1.5000	29.9600	.1200	20.8000
246 246	12887.0000	830.0000	.5000	30.0000	58.0000	.0000	.0000	29.6200	.1400	20.8000
247 247	12987.0000	715.0000	.5000	22.0000	45.0000	.0000	.0000	29.8900	.1500	20.9000
248 248	13087.0000	800.0000	1.0000	17.0000	70.0000	.0000	.0000	30.0500	.1200	20.9000
249 249	20287.0000	800.0000	2.0000	34.0000	40.0000	.0000	.0000	29.8500	.1100	21.1000
250 250	20387.0000	800.0000	2.0000	24.0000	67.0000	.0000	.0000	29.8500	.1200	21.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In barom	%CO2(p)	%O2(p)
251 251	20487.0000	700.0000	2.0000	22.0000	90.0000	.0000	.0000	29.9500	.1500	21.1000
252 252	20587.0000	810.0000	2.5000	18.0000	80.0000	.0000	1.0000	30.2200	.1400	21.0000
253 253	20687.0000	700.0000	2.0000	22.0000	62.0000	.0000	.2500	30.3700	.1400	21.1000
254 254	20987.0000	720.0000	2.0000	26.0000	60.0000	.0000	.0000	30.0000	.1300	21.1000
255 255	21087.0000	750.0000	2.5000	28.0000	61.0000	.0000	.0000	29.9000	.1100	21.1000
256 256	21187.0000	825.0000	3.0000	35.0000	68.0000	.0000	.0000	30.0400	.1400	21.1000
257 257	21287.0000	740.0000	4.0000	24.0000	84.0000	.0000	.0000	30.0700	.1400	21.1000
258 258	21387.0000	800.0000	3.5000	28.0000	70.0000	.0000	.0000	29.9000	.1300	21.1000
259 259	21887.0000	740.0000	2.5000	18.0000	78.0000	.4000	.0000	29.9000	.1300	21.1000
260 260	21987.0000	745.0000	2.0000	20.0000	98.0000	.0000	3.5000	29.9300	.1100	21.1000
261 261	22087.0000	810.0000	2.0000	18.0000	98.0000	.0000	6.0000	30.1000	.1400	21.1000
262 262	22387.0000	710.0000	2.0000	17.0000	70.0000	.2000	3.5000	29.6900	.1400	21.0000
263 263	22487.0000	820.0000	2.0000	16.0000	98.0000	.0000	3.5000	29.7900	.1200	20.8000
264 264	22587.0000	735.0000	2.0000	18.0000	98.0000	.0000	3.0000	29.7500	.0900	21.0000
265 265	22687.0000	700.0000	1.5000	17.0000	98.0000	.0000	3.5000	29.8200	.1200	20.9000
266 266	22787.0000	710.0000	1.0000	10.0000	94.0000	.0000	6.0000	29.7700	.1200	21.0000
267 267	30287.0000	650.0000	1.0000	23.0000	60.0000	.4000	3.5000	29.9200	.1100	21.0000
268 268	30387.0000	815.0000	1.0000	36.0000	40.0000	.0000	2.5000	30.1500	.1000	21.0000
269 269	30487.0000	730.0000	1.0000	27.0000	58.0000	.0000	1.5000	30.2000	.1200	21.0000
270 270	30587.0000	725.0000	1.5000	29.0000	55.0000	.0000	.0000	30.1300	.1000	21.0000
271 271	30687.0000	655.0000	2.0000	33.0000	44.0000	.0000	.0000	30.0000	.0800	21.0000
272 272	30987.0000	705.0000	3.0000	12.0000	97.0000	.3000	3.5000	29.9900	.1100	21.0000
273 273	31087.0000	800.0000	2.5000	18.0000	98.0000	.0000	2.5000	29.9900	.1000	21.0000
274 274	31387.0000	650.0000	2.5000	30.0000	54.0000	.0000	.0000	29.9000	.0900	21.0000
275 275	31687.0000	705.0000	4.0000	25.0000	98.0000	.1500	1.5000	29.5800	.1000	21.0000
276 276	31787.0000	645.0000	3.0000	22.0000	98.0000	1.0000	.5000	29.7000	.0900	20.9000
277 277	31887.0000	700.0000	2.5000	23.0000	98.0000	.0000	.0000	29.6000	.1100	20.8000
278 278	31987.0000	645.0000	3.0000	27.0000	63.0000	.0000	.0000	29.5100	.1000	20.9000
279 279	32087.0000	630.0000	3.0000	31.0000	95.0000	.0000	.0000	29.4800	.1000	20.8000
280 280	41387.0000	650.0000	4.0000	36.0000	31.0000	.0000	3.0000	30.0300	.1000	20.9000
281 281	41487.0000	850.0000	3.0000	45.0000	40.0000	.0000	.0000	30.0500	.1200	20.9000
282 282	41587.0000	810.0000	4.0000	68.0000	28.0000	.0000	.0000	29.9900	.1200	20.9000
283 283	41687.0000	720.0000	6.0000	45.0000	47.0000	.0000	.0000	30.0000	.1300	20.8000
284 284	41787.0000	835.0000	7.0000	72.0000	27.0000	.0000	.0000	29.8800	.1400	20.9000
285 285	42087.0000	700.0000	8.5000	27.0000	98.0000	.2000	1.5000	30.1400	.1300	20.9000
286 286	42187.0000	720.0000	5.5000	23.0000	86.0000	.2000	.0000	30.3000	.1100	20.9000
287 287	42287.0000	550.0000	5.5000	30.0000	67.0000	.0000	.0000	30.0400	.1000	20.9000
288 288	42387.0000	635.0000	6.5000	37.0000	68.0000	.0000	.0000	30.0000	.1100	20.9000
289 289	42487.0000	550.0000	8.0000	41.0000	50.0000	.0000	.0000	29.9600	.1400	20.9000
290 290	42787.0000	540.0000	11.0000	42.0000	88.0000	.0000	.0000	30.2800	.1400	20.8000
291 291	42887.0000	625.0000	11.0000	40.0000	82.0000	.0000	.0000	30.1100	.1300	20.7000
292 292	42987.0000	620.0000	11.5000	45.0000	60.0000	.0000	.0000	30.0000	.1600	20.8000
293 293	43087.0000	630.0000	12.0000	42.0000	69.0000	.0000	.0000	29.9200	.1500	20.8000
294 294	50187.0000	535.0000	12.0000	42.0000	72.0000	.0000	.0000	29.8000	.1400	20.6000
295 295	50487.0000	720.0000	9.0000	31.0000	98.0000	1.3500	.0000	30.1500	.1700	20.8000
296 296	50587.0000	545.0000	9.0000	38.0000	98.0000	.0000	.0000	30.1300	.1800	20.9000
297 297	50687.0000	600.0000	10.0000	40.0000	84.0000	.0000	.0000	30.2600	.1200	20.7000
298 298	50787.0000	550.0000	10.0000	38.0000	62.0000	.1000	.0000	30.2100	.1200	20.7000
299 299	51587.0000	1230.0000	14.0000	67.0000	50.0000	.0000	.0000	29.9800	.2000	20.5000
300 300	51887.0000	700.0000	14.0000	43.0000	98.0000	.0500	.0000	29.8800	.1800	20.6000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	Date	Time	Soil C	Air F	% humid	In rain	In snow	In barom	%CO2(p)	%O2(p)
301	301	51987.0000	545.0000	14.0000	42.0000	79.0000	.0000	.0000	29.8200	.2100	20.6000
302	302	52087.0000	545.0000	13.5000	42.0000	98.0000	.3000	.0000	29.7100	.2400	20.5000
303	303	52187.0000	600.0000	13.0000	35.0000	98.0000	1.2000	.0000	29.9200	.2500	20.2000
304	304	52287.0000	550.0000	11.5000	34.0000	98.0000	.5000	.0000	30.0500	.1900	20.2000
305	305	2687.0000	715.0000	12.0000	47.0000	65.0000	.2000	.0000	29.6500	.2200	20.3000
306	306	52787.0000	545.0000	12.0000	34.0000	78.0000	.0000	.0000	29.7000	.2100	20.3000
307	307	52887.0000	710.0000	12.0000	44.0000	64.0000	.0000	.0000	29.8000	.2400	20.3000
308	308	52987.0000	650.0000	12.5000	43.0000	84.0000	.0000	.0000	29.9200	.2400	20.4000
309	309	60187.0000	540.0000	14.0000	47.0000	57.0000	.0000	.0000	29.8700	.2300	20.5000
310	310	60287.0000	545.0000	14.5000	42.0000	70.0000	.0000	.0000	30.0200	.2800	20.5000
311	311	60387.0000	615.0000	14.5000	43.0000	60.0000	.0000	.0000	30.2900	.2600	20.6000
312	312	60487.0000	545.0000	14.5000	41.0000	85.0000	.0000	.0000	30.2000	.3000	20.4000
313	313	60587.0000	540.0000	15.5000	53.0000	50.0000	.0000	.0000	30.0800	.0000B	.0000B

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
1	1	-508.0000	.0000B	.0000B	.0000B
2	2	-400.0000	.0000B	.0000B	.0000B
3	3	-292.0000	.0000B	.0000B	.0000B
4	4	-427.0000	.2100	18.0000	-481.0000
5	5	-346.0000	.2000	18.1400	-454.0000
6	6	148.0000	.2000	18.3900	-92.0000
7	7	148.0000	.2000	18.1500	108.0000
8	8	-12.0000	.2000	18.1600	-12.0000
9	9	302.0000	.2100	18.2000	442.0000
10	10	442.0000	.2000	18.7100	534.0000
11	11	534.0000	.2000	17.8400	348.0000
12	12	442.0000	.2100	18.4800	178.0000
13	13	28.0000	.2000	18.2200	28.0000
14	14	28.0000	.2200	18.8500	28.0000
15	15	78.0000	.2200	18.7000	-72.0000
16	16	-22.0000	.2200	19.1600	35.0000
17	17	136.0000	.2200	19.0000	102.0000
18	18	169.0000	.2400	18.8500	35.0000
19	19	270.0000	.2200	18.8800	26.0000
20	20	90.0000	.2200	18.8800	154.0000
21	21	90.0000	.2000	18.8500	806.0000
22	22	538.0000	.2100	18.7700	638.0000
23	23	672.0000	.2100	18.5200	504.0000
24	24	604.0000	.2200	18.1700	470.0000
25	25	338.0000	.2400	18.6800	128.0000
26	26	398.0000	.2200	18.7700	338.0000
27	27	358.0000	.2500	18.6700	248.0000
28	28	188.0000	.2200	18.5300	68.0000
29	29	188.0000	.2300	18.2600	188.0000
30	30	98.0000	.2200	19.9000	128.0000
31	31	466.0000	.2200	19.6800	466.0000
32	32	428.0000	.2200	19.8200	353.0000
33	33	316.0000	.2400	19.7300	240.0000
34	34	316.0000	.2300	19.8400	368.0000
35	35	474.0000	.2400	19.7200	226.0000
36	36	261.0000	.2600	19.7100	368.0000
37	37	616.0000	.2200	19.8300	154.0000
38	38	190.0000	.2200	19.8300	428.0000
39	39	706.0000	.2000	20.0400	68.0000
40	40	428.0000	.2200	19.6400	348.0000
41	41	428.0000	.2200	19.6700	188.0000
42	42	468.0000	.2500	20.4000	348.0000
43	43	388.0000	.2300	19.8200	348.0000
44	44	388.0000	.2400	20.3000	348.0000
45	45	388.0000	.2300	19.8600	434.0000
46	46	391.0000	.2300	20.3400	305.0000
47	47	477.0000	.2200	20.3300	305.0000
48	48	348.0000	.2200	20.3900	434.0000
49	49	390.0000	.2400	20.3200	52.0000
50	50	278.0000	.2400	20.7100	128.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
51	51	240.0000	.2200	20.9400	166.0000
52	52	203.0000	.2200	20.8800	16.0000
53	53	391.0000	.2200	20.8400	176.0000
54	54	477.0000	.2200	20.9000	434.0000
55	55	391.0000	.2200	21.1200	176.0000
56	56	262.0000	.2200	20.8800	305.0000
57	57	391.0000	.2300	20.7400	133.0000
58	58	391.0000	.2300	20.1500	262.0000
59	59	477.0000	.2200	20.9100	262.0000
60	60	348.0000	.2200	20.8900	262.0000
61	61	133.0000	.2200	20.7700	262.0000
62	62	305.0000	.2200	20.1200	219.0000
63	63	262.0000	.2200	20.7900	262.0000
64	64	391.0000	.2300	20.8900	348.0000
65	65	165.0000	.2200	20.8800	278.0000
66	66	278.0000	.2200	20.7400	240.0000
67	67	353.0000	.2200	20.7000	278.0000
68	68	278.0000	.2200	20.8900	128.0000
69	69	353.0000	.2000	20.7900	315.0000
70	70	240.0000	.2100	20.8400	203.0000
71	71	315.0000	.2100	20.8400	203.0000
72	72	278.0000	.2100	20.8900	166.0000
73	73	353.0000	.2200	20.9400	203.0000
74	74	503.0000	.2200	21.0100	128.0000
75	75	203.0000	.2400	21.0000	128.0000
76	76	190.0000	.2000	21.3600	261.0000
77	77	225.0000	.2100	21.0900	119.0000
78	78	438.0000	.2100	21.4500	616.0000
79	79	793.0000	.2200	21.1800	474.0000
80	80	3075.0000	.3100	20.0800	2960.0000
81	81	3305.0000	.2000	20.6400	2845.0000
82	82	16.0000	.2600	19.9600	-291.0000
83	83	-138.0000	.2600	20.2400	-407.0000
84	84	-368.0000	.2400	20.3200	-215.0000
85	85	-253.0000	.2400	20.0700	-253.0000
86	86	-291.0000	.1500	21.0000	-291.0000
87	87	-368.0000	.1800	20.9000	-328.0000
88	88	-330.0000	.1500	21.0000	-177.0000
89	89	-138.0000	.0900	21.0000	-291.0000
90	90	-292.0000	.1800	21.0000	-215.0000
91	91	-292.0000	.1800	20.9000	-291.0000
92	92	-215.0000	.1600	21.2000	-253.0000
93	93	-138.0000	.1900	21.1000	-291.0000
94	94	-291.0000	.1800	21.1000	-291.0000
95	95	-138.0000	.1400	21.2000	-138.0000
96	96	-215.0000	.2400	21.1000	-368.0000
97	97	-138.0000	.2400	21.1000	-215.0000
98	98	-138.0000	.1700	21.1000	-215.0000
99	99	-138.0000	.2100	21.1000	-368.0000
100	100	-368.0000	.2000	21.1000	-138.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
101	101	-138.0000	.1500	21.2000	-215.0000
102	102	15.0000	.1800	21.2000	-61.0000
103	103	-138.0000	.1800	21.2000	-61.0000
104	104	-61.0000	.1200	21.3000	15.0000
105	105	92.0000	.2100	21.1000	-215.0000
106	106	-138.0000	.1700	21.3000	15.0000
107	107	-61.0000	.1800	21.2000	-61.0000
108	108	15.0000	.1800	21.4000	92.0000
109	109	15.0000	.1900	21.3000	-138.0000
110	110	169.0000	.1900	21.2000	-61.0000
111	111	-368.0000	.1700	21.3000	-61.0000
112	112	-215.0000	.2400	21.3000	-291.0000
113	113	169.0000	.0000	21.1000	-138.0000
114	114	169.0000	.2000	21.0000	-138.0000
115	115	92.0000	.2200	21.0000	-368.0000
116	116	15.0000	.3500	20.9000	15.0000
117	117	-518.0000	.1500	20.1000	-598.0000
118	118	-518.0000	.2000	21.1000	-518.0000
119	119	-518.0000	.2100	21.1000	-751.0000
120	120	-598.0000	.1900	21.2000	-598.0000
121	121	-675.0000	.2600	21.0000	-675.0000
122	122	-598.0000	.3100	21.0000	-598.0000
123	123	-598.0000	.2300	21.1000	-598.0000
124	124	-598.0000	.2700	21.0000	-675.0000
125	125	-598.0000	.2200	21.0000	-598.0000
126	126	-518.0000	.3100	21.0000	-675.0000
127	127	-658.0000	.2700	21.0000	-748.0000
128	128	-523.0000	.2300	21.1000	-658.0000
129	129	-658.0000	.2000	21.1000	-523.0000
130	130	-433.0000	.2300	21.1000	-478.0000
131	131	-523.0000	.2900	20.7000	-568.0000
132	132	-478.0000	.2800	20.7000	-793.0000
133	133	-478.0000	.2000	21.0000	-568.0000
134	134	-568.0000	.2300	20.8000	-613.0000
135	135	-478.0000	.2100	21.1000	-703.0000
136	136	-568.0000	.2100	21.0000	-433.0000
137	137	-568.0000	.1400	20.6000	-433.0000
138	138	-478.0000	.1000	20.6000	-568.0000
139	139	-478.0000	.1600	20.6000	-478.0000
140	140	-478.0000	.1100	20.7000	-433.0000
141	141	-433.0000	.1600	20.6600	-658.0000
142	142	-478.0000	.2000	20.6300	-568.0000
143	143	-228.0000	.0500	22.1000	-334.0000
144	144	-228.0000	.1100	21.6400	-387.0000
145	145	-1129.0000	.1300	21.3800	-387.0000
146	146	-334.0000	.0700	21.2800	-334.0000
147	147	-387.0000	.0900	21.4700	-281.0000
148	148	-281.0000	.1700	21.5000	-334.0000
149	149	-387.0000	.0900	21.6500	-387.0000
150	150	-334.0000	.1100	22.3400	-387.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
151	151	-334.0000	.1200	22.2100	-387.0000
152	152	-334.0000	.1300	21.5600	-281.0000
153	153	-313.0000	.0900	22.2300	-313.0000
154	154	-248.0000	.0800	21.6800	-378.0000
155	155	-183.0000	.1100	22.0200	-313.0000
156	156	-248.0000	.1200	21.3900	-248.0000
157	157	-433.0000	.1100	21.4200	-262.0000
158	158	-376.0000	.1200	22.0000	-433.0000
159	159	-262.0000	.1100	21.5300	-319.0000
160	160	-376.0000	.1000	21.7000	-376.0000
161	161	-262.0000	.1500	21.5700	-376.0000
162	162	-376.0000	.1500	21.8300	-433.0000
163	163	-181.0000	.1000	21.7900	172.0000
164	164	-231.0000	.0900	21.3300	-483.0000
165	165	-130.0000	.1200	22.1700	-80.0000
166	166	-30.0000	.0900	21.5000	-30.0000
167	167	71.0000	.1100	21.5300	-30.0000
168	168	-181.0000	.0900	21.9000	-181.0000
169	169	121.0000	.0800	21.6500	-30.0000
170	170	21.0000	.1000	21.6200	373.0000
171	171	222.0000	.1000	22.7700	121.0000
172	172	-80.0000	.0700	21.6400	-181.0000
173	173	222.0000	.0800	21.5400	-80.0000
174	174	172.0000	.1000	22.1700	-30.0000
175	175	71.0000	.0800	21.6200	-181.0000
176	176	71.0000	.0900	21.7200	-80.0000
177	177	71.0000	.0700	21.6300	21.0000
178	178	-30.0000	.1100	21.7500	373.0000
179	179	-30.0000	.0700	21.7600	-80.0000
180	180	21.0000	.1100	21.5300	-80.0000
181	181	121.0000	.0900	20.8400	-30.0000
182	182	21.0000	.0800	20.7500	-130.0000
183	183	-262.0000	.0000B	.0000B	-262.0000
184	184	-224.0000	.0900	20.7000	-680.0000
185	185	-376.0000	.0800	20.8700	-338.0000
186	186	-224.0000	.0600	20.9800	-376.0000
187	187	-338.0000	.0900	20.8900	-262.0000
188	188	-300.0000	.1000	20.9500	-376.0000
189	189	-186.0000	.0800	20.9700	-224.0000
190	190	-376.0000	.0900	20.7200	-376.0000
191	191	-224.0000	.0500	21.0100	-376.0000
192	192	-338.0000	.0900	20.9900	-300.0000
193	193	-256.0000	.0500	21.0600	-127.0000
194	194	-170.0000	.0800	21.0800	-385.0000
195	195	-170.0000	.0600	21.0300	-213.0000
196	196	-84.0000	.0800	21.1300	-41.0000
197	197	-84.0000	.0600	21.1800	-170.0000
198	198	-170.0000	.0700	21.1700	-127.0000
199	199	2.0000	.0900	21.0000	-84.0000
200	200	-118.0000	.0700	20.9000	-208.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
201	201	-433.0000	.0800	20.9600	-433.0000
202	202	-163.0000	.0400	20.9900	-163.0000
203	203	-208.0000	.1000	21.1500	-253.0000
204	204	-163.0000	.0900	21.1600	-73.0000
205	205	-118.0000	.0800	21.1600	-118.0000
206	206	-253.0000	.0600	21.1900	-253.0000
207	207	-208.0000	.0700	21.1800	-253.0000
208	208	-208.0000	.1100	20.9000	-118.0000
209	209	-163.0000	.0900	20.8000	-163.0000
210	210	77.0000	.1000	20.5000	77.0000
211	211	441.0000	.1000	21.1000	714.0000
212	212	714.0000	.1100	20.7000	714.0000
213	213	532.0000	.1200	20.7000	350.0000
214	214	532.0000	.1200	20.9000	532.0000
215	215	168.0000	.1100	20.7000	714.0000
216	216	1078.0000	.1100	20.8000	623.0000
217	217	532.0000	.1300	21.1000	259.0000
218	218	350.0000	.1300	20.9000	623.0000
219	219	-14.0000	.1200	20.7000	441.0000
220	220	259.0000	.1300	20.6000	441.0000
221	221	441.0000	.1100	20.8000	441.0000
222	222	168.0000	.1300	21.1000	441.0000
223	223	259.0000	.1000	20.9000	168.0000
224	224	259.0000	.1400	20.9000	77.0000
225	225	441.0000	.1000	21.3000	441.0000
226	226	623.0000	.1000	20.4000	441.0000
227	227	441.0000	.1000	20.5000	441.0000
228	228	441.0000	.1000	20.5000	896.0000
229	229	-232.0000	.0750	20.8000	-88.0000
230	230	-184.0000	.0500	20.7000	-280.0000
231	231	-328.0000	.0700	20.8000	-376.0000
232	232	-40.0000	.0700	20.7000	-136.0000
233	233	-280.0000	.0700	20.7000	-88.0000
234	234	-232.0000	.0800	20.7000	-184.0000
235	235	8.0000	.0500	20.7000	-184.0000
236	236	-40.0000	.0650	20.7000	104.0000
237	237	-280.0000	.0600	20.8000	8.0000
238	238	-40.0000	.0500	20.8000	-184.0000
239	239	-136.0000	.1100	20.7000	-280.0000
240	240	104.0000	.0500	20.8000	8.0000
241	241	56.0000	.0700	20.8000	-88.0000
242	242	-328.0000	.0850	20.8000	-328.0000
243	243	-40.0000	.0600	20.8000	-88.0000
244	244	-280.0000	.0600	20.9000	-136.0000
245	245	8.0000	.0550	20.9000	8.0000
246	246	-136.0000	.0600	20.9000	-232.0000
247	247	104.0000	.0800	20.9000	8.0000
248	248	-40.0000	.0700	21.0000	104.0000
249	249	-40.0000	.1000	21.1000	56.0000
250	250	-40.0000	.0800	21.1000	-184.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
251	251	524.0000	.0700	21.1000	600.0000
252	252	486.0000	.0400	21.2000	713.0000
253	253	675.0000	.0600	21.2000	600.0000
254	254	675.0000	.0600	21.2000	675.0000
255	255	-80.0000	.0600	21.2000	-80.0000
256	256	-344.0000	.0800	21.2000	2223.0000
257	257	-155.0000	.0800	21.2000	-382.0000
258	258	-188.0000	.0800	21.1000	-80.0000
259	259	-155.0000	.0600	21.2000	-306.0000
260	260	.0000	.0800	21.2000	-155.0000
261	261	-306.0000	.0500	21.1000	-155.0000
262	262	-155.0000	.1000	21.1000	-155.0000
263	263	-193.0000	.1000	20.8000	-420.0000
264	264	-80.0000	.0700	21.0000	-80.0000
265	265	-193.0000	.0500	21.0000	-155.0000
266	266	-193.0000	.0700	21.0000	-193.0000
267	267	-193.0000	.0700	21.1000	-306.0000
268	268	-306.0000	.0600	21.1000	-155.0000
269	269	-382.0000	.0600	21.1000	-4.0000
270	270	-306.0000	.0500	20.9000	-231.0000
271	271	-118.0000	.0600	21.1000	-80.0000
272	272	-4.0000	.0600	21.0000	-155.0000
273	273	207.0000	.0600	21.1000	437.0000
274	274	667.0000	.0600	21.1000	322.0000
275	275	552.0000	.0500	21.0000	437.0000
276	276	207.0000	.0700	21.0000	380.0000
277	277	610.0000	.0700	21.0000	610.0000
278	278	380.0000	.0500	21.0000	552.0000
279	279	322.0000	.0700	21.0000	265.0000
280	280	169.0000	.0800	20.9000	-133.0000
281	281	-160.0000	.0000	21.0000	-301.0000
282	282	-19.0000	.0700	20.9000	-66.0000
283	283	-66.0000	.1000	20.9000	-113.0000
284	284	28.0000	.0800	21.0000	28.0000
285	285	122.0000	.0700	21.0000	28.0000
286	286	-66.0000	.0700	21.0000	28.0000
287	287	-19.0000	.0900	21.1000	122.0000
288	288	-113.0000	.0900	21.0000	-66.0000
289	289	-160.0000	.0700	21.1000	-66.0000
290	290	122.0000	.0900	21.0000	122.0000
291	291	357.0000	.0900	20.9000	122.0000
292	292	-19.0000	.1000	20.9000	263.0000
293	293	357.0000	.0900	21.0000	263.0000
294	294	-113.0000	.0900	20.9000	-207.0000
295	295	75.0000	.0500	21.0000	592.0000
296	296	310.0000	.1100	21.1000	545.0000
297	297	-442.0000	.0500	21.0000	-160.0000
298	298	-442.0000	.0600	20.9000	-160.0000
299	299	97.0000	.0800	21.0000	-146.0000
300	300	-97.0000	.0800	21.0000	-97.0000

Table 2: Meteorology Data and Results of Soil Gas Analyses

ROW	ID	ppbHe(p)	%CO2(h)	%O2(h)	ppbHe(h)
301	301	49.0000	.0800	21.0000	-81.0000
302	302	-16.0000	.0800	20.9000	-32.0000
303	303	146.0000	.0800	20.7000	.0000
304	304	-49.0000	.0700	20.7000	.0000
305	305	.0000	.1000	20.9000	-79.0000
306	306	-79.0000	.0900	20.9000	47.0000
307	307	-142.0000	.1000	21.0000	-79.0000
308	308	-32.0000	.0600	21.1000	.0000
309	309	63.0000	.0800	21.0000	79.0000
310	310	63.0000	.1000	21.1000	-16.0000
311	311	47.0000	.0800	21.0000	-79.0000
312	312	47.0000	.0900	21.0000	-79.0000
313	313	31.0000	.1100	21.2000	-63.0000