Some Observations on Geogas Survey in China

Wang Mingqi and Yang Zhongfang

China University of Geosciences,Beijing

2003

Since a special meaning for "geogas" was first given in Exploration Geochemistry by Kristiansson and Malmqvist in the early 1980s, geogas surveys have been tested in many parts of the world (Sweden, Russia, China etc.).

After the geogas survey was introduced in China during the early 1990s (Tong *et al.*,1991), a great attention has been paid to it in China.

Dreaming that the the geogas survey would solve some problems of geochemical exploration in overburdens, the Department of Science and Technology, the former Ministry of Geology and Mineral resources, the China Geological Survey and National Foundation of Nature Sciences(NFNS) have been strongly supporting the research in the field since 1990.

The experiments on the geogas survey in China were carried out both on a limited scale over known mineralizations (Tong Chunhan et al; Liu Yinhan et al; Wu Zonghua et al). and wide-spaced regional exploration in overburdens(Xie Xuejin and Wang Xueqiu). Because the Geogas testing easily won the support of sponsors, even three groups of researchers from different departments of IGGE were involved in this field.

Based on the sampling procedures, the geogas survey in China can be classified as:

(1)Passively accumulative sampling (buried in soil, mostly used by Tong et al.)

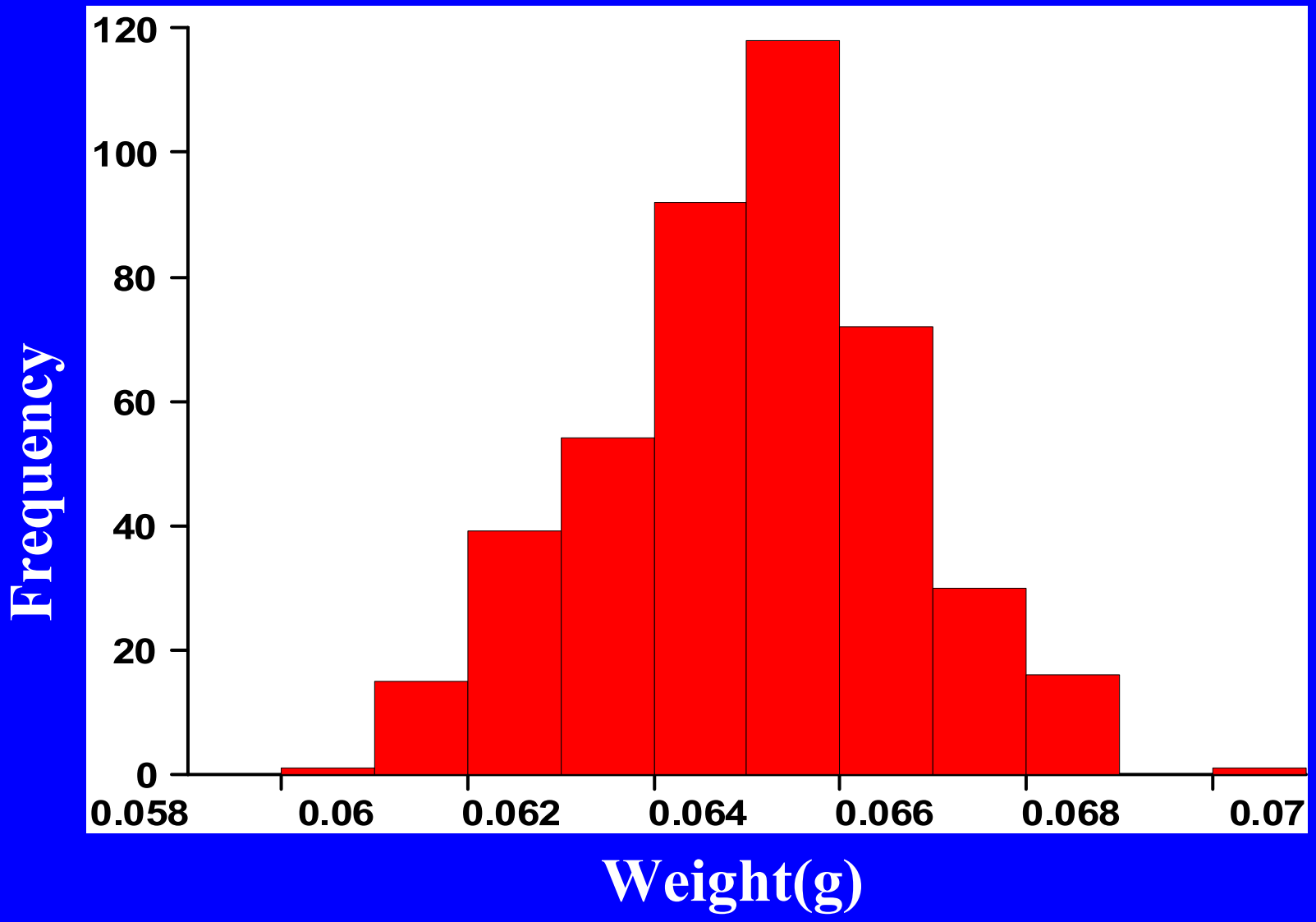
(2) Rapid collection (actively accumulative sampling-pumping, employed in IGGE)

However, no significant progress has been made both in understanding its mechanism and testing procedures over a dozen of years. The Questions still lie in how geogases form and what observations would be effective and reliable.

One of big problems is how to catch it effectively using a right medium without the knowledge of geogas forms. Solid catchers such as polystyrene, polyurethane foam and activated carbon was used before 1999.

The polyurethane foam with varied shapes and sizes was commonly used as a geogas catcher in China (Tong *et al.*; Xie and Wang *et al.*; Liu *et al.*; Wu *et al.*). However, there has been no serious discussion about the blank of the catchers in the publications related to geogas study.

In fact, the blank of polyurethane foam was controlled by many facts including its density, raw material background, the procedures to prepare and analyze it.



The weight distribution of a polyurethane foam column (1cm in diameter by 3 cm thick).

Sample No.	Weight(g)	Cu(ng)	Pb(ng)	Zn(ng)
PM65	0.063	169	107	430
PM66	0.063	156	129	230
PM67	0.063	412	96	300
PM68	0.065	181	193	500
PM69	0.065	156	154	270
PM70	0.065	178	143	279
PM71	0.066	94	143	220
PM72	0.066	138	243	400
PM73	0.066	156	157	230
PM74	0.066	213	121	330
PM75	0.066	172	133	280

The contents of Cu,Pb,Zn in foams determined by GFAAS after carbonization at 200℃ **and** ashing at 600℃ in crucible, and digestion in 1+1 aqua regia.

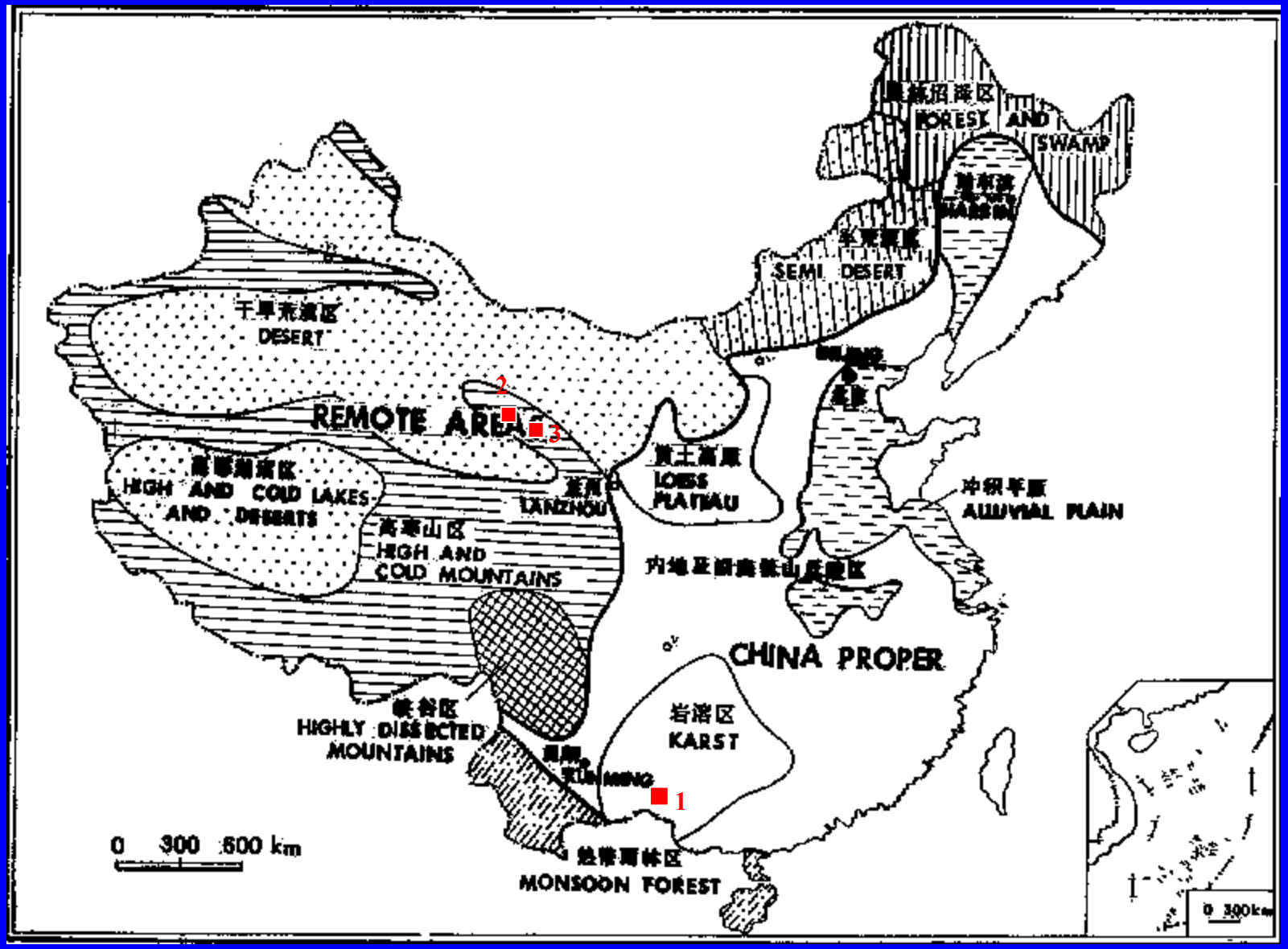
The average contents of some elements in the foam column determined by GFAAS in different time and batches.

Time	Load	Ni	Co	Cu	Mn	Ag	Zn	Pb	n
July, 1996	No	46	6.5	60	220	1.8	82	17.5	14
Sept., 1996	No	12	10	54	38	0.33	29	20	23
Sept., 1995	Ac	30	9.4	280	150	2.0	210	60	27

Based on Liu *et al.*,1997.

No-the specially treated foam columns without loads;

Ac-the foam columns with active carbon.



The locations of the related research areas

The blank contents of elements in the specially treated foam columns analyzed by INAA in 1996(ppb)

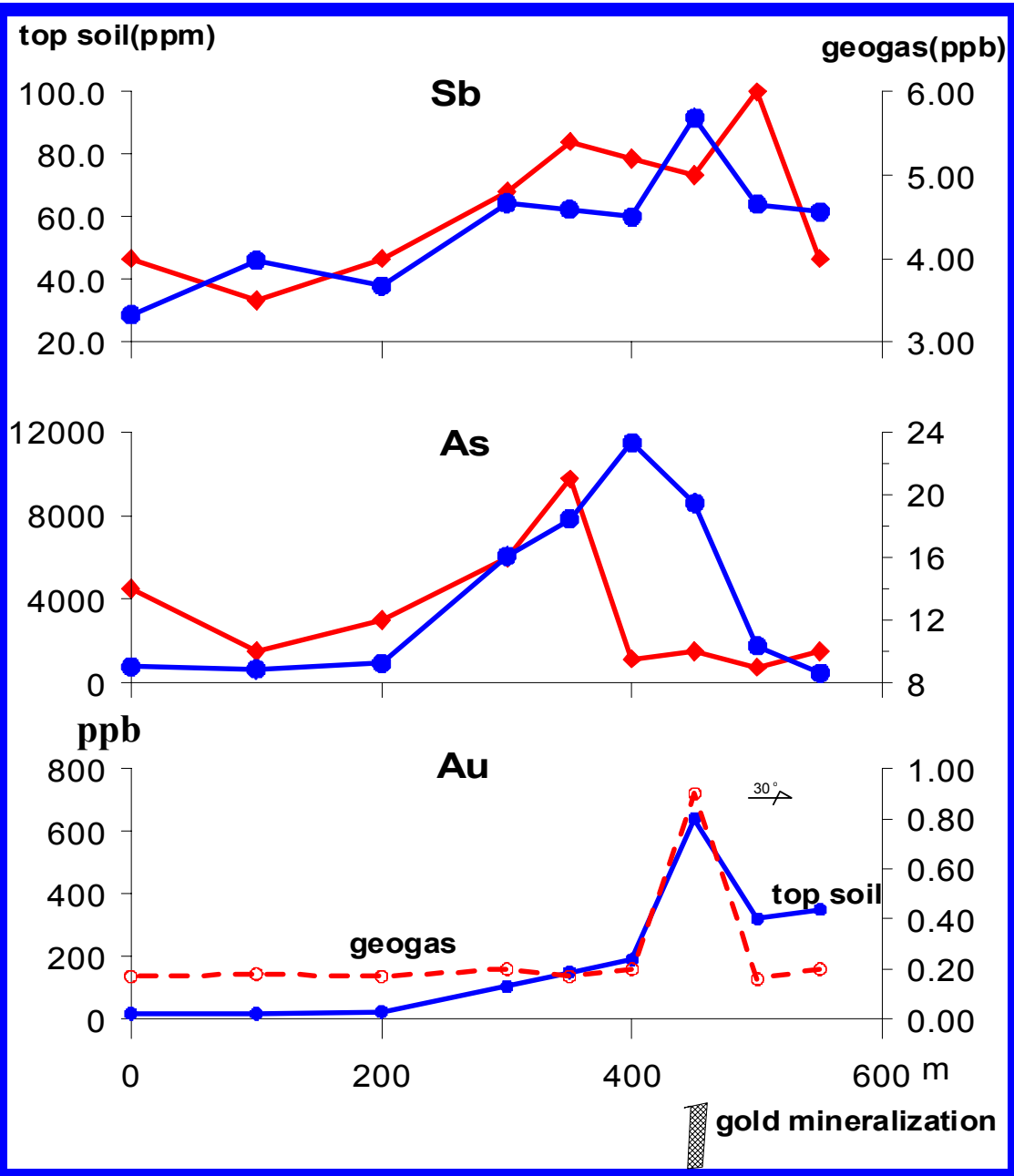
Samp. No.	Pm1	Pm2	Pm3	Pm4
Weight(g)	0.852	0.086	0.0864	0.0836
As	5.56	5.79	4.5	4.86
Au	0.11	0.115	0.135	0.126
Ba	81.4	77	118	94.7
Br	296	292	271	268
Ce	8.7	11.4	10.5	9.92
Co	1.78	2.07	2	1.96
Cr	45.4	124	95	75.4
Fe	1140	1350	1410	1160

The blank contents of elements in the specially treated foam columns analyzed by INAA in 1996(ppb)

No.	Pm1	Pm2	Pm3	Pm4
Weight(g)	0.852	0.086	0.0864	0.0836
Hg	9.54	11.7	8.51	6.89
La	5.18	8.11	6.12	5.91
Na	1820	2020	1850	1900
Sb	2.43	2.67	2.26	2.42
Sm	0.474	0.708	0.703	0.757
Sn	20100	29100	20600	22500
Sc	0.197	0.277	0.232	0.199
Th	1.5	2.23	1.81	1.74
Zn	38.7	60.5	42	39.2

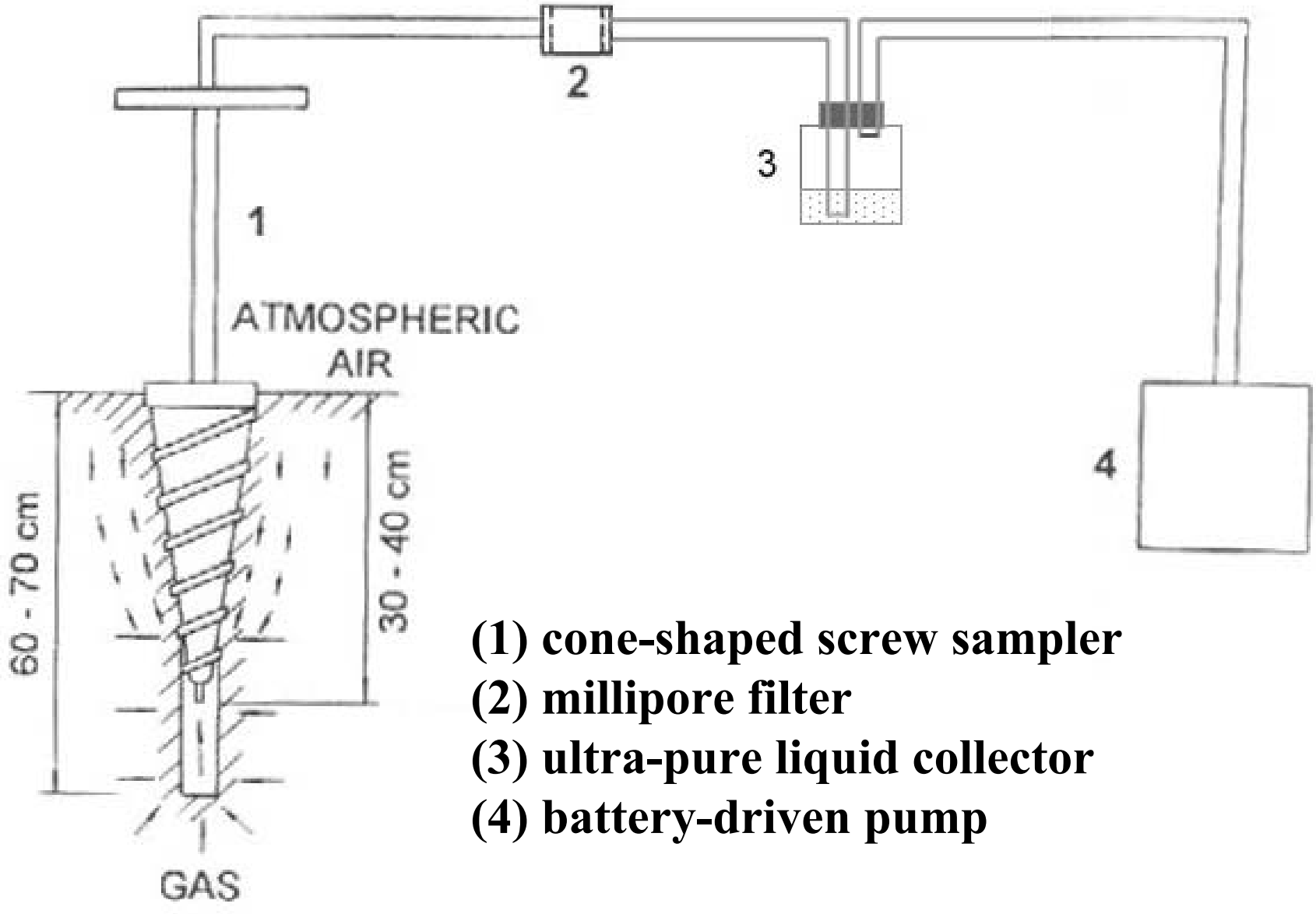
The range of element contents in the blank and loaded foam column in a disseminated gold mineralizations, Yunnan (ppb)

Sam. No.	Pm1	Pm2	Pm3	Pm4	Loaded sample
weight	0.852	0.086	0.0864	0.0836	0.0823-0.0885
As	5.56	5.79	4.5	4.86	8.23-26.1
Au	0.11	0.115	0.135	0.126	0.0765-0.811
Br	296	292	271	268	128-339
Co	1.78	2.07	2	1.96	1.37-2.53
Cr	45.4	124	95	75.4	10.6-80.2
Fe	1140	1350	1410	1160	1.15-7.51
Hg	9.54	11.7	8.51	6.89	15.1-25.7
Sb	2.43	2.67	2.26	2.42	3.98-22.8
Th	1.5	2.23	1.81	1.74	1.43-3.1
Zn	38.7	60.5	42	39.2	38-195

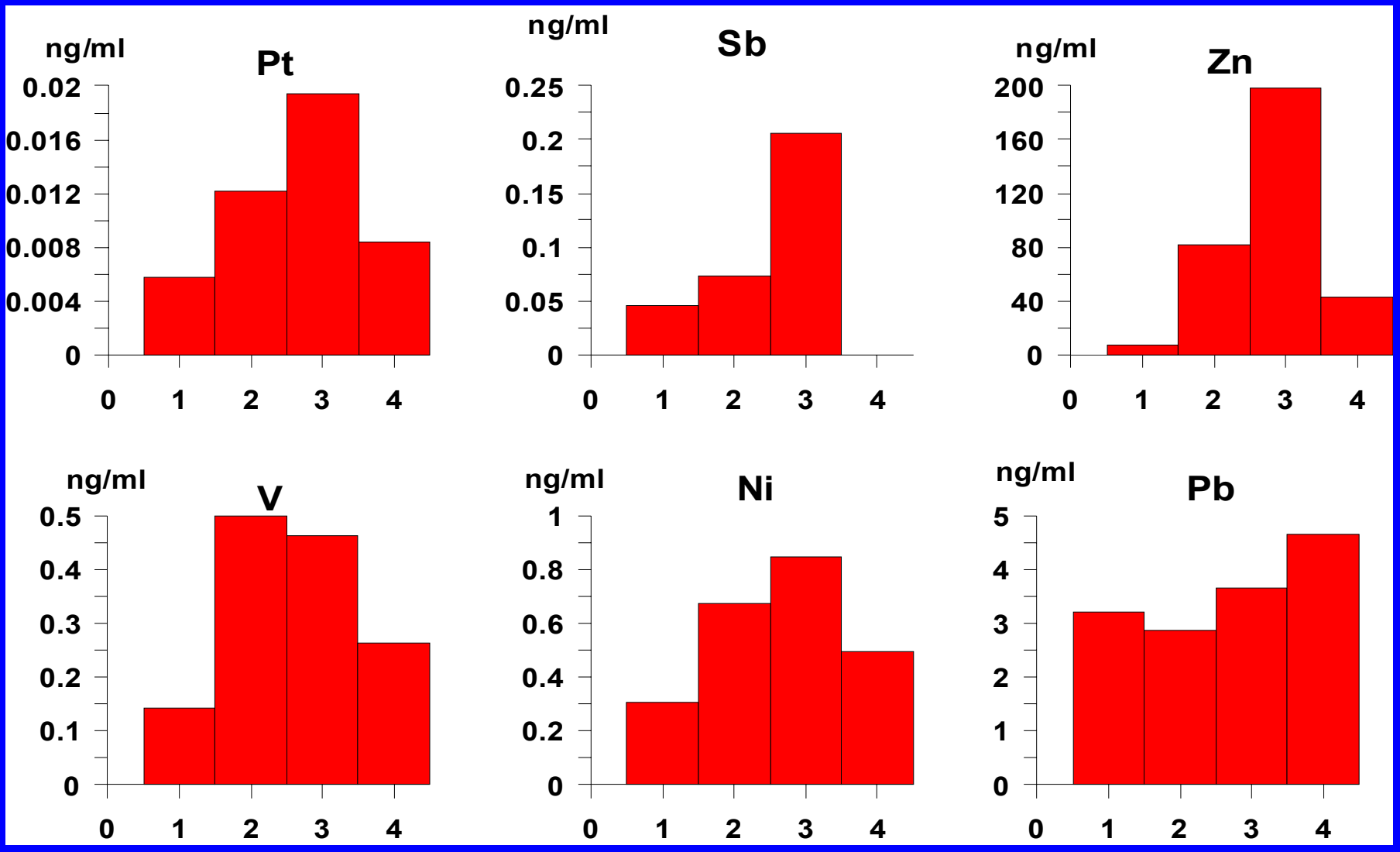


The distribution of Au,As,Sb in geogas from a Karlin-type gold mineralization, Yunnan (9 litres of gas from three holes)

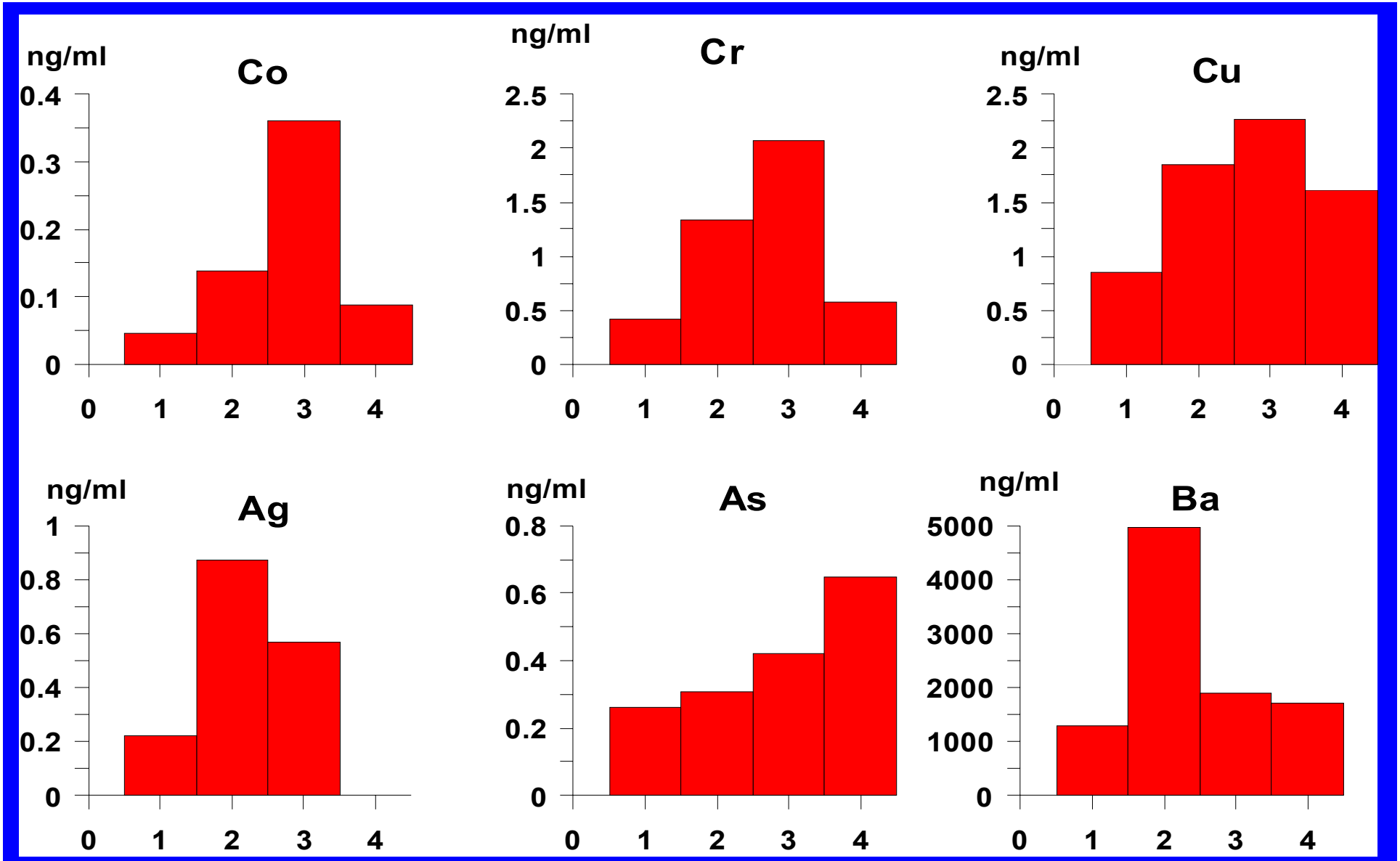
To test the effects of a liquid catcher, ultra-pure water with a low concentration of ultra-purified HNO_3 was used as a geogas catcher and ICP/MS was employed as an analytical method in different deposits.



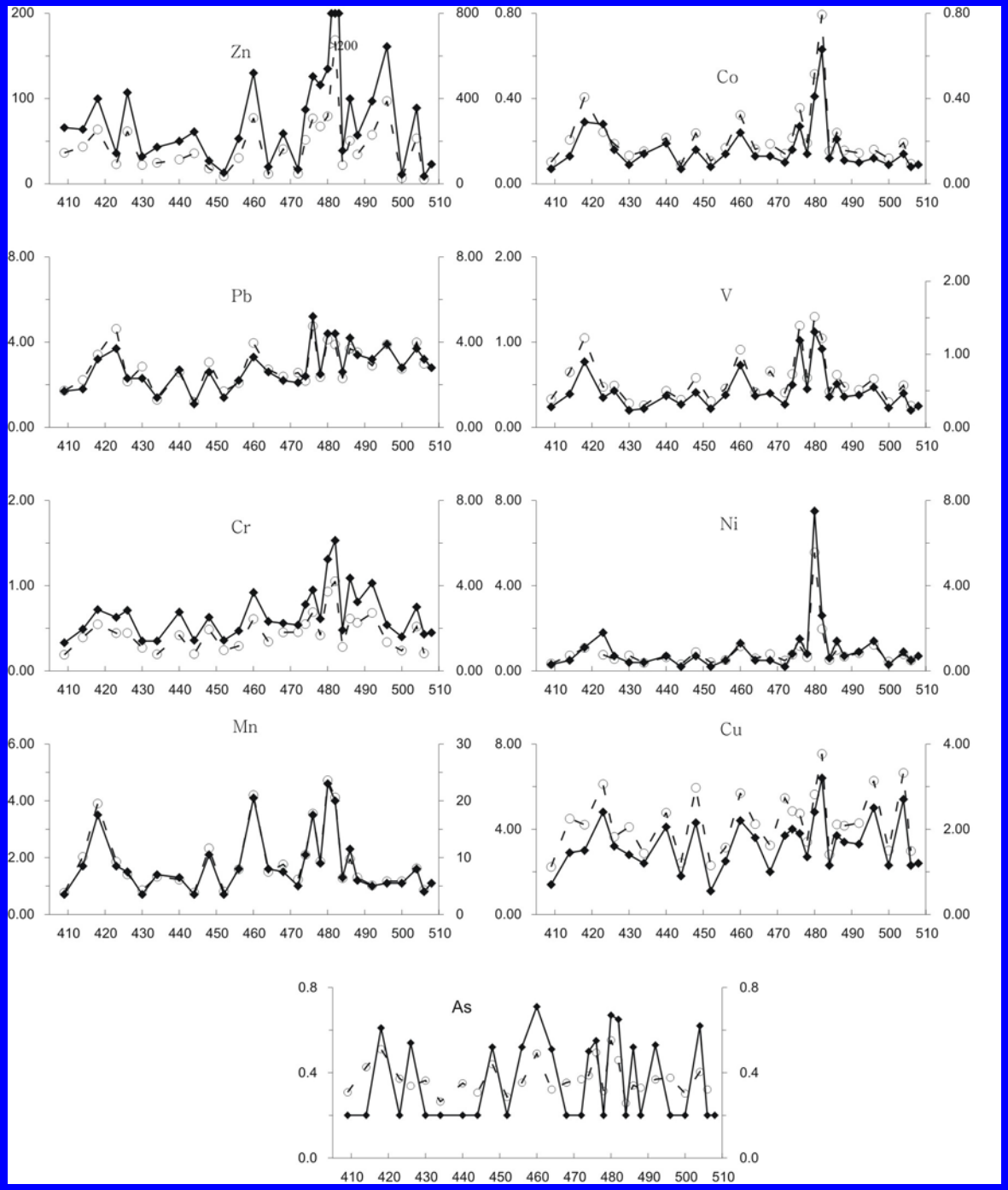
Schematic diagram of the geogas sampling device



The content of blank and loaded samples in liquid catcher. (1) blank;(2) 9 liters of gas through 10ml liquid from 3 holes (3L/hole) on VMS covered by overburden; (3) 18 liters of gas from 6 holes on VMS; (4) 9 liters of gas from 3 holes on quartz-gold mineralization



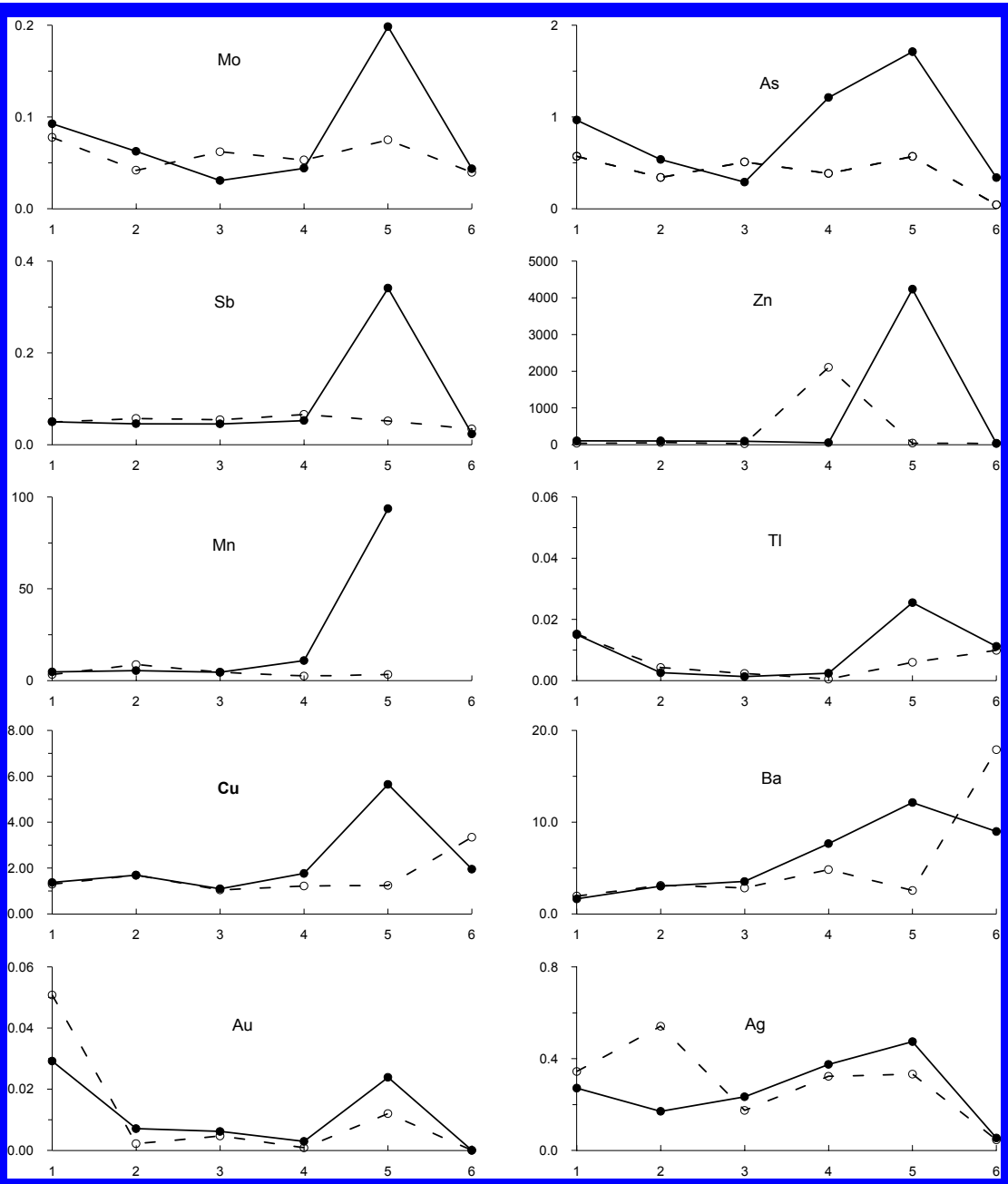
The content of blank and loaded samples in liquid catcher. (1) blank;(2) 9 liters of gas through 10ml liquid from 3 holes (3L/hole) on VMS covered by overburden; (3) 18 liters of gas from 6 holes on VMS; (4) 9 liters of gas from 3 holes on quartz-gold mineralization



The analytical results by ICP/MS from different Labs.

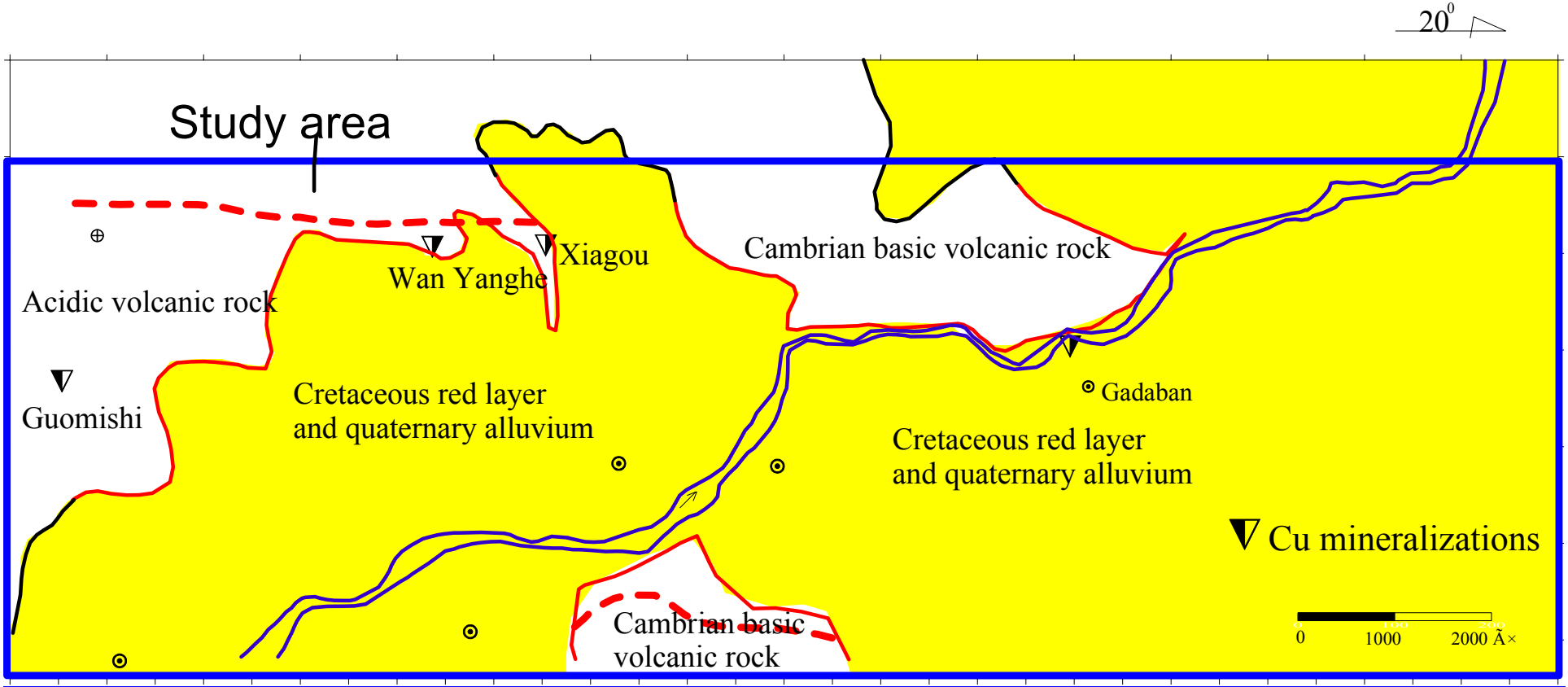
Dash-China University of Geosciences, Wuhan

Solid Line-National Center of Geological Analysis.

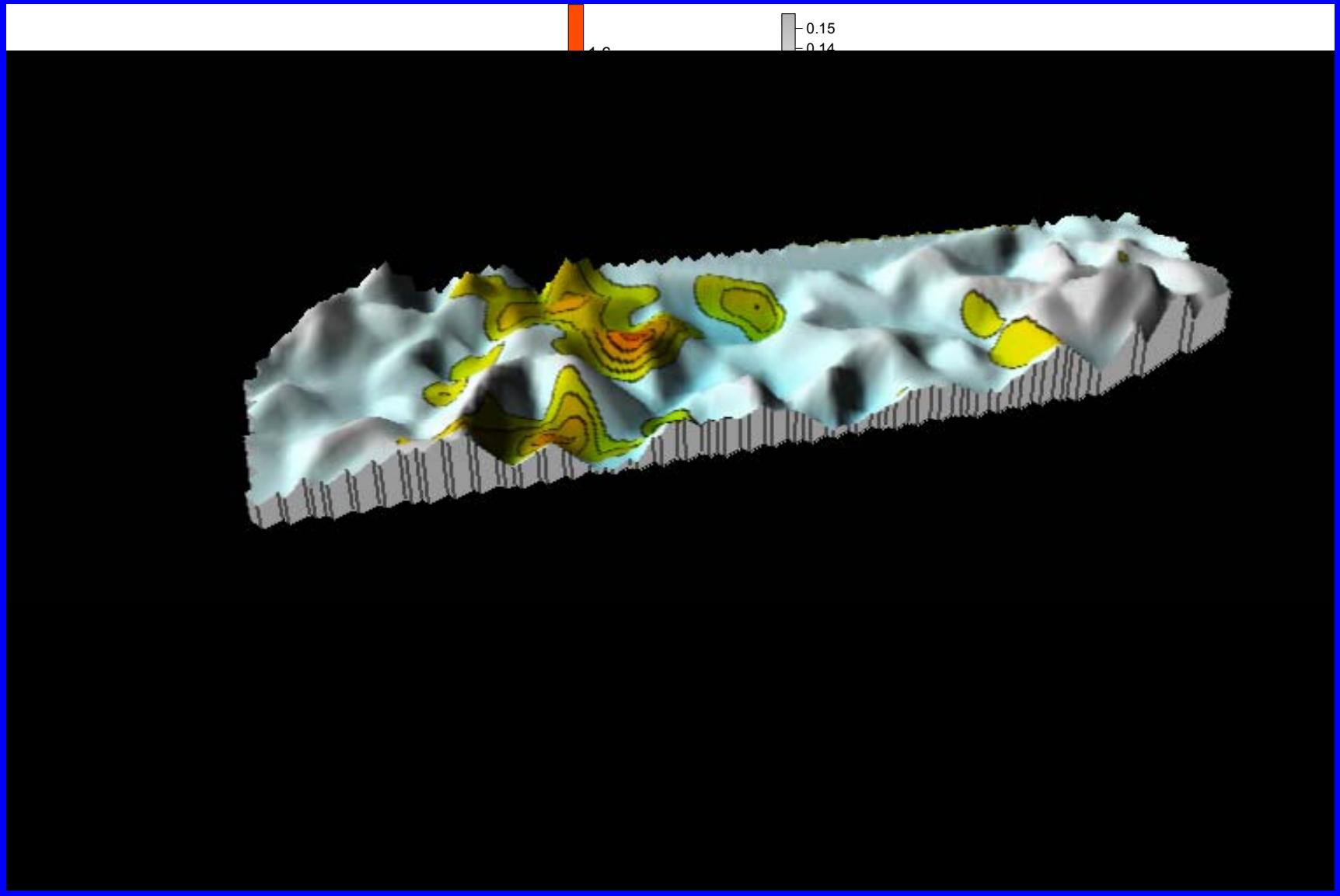


Reproduction in duplicate of geogas survey

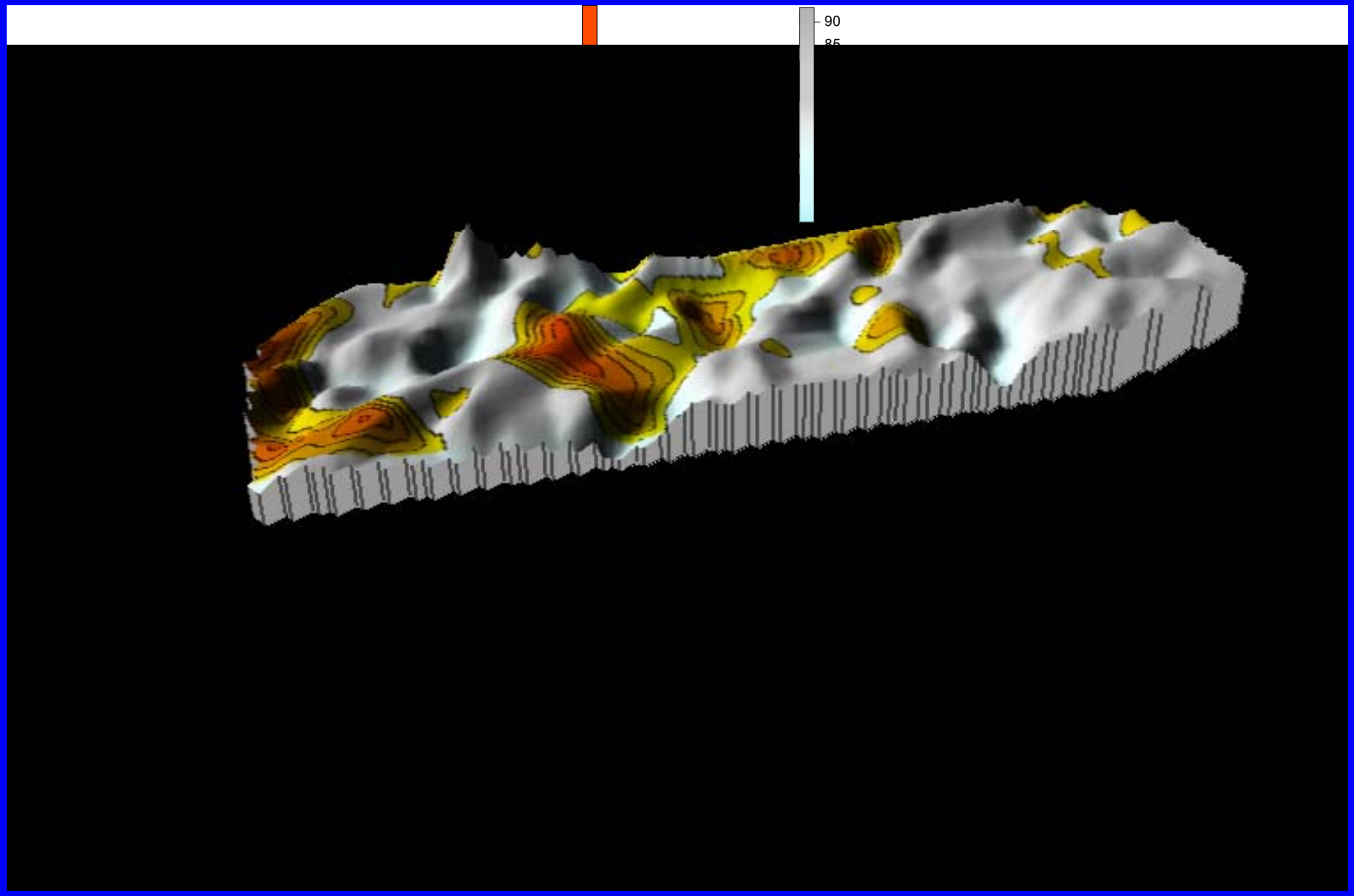
Gadaban test area for exploring Massive sulphide deposits, Qilian County, Qinghai.



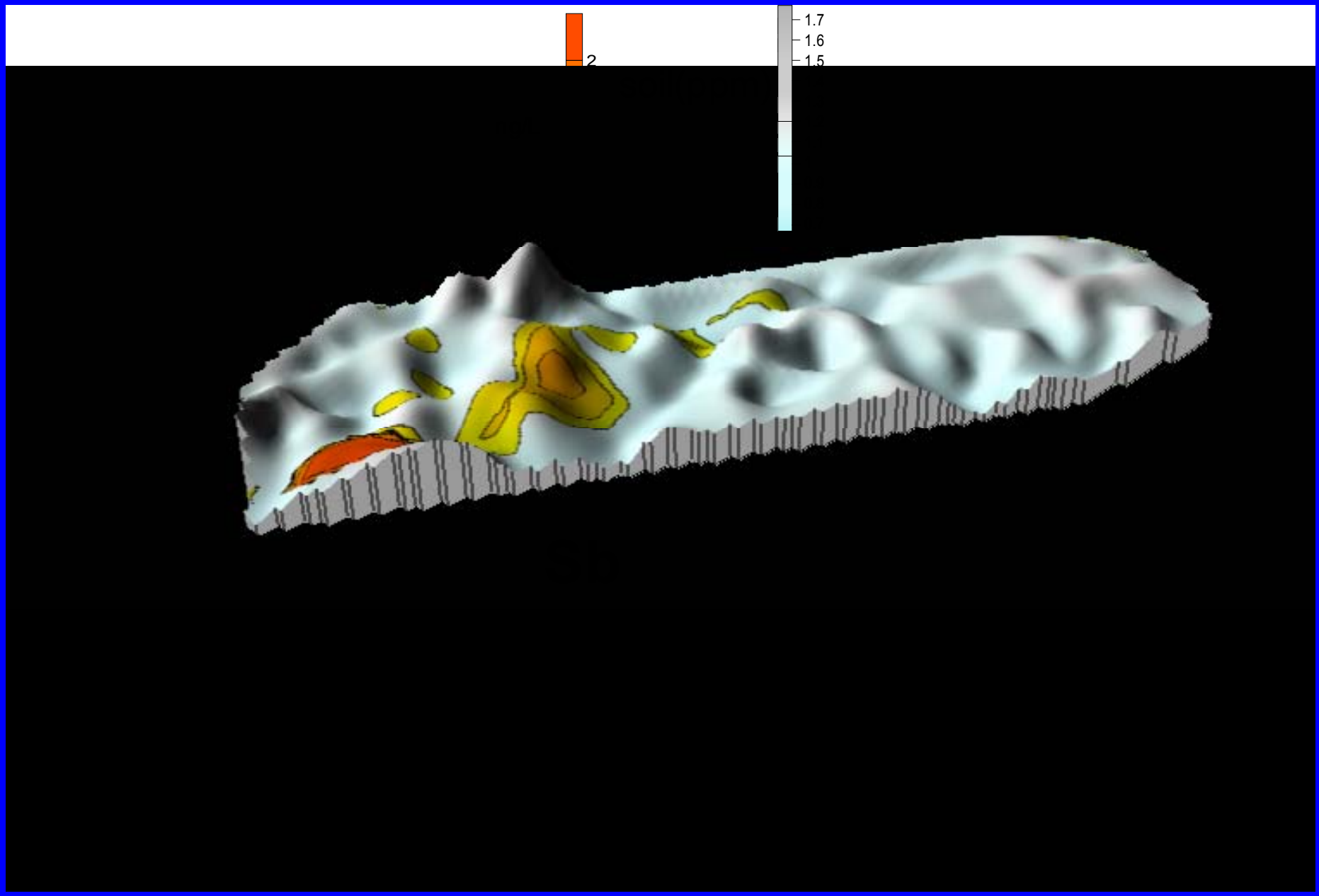
Simplified geological map of Gadaban study, Qilian County, Qinghai.



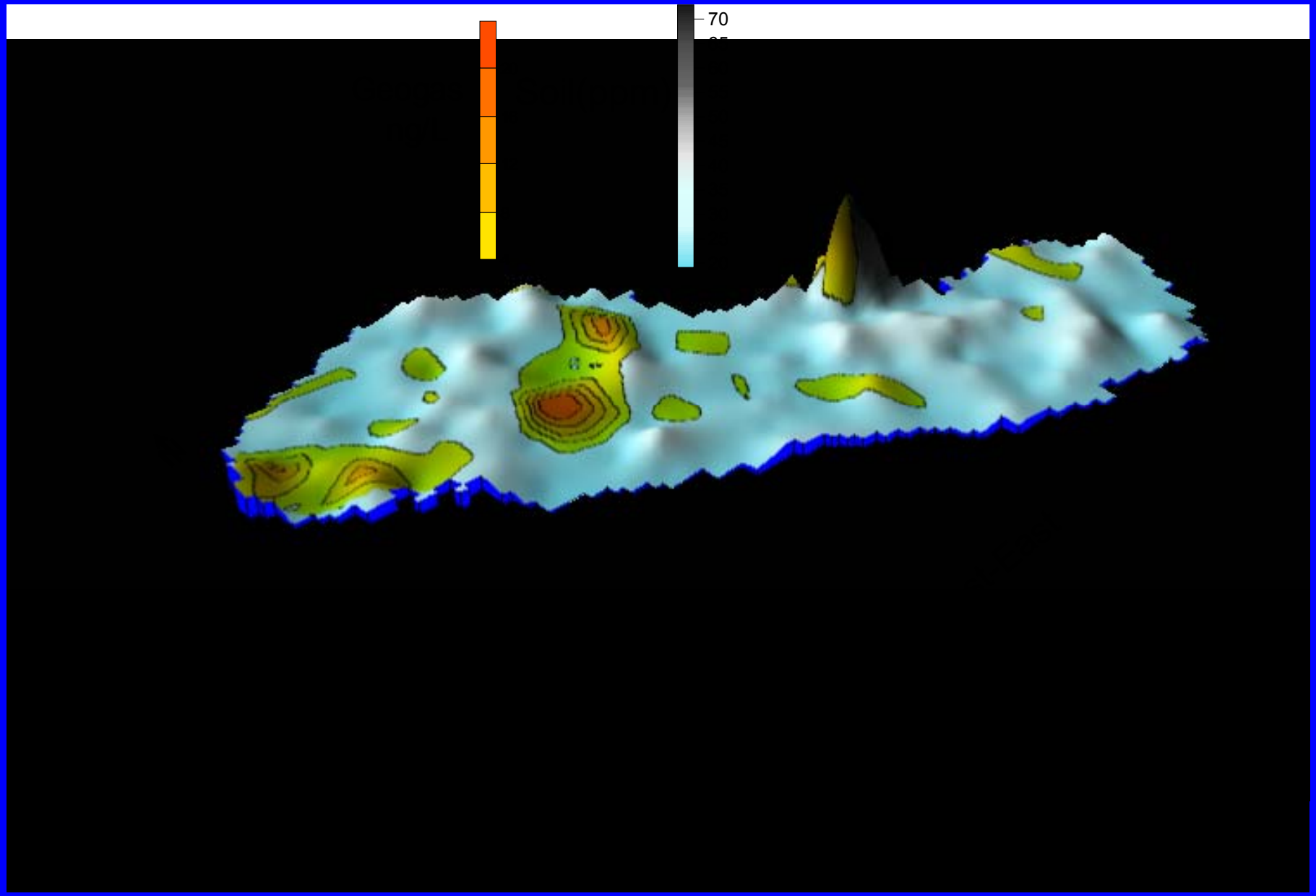
Silver anomalies in geogas overlain on Ag in soil as 3 D relief map,Gadaban massive sulphide mineraliztions, Qinghai.



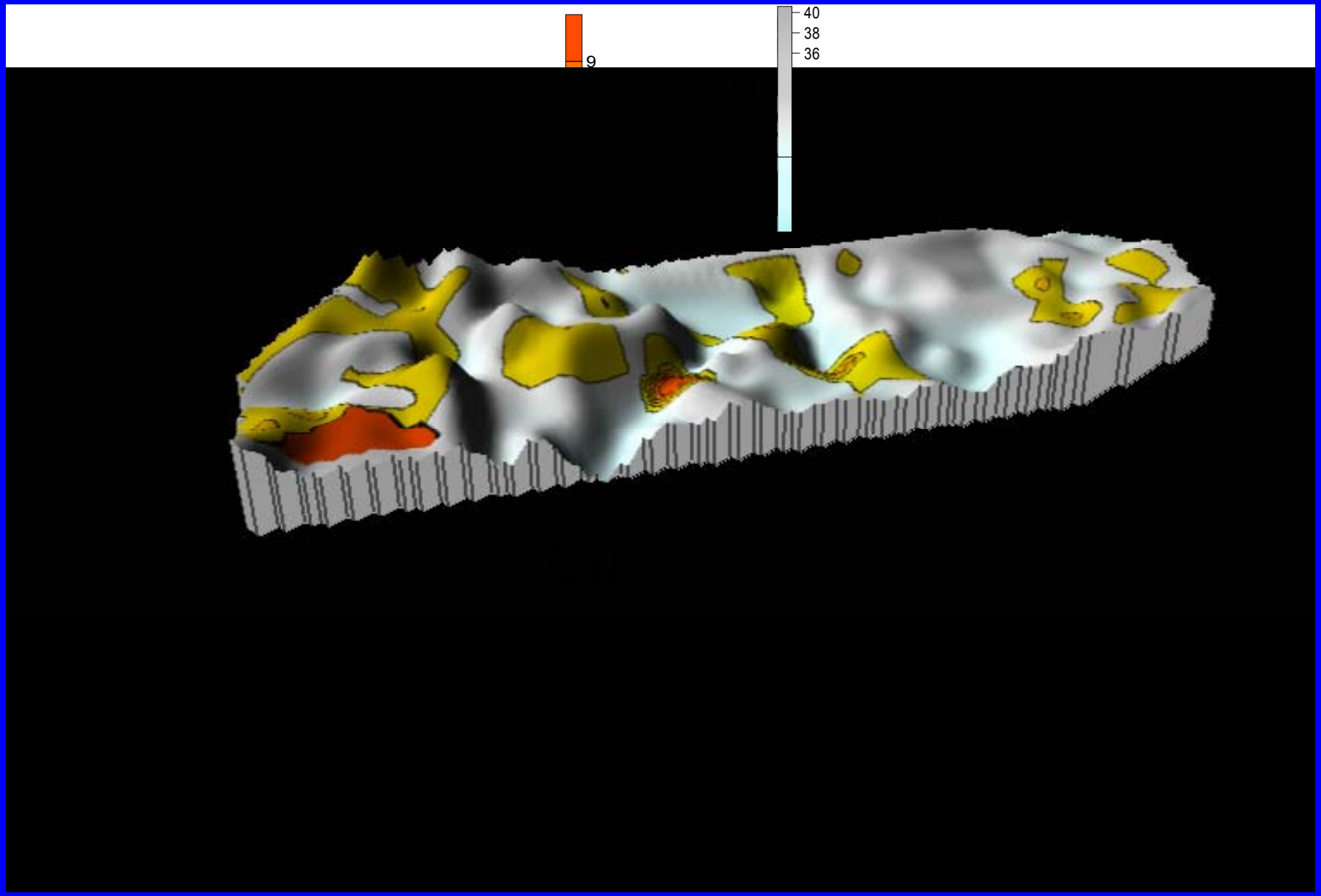
Zinc anomalies in geogas overlain on zinc in soil as 3 D relief map,Gadaban massive sulphide mineraliztions, Qinghai.



Sb anomalies in geogas overlain on Sb in soil as 3 D relief map,Gadaban massive sulphide mineraliztions, Qinghai.



Pb anomalies in geogas overlain on Pb in soil as 3 D relief map,Gadaban massive sulphide mineraliztions, Qinghai.



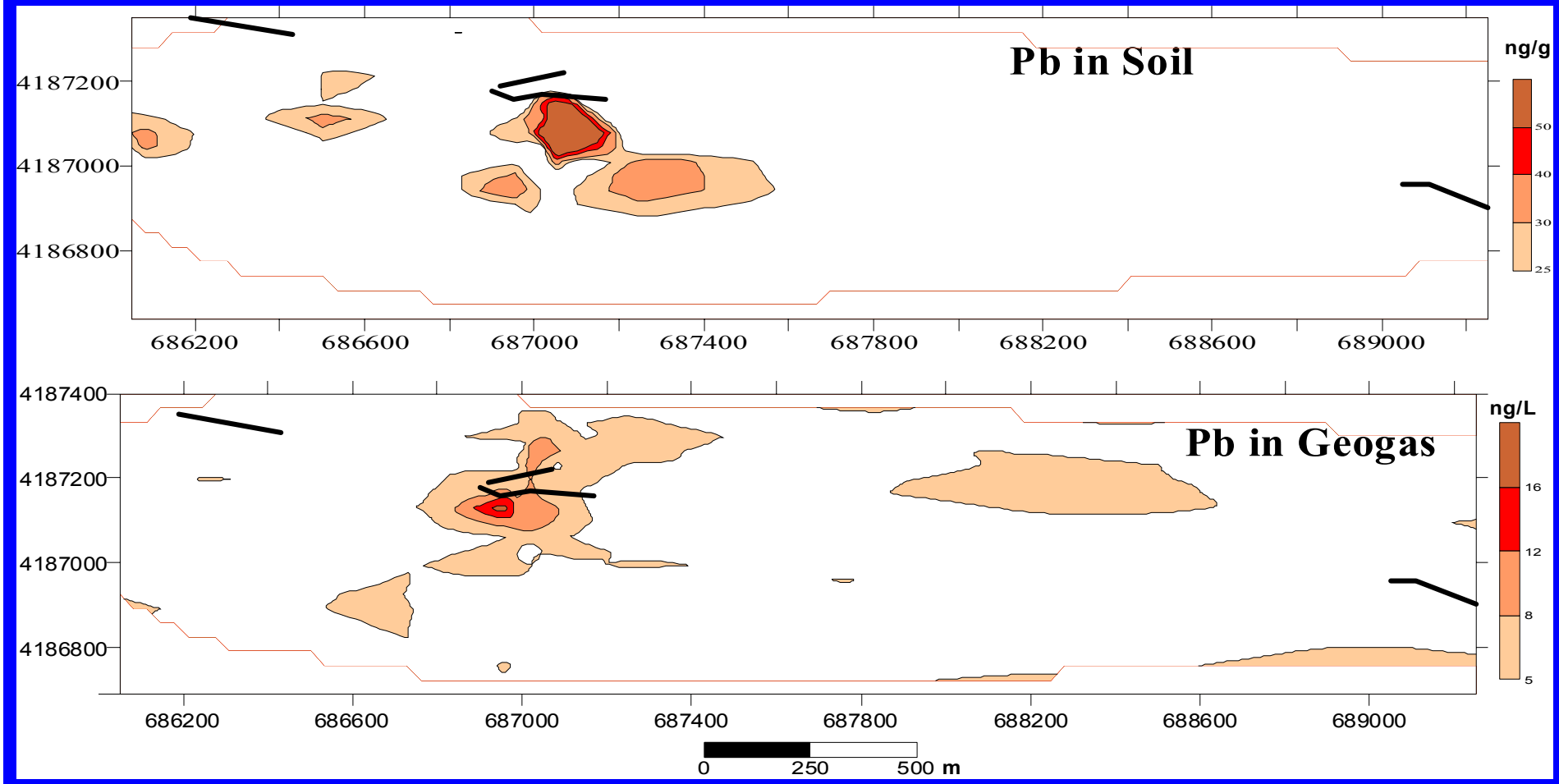
Cu anomalies in geogas overlain on Cu in soil as 3 D relief map,Gadaban massive sulphide mineraliztions, Qinghai.

Tongchanggou Gold Mineralization, Men Yuan County, Qinghai.

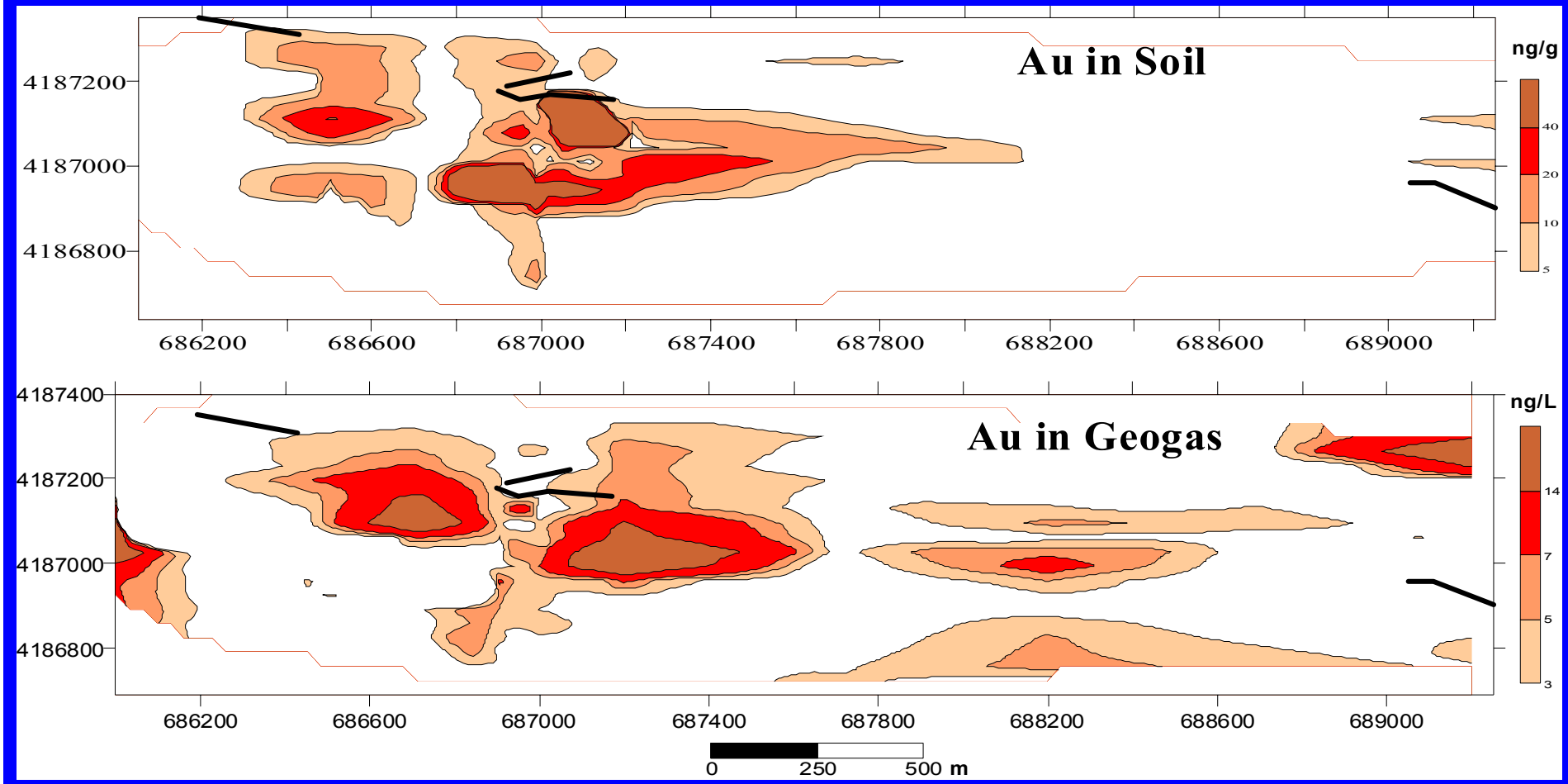
Cambrian volcanic rock and Ordovician marine clastic sedimentary rock and carbonate are the host rocks of gold mineralizations. Gold-bearing quartz veins occur in the altered diorite or contacts between diorite and other rocks. Pyrite, sphalerite, galena are main metal minerals.

Tongchanggou Gold Mineralization, Men Yuan County, Qinghai.

The study area, with elevation of 3800~4500m and extremely humid condition during Summer time, is mostly covered by colluvium, talus and glacial till (0.5~5m thick). Conventional soil survey proved to be useful for mineral exploration though glaciation and other agent may complicate the geochemical anomalies.



Pb anomalies in geogas and on Pb anomalies in soil, Tongchanggou gold mineraliztions, Qinghai.



Au anomalies in geogas and on Au anomalies in soil, Tongchanggou gold mineraliztions, Qinghai.

Conclusions

Some differences were observed between the blank catcher and loaded samples since the liquid catcher blank can be controlled to a very low level with little variations and conclusion can be easily drawn that the geogases do exist in soil gas

Conclusions

A similar distribution of elements related to mineralization in the residual soil and soil gas may indicate that much of geogas elements come directly from surface soil rather than from the deep ore bodies

Conclusions

There are two kinds of anomalies of elements in geogas:

(1) in a overburden area, a total different distribution pattern of elements in the soil and the soil gas may indicate that much of geogas elements come directly from surface soil rather than from the deep ore bodies

Conclusions

(2) in the residual soil covered area, a similar distribution of elements related to mineralization in the residual soil and the soil gas may indicate that much of geogas elements come directly from surface soil rather than from the deep ore bodies.

Conclusions

Problems :

1. Blanks are still too high for some elements such as Pb

2. Forms of elements in geogas and Absorption capability

3. Low reproduction results

4. Difficult in Result interpretation

Thank You!