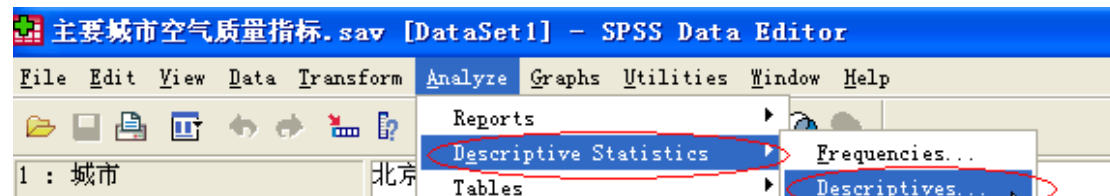


## 一. 数据标准化处理（消除量纲影响）

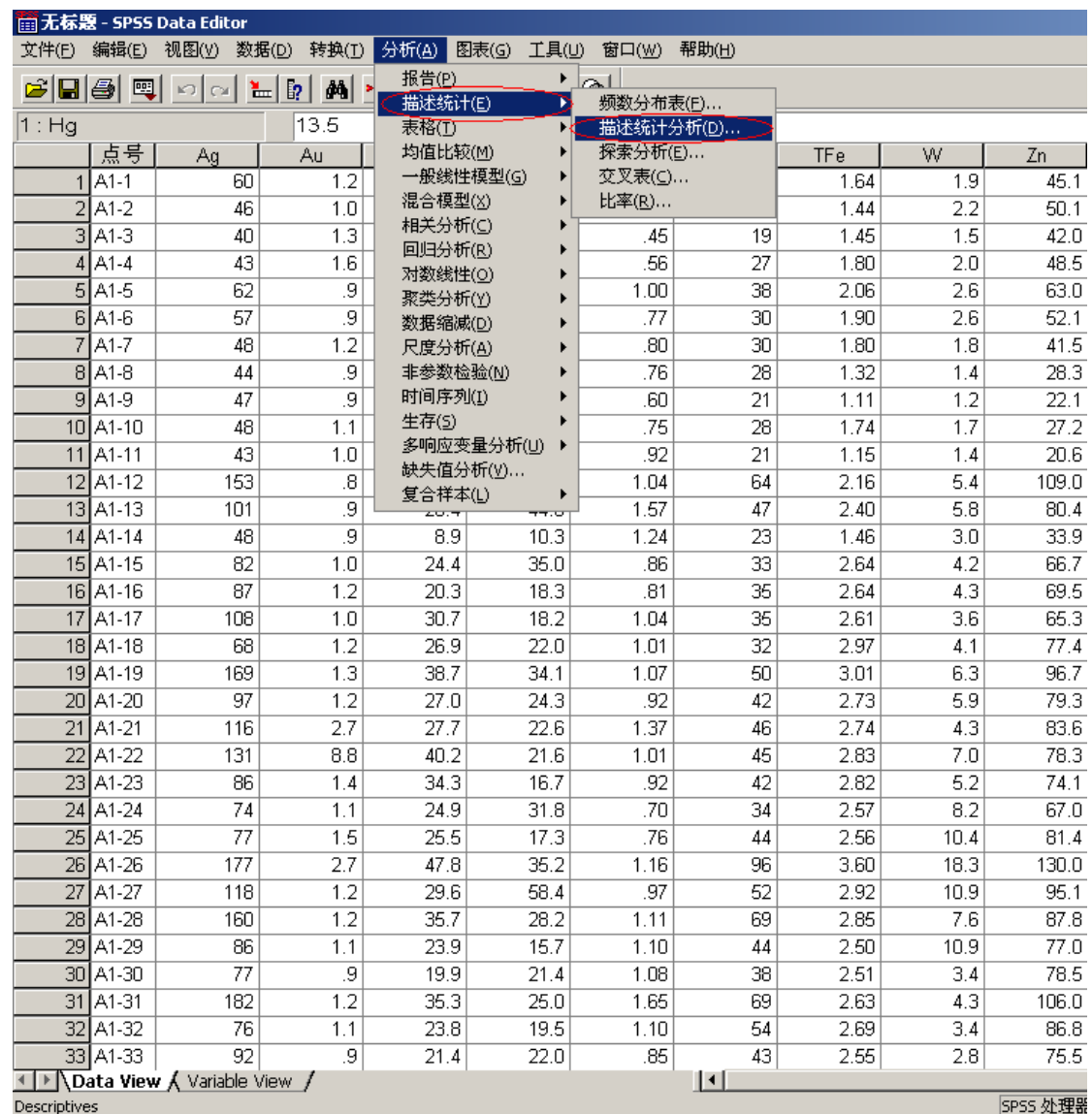
### (1) .处理过程 1

总体思路：Analyze（分析）→Descriptive Statistics（描述性统计）→Descriptives(描述统计分析)

### ①英文版面 SPSS 软件

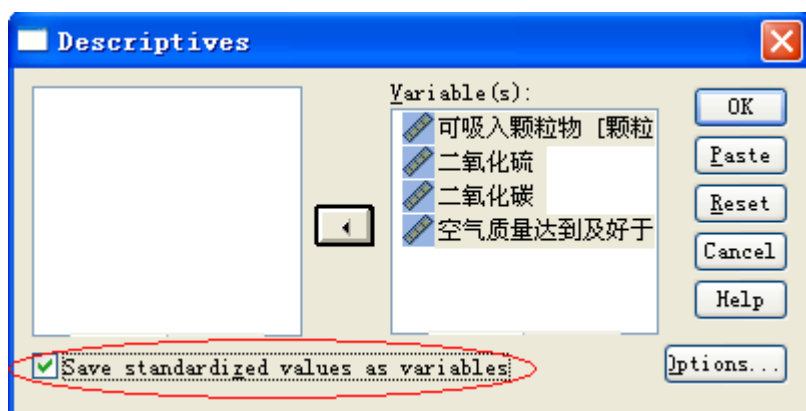


### ②中文版面 SPSS 软件



## (2) .处理过程 2

### ①英文版面 SPSS 软件



### ②中文版面 SPSS 软件

无标题 - SPSS Data Editor

文件(F) 编辑(E) 视图(V) 数据(D) 转换(T) 分析(A) 图表(G) 工具(U) 窗口(W) 帮助(H)

1 : Hg 13.5

描述

变量(V): Ag, Au, Cu, Hg, Mo, Pb, TFe

☒ 将标准化数值保存为变量(Z)

确定, 粘贴(P), 重置(R), 取消, 帮助, 选项(O)

	Pb	TFe	W	Zn
1	27	1.64	1.9	45.1
2	26	1.44	2.2	50.1
3	19	1.45	1.5	42.0
4	27	1.80	2.0	48.5
5	38	2.06	2.6	63.0
6	30	1.90	2.6	52.1
7	30	1.80	1.8	41.5
8	28	1.32	1.4	28.3
9	21	1.11	1.2	22.1
10	28	1.74	1.7	27.2
11	21	1.15	1.4	20.6
12	64	2.16	5.4	109.0
13	47	2.40	5.8	80.4
14	23	1.46	3.0	33.9
15	33	2.64	4.2	66.7
16	35	2.64	4.3	69.5
17	35	2.61	3.6	65.3
18	32	2.97	4.1	77.4
19	50	3.01	6.3	96.7
20	42	2.73	5.9	79.3
21	46	2.74	4.3	83.6
22	45	2.83	7.0	78.3
23	42	2.82	5.2	74.1
24	34	2.57	8.2	67.0
25	44	2.56	10.4	81.4
26	96	3.60	18.3	130.0
27	52	2.92	10.9	95.1
28	69	2.85	7.6	87.8
29	44	2.50	10.9	77.0
30	38	2.51	3.4	78.5
31	69	2.63	4.3	106.0
32	54	2.69	3.4	86.8
33	43	2.55	2.8	75.5

Data View / Variable View

SPSS 处理器

### (3) .处理结果

数据标准化处理结果，需存储

	Au	Cu	Hg	Mo	Pb	TFe	W	Zn	ZAg	ZAu	ZCu	ZHg	ZMo
1	1.2	8.8	13.5	67	27	1.64	1.9	45.1	-.58183	-.09842	-1.98107	-1.57718	-1.31368
2	1.0	9.2	18.1	48	26	1.44	2.2	50.1	-.80532	-.17305	-1.92906	-1.20194	-1.66330
3	1.3	7.2	10.4	45	19	1.45	1.5	42.0	-.90111	-.06110	-2.18911	-1.83005	-1.71850
4	1.6	10.7	15.6	56	27	1.80	2.0	48.5	-.85322	-.05084	-1.73402	-1.40587	-1.51609
5	9	14.0	13.6	1.00	38	2.06	2.6	63.0	-.54990	-.21036	-1.30493	-1.56902	-1.70646
6	9	13.4	17.2	.77	30	1.90	2.6	52.1	-.62972	-.21036	-1.35295	-1.27536	-1.12968
7	1.2	14.0	15.8	.80	30	1.80	1.8	41.5	-.77340	-.09842	-1.30493	-1.38956	-1.07447
8	9	11.5	12.4	.76	28	1.32	1.4	28.3	-.83725	-.21036	-1.63000	-1.66691	-1.14808
9	9	6.2	10.4	.60	21	1.11	1.2	22.1	-.78936	-.21036	-2.31913	-1.83005	-1.44249
10	1.1	12.2	15.4	.75	28	1.74	1.7	27.2	-.77340	-.13573	-1.53898	-1.42219	-1.16648
11	1.0	7.3	9.2	.92	21	1.15	1.4	20.6	-.85322	-.17305	-2.17611	-1.92631	-.85366
12	8	63.6	23.6	1.04	64	2.16	5.4	109.0	-.90284	-.24767	5.14434	-.75329	-.63286
13	9	28.4	44.8	1.57	47	2.40	5.8	80.4	.07270	-.21036	.56743	.97606	.34239
14	9	8.9	10.3	1.24	23	1.46	3.0	33.9	-.77340	-.21036	-1.96807	-1.83821	-.26484
15	1.0	24.4	35.0	.86	33	2.64	4.2	66.7	-.23061	-.17305	.04733	.17665	-.96407
16	1.2	20.3	18.3	.81	35	2.64	4.3	69.5	-.15079	-.09842	-.48577	-1.18562	-1.05007
17	1.0	30.7	18.2	1.04	35	2.61	3.6	65.3	.18445	-.17305	.86649	-1.19378	-.63286
18	1.2	26.9	22.0	1.01	32	2.97	4.1	77.4	-.45411	-.09842	.37240	-.88380	-.68806
19	1.3	38.7	34.1	1.07	50	3.01	6.3	96.7	1.15827	-.06110	1.90670	.10323	-.57765
20	1.2	27.0	24.3	.92	42	2.73	5.9	79.3	.00885	-.09842	.38540	-.69619	-.85366
21	2.7	27.7	22.6	1.37	46	2.74	4.3	83.6	.31217	.46129	.46992	-.83894	-.02563
22	8.8	40.2	21.6	1.01	45	2.83	7.0	78.3	.55163	2.73745	2.10174	-.91643	-.68806
23	1.4	34.3	16.7	.92	42	2.82	5.2	74.1	-.16676	-.02379	1.33459	-1.31614	-.85366
24	1.1	24.9	31.8	.70	34	2.57	8.2	67.0	-.35833	-.13573	.11234	-.08439	-1.25848
25	1.5	25.5	17.3	.76	44	2.56	10.4	81.4	-.31044	.01352	.19036	-1.26720	-1.14808
26	2.7	47.8	35.2	1.16	96	3.60	18.3	130.0	1.28598	.46129	3.08993	.19296	-1.41205
27	1.2	29.6	58.4	.97	52	2.92	10.9	95.1	.34410	-.09842	.72347	2.08546	-.76166
28	1.2	35.7	28.2	1.11	69	2.85	7.6	87.8	1.01459	-.09842	1.51662	-.37805	-.50405
29	1.1	23.9	15.7	1.10	44	2.50	10.9	77.0	-.16676	-.13573	-.01768	-1.39772	-.52245
30	9	19.9	21.4	1.08	38	2.51	3.4	78.5	-.31044	-.21036	-.53778	-.93275	-.55925
31	1.2	35.3	25.0	1.65	69	2.63	4.3	106.0	1.36580	-.09842	1.46461	-.63908	.48959
32	1.1	23.8	19.5	1.10	54	2.69	3.4	86.8	-.32640	-.13573	-.03068	-1.08774	-.52245
33	9	21.4	22.0	.85	43	2.55	2.8	75.5	-.07097	-.21036	-.34274	-.88380	-.98247

## 二．聚类分析

R 分析需要进行分层聚类(Hierarchical Cluster)分析处理过程如下：

### (1) .处理过程

Analyze（分析）→Classify（聚类分析）→Hierarchical Cluster（分层聚类）：

①选择处理方式：

英文版面 SPSS 软件

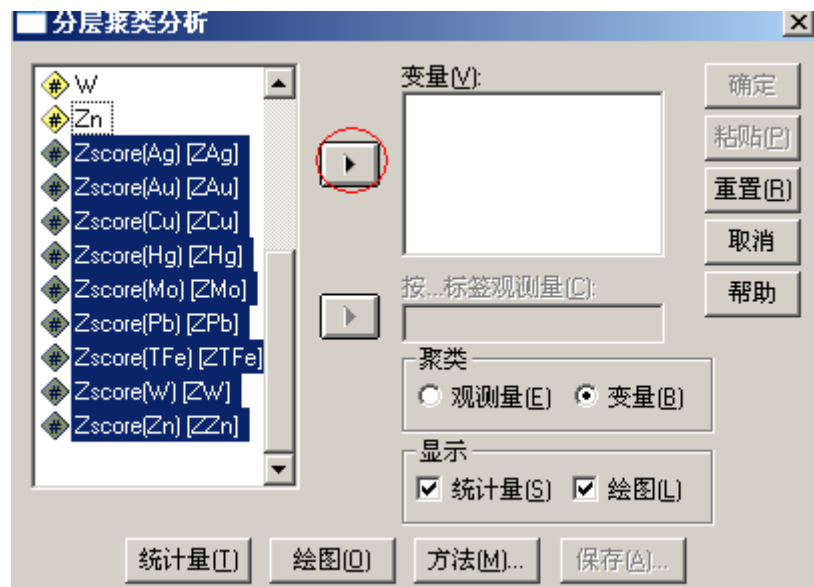
主要城市日照时数.sav [DataSet4] - SPSS Data Editor

city	Jan	Apr	May	Jun
1 北京	194.7	248.20	253.30	202.00
2 天津	161.7	214.30	221.00	182.50
3 石家庄	193.8	240.90	277.90	213.40
4 太原	138.9	266.70	262.50	195.80
5 呼和浩特	187.5	284.90	302.20	234.50
6 沈阳	165.4	245.30	219.30	230.30
7 大连	163.5			90.00
8 长春	194.1			65.50
9 哈尔滨	119.7			96.40
10 上海	113.1			52.00
11 南京	120.6			86.10
12 杭州	88.9			21.70
13 合肥	116.2			
14 福州	85.4			
15 南昌	83.5	205.40	158.30	183.40
16 济南	183.6	142.90	163.20	192.30
17 青岛	176.8	193.60	194.50	143.60
18 郑州	116.60	219.70	246.30	164.40
		230.00	211.70	155.10
		191.60	237.50	167.00

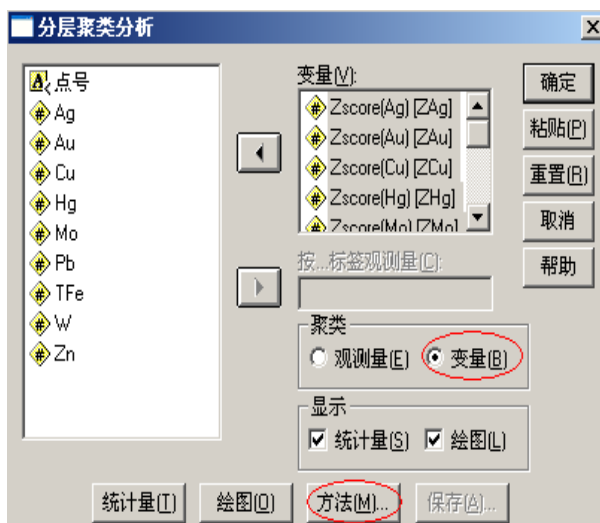
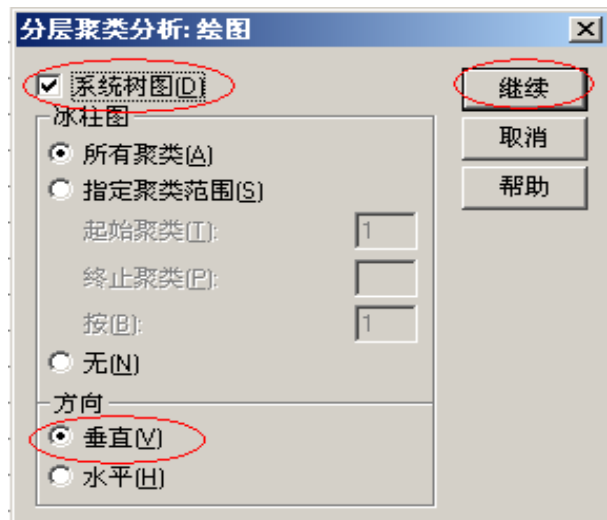
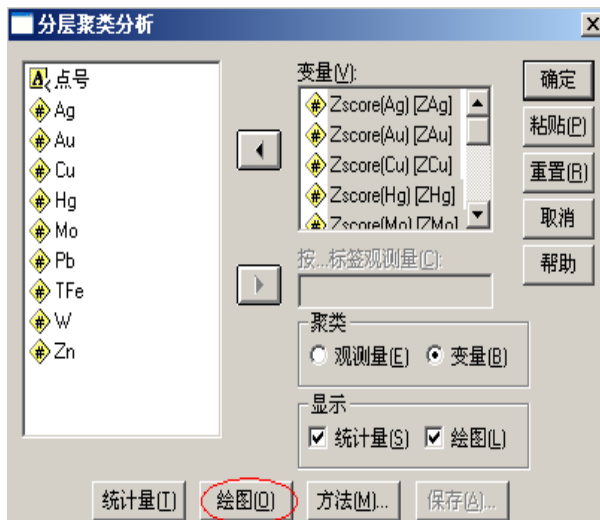
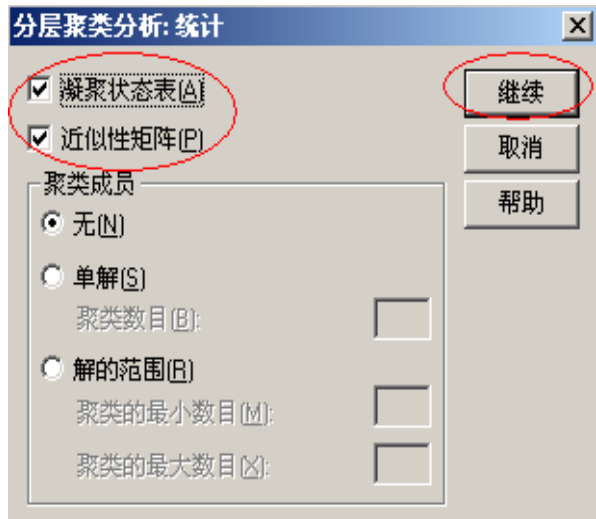
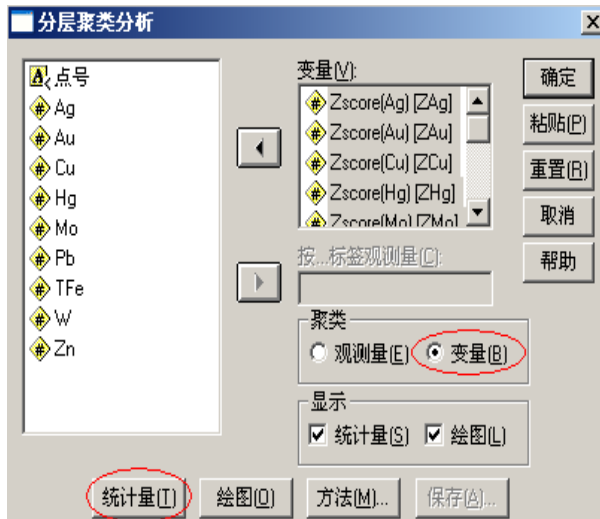
## 中文版面 SPSS 软件



②变量选择：（选择标准化后的数据）

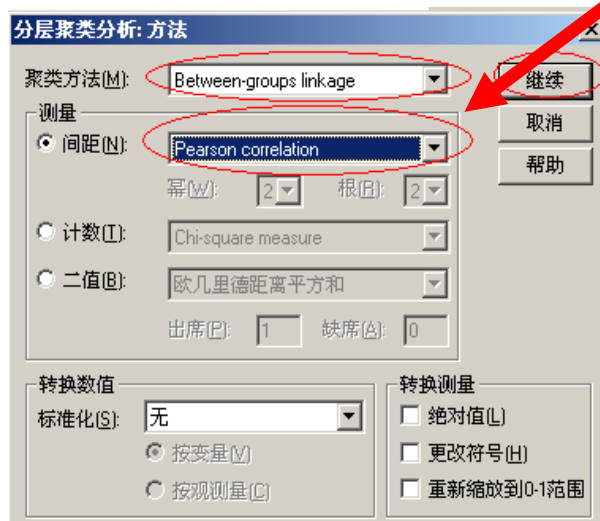


③参数选择(本次选择对变量用相关系数来进行聚类)



## (2) .结果输出

①下表(Proximity matrix)中行列交叉点为两个变量之间变量的相关系数：



分层聚类分析: 方法

聚类方法(M): Between-groups linkage

测量

☒ 间距(N): Pearson correlation

幂(W): 2 根(R): 2

☐ 计数(I): Chi-square measure

☐ 二值(B): 欧几里德距离平方和

出席(P): 1 缺席(A): 0

转换数值

标准化(S): 无

☒ 按变量(V)

☐ 按观测量(O)

转换测量

☐ 绝对值(L)

☐ 更改符号(H)

☐ 重新缩放到0-1范围

继续 取消 帮助

Proximity Matrix

Case	Matrix File Input								
	Zscore(Ag)	Zscore(Au)	Zscore(Cu)	Zscore(Hg)	Zscore(Mo)	Zscore(Pb)	Zscore(TFe)	Zscore(W)	Zscore(Zn)
Zscore(Ag)	1.000	.112	.334	.066	.460	.448	.021	.027	.361
Zscore(Au)	.112	1.000	.121	.171	.085	.069	.017	.020	.089
Zscore(Cu)	.334	.121	1.000	.316	.439	.527	.501	.383	.585
Zscore(Hg)	.066	.171	.316	1.000	.259	.184	.638	.143	.381
Zscore(Mo)	.460	.085	.439	.259	1.000	.446	.456	.053	.492
Zscore(Pb)	.448	.069	.527	.184	.446	1.000	.258	.256	.840
Zscore(TFe)	.021	.017	.501	.638	.456	.258	1.000	.221	.551
Zscore(W)	.027	.020	.383	.143	.053	.256	.221	1.000	.281
Zscore(Zn)	.361	.089	.585	.381	.492	.840	.551	.281	1.000

Proximity Matrix

Case	Matrix File Input								
	Zscore(Ag)	Zscore(Au)	Zscore(Cu)	Zscore(Hg)	Zscore(Mo)	Zscore(Pb)	Zscore(TFe)	Zscore(W)	Zscore(Zn)
Zscore(Ag)	1.000	.112	.334	.066	.460	.448	.021	.027	.361
Zscore(Au)	.112	1.000	.121	.171	.085	.069	.017	.020	.089
Zscore(Cu)	.334	.121	1.000	.316	.439	.527	.501	.383	.585
Zscore(Hg)	.066	.171	.316	1.000	.259	.184	.638	.143	.381
Zscore(Mo)	.460	.085	.439	.259	1.000	.446	.456	.053	.492
Zscore(Pb)	.448	.069	.527	.184	.446	1.000	.258	.256	.840
Zscore(TFe)	.021	.017	.501	.638	.456	.258	1.000	.221	.551
Zscore(W)	.027	.020	.383	.143	.053	.256	.221	1.000	.281
Zscore(Zn)	.361	.089	.585	.381	.492	.840	.551	.281	1.000

②过程图

### Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	6	9	.840	0	0	3
2	4	7	.638	0	0	6
3	3	6	.556	0	1	5
4	1	5	.460	0	0	5
5	1	3	.420	4	3	6
6	1	4	.300	5	2	7
7	1	8	.195	6	0	8
8	1	2	.085	7	0	0

### Average Linkage (Between Groups)

哪两个样本或小类聚成一类      相应的样本距离或小类距离      指明是样本(0)还是小类(n)      下面第几步用到

聚类分析的第几步

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	3	5	1272.000	0	0	4
2	1	4	1548.000	0	0	3
3	1	2	2132.000	2	0	4
4	1	3	2633.667	3	1	5
5	1	6	4322.200	4	0	0

③冰柱图

### Vertical Icicle

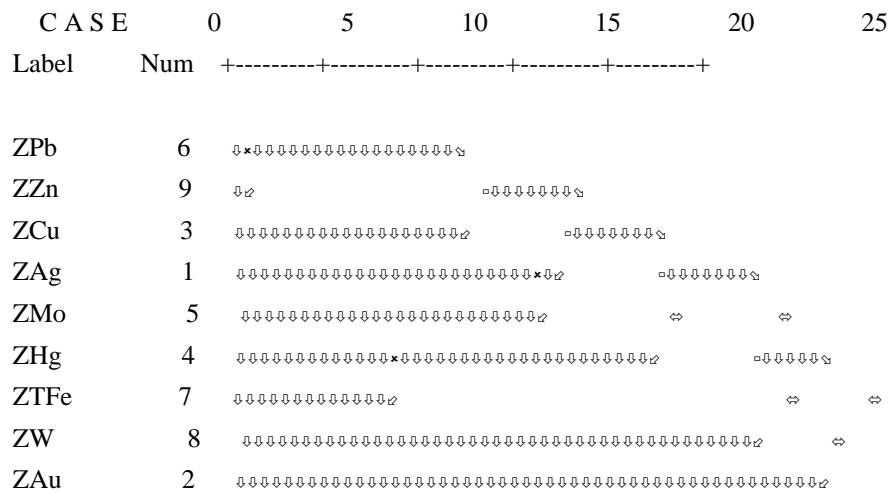
Number of clusters	Case															
	Au	W	Fe	Hg	Zn	Pb	Cu	Mo	Ag							
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	X		X	X	X		X	X	X	X	X	X	X	X	X	X
5	X		X	X	X		X	X	X	X		X	X	X	X	X
6	X		X	X	X		X	X	X	X		X			X	X
7	X		X	X	X		X	X	X		X		X			X
8	X		X		X		X	X	X		X		X			X

④树状图

\*\*\*\*\*HIERARCHICAL CLUSTER ANALYSIS\*\*\*\*\*

# Dendrogram using Average Linkage (Between Groups)

## Rescaled Distance Cluster Combine



⑤冰柱图与柱状图关系理解（从冰柱图最后一行向上观察理解）

## Vertical Icicle

	Case <sub>1</sub>															
Number of clusters <sub>1</sub>	Au <sub>1</sub>		W <sub>1</sub>		Fe <sub>1</sub>		Hg <sub>1</sub>		Zn <sub>1</sub>		Pb <sub>1</sub>		Cu <sub>1</sub>		Mo <sub>1</sub>	Ag <sub>1</sub>
1 <sub>1</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 <sub>1</sub>	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
3 <sub>1</sub>	X		X		X	X	X	X	X	X	X	X	X	X	X	X
4 <sub>1</sub>	X		X		X	X	X		X	X	X	X	X	X	X	X
5 <sub>1</sub>	X		X		X	X	X		X	X	X	X	X		X	X
6 <sub>1</sub>	X		X		X	X	X		X	X	X	X	X		X	X
7 <sub>1</sub>	X		X		X	X	X		X	X	X	X			X	X
8 <sub>1</sub>	X		X		X		X		X	X	X	X			X	X

## Dendrogram using Average Linkage (Between Groups)

## Rescaled Distance Cluster Combine

