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新疆哈密野马泉西金矿区资源量数据集

任经武[1] 杜贵超[2*] 王进宝[1] 杨艳绪[1] 叶雷[1]
余子昌[1] 刘志强[1] 刘增仁[1]

(1. 有色金属矿产地质调查中心，北京 100012；
2. 西安石油大学地球科学与工程学院，陕西 西安 710065)

摘要：康古尔塔格韧性剪切带是金矿重要控矿带，产有康古尔、马头滩、石英滩等重要矿床。野马泉西金矿即位于该韧性剪切带的东延苦水—雅满苏韧性剪切带上，属韧性剪切带控矿型金矿。本文在野外地质调查基础上采集了野马泉西金矿探矿工程坐标、工程内样品的分析测试成果等数据，采用地质块段法对野马泉西金矿资源量进行了估算，形成了数据集。数据集测试样品均委托有国家甲级资质的测试中心进行，内外检合格率90% 以上，数据质量可靠，对周边同类型矿床的资源量估算具参考意义。

关键词：野马泉西金矿；资源量；数据集；韧性剪切带；新疆哈密

数据服务系统网址：http://dcc.cgs.gov.cn

1 引言

东天山觉罗塔格铜镍铁锰钒钛金银钨钼稀有金属矿带是新疆最重要的成矿带之一，主要矿产地有上百处。康古尔塔格韧性剪切带即位于该矿带内，赋存有康古尔、马头滩、石英滩等重要矿床（董连慧等，2010）。区域地层出露太古宇至新生界，其中以石炭系分布最广。大型构造非常发育，自北向南分布有康古尔塔格—黄山断裂、秋格明塔什—黄山韧性剪切带、苦水—雅满苏断裂带、尾亚韧性剪切带和阿其克库都克—沙泉子大断裂等。岩浆活动频繁，形成的岩浆岩以晚古生代侵入岩最为发育❶。

野马泉西金矿区位于康古尔塔格韧性剪切带的东延苦水—雅满苏韧性剪切带上（图 1）。矿区出露地层较简单，除第四系外，主要见下石炭统雅满苏组，岩性以砾岩、砂岩、硅质粉砂岩为主，夹灰岩和凝灰岩等（图 2）。区内构造发育，规模最大的主断裂为苦水—雅满苏断裂，向东横贯野马泉西整个矿区，呈 NE 向展布，为北倾逆断层，走向 60°~70°，倾角 70°~85°。断裂南侧发育一套北强南弱具推覆逆冲性质的走滑型韧性剪切带，由 F_1、F_2 控制。韧性剪切带内次级断裂主要有三组，一组与主构造方向

第一作者简介：任经武，男，1985 年生，工程硕士，工程师，现从事地质矿产勘查工作；E-mail：371662737@qq.com。
通讯作者简介：杜贵超，男，1983 年生，博士，副教授，从事沉积学、储层地质学研究；E-mail：duguichao@sina.com。

大致一致，与剪切带边界成 10°~15°夹角；一组与剪切带呈高角度相交，夹角约 70°，以 NNE 向剪性裂隙为主；一组以 SN 向为主，为压性断裂。目前金矿体多分布于第一组断裂中，后两组断裂中未发现金矿（化）体。矿区岩浆岩发育，以海西中、晚期中酸性侵入岩为主。北侧为花岗闪长岩，南侧为闪长岩。此外中酸性岩脉发育，以花岗斑岩、石英闪长岩、闪长岩脉、石英脉占主体❷。

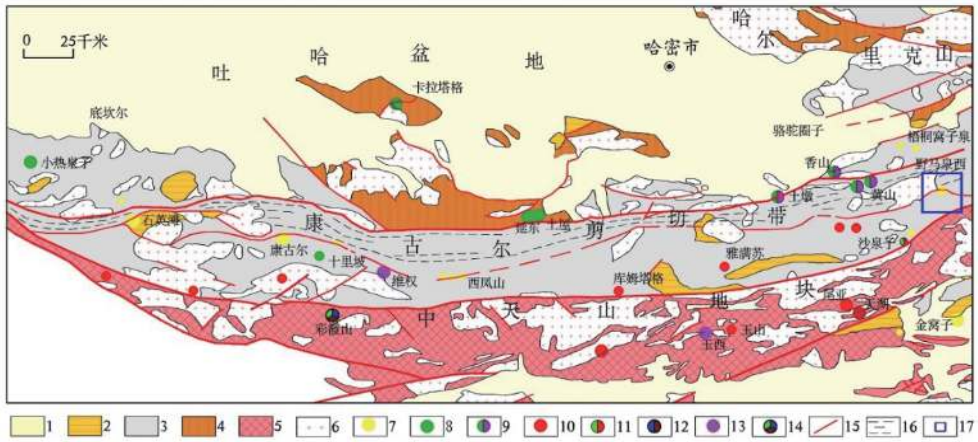

图 1　新疆东天山觉洛塔格地区区域地质简图（据韩春明等，2002 修改）

1—中新生代沉积盖层；2—二叠纪陆相火山-沉积岩系；3—石炭纪火山-沉积岩系；4—奥陶—泥盆纪火山-沉积岩系；5—前寒武纪变质岩；6—花岗岩类；7—金矿床；8—铜矿床；9—铜镍硫化物矿床；10—铁矿床；11—铁铜矿床；12—铅锌矿床；13—银多金属矿床；14—多金属矿床；15—断层；16—剪切带；17—矿区位置

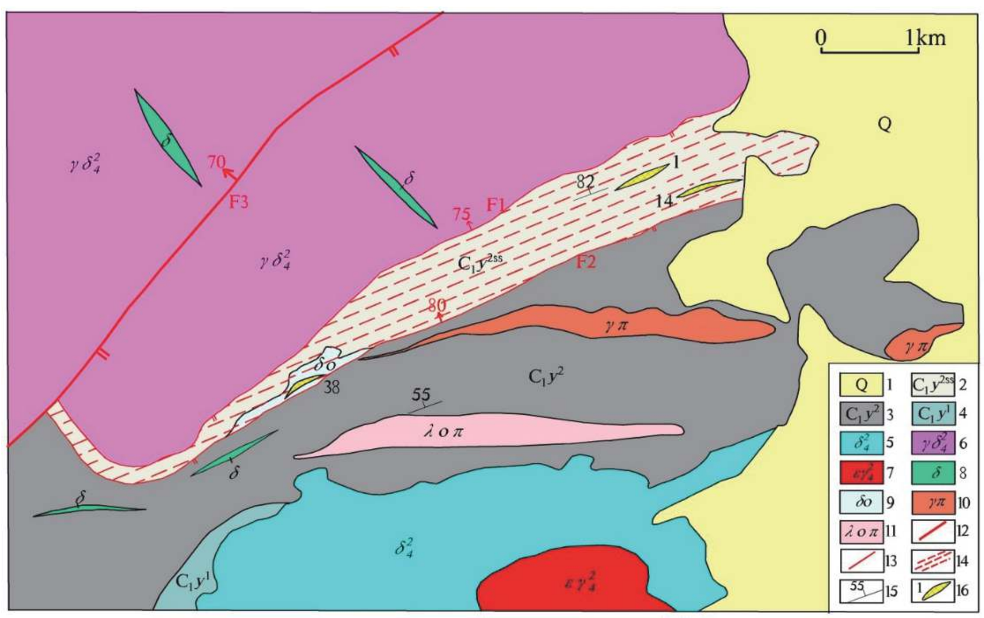

图 2　野马泉西金矿区地质简图

（据任经武等, 2017. 新疆东天山野马泉西发现中型金矿床. 中国地质调查成果快讯, 3(14): 5–8）

1—第四系冲-洪积物；2—下石炭统雅满苏组上段砂岩；3—下石炭统雅满苏组；4—下石炭统雅满苏组下段；5—中华力西期闪长岩；6—中华力西期花岗闪长岩；7—中华力西期钾长花岗岩；8—闪长岩脉；9—石英闪长岩脉；10—花岗斑岩脉；11—石英斑岩脉；12—区域性大断裂；13—次级断裂；14—韧性剪切带；15—地层产状；16—金矿体及编号

区内共圈出金矿体群 3 处（Ⅰ、Ⅱ、Ⅲ，见表 1），其中金矿体 12 条，金矿化体 23 条。1 号矿体为矿区的主要矿体，总体走向 70°。矿体形态多为似层状、透镜状、脉

状。矿体长 160 m，倾向延伸大于 400 m，厚 1.14~5.54 m。金品位 0.54×10^{-6}~109.10×10^{-6}，矿床成因属韧性剪切带型，工业类型属于石英脉型（资料来源：同图 2）。对该矿床进行资源量的调查与评估，既可对同类型矿床的资源量评估作为参考，又可为研究野马泉西地区同类型矿床的矿体分布特征提供借鉴（刘焕贵等，2017）。

表 1　野马泉西金矿体群特征一览表

编号	规模（m）		走向（°）	地质特征	金矿类型	金矿体数
	长	宽				
Ⅰ	1000	300~500	60~70	产于北部花岗闪长岩体与下石炭统雅满苏组接触带的韧性剪切带中。矿体顶底板均为石炭纪雅满苏组砂岩、粉砂岩、泥岩、灰岩。	石英脉型、破碎蚀变岩型	8
Ⅱ	320~400	2~20	60	产于北部花岗闪长岩体与下石炭统雅满苏组接触带的韧性剪切带中。矿体顶底板均为石炭纪雅满苏组砂岩、粉砂岩、砾岩。	石英脉型	1
Ⅲ	1300	60~200	60	产于北部花岗闪长岩体与下石炭统雅满苏组接触带的韧性剪切带内。矿体顶底板均为下石炭统雅满苏组砂岩、粉砂岩、灰岩。	碎裂脉岩型	3

金属矿产资源量估算方法的研究工作开展较多，多侧重于传统方法与地质统计、信息技术相结合或者地质统计学方法（白瑞和等，2010；郭慧锦，2010；肖玉华等，2012；曹建洲等，2015；张鹏川等，2017）。传统资源量估算方法的实质是将自然界不规则的地质体看作近似规则的几何体，然后运用几何学的方法计算几何体的体积，并将其视为矿体的资源量。它包括断面法和地质块段法两种基本方法（张鹏川等，2017），本次资源量估算主要采用地质块段法。

新疆野马泉西金矿区的资源量数据集为 3 个 Excel 工作簿（.xls 格式），它们分别被命名为“工程登记表”、“样品测试结果表”和“资源量估算表”。其中“工程登记表”工作簿由 2 个 Excel 工作表页文件构成，即槽探工程登记表和钻探工程登记表；“样品测试结果表”工作簿由 3 个 Excel 工作表页文件构成，即槽探样品测试结果表、钻探样品测试结果表和小体积质量测试结果表；“资源量估算表”工作簿由 5 个 Excel 工作表页文件构成，即槽探工程矿体水平厚度与加权平均品位计算表，钻探工程矿体水平厚度与加权平均品位计算表，矿体块段面积计算表，矿体块段厚度与加权品位计算表，以及资源量估算表。

新疆哈密市野马泉西金矿资源量数据集元数据如表 2 所示。

表 2　数据库（集）元数据简表

条目	描述
数据库（集）名称	新疆哈密市野马泉西金矿区资源量数据集
数据库（集）作者	任经武，有色金属矿产地质调查中心 杜贵超，西安石油大学地球科学与工程学院 王进宝，有色金属矿产地质调查中心 杨艳绪，有色金属矿产地质调查中心 叶雷，有色金属矿产地质调查中心 余子昌，有色金属矿产地质调查中心 刘志强，有色金属矿产地质调查中心 刘增仁，有色金属矿产地质调查中心

续表 2

条目	描述
数据时间范围	2012年6月—2015年12月
地理区域	新疆哈密市星星峡镇、沁城乡、双井子乡
数据格式	*.xls
数据量	7.25 MB
数据服务系统网站	http://dcc.cgs.gov.cn
基金项目	中国地质调查局项目“新疆哈密市野马泉西地区矿产调查”（1212011140054）和新疆维吾尔自治区基金项目“新疆哈密市野马泉西金矿普查”（T13-3-XJ30）
语种	中文
数据库（集）组成	数据集包括10个Excel格式的工作表页文件，分别为槽探工程登记表，钻探工程登记表，槽探样品测试结果表，钻探样品测试结果表，小体积质量测试结果表，槽探工程矿体水平厚度与加权平均品位计算表，钻探工程矿体水平厚度与加权平均品位计算表，矿体块段面积计算表，矿体块段厚度与加权品位计算表，资源量估算表。

2　数据采集和处理方法

2.1　样品采集

本次调查工作所采集的样品主要来自探槽和钻孔岩心，共采集样品 270 个。采集的样品包括岩化粉砂岩、变质粉砂岩和石英闪长玢岩等。钻孔岩心采用劈半法，按样长 0.8~1.5 m 连续采样。地表矿体以 10 cm×5 cm 规格，0.8~1.5 m 一个样品，连续刻槽采样。组合样采用单工程组合，一般视地质情况变化，取 2~7 个样品为一组合。

角岩化粉砂岩：深灰绿色，变余粉砂结构，块状构造。碎屑较细，一般粒径<0.03 mm，属细粉砂级，碎屑物粒度均匀。岩石中泥质物发生变质重结晶作用，产生新生矿物棕红色的黑云母，及少量绢云母。金属矿物少见，有时呈不规则细脉产出。岩石中可见少量石英呈不规则细脉状，或不规则团块状产出，系岩石热变质产物。

变质粉砂岩：灰黑色，青灰色，变余粉砂状结构，变余层理状构造。碎屑物长石粘土化比较明显，石英呈次棱角状。碎屑物粒径多小于 0.1 mm，属粗粉砂—细砂级。偶见粗者粒径在 0.25 mm 左右，属细砂级。碎屑物存在变质结晶现象，长石与石英紧密弯曲镶嵌。泥质物变质重结晶产生新生矿物细鳞片状绢云母、黑云母雏晶等，其晶面展布与岩石的微层理方向一致。岩石受到一定的后期气液交代作用，发生次生石英岩化。石英呈他形粒状，颗粒之间紧密镶嵌，在岩石中分布不均匀，或呈团块状集合体，或断续相连成线状、细脉状，与岩石的微层理方向基本一致。偶见碳酸盐细脉穿切岩石。

石英闪长玢岩：褐黄色、褐色，变余斑状结构，基质显微鳞片微粒变晶结构，定向构造。岩石轻度变质重结晶，斑晶、基质平行定向，新生黑云母呈条痕状平行分布。斜长石含量 90%，不等粒，多数呈粒径<0.25 mm 他形微粒基质。变余斑晶占 35%，粒径 0.73~1.7 mm×1.2 mm 半自形板粒状，斑晶斜长石泥化强，可见双晶，压扁定向密集分布。石英含量 5%，粒径一般 0.03~0.18 mm，他形粒状，散布于斜长石粒间。黑云母含量 5%，黄褐色，显微鳞片状，呈条痕状平行分布于长石和石英颗粒间。偶见粒状磁铁矿，粒径<0.05 mm，星点状分布。

2.2　测试方法

金样品测试单位为新疆维吾尔自治区有色地质勘查局测试中心。体重样采用常规蜡封法，化验分析采用原子吸收测定法。

2.3 资源量估算方法

2.3.1 采用的工业指标

按照《岩金矿地质勘查规范》(DZ/T0205−2002)的要求，综合物相分析，确定的金矿物以自然金和硫化物包裹金为主的矿物学特征。其中1号金矿体品位高、规模大，埋藏浅(地表直接出露)(图3)，地形平坦、交通方便，适宜露天开采。确定的工业指标如下：

图3 野马泉西1号金矿体地表特征

边界品位Au(10^{-6})：0.5；

最低工业品位Au(10^{-6})：1；

最小可采厚度(m)：0.8；

夹石剔除厚度(m)：4。

2.3.2 资源量估算方法的选择及其依据

根据矿体的形态、产状和规模，采用地质块段法，在矿体垂直纵投影图上进行资源量估算(国土资源部储量司，2000)。

资源量估算公式：

$Q=d\cdot S\cdot H$

$P=Q\cdot c$

式中：Q—矿石量；d—矿石体；S—块段投影面积；H—块段平均水平厚度；P—金属量；c—矿石平均品位。

2.3.3 资源量估算参数的确定

(1)块段面积的测定

在资源量估算的垂直纵投影图上，根据所圈定矿体块段的形态利用MapGIS软件测量块段区面积。

(2)水平厚度的确定

单工程矿体水平厚度采用该工程内切穿矿体厚度连续样品的水平厚度之和。探槽和钻探工程均采用厚度公式计算，即

$Hv=L(\sin\alpha\cdot\cos\beta\cdot\sin\gamma\pm\cos\alpha\cdot\sin\beta)/\sin\alpha$。

式中：Hv—矿体水平厚度(m)；L—矿体视厚度(m)；β—工程穿过矿体时坡度角(°)；α—矿体倾角(°)；γ—探槽方位与矿体走向间夹角(°)，其中地层倾向与坡向相反取正号，地层倾向与坡向相同取负号。

矿体块体水平厚度为矿块内各单工程矿体水平厚度的算术平均值。

（3）平均品位的确定

单工程矿体平均品位由工程内样品的成矿元素含量与长度加权平均求得：

$$C=(C_1L_1+C_2L_2+\cdots+C_nL_n)/(L_1+L_2+\cdots+L_n)$$

式中：C—单工程矿体平均品位，C_1、$C_2\cdots C_n$—单样品成矿元素含量；L_1、$L_2\cdots L_n$—单样品长度（m）。

矿体平均品位采用各单工程加权平均品位算得。

2.3.4 资源量的分类

由于区内工程控制程度低，控制网度较稀疏，本次仅对矿床 333 类推断的资源量和 334 类预测的资源量进行估算。矿区内矿体地质块段划分为 4 段，分别为 1 号矿体：333、334；38 号矿体：333、334。

2.4 金矿测试数据统计表

参与资源量估算的样品大部分进行了内外检分析测试，具体见表 3、4。

表 3 金矿测试数据统计表（内检分析与基本分析对照表）

序号	样品编号	基本分析/$\times10^{-6}$	内检分析/$\times10^{-6}$	相对偏差/RD%	误差允许限/Y_G%	备注	合格率/%
		Au	Au	Au	Au		
1	YMTC21-H112	1.68	2.04	9.68	14.36	合格	
2	YMTC0-H4	1.00	0.98	1.01	17.37	合格	
3	YMTC0-H5	109.10	108.60	0.23	4.22	合格	
4	YMTC0-H6	27.75	25.50	4.23	6.44	合格	
5	YMTC0-H7	4.46	4.06	4.69	11.19	合格	
6	YMTC0-H8	16.90	17.30	1.17	7.36	合格	
7	YMTC0-H10	1.38	1.28	3.76	15.89	合格	
8	YMTC21-H135	1.40	1.41	0.36	15.63	合格	
9	YMZK002-H51	1.50	0.34	63.04	17.76	超差	
10	YMZK001-H22	2.29	2.67	7.77	13.18	合格	
11	YMZK001-H23	5.42	5.30	1.07	10.44	合格	
12	YMTC0-H128	2.34	5.47	40.08	11.49	超差	
13	YMZK003-H206	18.39	16.15	6.49	7.34	合格	92
14	YMZK003-H207	1.46	1.40	2.10	15.55	合格	
15	YMZK003-H208	0.70	0.62	6.06	19.62	合格	
16	YMZK004-H36	1.03	1.25	9.65	16.65	合格	
17	YMZK004-H39	0.81	0.79	1.25	18.52	合格	
18	YMZK001-H84	3.33	2.86	7.59	12.32	合格	
19	YMZK001-H37	32.25	24.58	13.50	6.32	超差	
20	YMZK001-H43	0.79	0.94	8.67	18.09	合格	
21	YMZK002-H62	1.30	1.30	0.19	16.01	合格	
22	YMZK002-H63	1.37	1.14	8.98	16.18	合格	
23	YMZK002-H64	3.82	4.31	6.09	11.35	合格	
24	YMDK27	2.67	2.25	8.54	13.20	合格	
25	YMDK34	2.65	2.45	3.92	13.06	合格	

续表 3

序号	样品编号	基本分析/ $\times10^{-6}$ Au	内检分析/ $\times10^{-6}$ Au	相对偏差/ RD% Au	误差允许限/ Y_G% Au	备注	合格率/ %
26	YMZK24301−H42	1.53	1.5	0.99	15.28	合格	92
27	YMZK22701−H27	1.49	1.52	1.00	15.31	合格	
28	YMZK22701−H101	1.96	1.84	3.16	14.27	合格	
29	BTC25−1−H113	0.01	0.01	0.00	69.32	合格	
30	BTC31−1−H15	0.01	0.01	0.00	69.32	合格	
31	BTC39−1−H26	0.12	0.08	20.00	34.65	合格	
32	YMZK10301−H167	0.21	0.20	2.44	27.91	合格	
33	YMZK10301−H169	0.41	0.44	2.96	22.45	合格	
34	YMZK10301−H170	0.25	0.25	1.01	26.37	合格	
35	YMZK24301−H105	0.37	0.38	0.67	23.31	合格	
36	YMZK24301−H111	1.12	1.12	0.22	16.75	合格	
37	KTC11−1−H4	0.23	0.25	4.26	26.78	合格	
38	KTC11−1−H14	0.27	0.23	7.07	26.37	合格	
39	KTC11−2−H11	0.51	0.53	1.45	21.12	合格	

表 4 金矿测试数据统计表（外检分析与基本分析结果对照表）

序号	样品编号	基本分析/ $\times10^{-6}$ Au	外检分析/ $\times10^{-6}$ Au	相对偏差/ RD% Au	误差允许限/ Y_G% Au	备注	合格率/ %
1	YMTC21−H112	1.68	1.64	1.20	14.86	合格	93
2	YMTC0−H4	1.00	0.84	8.70	17.76	合格	
3	YMTC0−H5	109.10	114.60	2.46	4.18	合格	
4	YMTC0−H6	27.75	26.78	1.78	6.40	合格	
5	YMTC0−H7	4.46	4.15	3.60	11.16	合格	
6	YMTC0−H8	16.90	18.63	4.87	7.28	合格	
7	YMTC0−H10	1.38	1.48	3.50	15.55	合格	
8	YMTC21−H135	1.40	1.36	1.45	15.72	合格	
9	YMZK002−H51	1.50	1.46	1.35	15.39	合格	
10	YMZK001−H22	2.29	2.28	0.11	13.50	合格	
11	YMZK001−H23	5.42	6.11	6.03	10.22	合格	
12	YMTC0−H128	2.34	3.40	18.43	12.61	超差	
13	YMZK003−H206	18.39	22.63	10.34	6.97	超差	
14	YMZK003−H207	1.46	1.17	11.16	15.95	合格	
15	YMZK003−H208	0.70	0.87	10.65	18.64	合格	
16	YMZK004−H36	1.03	0.99	2.13	17.27	合格	
17	YMZK004−H39	0.81	0.79	1.45	18.53	合格	
18	YMZK001−H84	3.33	3.76	6.01	11.83	合格	
19	YMZK001−H37	32.25	34.75	3.73	6.01	合格	
20	YMZK001−H43	0.79	0.89	5.95	18.25	合格	

续表 4

序号	样品编号	基本分析/ $\times10^{-6}$ Au	外检分析/ $\times10^{-6}$ Au	相对偏差/ RD% Au	误差允许限/ Y_G% Au	备注	合格率/ %
21	YMZK002-H62	1.30	1.39	3.56	15.84	合格	93
22	YMZK002-H63	1.37	1.48	3.95	15.58	合格	
23	YMZK002-H64	3.82	4.45	7.68	11.29	合格	
24	YMDK27	2.67	2.60	1.26	12.93	合格	
25	YMDK34	2.65	2.86	3.88	12.76	合格	
26	YMZK24301-H42	1.53	1.92	11.30	14.69	合格	
27	YMZK22701-H27	1.49	1.58	2.93	15.22	合格	
28	YMZK22701-H101	1.96	1.89	1.82	14.22	合格	
29	YMZK24301-H111	1.12	1.32	8.20	16.31	合格	
30	KTC11-2-H11	0.51	0.43	8.51	21.74	合格	

3 数据样本描述

“槽探工程登记表”（表 5）包含如下内容：序号、工程编号、施工目的、开工日期、完工日期、地质编录（开始日期、结束日期、编录人）、施工结果、设计长度（单位 m）、实际长度（单位 m）、设计方位（单位°）、实际方位（单位°）、起点坐标（X、Y、Z）、备注。

表 5 槽探工程登记表

序号	字段名称	量纲	数据类型	实例
1	序号	–	字符型	2
2	工程编号	–	字符型	YMTC0
3	施工目的	–	字符型	控制矿体
4	开工日期	–	字符型	2012年6月7日
5	完工日期	–	字符型	2012年6月11日
6	地质编录	–	字符型	–
	开始日期	–	字符型	2012年6月11日
	结束日期	–	字符型	2012年6月15日
	编录人	–	字符型	任经武
7	施工结果	–	字符型	达到预定目的
8	设计长度	m	浮点型	120
9	实际长度	m	浮点型	117
10	设计方位	°	浮点型	160
11	实际方位	°	浮点型	160
12	起点坐标	–	字符型	–
	X	–	浮点型	4677356
	Y	–	浮点型	16682351
	Z	–	浮点型	1285
13	备注	–	字符型	–

“钻探工程登记表”（表 6）包含如下内容：序号、工程编号、施工目的、开工日期、完工日期、地质编录（开始日期、结束日期、编录人）、施工结果、设计长度（单位 m）、实际长度（单位 m）、设计方位（单位°）、实际方位（单位°）、设计倾角（单位°）、实际倾角（单位°）、起点坐标（X、Y、Z）、备注。

表 6　钻探工程登记表

序号	字段名称	量纲	数据类型	实例
1	序号	–	字符型	1
2	工程编号	–	字符型	YMZK001
3	施工目的	–	字符型	控制矿体
4	开工日期	–	字符型	2012年9月18日
5	完工日期	–	字符型	2012年10月20日
6	地质编录	–	字符型	
	开始日期	–	字符型	2012年9月18日
	结束日期	–	字符型	2012年10月23日
	编录人	–	字符型	黄小伟
7	施工结果	–	字符型	达到目的
8	设计长度	m	浮点型	300
9	实际长度	m	浮点型	269.99
10	设计方位	°	浮点型	160
11	实际方位	°	浮点型	160.9
12	设计倾角	°	浮点型	78
13	实际倾角	°	浮点型	76.1
14	起点坐标	–	字符型	
	X	–	浮点型	4677356
	Y	–	浮点型	16682351
	Z	–	浮点型	1285
15	备注	–	字符型	

“槽探样品测试结果表”（表 7）包含如下内容：序号、工程编号、样品编号、采用位置[自（单位 m）、至（单位 m）、计（单位 m）]、采样线[样长（单位 m）、方位（单位°）、坡度（单位°）]、矿体产状[倾向（单位°）、倾角（单位°）]、Pb 品位（单位 %）、Zn 品位（单位 %）、Cu 品位（单位 %）、Au 品位（单位$\times10^{-6}$）。

表 7　槽探样品分析结果表

序号	字段名称	量纲	数据类型	实例
1	序号	–	字符型	2
2	工程编号	–	字符型	YMTC0
3	样品编号	–	字符型	H1
4	采用位置	–	字符型	
	自	m	浮点型	36.0
	至	m	浮点型	37.0
	计	m	浮点型	1.0

续表 7

序号	字段名称	量纲	数据类型	实例
5	采样线	–	字符型	
	样长	m	浮点型	1.0
	方位	°	浮点型	180
	坡度	°	浮点型	−3
6	矿体产状	–	字符型	
	倾向	°	浮点型	340
	倾角	°	浮点型	75
7	Pb	%	字符型	0.01
8	Zn	%	浮点型	0.02
9	Cu	%	字符型	0.01
10	Au	$\times10^{-6}$	浮点型	1.25

“钻探样品测试结果表”与“槽探样品分析结果表”一致，同表 7。

“小体积质量测试结果表”（表 8）包含如下内容：序号、样品编号、样品取样工程位置、岩石特征、矿体编号、矿石品位（单位$\times10^{-6}$）（Au、Ag）、小体积质量（单位 g/cm^3）、备注。

表 8 小体积质量测试结果表

序号	字段名称	量纲	数据类型	实例
1	序号	–	字符型	1
2	样品编号	–	字符型	YMXT1
3	样品取样工程位置	–	字符型	YMTC0–H5
4	岩石特征	–	字符型	混合矿石
5	矿体编号	–	字符型	1
6	矿石品位	–	字符型	
	Au	$\times10^{-6}$	浮点型	1.25
	Ag	$\times10^{-6}$	浮点型	2.4
7	小体积质量	g/cm^3	浮点型	2.77
8	备注	–	字符型	

“槽探工程矿体水平厚度与加权平均品位计算表”（表 9）包含如下内容：序号、工程编号、矿体编号、样品编号、采样位置[自（单位 m）、至（单位 m）、计（单位 m）]、采样线[样长（单位 m）、方位（单位°）、坡度（单位°）]、勘探线方位（单位°）、矿体产状[倾向（单位°）、倾角（单位°）]、工程方位与矿体倾向夹角（单位°）、样品真厚度（单位 m）、样品水平厚度（单位 m）、Au 品位（单位$\times10^{-6}$）、Au 矿体平均品位（单位$\times10^{-6}$）、Au 矿体真厚度（单位 m）、Au 矿体水平厚度（单位 m），备注。

表 9 槽探工程矿体水平厚度与加权平均品位计算表

序号	字段名称	量纲	数据类型	实例
1	序号	–	字符型	1
2	工程编号	–	字符型	YMTC0

续表 9

序号	字段名称	量纲	数据类型	实例
3	矿体编号	–	字符型	1
4	样品编号	–	字符型	YMXT1
5	采样位置	–	字符型	
	自	m	浮点型	12.0
	至	m	浮点型	13.0
	计	m	浮点型	1.0
6	采样线	–	字符型	
	样长	m	浮点型	1.0
	方位	°	浮点型	160
	坡度	°	浮点型	2
7	勘探线	–	字符型	160
8	矿体产状	–	字符型	
	倾向	°	浮点型	330
	倾角	°	浮点型	70
9	工程方位与矿体倾向夹角	°	浮点型	−170
10	样品真厚度	m	浮点型	0.93
11	样品水平厚度	m	浮点型	0.97
12	Au品位	$\times10^{-6}$	浮点型	1.23
13	Au矿体平均品位	$\times10^{-6}$	浮点型	1.55
14	Au矿体真厚度	m	浮点型	3.2
15	Au矿体水平厚度	m	浮点型	3.65
16	备注	–		

“钻探工程矿体水平厚度与加权平均品位计算表”与“槽探工程矿体水平厚度与加权平均品位计算表”一致，见表 9。

“矿体块段面积计算表”（表 10）包含如下内容：矿区、序号、矿体编号、资源量类别、块段面积（单位 m^2）、备注。

表 10　矿体块段面积计算表

序号	字段名称	量纲	数据类型	实例
1	矿区	–	字符型	野马泉西
2	序号	–	字符型	1
3	矿体编号	–	字符型	1
4	资源量类别	–	字符型	333
5	块段面积	m^2	浮点型	36543.72
6	备注	–	字符型	

“矿体块段厚度与加权品位计算表”（表 11）包含如下内容：矿区、序号、矿体编号、工程编号、资源量类别、单工程矿体水平厚度（单位 m）、单工程矿体平均品位（Au、Ag）、矿体块段水平厚度（单位 m）、矿体块段品位（Au、Ag）。

表 11　矿体块段厚度与加权品位计算表

序号	字段名称	量纲	数据类型	实例
1	矿区	–	字符型	野马泉西
2	序号	–	字符型	1
3	矿体编号	–	字符型	1
4	工程编号	–	字符型	YMTC0
5	资源量类别	–	字符型	333
6	单工程矿体水平厚度	m	浮点型	2.5
	单工程矿体平均品位	–	字符型	
7	Au	$\times 10^{-6}$	浮点型	1.38
	Ag	$\times 10^{-6}$	浮点型	2.58
8	矿体块段水平厚度	m	浮点型	2.56
	矿体块段品位	–	字符型	
9	Au	$\times 10^{-6}$	浮点型	1.61
	Ag	$\times 10^{-6}$	浮点型	2.58

“资源量估算表”（表 12）包含如下内容：矿区、矿体编号、资源量类别、块段水平厚度（单位 m）、块段品位（Au、Ag）、块段面积（单位 m^2）、平均体积质量（单位 t/m^3）、矿石量（单位 kt）（Au、Ag）、金属量（单位 kg）（Au、Ag）、备注。

表 12　资源量估算表

序号	字段名称	量纲	数据类型	实例
1	矿区	–	字符型	野马泉西
2	矿体编号	–	字符型	1
3	资源量类别	–	字符型	333
4	块段水平厚度	m	浮点型	2.65
	块段品位	–	字符型	
5	Au	$\times 10^{-6}$	浮点型	1.61
	Ag	$\times 10^{-6}$	浮点型	2.58
6	块段面积	m^2	浮点型	36549.73
7	平均体积质量	t/m^3	浮点型	2.67
	矿石量	–	字符型	
8	Au	kt	浮点型	259
	Ag	kt	浮点型	259
	金属量	–	字符型	
9	Au	kg	浮点型	1627
	Ag	kg	浮点型	4031
10	备注	–		

4　数据质量控制和评估

对矿区主要工程点（钻孔、探槽），在已有已知控制点的基础上，使用拓普康 RTK 卫星定测与全站仪测量相结合的方法进行测量，精度可以满足预普查资源量估算要求。

外检样品 30 个，委托国土资源部乌鲁木齐矿产资源监督检测中心和有色金属桂林矿产地质测试中心进行外检分析对比。内检样品 39 个，由新疆维吾尔自治区有色地质勘查局测试中心进行自检。根据基本分析结果和内外检结果对比，测试结果基本准确可靠，外检合格率 93%，内检合格率 92%，基本满足资源量估算要求。

5 结论

新疆野马泉西金矿区的资源量数据集包含 3 个 Excel 工作簿，内含 10 个 Excel 工作表页文件，是采用地质块段法对野外采集的数据进行计算和整理形成的。各类表格参数齐全，数据真实可靠。数据集内地表槽探样品 3 537 个，深部钻探样品 1 471 个，样品总含矿率为 12.4%，含矿岩性以粉砂岩、石英脉、石英闪长岩脉为主，富矿率（高品位样品）0.22%，富矿体主要集中于石英脉中，具开采利用价值。该数据集对矿区下一步勘查开发和周边同类型矿床的资源量估算具参考意义。

注释：

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Resource Dataset for West Yemaquan Gold Ore Deposit, Kumul, Xinjiang

REN Jingwu [1], DU Guichao [2*], WANG Jinbao [1], YANG Yanxu [1], YE Lei [1], YU Zichang [1], LIU Zhiqiang [1], LIU Zengren [1]

(1. *China Non-ferrous Metals Resource Geological Survey*, *Beijing* 100012, *China*;
2. *College of Geosciences and Engineering*, *Xi'an Shiyou University*, *Xi'an* 710065, *China*)

Abstract: The Kangguertage ductile shear zone in western China is an important gold ore-controlling belt, where important deposits such as Kangguer, Matoutan and Shiyingtan are found. The West Yemaquan gold ore deposit, typical of the ductile shear zone ore-controlling type, is situated along the eastern shear zone extension—the Kushui–Yamansu ductile shear zone. A new dataset created from estimation of resources in the West Yemaquan gold ore deposit uses the geological ore block method, utilizing data on coordinates of mineral prospecting sites and results obtained from the analytic testing of samples collected during field geological survey in sites within the West Yemaquan Goldfield. All samples for the dataset were tested by national testing centers owning Level-A certificate. The qualified rates from both internal and external inspection are over 90%, indicating that the data are credible and provide important referential implications for the estimation of surrounding deposits of the same kind.

Key words: West Yemaquan gold ore deposit; Resource; Dateset; Ductile shear zone; Kumul Xinjiang

Data service system URL: http://dcc.cgs.gov.cn

1 Introduction

The Jueluotage Cu−Ni−Fe−Mn−V−Ti−Au−Ag−W−Mo rare metal ore belt in East Tianshan is one of the most important metallogenic belts in Xinjiang, with hundreds of main deposits. The Kangguertage ductile shear zone is also situated within this belt, where important deposits such as Kangguer, Matoutan and Shiyingtan are found (Dong LH et al., 2010). The

About the first author: REN Jingwu, male, born in 1985, an engineering master and engineer, now engages in geological mineral survey; E-mail: 371662737@qq.com.

The corresponding author: DU Guichao, male, born in 1983, PhD and associate professor, engages in research in sedimentology and reservoir geology; E-mail: duguichao@sina.com.

strata range in age from Archaean to Cenozoic outcrops in this region and strata of the Carboniferous system is widely distributed. There are well-developed large structures, including from north to south, Kangguertage–Huangshan fault, Qiugemingtashi–Huangshan ductile shear zone, Kushui−Yamansu fault zone, Weiya ductile shear zone, and Aqqikkuduk–Shaquanzi major fault. The area experiences frequent magmatic activities and among the generated igneous rocks, Late Paleozoic intrusive rocks are most developed[1].

The West Yemaquan gold ore deposit is situated along the east of the shear zone extension——the Kushui–Yamansu ductile shear zone (see Fig. 1). The outcropping strata within the gold field present a simple structure, which except for Quaternary strata, are primarily the Lower Carboniferous Yamansu Formation. The lithology is predominantly conglomerate, sandstone and siliceous siltstone, interbedded with limestone and tuff (Fig. 2). There are developed structures within the region and the largest main fault is the Kushui–Yamansu Fault, which traverses the whole West Yemaquan Mine Area in the east, distributed in a NE direction, a north−dipping thrust fault with a strike of 60°~70° and at a dip angle of 70°~85°. On the south side of the fault there is a developed a set of strike-slip faults in a ductile shear zone encompassed in a nappe thrust which is strong in the south and weak in the north, under control of F_1 and F_2. Within this ductile shear zone, there are mainly three sets of secondary faults: the first is roughly in the same direction as the major fault, at an intersection angle of 10°~15° with the boundary of the shear zone; the second intersects with the shear zone at a larger angle of about 70°, primarily with NNE-strike fissures; the third is a compressional fracture mainly on a NS strike. At present, most gold orebodies are distributed within the first set of faults and no mineral (mineralized) body is found in the other two fault sets. There are developed magmatic rocks within the mine area, which are dominantly medium and later Hercynian intermediate-acid intrusive rocks. Granodiorite lies on the north side while diorite is in the south. In addition, there are developed intermediate-acid veins, which are mainly granite porphyry, quartz diorite, diorite vein and quartz vein[2].

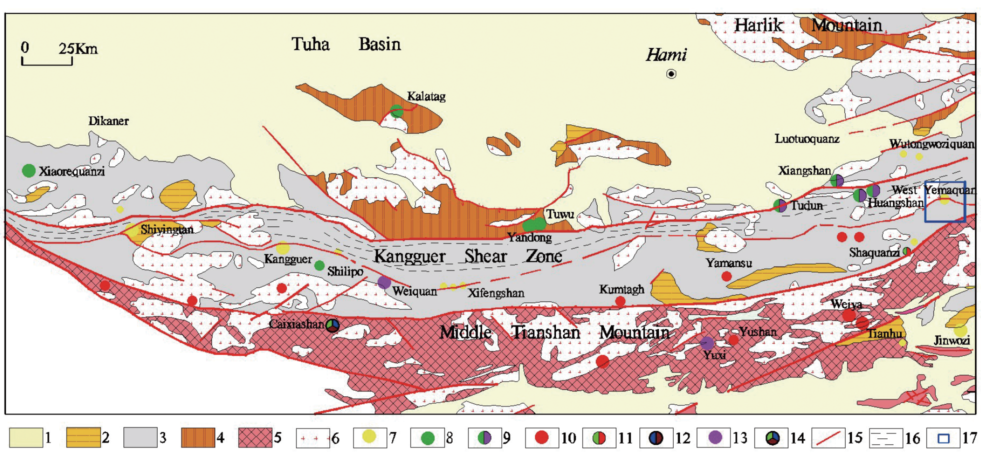

Fig. 1 Simplified geological map at Jueluotage, East Tianshan, Xinjiang (Han CM et al., revised in 2002)

1−Mesozoic–Cenozoic sedimentary cover; 2- Permian continental volcano-sedimentary rock series; 3−Carboniferous volcano-sedimentary rocks; 4−Ordovician−Devonian volcano−sedimentary rocks; 5−Precambrian metamorphic rocks; 6−granitic rocks; 7−gold deposit; 8−copper deposit; 9−Cu−Ni−sulfide deposit; 10−iron deposit; 11−iron−copper deposit; 12−Pb−Zn deposit; 13−Ag multi−metal deposit; 14−multi−metal deposit; 15−fault; 16−shear zone; 17−the location of the gold field.

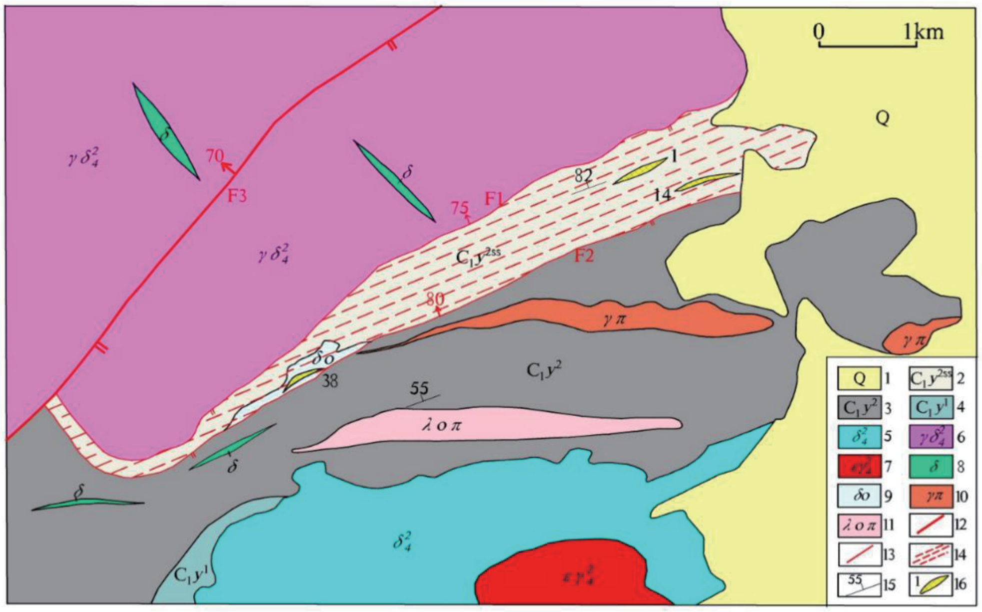

Fig. 2 Simplified geological map of West Yemaquan Gold Field

(Ren JW et al., 2017: Medium−scale Gold Deposit Found in West Yemaquan, East Tianshan, Xinjiang.New Letters of China Geological Survey, 3(14): 5-8)1−Quaternary alluvial-diluvium; 2−sandstone in Upper Yamansu Formation, Lower Carboniferous; 3−Yamansu Formation, Lower Carboniferous; 4−Lower Yamansu Formation, Lower Carboniferous; 5−medium Variscan diorite; 6−medium Variscan granodiorite; 7−medium Variscan moyite; 8−diorite vein;
9−quartz diorite vein; 10−granitic porphyry vein; 11− quartz porphyry vein; 12−regional major fault; 13−secondary fault; 14−ductile shear zone; 15−formation occurrence; 16−gold orebody and its number.

Within the area, three groups of gold orebodies are delineated (I, II, and III, as shown in Table 1) of which there are 12 strips of gold bodies and 23 mineralized gold bodies. The orebody shapes are mostly stratified, lentoid or vein-like. Orebody #1 is the main one within the mine area, which is generally along a strike of 70°; it is 160 m in length, 1.14~5.54 m in thickness and more than 400 m in depth along the direction of dip. The gold grade is 0.54~109.10 $\times 10^{-6}$. The ore origin and industrial type of the deposit belongs to the ductile shear zone type and the quartz vein type, respectively (source: as for Fig. 2). Survey and assessment of the deposit of resources not only allows provision of a valuable reference for assessment of resources of any deposits of the same type, but also sets an example for research into the distribution features of orebodies in the deposits of the same type within West Yemaquan (Liu HG et al., 2017).

Table 1 Summary of Features of Orebody Groups within West Yemaquan

No.	Size (m)		Strike (°)	Geological features	Type of gold mineral	Number of gold orebodies
	Length	Width				
I	1000	300~500	60~70	Stands in the ductile shear zone of contact zone between granitic diorite rock mass in the north and the Lower Carboniferous Yamansu Formation. The orebody roof and base comprise Yamansu Formation sandstone, siltstone, mudstone and limestone.	Quartz vein type, and fractured alteration rock type	8

Continued table 1

No.	Size (m)		Strike (°)	Geological features	Type of gold mineral	Number of gold orebodies
	Length	Width				
Ⅱ	320~400	2~20	60	Stands in ductile shear zone of contact zone between the granitic diorite rock mass in the north and the Lower Carboniferous Yamansu Formation. The orebody roof and base comprise Yamansu Formation sandstone, siltstone and conglomerate.	Quartz vein type	1
Ⅲ	1300	60~200	60	Stands in ductile shear zone of contact zone between the granitic diorite rock mass in the north and the Lower Carboniferous Yamansu Formation. The orebody roof and base comprise Yamansu Formation sandstone, siltstone and limestone.	Fractured vein type	3

Much research has been conducted to estimate the resources of metallic deposits, most of which uses traditional methods in combination with geo-statistics and information technology or geo–statistical methods (Bai RH et al., 2010; Guo HJ, 2010; Xiao YH et al., 2012; Cao JZ et al., 2015; Zhang PC et al., 2017). In traditional resource estimation methods, irregular geologic bodies are regarded roughly as regular geometries and then geometric methods are adopted to calculate the volumes of geometries, which are then considered as the volume of resources in the orebodies. For this purpose, there are two basic methods: the cross-section method and the geological ore block method (Zhang PC et al., 2017), the last of which was applied as a main method for this resource estimation.

The dataset for resources of the West Yemaquan gold ore deposit, Xinjiang, includes three Excel workbooks, namely "Work Registration.xls", "Sample Testing Result.xls" and "Resource Estimation.xls". The "Work Registration" workbook consists of two Excel sheets, i.e., the trenching work registration sheet and the drilling work registration sheet. The "Sample Testing Result" workbook contains three Excel sheets, i.e., the trenching sample testing sheet, the drill sample testing result sheet and the small-volume mass testing result sheet. The "Resource Estimation" workbook consists of five Excel sheets, i.e., the trenching work orebody horizontal thickness and weighted mean grade calculation sheet, the drill work orebody horizontal thickness and weighted mean grade calculation sheet, the orebody block area calculation sheet, the orebody block thickness and weighted grade calculation sheet and the resource estimation sheet. See Table 2 for Metadata.

Table 2 Metadata Table of Dataset (Database)

Items	Description
Database (dataset) name	Resource Dataset for West-Yemaquan Goldfield, Kumul, Xingjiang
Database (dataset) authors	Ren Jingwu, China Non–ferrous Metals Resource Geological Survey Du Guichao, College of Geosciences and Engineering, Xi'an Shiyou University Wang Jingbao, China Non–ferrous Metals Resource Geological Survey Yang Yanxu, China Non–ferrous Metals Resource Geological Survey Ye Lei, China Non–ferrous Metals Resource Geological Survey Yu Zichang, China Non–ferrous Metals Resource Geological Survey Liu Zhiqiang, China Non–ferrous Metals Resource Geological Survey Liu Zengren, China Non–ferrous Metals Resource Geological Survey

Continued table 2

Items	Description
Data acquisition time	June 2012 to December 2015
Geographical region	Xingxingxia Town, Qincheng Town and Shuangjingzi Town, Kumul, Xinjiang
Data format	*.xls
Data size	7.25MB
Data service system URL	http://dcc.cgs.gov.cn
Fund project	CGS project "Mineral Survey at West Yemaquan, Kumul, Xinjiang" (1212011140054) and fund project of Xinjiang Uygur Autonomous Region "General Survey of Gold Ore in West Yemaquan, KUmul, Xinjiang" (T13−3−XJ30).
Language	Chinese
Database (dataset) composition	The dataset consists of 10 Excel sheets: trenching work registration; drilling work registration; trenching sample testing result; drill sample testing result; small−volume mass testing result; trenching work mineral−body horizontal thickness and weighted mean grade calculation; drill work orebody horizontal thickness and weighted mean grade calculation; orebody block area calculation; orebody block thickness and weighted grade calculation; and resource estimation.

2 Method for Data Acquisition and Processing

2.1 Sampling

270 samples were acquired for this survey from the trenching and drill cores. Samples acquired contain hornfelsic siltstone, metamorphic siltstone and quartz diorite porphyrite. Drill cores were sampled in the length of 0.8~1.5 m per sample continuously using the half-splitting method. In the surface orebody, samples with the size of 10 cm × 5 cm and 0.8~1.5 m long were taken continuously by grooving. Sample combinations are in the form of single work combination and sample combination generally consists of 2~7 samples depending on geological conditions.

Hornfelsic siltstone: dark grey−green, palimpsest silt texture and massive structure. This sample generally has finer debris with an even particle size <0.03 mm, thus it belongs to fine silt. Metamorphic recrystallization of argillaceous matter in rocks has generated neogenic minerals, namely brownish−red biotite and a small amount of sericite. Metallic minerals are rare and sometimes appear in the form of an irregular stringer. A small amount of quartz in the form of irregular stringers or irregular blocks was found in the samples, which results from thermal metamorphism of the rock.

Metamorphic siltstone: grey−black or steel grey, palimpsest silt texture and palimpsest bedding-like structure. Debris feldspar is markedly clayey and quartz is subangular in shape. Since particle size of most debris is smaller than 0.1 mm, this sample belongs to the coarse silt−fine sand grade. Occasionally, the particle size of the coarse debris is around 0.25 mm, belonging to the fine-sand grade. Metamorphic crystallization has happened to the debris. Feldspar and quartz are closely bent and inlaid. Metamorphic recrystallization of argillaceous matter has generated neogenic minerals, such as fine scale-like sericite and biotite crystallites, with the crystal plane distributed in a direction consistent with the direction of micro-stratification in the rocks. Under certain action of later gas−liquid metasomatism, the rocks have turned into secondary quartzite. Quartz is in the allotriomorphic granular form with closely inlaid particles; it is unevenly distributed in the rocks, in the form of lumpy aggregations or connected intermittently in a line or in a stringer−like form, in a direction generally consistent with the direction of micro−stratification of the rocks. Occasionally it is found that a carbonate stringer cuts through the rocks.

Quartz diorite porphyrite: isabelline or brown, palimpsest porphyritic texture, micro−scale granular crystalloblastic texture for the matrix and directional structure. Light metamorphic recrystallization has occurred in the rocks. Phenocrysts and matrix are parallel in direction. Neogenic biotite is distributed in a pattern of parallel striae. Plagioclase, accounting for 90%, is inequigranular; most are anhedral in a granular matrix with particle size <0.25mm. Palimpsest phenocryst, account for 35%, with a particle size of 0.73~1.7 mm ×1.2 mm and in a granular subhedral shape. Phenocryst plagioclase has been subjected to strong argillization from which bicrystals are visible, flattened, directional and closely distributed. Quartz accounts for 5% with a particle size typically of 0.03~0.18 mm, in anhedral granular form, sparsely distributed among the plagioclase particles. Micro-scale fine isabelline biotite accounts for 5%, and is distributed in a pattern of parallel striae among feldspar and quartz particles. Granular magnetite is occasionally seen, with a particle size <0.05 mm, distributed in a star−like pattern.

2.2 Test Method

Gold samples were tested by the Testing Center of the Nonferrous Geological Survey of Xinjiang Uygur Autonomous Region. Weight samples were tested with the conventional wax−sealing method and assay analysis was done using atomic absorption spectrometry.

2.3 Resource Estimation Methods

2.3.1 Industrial Indexes Used

In accordance with the *Specifications for Hard Rock Gold Exploration (DZ/T 0205−2002)* and in combination with phase analysis, an investigation was done to determine the mineralogical characteristics of the gold minerals in the samples, which are primarily natural gold and invisible gold as inclusions within sulfide. From this, the gold orebody #1 is deemed to be suitable for open mining for its high grade, large scale, shallow depth (outcrop over surface) (Fig. 3), flat landform and convenient transport condition. The established industrial indexes are:

Fig. 3 Surface characteristics of Gold orebody #1 in West Yemaquan.

Cutoff grade Au (10^{-6}): 0.5;

Min. industrial grade Au (10^{-6}): 1;

Min. minable thickness (m): 0.8;

Band rejected thickness (m): 4.

2.3.2 Selection of Resource Estimation Methods and Basis

Based on the form, occurrence and scale of orebodies, the geological ore block method was selected to estimate resources in the orebody vertical longitudinal projection map (Resource Department of Ministry of Land and Resources, 2000).

Formulas for resource estimation are as follows:

$$\begin{aligned} Q &= d \cdot S \cdot H \\ P &= Q \cdot c \end{aligned} \tag{1}$$

Where, Q—mineral volume; d—orebody; S—block projection area; H—block mean horizontal thickness; P—metal volume; c—mineral mean grade.

2.3.3 Determination of Parameters for Resource Estimation

(1) Determination of block area: in the vertical longitudinal projection map for resource estimation, the block area is measured with the software MAPGIS based on the form of the delineated orebody blocks.

(2) Determination of the horizontal thickness: the horizontal thickness of a single-work orebody is the sum of the horizontal thicknesses of cutting continuous samples through the orebody within the single work. The following thickness calculation formulas are used for both trenching and drilling works:

$$H_v = L(\sin\alpha \cdot \cos\beta \cdot \sin\gamma \pm \cos\alpha \cdot \sin\beta) / \sin\alpha \tag{2}$$

Where, H_v—orebody horizontal thickness (m); L—orebody apparent thickness (m); β—the slope angle at which the work cuts through the orebody (°); α—orebody dip (°); γ—the angle between the trench direction and the orebody strike (°), which is positive when the stratal dip is opposite to the slope direction and negative when they are in the same direction.

The orebody block horizontal thickness is the arithmetical mean value of the orebody horizontal thicknesses of all single works within the mineral block.

(3) Determination of mean grade: the mean grade of a single−work orebody is the weighted mean value of the sum of the products of the content of the metallogenic element and its length within the single work:

$$C = (C_1L_1 + C_2L_2 + \ldots + C_nL_n) / (L_1 + L_2 + \ldots + L_n) \tag{3}$$

Where, C—the mean grade of the single-work orebody; C_1, C_2, ... C_n—metallogenic element content in a single sample; and L_1, $L_2 \ldots L_n$—the length of a single sample (m).

The mean grade of the orebody is calculated from weighted mean grades of all single works.

2.3.4 Classification of Resources

Since the work control level is low within the goldfield and the control network is sparse, in this investigation, only the inferred resources of Category 333 and predicted resources of Category 334 in the deposit were estimated. Within the goldfield, the orebody was divided into four geological blocks, namely orebody #1: Categories 333 and 334 and orebody #38: categories 333 and 334.

2.4 Statistical Data Sheet from Testing within the Goldfield

Most samples involved in resource estimation were tested and analyzed through internal and external inspection. See Table 3 and 4 for details.

Table 3 Statistical Data Sheet from Testing within the Goldfield (comparison between internal inspection analysis and basic analysis)

No.	Sample No.	Basic analysis ($\times10^{-6}$)	Internal-inspection analysis ($\times10^{-6}$)	Relative deviation RD%	Allowed error limit Y_G%	Remarks	Qualified rate (%)
		Au	Au	Au	Au		
1	YMTC21-H112	1.68	2.04	9.68	14.36	Qualified	
2	YMTC0-H4	1.00	0.98	1.01	17.37	Qualified	
3	YMTC0-H5	109.10	108.60	0.23	4.22	Qualified	
4	YMTC0-H6	27.75	25.50	4.23	6.44	Qualified	92
5	YMTC0-H7	4.46	4.06	4.69	11.19	Qualified	
6	YMTC0-H8	16.90	17.30	1.17	7.36	Qualified	
7	YMTC0-H10	1.38	1.28	3.76	15.89	Qualified	
8	YMTC21-H135	1.40	1.41	0.36	15.63	Qualified	
9	YMZK002-H51	1.50	0.34	63.04	17.76	Very poor	
10	YMZK001-H22	2.29	2.67	7.77	13.18	Qualified	
11	YMZK001-H23	5.42	5.30	1.07	10.44	Qualified	
12	YMTC0-H128	2.34	5.47	40.08	11.49	Very poor	
13	YMZK003-H206	18.39	16.15	6.49	7.34	Qualified	
14	YMZK003-H207	1.46	1.40	2.10	15.55	Qualified	
15	YMZK003-H208	0.70	0.62	6.06	19.62	Qualified	
16	YMZK004-H36	1.03	1.25	9.65	16.65	Qualified	
17	YMZK004-H39	0.81	0.79	1.25	18.52	Qualified	
18	YMZK001-H84	3.33	2.86	7.59	12.32	Qualified	
19	YMZK001-H37	32.25	24.58	13.50	6.32	Very poor	
20	YMZK001-H43	0.79	0.94	8.67	18.09	Qualified	
21	YMZK002-H62	1.30	1.30	0.19	16.01	Qualified	
22	YMZK002-H63	1.37	1.14	8.98	16.18	Qualified	
23	YMZK002-H64	3.82	4.31	6.09	11.35	Qualified	
24	YMDK27	2.67	2.25	8.54	13.20	Qualified	
25	YMDK34	2.65	2.45	3.92	13.06	Qualified	
26	YMZK24301-H42	1.53	1.5	0.99	15.28	Qualified	
27	YMZK22701-H27	1.49	1.52	1.00	15.31	Qualified	
28	YMZK22701-H101	1.96	1.84	3.16	14.27	Qualified	
29	BTC25-1-H113	0.01	0.01	0.00	69.32	Qualified	
30	BTC31-1-H15	0.01	0.01	0.00	69.32	Qualified	
31	BTC39-1-H26	0.12	0.08	20.00	34.65	Qualified	
32	YMZK10301-H167	0.21	0.20	2.44	27.91	Qualified	
33	YMZK10301-H169	0.41	0.44	2.96	22.45	Qualified	
34	YMZK10301-H170	0.25	0.25	1.01	26.37	Qualified	
35	YMZK24301-H105	0.37	0.38	0.67	23.31	Qualified	
36	YMZK24301-H111	1.12	1.12	0.22	16.75	Qualified	
37	KTC11-1-H4	0.23	0.25	4.26	26.78	Qualified	
38	KTC11-1-H14	0.27	0.23	7.07	26.37	Qualified	
39	KTC11-2-H11	0.51	0.53	1.45	21.12	Qualified	

Table 4 Statistical Data Sheet from Testing within the Goldfield (comparison between results from external inspection analysis and basic analysis)

No.	Sample No.	Basic analysis ($\times10^{-6}$)	External-inspection analysis ($\times10^{-6}$)	Relative deviation *RD*%	Allowed error limit (Y_G%)	Remarks	Qualified rate(%)
		Au	Au	Au	Au		
1	YMTC21-H112	1.68	1.64	1.20	14.86	Qualified	93
2	YMTC0-H4	1.00	0.84	8.70	17.76	Qualified	
3	YMTC0-H5	109.10	114.60	2.46	4.18	Qualified	
4	YMTC0-H6	27.75	26.78	1.78	6.40	Qualified	
5	YMTC0-H7	4.46	4.15	3.60	11.16	Qualified	
6	YMTC0-H8	16.90	18.63	4.87	7.28	Qualified	
7	YMTC0-H10	1.38	1.48	3.50	15.55	Qualified	
8	YMTC21-H135	1.40	1.36	1.45	15.72	Qualified	
9	YMZK002-H51	1.50	1.46	1.35	15.39	Qualified	
10	YMZK001-H22	2.29	2.28	0.11	13.50	Qualified	
11	YMZK001-H23	5.42	6.11	6.03	10.22	Qualified	
12	YMTC0-H128	2.34	3.40	18.43	12.61	Very poor	
13	YMZK003-H206	18.39	22.63	10.34	6.97	Very poor	
14	YMZK003-H207	1.46	1.17	11.16	15.95	Qualified	
15	YMZK003-H208	0.70	0.87	10.65	18.64	Qualified	
16	YMZK004-H36	1.03	0.99	2.13	17.27	Qualified	
17	YMZK004-H39	0.81	0.79	1.45	18.53	Qualified	
18	YMZK001-H84	3.33	3.76	6.01	11.83	Qualified	
19	YMZK001-H37	32.25	34.75	3.73	6.01	Qualified	
20	YMZK001-H43	0.79	0.89	5.95	18.25	Qualified	
21	YMZK002-H62	1.30	1.39	3.56	15.84	Qualified	
22	YMZK002-H63	1.37	1.48	3.95	15.58	Qualified	
23	YMZK002-H64	3.82	4.45	7.68	11.29	Qualified	
24	YMDK27	2.67	2.60	1.26	12.93	Qualified	
25	YMDK34	2.65	2.86	3.88	12.76	Qualified	
26	YMZK24301-H42	1.53	1.92	11.30	14.69	Qualified	
27	YMZK22701-H27	1.49	1.58	2.93	15.22	Qualified	
28	YMZK22701-H101	1.96	1.89	1.82	14.22	Qualified	
29	YMZK24301-H111	1.12	1.32	8.20	16.31	Qualified	
30	KTC11-2-H11	0.51	0.43	8.51	21.74	Qualified	

3 Description of Data Samples

The “Trenching Work Registration Sheet” (Table 5) contains the following details: No., Work No., Work goal, Work start date, Work completion date, Geological record (Start date, End date and Recorder), Work result, Designed length (m), Actual length (m), Designed orientation (°), Actual orientation (°) and Coordinates of starting point (*X, Y and Z*) and Remarks.

Table 5 Trenching Work Registration Sheet

No.	Field name	Dimension	Data type category	Example
1	No.	–	Character type	2
2	Work No.	–	Character type	YMTC0
3	Work goal	–	Character type	Controlled orebody
4	Work start date	–	Character type	June 7 2012
5	Work completion date	–	Character type	June 11 2012
6	Geological record	–	Character type	
	Start date	–	Character type	June 11 2012
	End date	–	Character type	June 15 2012
	Recorder	–	Character type	Ren Jingwu
7	Work result	–	Character type	Met the intended goal
8	Designed length	m	Floating-point type	120
9	Actual length	m	Floating-point type	117
10	Designed orientation	°	Floating-point type	160
11	Actual orientation	°	Floating-point type	160
12	Coordinates of start point	–	Character type	
	X	–	Floating-point type	4677356
	Y	–	Floating-point type	16682351
	Z	–	Floating-point type	1285
13	Remarks	–	Character type	–

The "Drilling Work Registration Sheet" (Table 6) includes: No., Work No., Work goal, Work start date, Work completion date, Geological record (Start date, End date and Recorder), Work result, Designed length (m), Actual length (m), Designed orientation (°), Actual orientation (°), Designed dip angle (°), Actual dip angle (°) and Coordinates of Starting point (X, Y and Z) and Remarks.

Table 6 Drilling Work Registration Sheet

No.	Name	Dimension	Data category	Example
1	No.	–	Character type	1
2	Work No.	–	Character type	YMZK001
3	Work goal	–	Character type	Controlled orebody
4	Work start date	–	Character type	Sep. 18 2012
5	Work completion date	–	Character type	Oct. 20 2012
6	Geological record	–	Character type	
	Start date	–	Character type	Sep. 18 2012
	End date	–	Character type	Oct. 23 2012
	Recorder	–	Character type	Huang Xiaowei
7	Work result	–	Character type	Met the goal
8	Designed length	m	Floating-point type	300
9	Actual length	m	Floating-point type	269.99
10	Designed orientation	°	Floating-point type	160
11	Actual orientation	°	Floating-point type	160.9
12	Designed dip angle	°	Floating-point type	78

Continued table 6

No.	Name	Dimension	Data category	Example
13	Actual dip angle	°	Floating-point type	76.1
14	Coordinates of start point	–	Character type	
	X	–	Floating-point type	4677356
	Y	–	Floating-point type	16682351
	Z	–	Floating-point type	1285
15	Remarks	–	Character type	

The "Trenching Sample Testing Result Sheet" (Table 7) includes: No., Work No., Sample No., Sampling location [from (m), to (m), Length (m)], Sampling line [Sample length (m), Orientation (°), and Gradient (°)], Orebody Occurrence [Dip (°), Dip angle (°)], Pb grade (%), Zn grade (%), Cu grade (%) and Au grade ($\times10^{-6}$).

The "Drill Sample Testing Result Sheet" is consistent with the "Trenching Sample Testing Result Sheet", as shown in Table 7.

Table 7 Trenching Sample Testing Result Sheet

No.	Field name	Dimension	Data category	Example
1	No.	–	Character type	2
2	Work No.	–	Character type	YMTC0
3	Sample No.:	–	Character type	H1
4	Sampling location	–	Character type	
	from	m	Floating-point type	36.0
	to	m	Floating-point type	37.0
	Length	m	Floating-point type	1.0
5	Sampling line	–	Character type	
	Sample length	m	Floating-point type	1.0
	Orientation	°	Floating-point type	180
	Gradient	°	Floating-point type	−3
6	Orebody occurrence	–	Character type	
	Dip	°	Floating-point type	340
	Dip angle	°	Floating-point type	75
7	Pb	%	Character type	0.01
8	Zn	%	Floating-point type	0.02
9	Cu	%	Character type	0.01
10	Au	$\times10^{-6}$	Floating-point type	1.25

The "Small volume Mass Testing Result Sheet" (Table 8) includes: No., Sample No., Location of sampling work, Rock feature, Orebody No., Mineral grade ($\times10^{-6}$)(Au and Ag), Small volume mass (g/cm^3) and Remarks.

Table 8 Small Volume Mass Testing Result Sheet

No.	Field name	Dimension	Data category	Example
1	No.	–	Character type	1

Continued table 8

No.	Field name	Dimension	Data category	Example
2	Sample No.:	−	Character type	YMXT1
3	Location of sampling work	−	Character type	YMTC0−H5
4	Rock feature	−	Character type	Mixed ore
5	Orebody No.	−	Character type	1
6	Mineral grade	−	Character type	
	Au	$\times10^{-6}$	Floating−point type	1.25
	Ag	$\times10^{-6}$	Floating−point type	2.4
7	Small−volume mass	g/cm^3	Floating−point type	2.77
8	Remarks	−	Character type	

The " Trenching Work Orebody Horizontal Thickness and Weighted Mean grade Calculation Sheet" (Table 9) includes: No., Work No., Sample No., Orebody No., Sampling location [from (m), to (m), Length (m)], Sampling line [Sample length (m), Orientation (°), and Gradient (°)], Exploration line, Orebody occurrence [Dip (°), Dip angle (°)], the Angle between work orientation and orebody dip (°), Sample real thickness (m), Sample horizontal thickness (m), Au grade ($\times10^{-6}$), Au orebody mean grade ($\times10^{-6}$), Au orebody real thickness (m), Au orebody horizontal thickness (m) and Remarks.

The "Drilling Work Orebody Horizontal Thickness and Weighted Mean grade Calculation Sheet" is consistent with the "Trenching Work Orebody Horizontal Thickness and Weighted Mean grade Calculation Sheet", as shown in Table 9.

Table 9 Trenching Work Orebody Horizontal Thickness and Weighted Mean Grade Calculation Sheet

No.	Field name	Dimension	Data category	Example
1	No.	−	Character type	1
2	Work No.	−	Character type	YMTC0
3	Orebody No.	−	Character type	1
4	Sample No.:	−	Character type	YMXT1
5	Sampling location	−	Character type	
	from	m	Floating−point type	12.0
	to	m	Floating−point type	13.0
	Length	m	Floating−point type	1.0
6	Sampling line	−	Character type	
	Sample length	m	Floating−point type	1.0
	Orientation	°	Floating−point type	160
	Gradient	°	Floating−point type	2
7	Exploratory line	−	Character type	160
8	Orebody occurrence	−	Character type	
	Dip	°	Floating−point type	330
	Dip angle	°	Floating−point type	70
9	Angle between work orientation and orebody dip	°	Floating−point type	−170
10	Sample real thickness	m	Floating−point type	0.93

Continued table 9

No.	Field name	Dimension	Data category	Example
11	Sample horizontal thickness	m	Floating−point type	0.97
12	Au grade	$\times 10^{-6}$	Floating−point type	1.23
13	Au orebody mean grade	$\times 10^{-6}$	Floating−point type	1.55
14	Au orebody real thickness	m	Floating−point type	3.2
15	Au orebody horizontal thickness	m	Floating−point type	3.65
16	Remarks	−		

The " Orebody Block Area Calculation Sheet" (Table 10) includes: Mine area, No., Orebody No., Resource volume classification, Block area (m^2) and Remarks.

Table 10 Orebody Block Area Calculation Sheet

No.	Field name	Dimension	Data category	Example
1	Mine area	−	Character type	West Yemaquan
2	No.	−	Character type	1
3	Orebody No.	−	Character type	1
4	Resource volume classification	−	Character type	333
5	Block area	m^2	Floating-point type	36543.72
6	Remarks	−	Character type	

The " Orebody Block Thickness and Weighted Grade Calculation Sheet" (Table 11) includes: Mine area, No., Orebody No., Work No., Resource volume classification, Single−work orebody horizontal thickness (m), Single−work orebody mean grade (Au and Ag), Orebody block horizontal thickness (m) and Orebody block grade (Au and Ag).

Table 11 Orebody Block Thickness and Weighted Grade Calculation Sheet

No.	Field name	Dimension	Data category	Example
1	Mine area	−	Character type	West Yemaquan
2	No.	−	Character type	1
3	Orebody No.	−	Character type	1
4	Work No.	−	Character type	YMTC0
5	Resource volume classification	−	Character type	333
6	Single−work orebody horizontal thickness	m	Floating−point type	2.5
7	Single−work orebody mean grade	−	Character type	
	Au	$\times 10^{-6}$	Floating−point type	1.38
	Ag	$\times 10^{-6}$	Floating−point type	2.58
8	Orebody block horizontal thickness	m	Floating−point type	2.56
9	Orebody block grade	−	Character type	
	Au	$\times 10^{-6}$	Floating−point type	1.61
	Ag	$\times 10^{-6}$	Floating−point type	2.58

The "Resource Estimation Sheet" (Table 12) includes: Mine area, Orebody No., Resource volume classification, Block horizontal thickness (m), Block grade (Au and Ag), Block area

(m^2), Mean volumetric mass (t/m^3), Mineral mass (kt) (Au and Ag), Metal mass (kg) (Au and Ag) and Remarks.

Table 12 Resource Estimation Sheet

No.	Field name	Dimension	Data category	Example
1	Mine area	−	Character type	West Yemaquan
2	Orebody No.	−	Character type	1
3	Resource volume classification	−	Character type	333
4	Block horizontal thickness	m	Floating−point type	2.65
5	Block grade	−	Character type	
	Au	$\times10^{-6}$	Floating−point type	1.61
	Ag	$\times10^{-6}$	Floating−point type	2.58
6	Block area	m^2	Floating−point type	36549.73
7	Mean volume mass	t/m^3	Floating−point type	2.67
8	Mineral mass	−	Character type	
	Au	kt	Floating−point type	259
	Ag	kt	Floating−point type	259
9	Metal mass	−	Character type	
	Au	kg	Floating−point type	1627
	Ag	kg	Floating−point type	4031
10	Remarks	−		

4 Data Quality Control and Assessment

Based on existing known control points, the main engineering points within the mine area (drilled boreholes and trenches) were surveyed using a combination of TOPCON RTK satellite positioning survey and total station measurement, with the accuracy meeting requirements for resource estimation from general survey.

30 samples for external inspection were sent to the Urumqi Center for Mineral Resource Supervision and Testing and the Guilin Testing Center for Mineral Geology for Nonferrous Metals, both under the Ministry of Land and Resources, for external inspection analysis and comparison. 39 samples for internal inspection were sent to the Testing Center of the Nonferrous Geological Survey of Xinjiang Uygur Autonomous Region for self−inspection. Based on comparison between results from the basic analysis and from the internal and external inspections, the tested results are generally accurate and credible, with the external inspection qualified rate of 93% and the internal inspection qualified rate of 92%, basically meeting the requirements on resource estimation.

5 Conclusions

The resource dataset for the Lower Carboniferous West Yemaquan gold ore deposit, Xinjiang, contains three Excel workbooks consisting of 10 Excel sheets, created by calculating and collating data acquired in the field by using the geological ore block method. Complete parameters, and true and credible data are included in the various sheets. Within the dataset, there are 3537 samples acquired from surface trenches and 1471 samples from deep drilling. Samples containing minerals account for 12.4% of total samples. The mineral lithology is primarily siltstone, quartz vein and quartz diorite vein. The high−grade ore rate (rate of high grade samples) is 0.22% and high−grade orebodies are mainly distributed in quartz vein, which are valuable for mining and exploitation. Therefore, the dataset has important referential implications for further survey and development of the mine area as well as for estimation of resources of the surrounding deposits of the same kind.

Notes:

❶Zhao Hengle, Guo Li, Liu Weiguo, Li Song, 1:50 000 Regional Geological Survey Results Report 2009 on Hancao Lake, Kumul, Xinjiang [R]. Xinjiang Uygur Autonomous Region Geological Survey.

❷ Ren Jinwu, Ye Lei, Qi Shuji et al., Geological Survey Results Report at West Yemaquan, Kumule, Xinjiang [R]. China Non−ferrous Metals Resource Geological Survey. 2016.

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