收稿日期：2019-03-08
改回日期：2019-06-17

基金项目：中国地质调查局地质调查项目“整装勘查区找矿预测与技术应用示范”子项目（121201004000150017-14）资助。

doi: 10.12029/gc2019Z109

论文引用格式：刘翠辉，于长琦，贺根文，李伟，刘孝斌. 2019. 赣南宁都地区 1∶50 000 青塘幅矿产地质图数据集 [J]. 中国地质，46(S1):75−83.

数据集引用格式：刘翠辉; 于长琦; 贺根文; 李伟; 刘孝斌. 赣南宁都地区 1∶50 000 青塘幅矿产地质图数据集(V1). 江西省地质矿产勘查开发局赣南地质调查大队 [创建机构]，2016. 全国地质资料馆 [传播机构], 2019-06-30. 10.23650/data.C.2019.P8; http://dcc.ngac.org.cn/geologicalData/rest/geologicalData/geologicalDataDetail/b912ea9bc14a51278ed9f93d155228f9

赣南宁都地区 1∶50 000 青塘幅矿产地质图数据集

刘翠辉　于长琦　贺根文　李伟　刘孝斌

(江西省地质矿产勘查开发局赣南地质调查大队，江西 赣州 341000)

摘要：青塘幅位于江西南部于都银坑−宁都青塘整装勘查区北部，于山成矿亚带的北部。本次工作采用了岩性−构造−蚀变矿化专项填图、遥感、物探、化探、钻探等多种方法进行数据采集，完成了矿产地质路线调查长度 533.68 km，采集水系沉积物样品 1 729 件，完成 1∶50 000 地面高精度磁法测量 458 km^2，遥感数据解译面积 458 km^2，钻探施工 422 m，化学分析样 119 件。数据集重点对燕山期早阶段成矿岩浆岩、含矿建造、控岩控矿构造及矿化蚀变标志等进行了调查划分，明确黑云母花岗岩为矽卡岩型硫铁钨多金属矿的成矿地质体，主要成矿结构面为梓山组上段的硅钙异性界面，蚀变以矽卡岩化、大理石化等为主；编制了青塘幅建造构造图，创建了区内矿产数据库，汇编了主要建造构造、断裂、地质界线、岩浆岩等属性特征；完善了狮吼山式矽卡岩型硫铁钨多金属矿床找矿预测模型，突出了区内矿产与建造构造之间的成因联系。

关键词：于都整装勘查区；青塘幅；矿产地质图数据集；矽卡岩硫铁钨矿；1∶50 000
数据服务系统网址：http://dcc.cgs.gov.cn

1　引言

2013 年，为加快推进找矿突破战略行动，原国土资源部将“江西于都银坑−宁都青塘金银多金属矿”列入全国第三批整装勘查区，统一部署并落实相关地质工作。2016 年，中国地质调查局发展研究中心在该整装勘查区内设立矿产地质调查与找矿预测子项目，主要目标任务为，系统收集和综合分析已有地、物、化、遥、矿产等资料，采用数字化填图技术，开展青塘幅（G50E010008）1∶50 000 矿产地质专项填图、1∶50 000 水系沉积物测量、1∶50 000 地面高精度磁法测量、矿产检查，开展找矿预测，圈定找矿靶区，评价资源潜力，提出下一步找矿工作部署建议，建立原始及成果资料数据库。

江西于都银坑−宁都青塘矿集区是赣南成矿地质条件较为特殊的区域，位于南岭成

第一作者简介：刘翠辉，男，1971 年生，高级工程师，长期从事矿产勘查和矿产调查工作；Email：2317199180@qq.com。

矿带与武夷成矿带的交汇部位，属雩山成矿带北部于都–宁都坳陷带内，是南岭成矿带东段的重要有色贵金属矿集区之一（陈毓川等，2013）。区内出露地层可划分为青白口系–寒武系褶皱基底、泥盆系–二叠系褶皱盖层和中生代陆相碎屑岩盖层（局部有火山岩）三个构造层（图 1），各构造层之间呈角度不整合或断层接触，主要形成于华南地区加里东、印支和燕山三期重要的构造事件。加里东期、印支期和燕山期在本区都有岩浆活动产物，尤以燕山期花岗岩最为发育，主要岩性有黑云母花岗岩、花岗闪长岩等，与区内的 W、Pb、Zn、Cu、Ag、Au 等矿化关系最为密切（王登红等，2012；赵正等，2016，2017）。区内褶皱、断裂、推覆构造、断陷盆地等构造类型发育，以北北东向、北东向最为突出，东西向、北西向、南北向相互交织。图幅西部为银坑–青塘晚古生代盆地，以宽阔向斜褶皱为主；中部构造行迹以北东向逆冲推覆构造为主，褶皱基底地层推覆至中生代沉积岩之上，形成构造窗和飞来峰；东部发育白垩纪断陷盆地，盆地边缘形成同沉积断层。

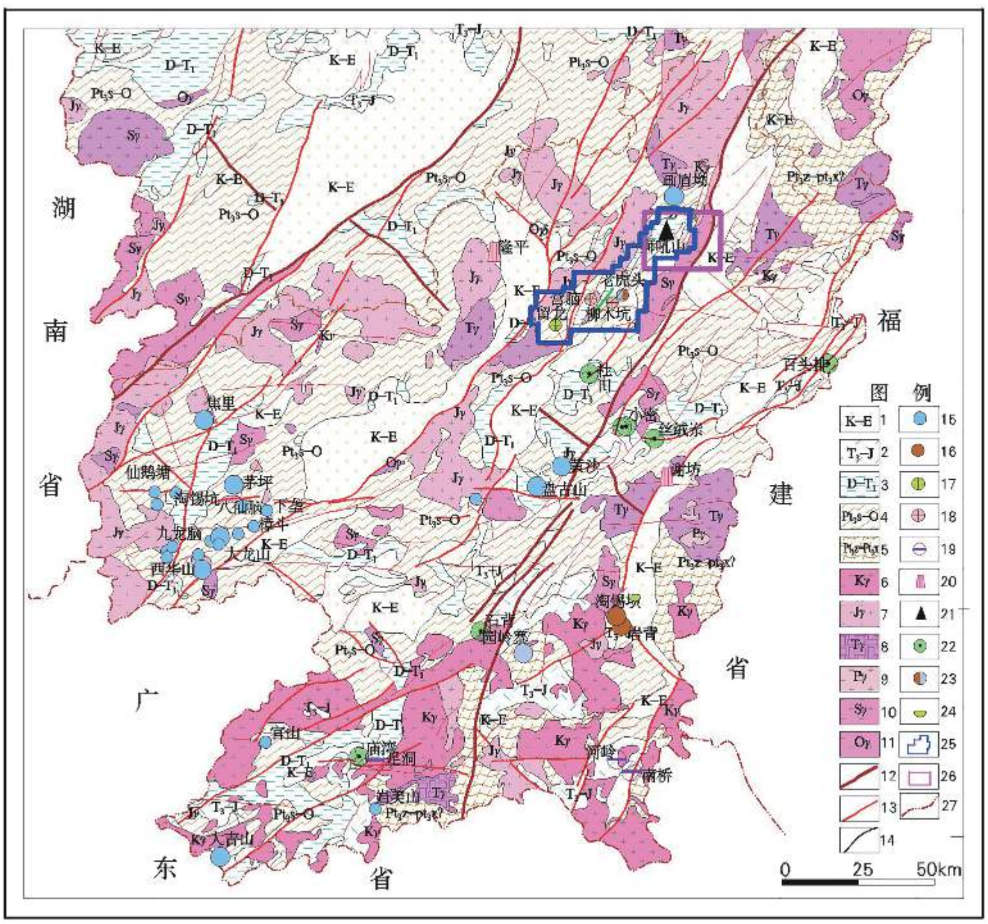

图 1　赣南地区地质矿产简图

1—白垩纪–第四纪沉积物；2— 三叠纪–侏罗纪沉积物；3—泥盆纪–三叠纪沉积物；4—青白口纪–奥陶纪浅变质岩；5—中元古代变质基底；6—白垩纪岩浆岩；7—侏罗纪岩浆岩；8—三叠纪岩浆岩；9—二叠纪岩浆岩；10—志留纪酸性岩；11—奥陶纪岩浆岩；12—深大断裂；13—断层；14—地质界线；15—钨矿床 (图例大小与矿床规模有关)；16—锡矿床；17—金矿床；18—银矿床；19—稀土矿产；20—萤石矿产；21—硫铁矿床；22—锰矿床；23—铅锌矿床；24—膏盐矿床；25—银坑–青塘整装勘查区范围；26—青塘幅工作区范围；27—省界

青塘幅（G50E010008）位于整装勘查区东北部，主要找矿方向为矽卡岩型硫铁钨多金属矿。已经发现的狮吼山硫铁矿区为赣南最大的矽卡岩型硫铁矿床，累计查明硫铁

矿石量 2 249.9 万吨，达到中型以上规模。依靠矿产品优势，区内形成了兴国氟化工和宁都硫化工两处初具规模的产业基地（图 2），逐渐成为当地经济发展和解决就业的支柱，有力支撑了老区精准扶贫。但是，随着矿产资源的逐年消耗，使得当地矿业经济规模逐渐萎缩，亟需在图幅内系统开展 1∶50 000 矿产地质调查工作，寻找新的矿产资源开发基地。本数据集即是在对区内含矿建造、成矿岩浆岩及控矿构造特征调查研究的基础上，归纳总结控矿要素及成矿规律，以 1∶50 000 含矿建造构造图为基础编制矿产地质图，明显提高了区内矿产地质调查程度和研究水平，有助于提升区内矿产地质工作服务资源安全、经济社会发展、生态文明建设的能力。

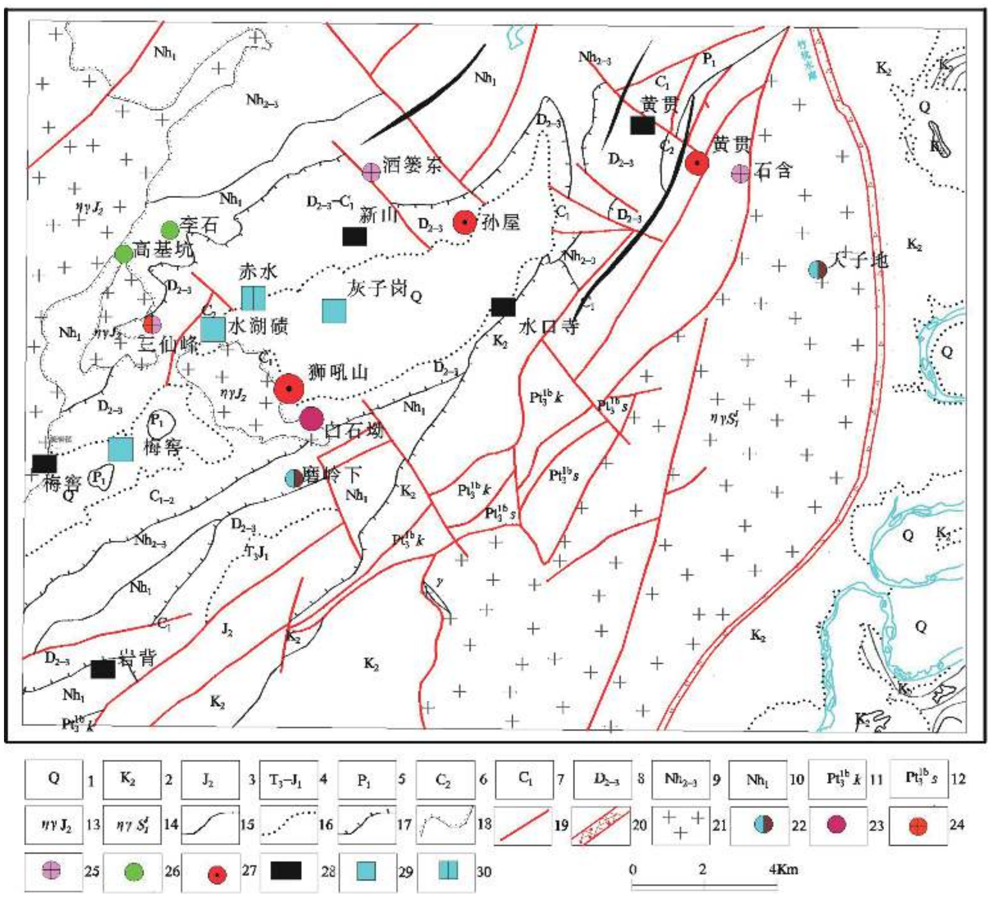

图 2　青塘幅测区地质矿产分布简图

1—第四系；2—上白垩统；3—中株罗统；4—上三叠统-下株罗统；5—下二叠统；6—上石炭统；7—上石炭统；8—中下泥盆统；9—中晚南华纪；10—早南华纪；11—青白口纪库里组；12—青白口纪神山组；13—中侏罗纪二长花岗岩；14—早志留纪二长花岗岩；15—地质界线；16—第四系沉积界线；17—沉积角度不整合界线；18—侵入接触界线；19—实测断层；20—硅化破碎带；21—花岗岩；22—铅锌；23—钨；24—金；25—银；26—铜；27—铁；28—煤；29—石灰石；30—白云岩

赣南宁都地区 1∶50 000 青塘幅矿产地质图数据集基本信息简表如表 1.

表 1　数据库（集）元数据简表

条目	描述
数据库（集）名称	赣南宁都地区1∶50 000青塘幅矿产地质图数据集

续表 1

条目	描述
数据库（集）作者	刘翠辉，江西省地质矿产勘查开发局赣南地质调查大队 李　伟，江西省地质矿产勘查开发局赣南地质调查大队 于长琦，江西省地质矿产勘查开发局赣南地质调查大队 贺根文，江西省地质矿产勘查开发局赣南地质调查大队 刘孝滨，江西省地质矿产勘查开发局赣南地质调查大队
数据时间范围	2016.05—2019.01
地理区域	江西省赣州市，东经115°45′ ~ 116°00′，北纬26°20′ ~ 26°30′
数据格式	*.wp，*.wl，*.wt，*.docx
数据量	47.2 MB
数据服务系统网址	http://dcc.cgs.gov.cn
基金项目	中国地质调查局地质调查项目“整装勘查区找矿预测与技术应用示范”子项目（121201004000150017-14）资助
语种	中文
数据库（集）组成	该数据集主要由矿产地质图（MapGIS格式）及矿产信息卡片（Word格式）组成。矿产地质图主要由主图、综合柱状图、镶图、地质构造格架剖面图、成矿区带图及图例组成。镶图包括牛形坝银金和狮吼山矽卡岩型硫铁多金属2个典型矿床的平面图和剖面图；图例包括构造、蚀变矿化、岩脉、矿产图例；修饰内容主要包括责任表、中国地质调查局局徽及图幅索引。青塘幅矿产信息卡片汇编了图幅内主要的矿床、矿点情况，包括金属矿产、能源矿产和非金属矿产，共14个矿区的基本矿产地质信息。

2　数据采集和处理方法

2.1　基础数据采集

本次工作综合应用了岩性−构造−矿化蚀变专项填图、遥感、物探、化探、钻探等多种方法进行数据采集，利用 GIS 软件进行原始数据整理和成果图件编制。原始数据采集过程中采用坐标系统为：1954 年北京坐标系，1985 年国家高程基准；后期按国家相关要求，对成果图件进行了坐标系转换，统一使用国家 2000 坐标系。其中，1∶50 000 矿产地质专项填图采用 DGSS 数字化填图系统，完成路线调查长度 533.68 km，重点对燕山期早阶段成矿岩浆岩、含矿建造、控岩控矿构造及矿化蚀变标志等成矿要素进行了调查划分，编制了 1∶50 000 含矿建造构造图。采用“岩性+时代”的填图方法，对成矿岩浆岩进行了解体和期次的划分；通过穿越+追索相结合的工作思路，对图幅内含矿建造及控岩控矿构造进行了系统填绘；采用宏观+微观精细研究，确定主要矿化蚀变类型，综合圈定图幅矿化蚀变区。同时，完成了 1∶50 000 水系沉积物测量面积 458 km^2，1∶50 000 地面高精度磁法测量面积 458 km^2，1∶50 000 遥感地质解译面积 458 km^2，按要求编制了相关成果图件，优选并评价了物探、化探综合异常。

2.2　矿产数据采集

全面收集了图幅内已有矿产资料，资料来源包括矿区勘查报告、矿产卡片、区调报告等，并对典型矿床、重要矿（化）点进行了矿产检查。同时选择重要的物化遥异常开展了综合检查工作，主要采用地面高精度磁法剖面、土壤剖面、汞气剖面等物化探测量手段，配合大比例尺专项填图及剖面测量，新发现寨脑、坳下、黄贯硫铁矿点 3 处，圈定找矿线索 5 处；针对重要的矿化线索，采集化学分析样 119 件。从成矿地质特征、矿化特征、找矿标志和资源潜力等方面综合矿产信息，共填写金属、非金属和能源矿产信

息卡片 14 处。

2.3 找矿预测模型建立

运用叶天竺研究员提出的“三位一体”勘查区找矿预测理论（叶天竺等, 2014, 2017），从成矿地质体、成矿构造及结构面和成矿作用特征标志等方面，对狮吼山式矽卡岩型硫铁钨多金属矿床进行典型矿床研究（图 3），认为其成矿地质体为燕山期早阶段的茶山迳复式岩体，岩性主要为中细粒斑状黑云母二长花岗岩和细粒二长花岗岩，含矿建造为早石炭世梓山组含铁含钙细碎屑岩建造，成矿构造主要为接触带构造及层间滑脱构造，结构面主要为梓山组上段含铁含钙细碎屑岩建造与黄龙组灰质白云岩之间的 Si/Ca 地球化学障。采取的技术手段包括岩矿鉴定、主微量元素地球化学分析、锆石 U–Pb 测年、稳定同位素测试等。从宏观和微观综合解构成矿作用过程。结合物化探异常分析结果，矽卡岩型硫铁矿区（体）常位于低重力区，磁黄铁矿等高磁性体表现为正负磁异常转换，Au、Pb、As、W、Sn 等元素水系沉积物化探异常明显，由此建立了矽卡岩型硫铁钨多金属矿床的找矿预测模型（图 3，表 2）。

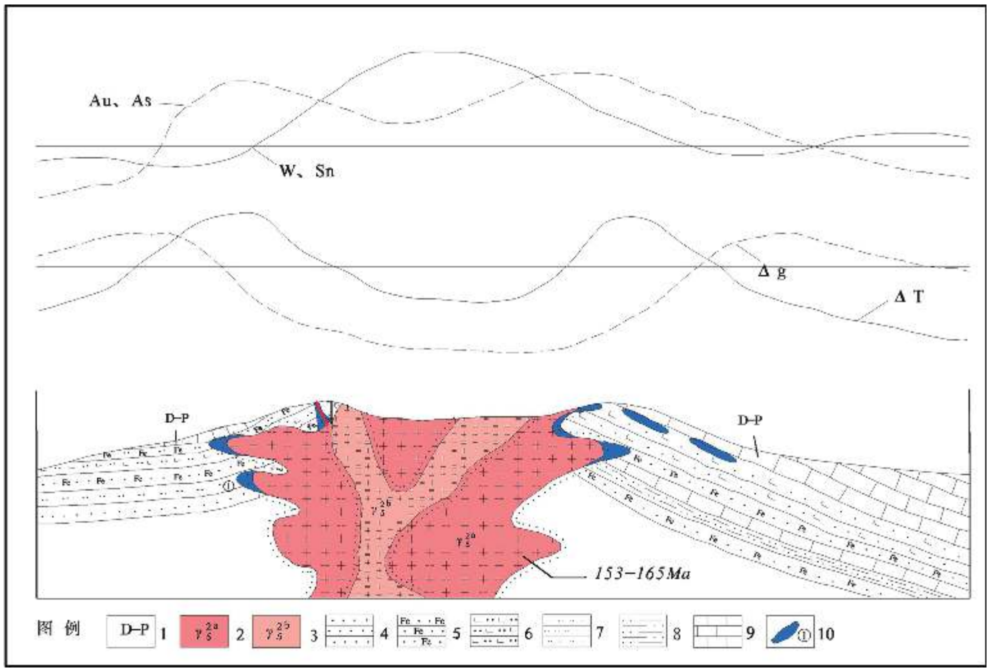

图 3　狮吼山式硫铁多金属矿预测模型

1—泥盆系–二叠系盖层；2—燕山早期第一阶段花岗岩；3—燕山早期第二阶段花岗岩；4—砂岩；5—含铁砂岩；6—含钙砂岩；7—粉砂岩；8—粉砂质页岩；9—碳酸盐；10—狮吼山式接触交代型矿床。Δg 表示布格重力异常曲线；ΔT 表示磁异常曲线

表 2　狮吼山式矽卡岩型硫铁多金属矿预测要素表

预测要素		描述内容	分类
成矿地质背景	大地构造位置	武夷隆起西缘，宁都–南城坳陷断束南端和信丰–于都坳陷褶束交接部位的青塘–银坑坳陷带	重要
	区域成矿带	雩山隆褶带W–Ag–Pb–Zn–Au–Sn成矿亚带	重要
	岩浆岩带	于山岩浆岩褶隆带	重要
	成矿时代	燕山期早阶段	重要

续表 2

预测要素			描述内容	分类
矿床特征	成矿地质体		茶山迳复式岩体：燕山期花岗岩斑状黑云母花岗岩、细粒二长花岗岩	必要
	含矿建造		梓山组上段含铁含钙碎屑岩建造	重要
	成矿构造及结构面		成矿构造：石炭系梓山组内顺层破碎带，岩体侵入接触构造；成矿结构面：梓山组上段含钙细碎屑岩内硅钙异性界面	重要
	成矿作用特征	矿体特征	矿体以似层状、透镜状产出为主，沿走向及倾斜方向上具膨大缩小、分支复合及尖灭再现等现象，产状基本与地层产状一致，走向长2 300米以上。	重要
		矿物组合	磁黄铁矿、黄铁矿、黄铜矿、黑钨矿、白钨矿、石英、方解石、白云母、绢云母、黑云母、红柱石、萤石等	必要
		主金属元素	Fe、S、W、Au、Cu	次要
		矿床分带性	靠近岩体附近，矿床矽卡岩化、角岩化蚀变较强，矿化也较好；远离岩体，蚀变减弱，矿化变差	重要
		蚀变类型	矽卡岩化、大理岩化、黄铁矿化、磁黄铁矿矿化、绿泥石化、碳酸盐化、硅化、云英岩化、红柱石角岩化等	重要
	成矿模式		岩浆期后热液充填交代层控矽卡岩型含铜磁黄铁矿（伴生金）矿床	重要
物化遥综合信息	化探异常		Au、Pb、As、W、Sn等元素水系沉积物化探异常	重要
	物探异常		岩体位于负重力异常区；矿体位于正负磁异常变化部位，最高100nT以上。	重要
	遥感异常		环形构造，羟基、铁染异常明显	重要

3 数据内容评述

青塘幅矿产地质图数据集包括 1：50 000 矿产地质图数据库和 14 份矿产信息卡片。图形数据库包括矿产地质图主图和一系列镶图，主图以含矿建造构造图为底图进行编制，镶图包括综合柱状图、典型矿床平面图和剖面图、地质构造格架剖面图、成矿区带图及图例等。采用的坐标系：椭球参数为国家 2000，投影类型为高斯–克吕格投影，平面直角坐标系。矿产信息卡片汇编了青塘幅内主要矿床或矿点，包括金属矿产、非金属矿产和能源矿产。

“建造构造图层属性表”（表 3）包含如下内容：地质体面实体标识号（由工作区类型、图幅号和数据编号组成）、地质体面实体类型代码、地质体面实体名称、地质体面实体时代、建造大类、建造类型、岩石组合、大地构造环境。

表 3　青塘幅矿产地质图建造构造图层属性表

序号	数据项名称	标准编码	数据类型	实例
1	地质体面实体标识号	Feature_Id	字符串	AG50E010008000000484
2	地质体面实体类型代码	Feature_Type	字符串	C_1z^2
3	地质体面实体名称	Geobody_Name	字符串	下石炭统梓山组上段
4	地质体面实体时代	Geobody_Era	字符串	C_1
5	建造大类	Formation	字符串	沉积岩建造
6	建造类型	Metallogenic	字符串	含铁砂岩建造
7	岩石组合	Combination	字符串	铁质粉砂岩、钙质粉砂岩、页岩、细粒石英砂岩
8	大地构造环境	Structural_Env	字符串	大地构造位置处武夷块体与罗霄块体的交接带上

“地质界线属性表”（表 4）包含如下内容：要素标识号、地质界线（接触）代码、地质界线类型、界线左侧地质体代号、界线右侧地质体代号、界面走向、界面倾向、界面倾角。

表 4　青塘幅矿产地质图地质界线属性表

序号	数据项名称	标准编码	数据类型	实例
1	要素标识号	Feature_Id	字符串	AG50E010008000001489
2	地质界线（接触）代码	Feature_Type	字符串	F6
3	地质界线类型	Boundary_Name	字符串	断层接触
4	界线左侧地质体代号	Left_Boundary_Code	字符串	D_2y
5	界线右侧地质体代号	Right_Boundary_Code	字符串	Nh_1s
6	界面走向	Strike	整数型	30
7	界面倾向	Dip_Direction	整数型	300
8	界面倾角	Dip_Angle	整数型	60

“断裂属性表”（表 5）包含如下内容：要素分类代码、断层类型（地质代码）、断层名称、断层编号、断层性质、断层上盘地质体代号、断层下盘地质体代号、断层破碎带宽度、断层走向、断层倾向、断层面倾角、估计断距、断层形成时代、活动期次。

表 5　青塘幅矿产地质图断裂属性表

序号	数据项名称	标准编码	数据类型	实例
1	要素分类代码	Feature_Type	字符串	F17
2	断层类型（地质代码）	Fault_Type	字符串	F17
3	断层名称	Fault_Name	字符串	高岭–谢村断层F17
4	断层编号	Fault_Code	字符串	G50E010008F17
5	断层性质	Fault_Character	字符串	正断层
6	断层上盘地质体代号	Fault_Up_Body	字符串	Nh_1s,$Nh_{2\text{-}3}s^1$
7	断层下盘地质体代号	Fault_Bottom_Body	字符串	$Nh_{2\text{-}3}s^1$,Nh_1s
8	断层破碎带宽度	Fault_Wide	字符串	2~10 m
9	断层走向	Fault_Strike	整数型	60
10	断层倾向	Fault_Dip	整数型	330
11	断层面倾角	Fault_Dip_Angle	整数型	50
12	估计断距	Fault_Distance	浮点型	1 000 m
13	断层形成时代	Era	字符串	燕山期
14	活动期次	Movement_Period	字符串	燕山期

“矿产地属性表”（表 6）包含如下内容：要素标识号、矿种代码、矿种名称、共生矿、伴生矿、矿产地数、矿石品位、规模、成矿时代、矿产地名、矿化类型、成因类型。

表 6　青塘幅矿产地质图矿产地属性表

序号	数据项名称	标准编码	数据类型	实例
1	要素标识号	Feature_Id	字符串	AG50E010008000000001
2	矿种代码	Feature_Type	字符串	3 070
3	矿种名称	Commodities_Name	字符串	S

续表 6

序号	数据项名称	标准编码	数据类型	实例
4	共生矿	Paragenic_Ore	字符串	Fe
5	伴生矿	Associated_Ore	字符串	Au、W、Cu
6	矿产地数	Ore_Sums	整数型	1
7	矿石品位	Ore_Grade	字符串	TFe 41.413%、Cu 0.165%、WO 3 0.147%、Au 0.30g/t
8	规模	Deposite_Size	字符串	大型矿床
9	成矿时代	Metallogenetic_Epoch	字符串	燕山期晚阶段
10	矿产地名	Placename	字符串	狮吼山硫铁矿
11	矿化类型	Genesis_Types	字符串	矽卡岩型
12	成因类型	Industrial_Types	字符串	接触交代型

“侵入岩建造属性表”（表 7）包含如下内容：要素标识号、岩体填图单位名称、岩体填图单位符号、岩石名称、岩石颜色、岩石结构、岩石构造、主要矿物及含量、次要矿物及含量、与围岩接触关系、形成时代、含矿性。

表 7　青塘幅矿产地质图侵入岩建造图层属性表

序号	数据项名称	标准编码	数据类型	实例
1	要素标识号	Feature_Id	字符串	AG50E010008000000001
2	岩体填图单位名称	Intru_Body_Name	字符串	茶山迳岩体
3	岩体填图单位符号	Intru_Body_Code	字符串	$\eta\gamma J^2$
4	岩石名称	Rock_Name	字符串	中（中细）粒斑状黑云母二长花岗岩
5	岩石颜色	Color	字符串	肉红色
6	岩石结构	Rock_Texture	字符串	中（中细）粒似斑状结构
7	岩石构造	Rock_Structure	字符串	块状构造
8	主要矿物及含量	Primary_Mineral	字符串	斜长石35%、钾长石35%、石英25%
9	次要矿物及含量	Secondary_Mineral	字符串	黑云母5%
10	与围岩接触关系	Contact_Relation	字符串	侵入接触
11	形成时代	Era	字符串	燕山期
12	含矿性	Commodities	字符串	硫铁、钨

4　数据质量控制和评估

本次调查工作严格按照中国地质调查局《1∶50 000 矿产地质调查工作指南（试行）》（中地调函 [2016]117 号）执行，物化探专项工作亦严格执行国家和行业制定的标准及规范，如《地球化学普查规范（1∶50 000）》（DZ/T0011－2015）、《地面高精度磁测技术规程》（DZ/T0071－93）等，保证了获取资料的可靠性。按照项目设计要求，全部或超额完成了设计工作量，实现了目标任务，确保了工作精度。2017 年 7 月，二级项目组织专家对青塘幅矿产调查工作进行了野外验收，评定等级为优秀。

项目野外实施过程中，按照中国地质调查局《地质调查项目管理办法》相关要求，严格执行“三级质量检查制度”，其中，原始资料自检、互检比例均为 100%，项目组检查比例大于 50%，质检组抽查比例大于 15%，保证了资料数据的质量。样品测试分析

均在符合资质要求的实验室进行，分析过程进行了内外部监控，分析质量符合要求。

5 结论

赣南宁都地区 1∶50 000 青塘幅矿产地质图数据集在充分收集利用前人资料的基础上，运用“三位一体”勘查区找矿预测理论，系统调查研究了青塘幅内含矿建造、成矿岩浆岩、控矿构造和矿化蚀变特征，在编制含矿建造构造图的基础上形成了矿产地质图；建立了 1∶50 000 青塘幅矿产地质图数据库，汇集了重要建造构造、断裂、地质界线、岩浆岩的属性数据；查明了区内金属、非金属和能源矿产资源的时空分布特征，形成了较为完整的矿产信息卡片；通过典型矿床研究，认为区内矽卡岩型硫铁钨多金属矿成矿地质体为燕山期早阶段茶山迳复式岩体，含矿建造为早石炭世梓山组含铁含钙细碎屑岩建造，成矿构造主要为接触带构造及层间滑脱构造，结构面主要为梓山组上段含铁含钙细碎屑岩建造与黄龙组灰质白云岩之间的 Si/Ca 异性界面，蚀变类型以矽卡岩化、大理岩化、云英岩化等为主，为岩浆期后热液充填交代层控矽卡岩型含铜磁黄铁矿（伴生金）矿床。项目成果明显提高了区内矿产地质调查程度和研究水平，对今后矿产勘查部署具有重要参考价值。

参考文献

陈毓川, 陈郑辉, 曾载淋, 赵正, 赵斌, 王登红, 张永忠, 李建国, 周新鹏, 李江东. 2013. 南岭科学钻探第一孔选址研究 [J]. 中国地质, 40(3): 659−670.

王登红, 秦燕, 陈振宇, 侯可军. 2012. 赣南部分岩体的锆石铀-铅同位素年代学研究及其对成岩成矿机制的再认识 [J]. 岩矿测试, 31(4): 699−704.

叶天竺, 韦昌山, 王玉往. 等. 2014. 勘查区找矿预测理论与方法 (总论)[M]. 北京: 地质出版社.

叶天竺, 吕志成, 庞振山. 等. 2017. 勘查区找矿预测理论与方法 (各论)[M]. 北京: 地质出版社.

赵正, 陈毓川, 郭娜欣, 陈郑辉, 王登红, 曾载淋, 何绍森. 2016. 南岭科学钻探 (NLSD-1) 矿化规律与深部找矿方向 [J]. 中国地质, 43(5): 1613−1624.

赵正, 陈毓川, 曾载淋, 郭娜欣, 陈郑辉, 王登红, 刘翠辉, 刘宗翊, 王平安, 李江东. 2017. 江西银坑 W-Ag-Au 多金属矿田成矿规律与找矿方向: 兼论华南两个成矿系列叠加问题 [J]. 地学前缘, 24(5): 54−61.

doi: 10.12029/gc2019Z109

Article Citation: Liu Cuihui, Yu Changqi, He Genwen, Li Wei, Liu Xiaobin. 2019. The 1：50 000 Mineral Geological Map Dataset of the Qingtang Map-sheet, Ningdu, South Jiangxi[J]. Geology in China, 46(S1):100−111.
Dataset Citation: Liu Cuihui; Yu Changqi; He Genwen; Li Wei; Liu Xiaobin. The 1：50 000 Mineral Geological Map Dataset of the Qingtang Map-sheet, Ningdu, South Jiangxi(V1). Gannan Geological Party, JBED GMR[producer], 2016. National Geological Archives of China [distributor], 2019-06-30. 10.23650/data.C.2019.P8; http://dcc.ngac.org.cn/geologicalData/rest/geologicalData/geologicalDataDetail/b912ea9bc14a51278ed9f93d155228f9

Received: 08-03-2018
Accepted: 17-06-2019

Fund Project:
China Geological Survey Project "Demonstration Sub-project of Prospecting Prediction and Technical Application in Integrated Survey Areas" (1212010040 00150017-14)

The 1：50 000 Mineral Geological Map Dataset of the Qingtang Map-sheet, Ningdu, South Jiangxi

LIU Cuihui, YU Changqi, HE Genwen, LI Wei, LIU Xiaobin

(*Gannan Geological Party*, *JBED GMR*, *Ganzhou* 341000, *China*)

Abstract: The Qingtang map-sheet is located to the north of the Yudu Yingkeng - Ningdu Qingtang integrated survey area, south Jiangxi, and in the north of the Yushan metallogenic sub-zone. To develop this dataset, data were acquired comprehensively by using multiple methods such as mapping specific to lithology - structures - altered mineralization, remote sensing, geophysical/geochemical and drilling exploration. A route of 533.68 km was surveyed for mineral geology, with 1 729 stream sediment samples and 119 chemical analytical samples collected, 458 km^2 of land measured with the 1：50 000 ground high-precision magnetic method and interpreted based on remote-sensing data, as well as 422m of depth drilled. In the dataset, emphasis is placed on survey and division of early-Yanshanian metallogenic magmatite, ore-bearing formations, rock-controlled and ore-controlled structures, and mineralized alteration marks etc. It is clear that biotite granite is a metallogenic geologic body of skarn-type S-Fe-W multi-metal ores, the main metallogenic structural plane is the Si-Ca heterologous interface in the upper part of the Zishan Formation, and alteration is mainly through skarnization, marbleization etc. The project team has plotted the Qingtang Map-sheet formation and structural map, created the mineral database of the area, and compiled properties of the main formation structures, fractures, geological boundaries and magmatite etc. This has improved the prospecting prediction model for Shihoushan-styled, S-Fe-W multi-metal deposits and highlighted the causal relationship between deposits and tectonic formations in the area.

Key words: Yudu integrated survey area; Qingtang map-sheet; Mineral geological map dataset; Skarn S-Fe-W multi-metal ore; 1：50 000
Data service system URL: http://dcc.cgs.gov.cn

1 Introduction

In 2013, in order to accelerate the implementation of the strategic action of making

About the first author: LIU Cuihui, male, born in 1971, senior engineer, engaged in mineral prospecting and surveying; Email: 317199180@qq.com.

breakthroughs in prospecting, the previous Ministry of Land and Resources listed Yudu Yinkeng - Ningdu Qingtang Au-Ag Multi-metal Ores in Jiangxi in the 3rd batch of national integrated survey areas to make unified arrangements and promote their geological work. In 2016, Development and Research Center of China Geological Survey launched the Mineral Geological Survey and Prospecting Prediction Sub-project in the area, for which the main goals and tasks were systematically and comprehensively collecting and analyzing existing information such as the geology, physics, chemistry, remote sensing and minerals, applying digitalized mapping technologies to carry out the 1：50 000 mineral geological specific mapping in the Qingtang Map-sheet (G50E010008), 1：50 000 stream sediment measurement, 1：50 000 ground high-precision magnetic measurement, mineral inspection, and prospecting prediction, delineating prospecting target areas, evaluating resource potential, giving recommendations on the next step of prospecting deployment and creating databases on original and resulting information.

The ore-concentrated area from Yinkeng, Yudu to Qingtang, Ningdu, both in Jiangxi, an area with exceptional metallogenic geological conditions in South Jiangxi, is located at the intersection of Nanling and Wuyi metallogenic zones, and within the Yudu - Ningdu depression zone in the north of the Yu mountain metallogenic zone, one of the important nonferrous precious-metal ore concentrated areas in the eastern part of the Nanling metallogenic zone (Chen YC et al., 2013) (Fig. 1). Outcropped strata in the area can be divided into three tectonic layers: the Qingbaikou-system - Cambrian-system fold basement, the Devonian-system - Permian-system fold capping and Mesozoic-era continental-facies clasolite capping (with volcanic rock locally). Angular unconformable or fault contacts exist between these tectonic layers, mainly generated by 3 critical tectonic events in 3 periods in South China, i.e. Caledonian, Indo-Chinese and Yanshanian. In the area, there are the products of magma activities in the Caledonian, Indo-Chinese and Yanshanian, in particular Yanshanian granite is the most developed, with principal lithologies of biotite granite and granodiorite etc., mostly tied to the mineralization of W, Pb, Zn, Cu, Ag and Au etc. (Wang DH et al., 2012; Zhao Z et al., 2016 and 2017). In the area, structures such as folds, fractures, nappes and graben basins are developed, especially in a strike of NNE-NE, and those in strikes of EW, NW and NS are intertwined. In the west of the map sheet is the Yinkeng - Qingtang late-Paleozoic-era basin, which is mainly synclinal folds. In the central part, the main structural feature is the NE-strike thrust nappe structure, where the fold basement stratum is pushed over Mesozoic-era sedimentary rocks to form a tectonic window and klippe. In the east, Cretaceous-period graben basins are developed, in the margin of which are generated syn-sedimentary faults.

The Qingtang map sheet (G50E010008) is situated in the northeast of the integrated survey area and prospecting there is primarily focused on skarn-type S-Fe-W multi-metal ores. The Shihoushan S-Fe ore field discovered is the largest skarn-type S-Fe deposit in south Jiangxi, where the proven S-Fe ore is 22 499 000 tons in total, reaching mid-scale or above. Building on advantages in the mineral products, two industrial bases, a fluorine chemical base in Xingguo and a sulfur chemical base in Ningdu, are beginning to take shape (Fig. 2), which have been progressively growing into pillars of local economic growth and employment,

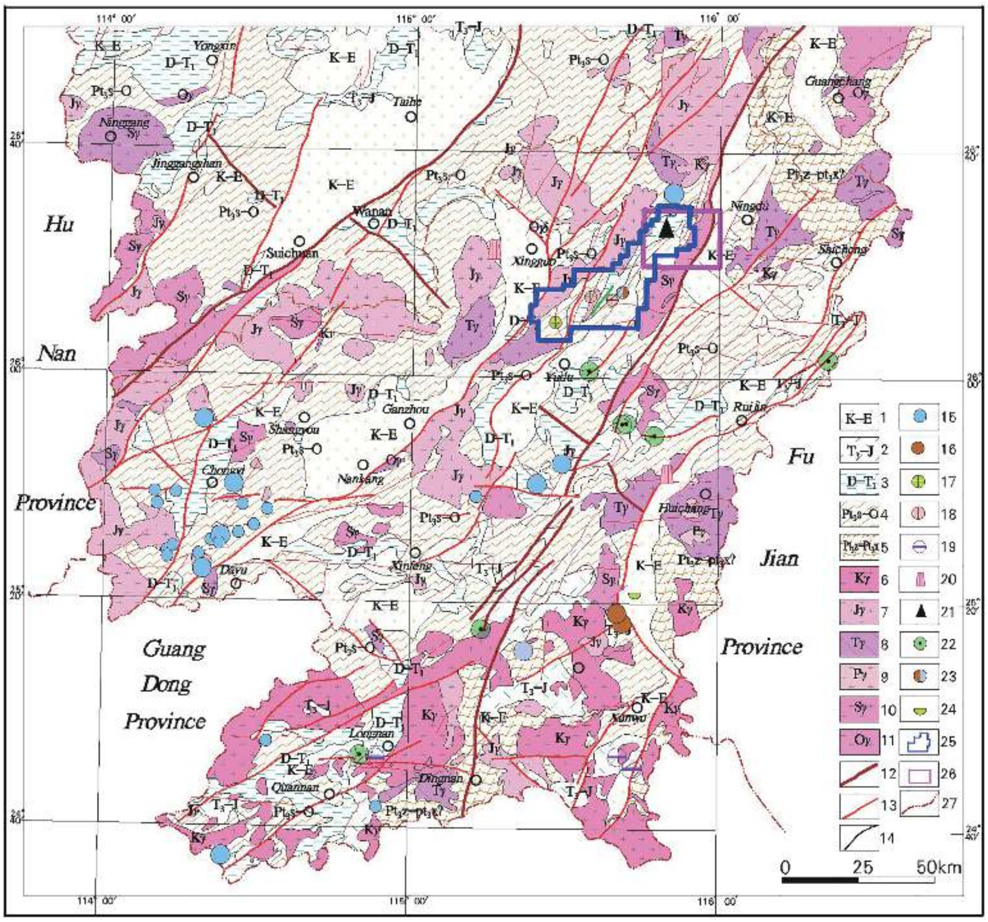

Fig. 1　Sketch showing geological and mineral features in South Jiangxi

1−Cretaceous period – Quaternary period sediment; 2−Triassic period – Jurassic period sediment; 3−Devonian period–Triassic period sediment; 4−Qingbaikou period – Ordovician period epimetamorphic rock; 5−Mid-Proterozoic era metamorphic basement; 6−Cretaceous period magmatite; 7−Jurassic period magmatite; 8−Triassic period magmatite; 9−Permian period magmatite; 10−Silurian period acidic rock; 11−Ordovician period magmatite; 12−Deep major fracture; 13−Fault; 14−Geological boundary; 15−W deposit (its legend size is related to the size of the deposit); 16−Sn deposit; 17−Au deposit; 18−Ag deposit; 19−Rare earth deposit; 20−Fluorite deposit; 21−Pyrite deposit; 22−Mn deposit; 23−Pb-Zn deposit; 24−Gypsiferous salt deposit; 25−Survey Range of the Yinkeng −Qingtang integrated survey area; 26−Range of the Qingtang map sheet work area; 27−Provincial border.

providing strong support to precise poverty alleviation in old revolutionary base areas. However, with the consumption of mineral resources year on year, the local mining-dominated economy is beginning to shrink, so it is imperative to systematically conduct a survey of the 1：50 000 mineralogical system within the map sheet to find out new bases for the development of mineral resources. Building on surveys and research on characteristics of ore-bearing formations, metallogenic magmatite and ore-control structures in the area, this dataset is intended to generalize and summarize ore-control elements and metallogenic regularities, and on the basis of the 1：50 000 ore-bearing formation & structural map, to plot mineral geological maps, in order to elevate mineral geological survey and research within the area, helping to enhance the ability of mineralogical work in the area to serve resource requirements for security, economic and social development, as well as the construction of ecological civilization.

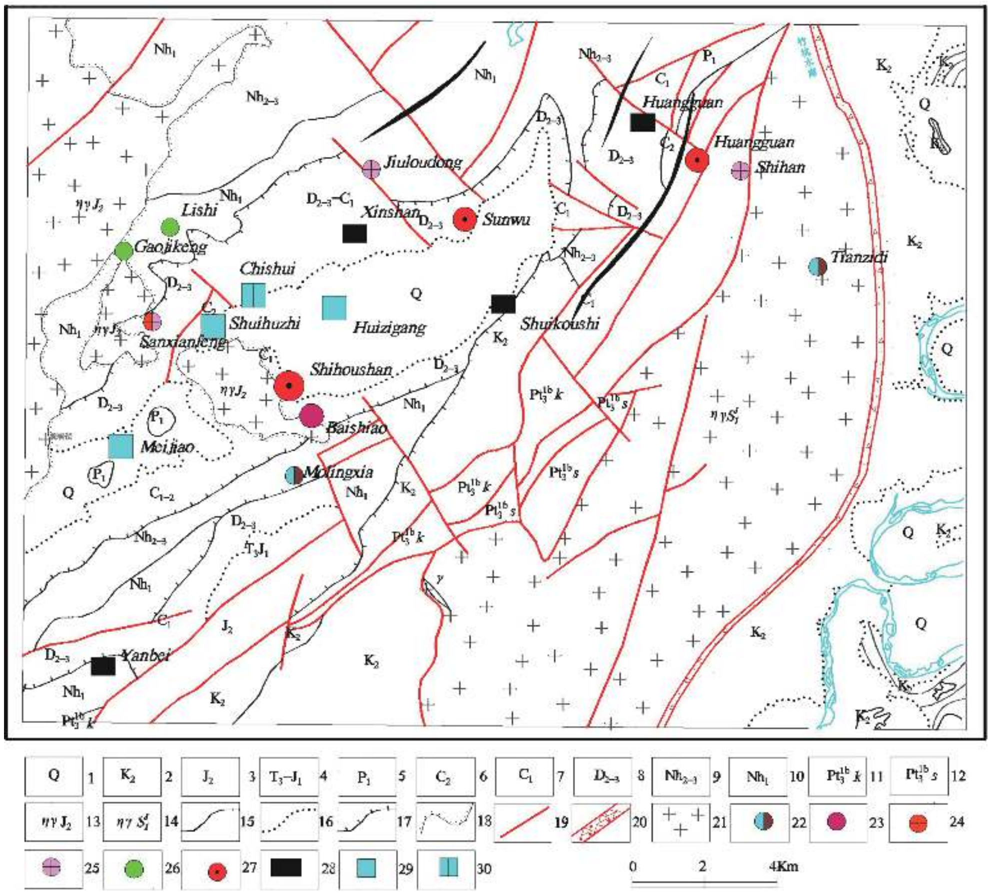

Fig. 2 Geology of the Qingtang map-sheet

1−Quaternary; 2−Upper Cretaceous series; 3−Middle Jurassic series; 4−Upper Triassic series-Late Jurassic series; 5−Late Permian series; 6−Upper Carboniferous series; 7−Upper Carboniferous series; 8−Middle and Lower Devonian series; 9−Mid-and-late Nanhua period; 10−Early Nanhua period; 11−Qingbaikou-period Kuli Formation; 12−Qingbaikou-period Shenshan Formation; 13−Mid-Jurassic period monzonitic granite; 14−Early Silurian period monzonitic granite; 15−Geological boundary; 16−Quaternary sedimentary boundary; 17−Sedimentary angular unconformable boundary; 18−Intrusive contact boundary; 19−Measured fault; 20−Silicified fracture zone; 21−Granite; 22−Pb-Zn; 23−W; 24−Au; 25−Ag; 26−Cu; 27−Fe; 28−Coal; 29−Limestone; 30−Dolomite

The basic information of the 1：50 000 Mineral Geological Map Dataset of the Qingtang Map-sheet, Ningdu, South Jiangxi, is briefly summarized in Table 1:

Table 1 Metadata Table of Database (Dataset)

Items	Description
Database (dataset) name	The 1：50 000 Mineral Geological Map Dataset of the Qingtang Map-sheet, Ningdu, South Jiangxi
Database (dataset) authors	Liu Cuihui, South Jiangxi Geological Survey Battalion, Jiangxi Geological Mineral Survey Development Bureau Li Wei, South Jiangxi Geological Survey Battalion, Jiangxi Geological Mineral Survey Development Bureau Yu Changqi, South Jiangxi Geological Survey Battalion, Jiangxi Geological Mineral Survey Development Bureau He Genwen, South Jiangxi Geological Survey Battalion, Jiangxi Geological Mineral Survey Development Bureau Liu Xiaobin, South Jiangxi Geological Survey Battalion, Jiangxi Geological Mineral Survey Development Bureau

Continued table 1

Items	Description
Data acquision time	2016.05—2019.01
Geographic area	Ganzhou City, Jiangxi Province; East Longitude: 115°45′~116°00′; North Latitude: 26°20′~26°30′
Data format	*.wp, *.wl, *.wt, *.docx
Data size	47.2 MB
Data service system URL	http://dcc.cgs.gov.cn
Fund project	China Geological Survey Project "Demonstration Sub-project of Prospecting Prediction and Technical Application in Integrated Survey Areas" (121201004000150017-14).
Language	Chinese
Database (dataset) composition	The dataset primarily consists of the mineral geological maps (MapGIS) and mineral information cards (Word). The mineral geological maps mainly include master maps, overall histograms, mosaic maps, the geological tectonic framework profile, metallogenic zone/belt maps and legends. Mosaic maps include plans and profiles of 2 typical deposits, the Niuxingba Au-Ag deposit and the Shihoushan skarn-type S-Fe multi-metal deposit; legends include those for tectonic, altered mineralization, vein and minerals; additional features mainly consist of the responsibility matrix, CGS logo and map-sheet index. The Qingtang map sheet information cards contain basic mineralogical information in the 14 mining areas, such as the main deposits and mineral occurrences in the map sheet, including metal, energy and non-metal minerals.

2 Method for Data Acquisition and Processing

2.1 Basic Data Acquisition

In this project, data were acquired comprehensively by using multiple methods such as mapping specific to lithology - structure - mineralized alterations, remote sensing, geophysical/ geochemical and drilling exploration, and the software GIS was used to collate original data and compile the resulting maps. In the process of the original data acquisition, the coordinate systems used were: 1954 Beijing coordinate system and 1985 national elevation reference; later, result maps were converted for their coordinate systems as per applicable national requirements, and the 2000 state coordinate system was used in all maps. Amongst these, the 1：50 000 mineralogical specific mapping was done using the digital mapping system DGSS: 533.68 km long routes were surveyed, emphasis being placed on survey and division of the early-Yanshanian metallogenic magmatite, ore-bearing formations, rock-controlled and ore-controlled structures, mineralized alteration marks etc., thus compiling the 1：50 000 ore-bearing formation tectonic map. Using the mapping method ' lithology + era', metallogenic magmatite was disaggregated and divided into different periods; in the working concept of crossing + tracing, ore-bearing formations and ore-controlled/rock-controlled structures within the map sheet were systematically plotted; by applying macro + micro elaborate study, the main types of mineralized alteration were determined and the mineralized alteration areas were comprehensively delineated within the map sheet. Meanwhile, 458 km^2 of land area was measured for the 1：50 000 stream sediments and the 1：50 000 ground high-precision magnetic method, as well as being geologically interpreted based on remote sensing. The resulting maps were plotted and anomalies from the geophysical and geochemical exploration were optimally selected and assessed.

2.2 Mineral Data Acquisition

Preexisting mineral information on the map sheet was collected overall, with sources including mine area exploration reports, mineral cards and regional survey reports etc. and typical deposits and important mineral (mineralization) points being checked for minerals there. Meanwhile, overall inspection was done by selecting important anomalies from geophysical and geochemical exploration and remote sensing, and by using mainly geochemical and geophysical surveying means such as ground high-precision magnetic profiling, soil profiling and mercury-vapour profiling, complete with large-scale specific mapping and profile measurement, resulting in the discovery of 3 new pyritic deposits found at Zhainao, Aoxia and Huangguan, and 5 places where prospecting signs were delineated. With the objective of highlighting important mineralization signs, 119 samples were collected for chemical analysis. By combining mineral information in terms of metallogenic geological features, mineralization features, prospecting marks and resource potential etc., 14 information cards on metallic, non-metallic and energy minerals were completed.

2.3 Building the Prospecting Prediction Model

By applying the “trinity” survey area prospecting prediction theory advanced by research fellow Ye Tianzhu (Ye TZ et al., 2014, 2017), Shihoushan-styled skarn-type S-Fe-W multi-metal deposit was researched as a typical deposit in terms of its metallogenic geological body, metallogenic structure and the characteristic marks of structural plane and metallogenesis etc. (Fig. 3), and it was concluded that its metallogenic geological body is the early-Yanshanian Chashanjing complex massif, lithologies mainly being medium-and-fine-grain porphyritic biotite monzonitic granite and fine-grain monzonitic granite, the ore-bearing formation is early Carboniferous epoch Zishan Formation Fe-bearing Ca-bearing fine clasolite formation, metallogenic structures are mainly contact-zone structures and inter-stratum detachment structures, and structural planes are mainly the Si/Ca geochemical barrier between Fe-bearing Ca-bearing fine clasolite in the upper part of the Zishan Formation and the Huanglong Formation calcite dolomite. Technical means applied include the identification of rocks and minerals, main trace-element geochemical analysis, Zircon U-Pb dating, stable isotope testing etc. for the purpose of microscopic and macroscopic overall deconstruction of the metallogenic process. In combination with results from the analysis of anomalies from geochemical and geochemical exploration, skarn-type S-Fe ore areas (bodies) are often within low-gravity areas, high magnetic bodies such as magnetic pyrite display conversion between negative and positive magnetic anomalies. An anomaly is significant for elements such as Au, Pb, As, W and Sn in geophysical and geochemical explorations of stream sediments, and, building on this, the prospecting prediction model on skarn-type S-Fe-W multi-metal deposit was constructed (Fig. 3 and Table 2).

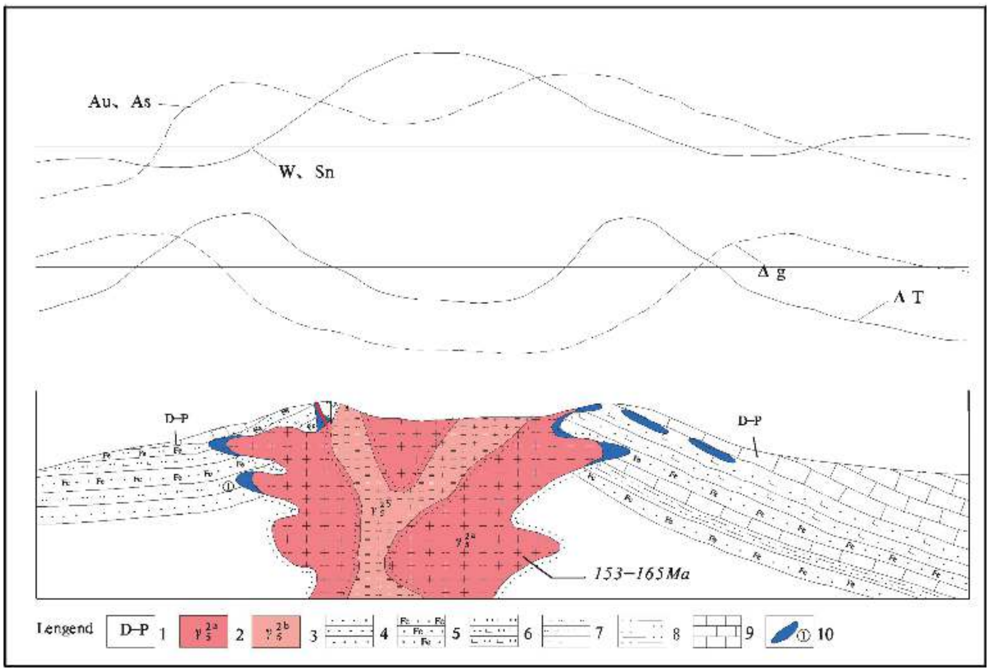

Fig. 3 Prediction model based on Shihoushan-styled S-Fe multi-metal deposit

1−Devonian system–Permian system capping; 2−Early Yanshanian Stage#1 granite; 3−Early Yanshanian Stage#2 granite; 4−Sandstone; 5−Fe-bearing sandstone; 6−Ca-bearing sandstone; 7−Siltstone; 8−Silty shale; 9−Carbonatite; 10−Shihoushan-styled contact replacement deposit. Δg: Bouguer gravity anomaly curve; ΔT: magnetic anomaly curve.

Table 2 Components for the prediction of Shihoushan-styled skarn-type S-Fe multi-metal deposit

Element for prediction		Description	Classification
Metallogenic geological background	Geotectonic location	Qingtang -Yinkeng depression zone, in the west margin of the Wuyi uplift, at the intersection of the south end of the Ningdu-Nancheng depression ‘fault bundle’ and the Xinfeng-Yudu depression fold.	important
	Regional metallogenic zone	W−Ag−Pb−Zn−Au−Sn metallogenic sub-zone of the Yu mountain uplift fold zone	important
	Magmatite zone	Yushan magmatite fold-uplift zone	important
	Metallogenic epoch	Early Yanshanian	important
Deposit feature	Metallogenic geologic body	Chashanjing-styled complex massif: Yanshanian granite porphyritic biotite monzonitic granite and fine-grain monzonitic granite	necessary
	Ore-bearing formation	Fe-bearing Ca-bearing clasolite in the upper part of the Zishan Formation	important
	Metallogenic tectonic and structural place	Metallogenic structure: bedding crushed zone within the Carboniferous system Zishan Formation, rock-mass intrusive contact structure; metallogenic structural plane: Si-Ca heterologous interface in the upper part of the Zishan Formation	important

Continued table 2

Element for prediction			Description	Classification
Deposit feature	Features of metallogenesis	Features of mineral bodies	Most mineral bodies are bedded and lentoid, there are phenomena such as expansion and contraction, branching and then combination, or thinning-out and recurrence in their strike and their slant direction; its altitude is basically consistent with the stratum's altitude, and the strike is longer than 2 300 m.	important
		Ore combination	Magnetic pyrite, pyrite, chalcopyrite, wolframite, scheelite, quartz, calcite, muscovite, sericite, biotite, andalusite, fluorite etc.	necessary
		Main metal elements	Fe, S, W, Au, Cu	secondary
		Deposit zonation	Close to the rock mass, deposit is skarnized, hornfelsic alteration is strong, and mineralization is better; far from the rock mass, alteration becomes weak and mineralization weakens.	important
		Alteration type	Skarnization, marbleization, pyritization, magnetic pyritization, chloritization, carbonatization, silicification, greisenization and andalusite hornfelsic etc.	important
	Metallogenic mode		Post-magma-period hydrothermal-solution filling-and-replacement strata-bound skarn-type Cu-bearing magnetic pyrite (Au-associated) deposit	important
Combined information from geochemical and geophysical exploration and remote sensing	Anomaly from geochemical exploration		Anomaly of stream sediments of elements such as Au, Pb, As, W and Zn from geochemical and geophysical exploration	important
	Anomaly from geophysical exploration		Rock mass is located in the negative gravity anomaly area; mineral body is located in places where negative and positive magnetism anomaly changes, more than 100 nT at least.	important
	Anomaly from remote sensing		Structure in the shape of a ring, with a clear hydroxyl and iron-stained anomaly	important

3 Review of Data Content

Mineral Geological Map Dataset of the Qingtang Map sheet comprises a 1∶50 000 mineral geological map database and 14 mineral information cards. The map database includes the mineral master maps which were compiled using the ore-bearing formation tectonic map as a base map and a set of mosaic maps which include overall histograms, a typical deposit plan and profile maps, a geological tectonic framework profile, metallogenic zone/belt maps and legends. The coordinate system used: 2 000 national geodetic coordinates system for ellipsoidal parameters, the project type is Gauss-Kruger Projection, with a rectangular plane coordinate system. The mineral information cards involve the main deposits or mineral points in the Qingtang map-sheet, including metal, energy and non-metal minerals.

The “Property table of formation tectonic map layers” (Table 3) contains: mark number of geological body’s planar map layer (comprising the type of the working area, the map sheet number and data number), type code, name and era of the geological body’s planar map layer, formation category, formation type, rock combination and geotectonic setting.

Table 3 Property table of formation - tectonic map layer in the mineral geological map of the Qingtang map-sheet

No.	Name of data item	Standard code	Data category	Real example
1	Mark number of geological body’s planar map layer	Feature_Id	Character string	AG50E010008000000484
2	Type code of geological body’s planar map layer	Feature_Type	Character string	C_1z^2
3	Name of geological body’s planar map layer	Geobody_Name	Character string	Upper part of late Carboniferous series Zishan Formation
4	Era of geological body/plane physical body	Geobody_Era	Character string	C_1
5	Formation category	Formation	Character string	Sedimentary rock formation
6	Formation type	Metallogenic	Character string	Fe-bearing sandstone formation
7	Rock combination	Combination	Character string	Ferrous siltstone, calcareous siltstone, shale, fine-grain quartz sandstone
8	Geotectonic setting	Structural_Env	Character string	Regarding its geotectonic location, it is located at the connecting zone between the Wuyi and Luoxiao blocks.

The “geological boundary property table’ (Table 4) contains: element identification number, geological boundary (contact) code, geological boundary type, codes of the geological body in the right and left of the boundary, the strike, dip and dip angle of the interface.

Table 4 Geological boundary property table of the mineral geological map of the Qingtang map-sheet

No.	Name of data item	Standard code	Data category	Real example
1	Element identification number	Feature_Id	Character string	AG50E010008000001489
2	geological boundary (contact) code	Feature_Type	Character string	F6
3	geological boundary type	Boundary_Name	Character string	Fault contact
4	code of geological body in the left of the boundary	Left_Boundary_Code	Character string	D_2y
5	code of geological body in the right of the boundary	Right_Boundary_Code	Character string	Nh_1s
6	Interface strike	Strike	Integer	30
7	Interface dip	Dip_Direction	Integer	300
8	Interface dip angle	Dip_Angle	Integer	60

The “fracture property table” (Table 5) contains: element classification code, fault type (geological code)/name/code/property, codes of the geological bodies overlying and underlying the fault, width of the crushed zone of the fault, fault strike/dip/dip angle, estimated fault displacement, era of fault generation and movement periods.

Table 5 Fracture property table of mineral geological map of the Qingtang map-sheet

No.	Name of data item	Standard code	Data category	Real example
1	Element classification code	Feature_Type	Character string	F17
2	Fault type (geological code)	Fault_Type	Character string	F17
3	Fault name	Fault_Name	Character string	Gaoling - Xiecun fault F17
4	Fault code	Fault_Code	Character string	G50E010008F17
5	Fault property	Fault_Character	Character string	normal fault
6	Code of geological body overlying the fault	Fault_Up_Body	Character string	Nh_1s,$Nh_{2\text{-}3}s^1$
7	Code of geological body underlying the fault	Fault_Bottom_Body	Character string	$Nh_{2\text{-}3}s^1$,Nh_1s
8	Width of crushed zone of fault	Fault_Wide	Character string	2~10 m
9	Fault strike	Fault_Strike	Integer	60
10	Fault dip	Fault_Dip	Integer	330
11	Fault dip angle	Fault_Dip_Angle	Integer	50
12	Estimated fault displacement	Fault_Distance	Floating-point type	1 000 m
13	Era of fault generation	Era	Character string	Yanshanian
14	Movement periods	Movement_Period	Character string	Yanshanian

The “deposit site property table” (Table 6) contains: element identification number, ore code and name, paragenic ore, associated ore, number of deposit sites, ore grade, scale, metallogenic era, deposit site name, mineralization type and genesis type.

Table 6 Deposit site property table of mineral geological map of the Qingtang map-sheet

No.	Name of data item	Standard code	Data category	Real example
1	Element identification number	Feature_Id	Character string	AG50E010008000000001
2	Ore type code	Feature_Type	Character string	3 070
3	Ore name	Commodities_Name	Character string	S
4	Paragenic ore	Paragenic_Ore	Character string	Fe
5	Associated ore	Associated_Ore	Character string	Au, W, Cu
6	Number of deposit sites	Ore_Sums	Integer	1
7	Ore grade	Ore_Grade	Character string	TFe 41.413%, Cu 0.165%, WO 3 0.147%, Au 0.30g/t
8	Scale	Deposite_Size	Character string	Large-sized deposit
9	Metallogenic epoch	Metallogenic_Epoch	Character string	Late Yanshanian
10	Deposit site name	Placename	Character string	Shihoushan S-Fe deposit
11	Mineralization types	Genesis_Types	Character string	skarn-type
12	Genesis type	Industrial_Types	Character string	Contact replacement type

The “intrusive rock formation property table” (Table 7) contains: element identification number, name and symbol of rock mass mapped, rock name/color/texture/structure, primary minerals and their content, secondary minerals and their content, contact relation with wall rock, generation era and ore-bearing potential.

Table 7 Intrusive rock formation property table of mineral geological map of the Qingtang map-sheet

No.	Name of data item	Standard code	Data category	Real example
1	Element identification number	Feature_Id	Character string	AG50E010008000000001
2	Name of rock mass mapped	Intru_Body_Name	Character string	Chashanjing rock mass
3	Symbol of rock mass mapped	Intru_Body_Code	Character string	$\eta\gamma J^2$
4	Rock name	Rock_Name	Character string	Medium (medium-fine)-grain porphyritic biotite monzonitic granite-
5	Rock color	Color	Character string	Pink
6	Rock texture	Rock_Texture	Character string	Medium (mid-fine)-grain porphyritic-like texture
7	Rock structure	Rock_Structure	Character string	Blocky structure
8	Primary mineral and content	Primary_Mineral	Character string	Plagioclase: 35%; K-feldspar: 35%; quartz: 25%
9	Secondary mineral and content	Secondary_Mineral	Character string	Biotite: 5%
10	Contact relation with wall rock	Contact_Relation	Character string	Intrusive contact
11	Generation era	Era	Character string	Yanshanian
12	Ore-bearing potential	Commodities	Character string	S-Fe, W

4 Data Quality Control and Assessment

To ensure the credibility of the information obtained, this project was implemented in strict accordance with the CGS's Guidance to the 1∶50 000 Mineral Geological Survey (Interim) (Zhongdidiaohan No.[2016]117) and the specific work for geochemical and geophysical exploration was conducted strictly in accordance with national and industrial standards and codes, for instance, the DZ/T 0011−2015 Code for Geochemical Reconnaissance Survey and DZ/T 0071−93 Technical Procedures for Ground-based High-precision Magnetic Survey. According to design requirements, all planned workload was completed or exceeded, and tasks and their goals were achieved, assuring the accuracy of the work. In July 2017, the Level 2 project organized experts to inspect and assess the mineral survey of the Qingtang map sheet in the field, which was assessed as excellence.

The project team conducted field work strictly following the " Three-level Quality Inspection System in accordance with the Rules for Management" of Geological Project Management of the CGS, and consequently, the original information was self-checked and mutually checked in 100% of cases, inspected by the project team in more than 50% of cases and randomly inspected by the QC team in more than 15% of cases, thus ensuring the quality of information and data. All samples were tested and analyzed in qualified labs under internal and external monitoring, so that analytical quality met the requirements.

5 Conclusions

In the 1∶50 000 Mineral Geological Map Dataset of the Qingtang Map-sheet, Ningdu, South Jiangxi, building on collecting and using preexisting information and applying the "trinity" survey area prospecting prediction theory, metallogenic magmatite, ore-bearing formations, ore-control structures, and mineralized alteration mark etc. were surveyed and searched systematically, and the mineral geological maps were plotted on the basis of compilation of ore-bearing formation structure maps. The 1：50 000 mineral geological map database of the Qingtang map sheet was created, which assembled property data of important formation structures, fractures, geological boundaries and magmatite. The temporal and spatial distribution features of metal, nonmetal and energy mineral resources within the area were well understood and mineral information cards completed. By studying typical deposits, it was concluded that the skarn-type S-Fe-W multi-metal ore metallogenic geological body was the early Yanshanian Chashanjing-styled complex massif, the ore-bearing formation was the early Carboniferous epoch Zishan Formation Fe-bearing Ca-bearing fine clasolite formation, the metallogenic structures were mainly contact zone structures and inter-stratum detachment structures, structural planes were mainly the Si/Ca heterologous interfaces between Fe-bearing Ca-bearing fine clasolite in the upper part of the Zishan Formation and the Huanglong Formation calcite dolomite, and alteration types were mainly skarnization, marbleization and greisenization, which was a post-magma-period hydrothermal-solution filling-and-replacement strata-bound skarn-type Cu-bearing magnetic pyrite (Au-associated) deposit. The project's outcomes lead to significantly improved mineralogical survey and research, which has important implications as a reference value for mineral survey deployment in the future.

References

Chen Yuchuan, Chen Zhenghui, Zeng Zailin, Zhao Zheng, Zhao Bin, Wang Denghong, Zhang Yongzhong, Li Jianguo, Zhou Xinpeng, Li Jiangdong. 2013. Research on the site selection of Nanling Scientific Drilling-1[J]. Geology in China, 40(3): 659−670 (in Chinese with English abstract).

Wang Denghong, Qin Yan, Chen Zhenyu, Hou Ke. 2012. U-Pb Isotopic Age and a Further Understanding of the Ore-forming Mechanism in Granite from the Southern Jiangxi Province[J]. Rock and Mineral Analysis, 31(04): 699−704 (in Chinese with English abstract).

Ye Tianzhu, Wei Changshan, Wang Yuwang. 2014. Prospecting Theory and Method for Prospecting in Exploration Area (pandect) [M]. Beijing:Geological Publishing House (in Chinese).

Ye Tianzhu, Lv Zhicheng, Pang Zhenshan.2017. Prospecting Theory and Method for Prospecting in Exploration Area (monograph) [M]. Beijing:Geological Publishing House (in Chinese).

Zhao Zheng, Chen Yuchuan, Guo Naxin, Chen Zhenghui, Wang Denghong, Zeng Zailin, He Shaosen. 2016. Ore-forming regularity and deep prospecting direction of Nanling Scientific Drilling-1(NLSD-1)[J]. Geology in China, 43(05): 1613−1624 (in Chinese with English abstract).

Zhao Zheng, Chen Yuchuan, Zeng Zailin, Guo Naxin, Chen Zhenghui, Wang Denghong, Liu Cuihui, Liu Zongli, Wang Pingan, Li Jiangdong. 2017. Jiangxi Yinkeng W-Ag-Au ore field's metallogenic regularity and prospecting direction:as well as the superposition of two metallogenic series in Southern China[J]. Earth Science Frontiers, 24(05): 54−61 (in Chinese with English abstract).