doi: 10.12029/gc2017Z109

论文引用格式：宋相龙，肖克炎，丁建华，范建福，李楠. 2017. 全国重要固体矿产重点成矿区带数据集[J]. 中国地质，44(S1)：72−81.
数据集引用格式：宋相龙，肖克炎，丁建华，范建福，李楠. 2017. 全国重要固体矿产重点成矿区带数据集[DB]. 全球地质数据，DOI: 10.23650/data.E.2017.P1.

收稿日期：2017-06-23
改回日期：2017-07-07

项目：中国地质调查局国土资源大调查项目"全国矿产资源潜力动态评价"(12120110300015000 3)和国土资源部公益性行业科研专项"地质大数据技术研究与应用试点(中国地质科学院矿产资源研究所)"(201511079-04)联合资助。

全国重要固体矿产重点成矿区带数据集

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提要：成矿区带是具有丰富矿产资源及其潜力的成矿地质单元。全国重要固体矿产重点成矿区带数据集是在以往矿产区划研究工作经验的基础上，结合矿产资源潜力评价成果，建立的一套完整的数据集。本数据集借助 23 个矿种圈定的成矿靶区、重要矿产地、物化遥异常等信息，基于最新的 90 个三级成矿区带，划分了 26 个全国固体矿产勘查重点成矿区带，其中主要包括：主要拐点坐标、面积、典型矿床、重要矿产资源潜力（矿种、累计查明资源量、预测资源量）、成矿远景区（远景区名称、主攻矿种、主攻矿种类型）、新发现（或有重大进展）矿产地等方面数据。该数据集不仅是对已经取得的矿产资源区划和资源潜力评价工作的整理和总结，也为科学地引导国家地质找矿部署工作提供理论基础。

关键词：成矿区带；成矿远景区；矿产资源潜力
数据服务系统网址：http://dcc.cgs.gov.cn

1 引言

成矿区带是具有地质构造演化史、经历过成矿作用（一次或多次）、造就成矿物质大量（或巨量）堆积，区内矿产资源丰富、存在潜力、具备找矿远景的成矿地质单元（肖克炎等，2016）。该成矿地质单元在平面上是已知矿床集中、垂向上具有成矿作用和成矿物质分带性、呈现特定的物化场及遥感影像的四维地质空间（朱裕生等，2000，2013）。成矿区带是研究成矿规律的基本途径及部署矿产勘查工作的科学依据，其重要性及实用价值早有共识，前人对其进行了大量的研究（谢家荣，1936；Mitchell，1985；Hutchison，1987；郭文魁，1987；Routhier，1990）。最早法国地质学家 L.de Launay 于 1905 年提出"成矿区带是研究金属的自然富集作用"的概念，并在 1913 年提出金属成矿省（metallogenic province）的概念，意指在地壳特定的区域内产出异常多特定类型的矿床；国内早在 1920 年翁文灏提出矿床成带状分布，将南岭地区划分出锡、锌－铅－铜、锑、汞 4 个成矿带；20 世纪中期到 90 年代成矿区带研究经历了成熟阶段和勘查实践结合时期，开始了理论化和理论化；1999 年陈毓川主编的《中国主要成矿区带矿产资源远景评价》将中国的主要成矿单元分为 5 级（Ⅰ级：全球成矿区（带），常用"成矿域"

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表示。成矿域往往对应于全球性构造域；Ⅱ级：Ⅰ级成矿单元内的次级成矿区带，与大地构造单元对应或跨越几个大地构造单元，成矿作用形成于几个或一个大地构造－岩浆旋回的地质历史时期；Ⅲ级：Ⅱ级成矿单元内的次级成矿区带，它是独特的一种或多种矿化集中分布区，成矿受控于某一构造－岩浆带、岩相带、区域构造或变质作用。在Ⅲ级成矿区带内还可分出Ⅳ级（矿化集中区）和Ⅴ级（矿田）成矿单元；2000—2003 年，在陈毓川负责的“中国成矿体系”研究中，将成矿区（带）正式命名为成矿域（Ⅰ级）、成矿省（Ⅱ级）、成矿区（带）(Ⅲ级)、成矿亚带（Ⅳ级）和矿田（Ⅴ级）的 5 级划分法，并依多元信息作依据，在全国划分出 5 个成矿域、16 个成矿省、81 个成矿区（带），该成果成为中国大陆成矿体系的重要内容之一（陈毓川等，2007 ；徐志刚等，2008)。

自成矿区带概念提出经过了 100 多年的发展，在实践中不断提高和深化，目前在理论和勘查时间应用中都达到了一定的高度。但随着科学技术的进步发展，成矿区带的划分逐渐由平面转向立体空间的研究。近年来针对隐伏矿和深部矿的探索研究，不断有新的预测成果、找矿突破涌现，以往的重点成矿区带内外不断有新矿种、新类型的发现，在全国范围内对成矿规律与矿产区划工作有了新一轮的研究和认识。因此，非常有必要在以往研究工作基础上，结合新的预测成果和找矿成果，建立一套完整的重点成矿区带数据集，为进一步矿产勘查进行规划部署提供重要的科学依据，同时也是矿产区划工作向信息化、智能化转变的关键环节。

本文中提出的重点成矿区带划分与科学意义上的反映地质与成矿作用的成矿区带划分有一定的区别，划分的目的是为了服务于国家战略和战术上的地质找矿工作部署。重点成矿区带是指：针对想要重点突破的矿种，以成矿规律与成矿远景区的划分为基础，综合考虑资源潜力、找矿前景、资源经济效益、开发利用等条件，而划分的成矿区带，用以指导找矿勘查工作部署，引导商业投入，提高找矿实际效益，从而提高我国资源安全保障能力。

表 1　数据库（集）元数据简表

条目	描述
数据库（集）名称	全国重要固体矿产重点成矿区带数据集
数据作者	宋相龙、肖克炎、丁建华、范建福、李楠
数据时间范围	2006—2015 年
地理区域	全国范围
数据格式	*.xlsx *.wl *.wt *.wp
数据量	534.164 kB
数据库（集）组成	全国 26 个固体矿产重点成矿区带信息包括有：成矿区带名称、主要拐点坐标、面积、典型矿床、成矿谱系、重要矿种预测资源潜力（矿种、累计查明资源量、预测资源量）、远景区（远景区名称、主攻矿种、主攻矿种类型）、新发现（或有重大进展）矿产地等。 全国重要固体矿产重点成矿区带数据集包括有两种类型数据： Data_China_SolidMineral_MMB_26_Mapgis 矢量数据，数据量 405.971 kB Data_China_SolidMineral_MMB_26_Xlsx 属性数据，数据量 128.193 kB

2 数据采集和处理方法

2.1 数据基础

近年来，随着国土资源大调查工作的开展，充分利用成矿预测理论和技术方法，对重要成矿区带进行深入的成矿预测和资源潜力评价（李厚民等，2012；左群超等，2012，2013；丁建华等，2013；王吉平等，2015），确定找矿目标和圈定找矿远景区，部署矿产勘查工作，实现地质找矿工作的重大突破，新发现矿产地 900 余处。

全国矿产资源潜力评价工作已完成了我国非油气重要矿产煤炭、铀、铁、铜、铝、铅、锌、锰、镍、钨、锡、钾、金、铬、钼、锑、稀土、银、硼、锂、磷、硫、萤石、菱镁矿、重晶石 25 个矿种的资源潜力预测评价，圈定各矿产最小预测区 49202 个，定量评价了各矿种 500 m 以浅、1000 m 以浅和 2000 m 以浅潜的在资源量，基本摸清 25 个矿产资源潜力及其空间（肖克炎等，2016）。在上述数据的基础上，总结前人有关中国成矿区带划分和资源潜力评价等（陈毓川等，1996；叶锦华等，1997；朱裕生等，1999；宋国耀等，1999；胡受奚等，2008）诸多认识，配合新的研究成果和找矿突破，本重点成矿区带数据共包括有 26 片，总面积为 $488\times10^4 km^2$。

26 片重点成矿区带名称如下：

（1）阿尔泰—准噶尔北缘铬铁矿 Cu-Au-Pb-Zn 多金属成矿带（丁建华等，2016）;

（2）天山西段 Fe-Pb-Zn-Au-Cu 成矿带（王岩等，2016）;

（3）东天山—北山 Cu-Ni-Au-Pb-Zn 成矿带（丁建华等，2016）;

（4）西昆仑—阿尔金 Fe-Pb-Zn-Au 稀有金属成矿带（王岩等，2016）;

（5）东昆仑 W-Pb-Ni-Cu-Au 成矿带（刘建楠等，2016）;

（6）祁连 Cu-Pb-Zn-Ni 钾盐成矿带（刘建楠等，2016）;

（7）秦岭 Au-Pb-Zn-Sb-Mo 成矿带（叶会寿等，2016）;

（8）班公湖—怒江 Cu-Au-Fe-Li 成矿带（崔宁等，2016）;

（9）冈底斯—藏南 Cu-Au-Pb-Zn-Mo 成矿带（席伟杰等，2016）;

（10）西南三江 Cu-Pb-Zn-Au-Sb 成矿带（高兰等，2016）;

（11）上扬子西缘成矿带（扬子西缘和扬子东缘并称环上扬子 Mn-Zn-Ag-Cu-Al 成矿带）;

（12）上扬子东缘成矿带（丛源等，2016）;

（13）南盘江—右江 Sn-Sb-Mn-Zn-Al-Au 成矿区（丛源等，2016）;

（14）大兴安岭 Cu-Mo-Ag 多金属成矿带（马玉波等，2016）;

（15）吉黑东部 Au-Ag-Cu-Mo 成矿带（马玉波等，2016）;

（16）辽东—吉南 Fe 菱镁矿 Cu-Au 成矿带（马玉波等，2016）;

（17）华北陆块北缘稀土 Mo-Pb-Zn-Au 多金属成矿带（张勇等，2016）;

（18）辽西—太行 Al-Fe-Au-Pb-Zn-Ag-Cu 煤成矿带（李俊健等，2016）;

（19）豫西铝土矿 Mo-W-Au-Pb 成矿带（李俊健等，2016）;

（20）胶东 Au-Fe 金刚石成矿带（张勇等，2016）;

（21）桐柏—大别 Mo-Pb-Zn 稀土成矿带（阴江宁等，2016）;

（22）长江中下游 W-Cu-Mn-Fe-Sb 成矿带（阴江宁等，2016）;

（23）江南陆块南缘 Cu-Pb-Zn-W-Sn 成矿带（刘一等，2016）；

（24）南岭 W-Sn-Pb-Zn-Ag 多金属成矿带（孙莉等，2016）；

（25）武夷山 Au-Sn-Pb-Mo-W 多金属成矿带（丁建华等，2016）；

（26）桂东—粤西 Au-Ag-Fe-Mo 铝土矿成矿带（孙莉等，2016）。

2.2 重点成矿区带划分的原则

通常科学意义上的成矿单元 / 成矿区带的划分主要依据区域成矿的地质构造环境及区域成矿作用的性质、产物（矿种）、强度及其他的相关矿化信息，结合已知矿床在现今地壳表层三维空间展布和矿床形成的地质时代特点，同时也要强调成矿构造环境及地球（大陆）动力学等相关问题，通过成矿规律理论的分析、推测，完成圈定、划分成矿区带（叶锦华等，1997；徐志刚等，2008）。

本文重点成矿区带概念（肖克炎等，2016）是指：针对想要重点突破的矿种，以成矿规律与成矿远景区的划分为基础，综合考虑资源潜力、找矿前景、资源经济效益、开发利用等条件，而划分的成矿区带，用以指导找矿勘查工作部署，引导商业投入，提高找矿实际效益，从而提高我国资源安全保障能力。该类成矿区带兼具技术和管理两个层面的含义。

按照宏观规划与突出重点相结合，战术部署与重点突破相结合的原则，可将矿产勘查工作部署区（带）划分 4 个层次（肖克炎等，2016）：

表 2 重点成矿区带 4 个层次描述

第 1 层次	第 2 层次	第 3 层次	第 4 层次
重点找矿区（带）	调查评价区（远景区）	勘查区	立体勘查区
属全国层面上的部署区（带）	基本查明重点成矿区带的矿产资源分布规律，提交一批找矿远景区	经矿产预测和矿产调查工作所确定的、预计能发现大、中型矿床的靶区	在具有资源潜力的已知矿山、已知矿床的深部和外围部署勘查评价工作
主要用于指导地质调查项目设置和管理，从而实现加大国家财政投入力度、鼓励、引导和拉动商业性地质勘查投资，进而形成一批重要的资源基地的目的	用以部署矿产资源远景调查和区域矿产调查评价。以全国重点成矿区带和重点矿种为目标，部署时要综合考虑成矿地质特征，地球物理、地球化学、遥感、重砂等多元信息异常。可进一步根据成矿有利程度分为优先部署工作的重点远景区和一般远景区	用以部署进一步的勘查工作，以期通过重点投入实现找矿突破	可通过追加投入发现新矿体（种），增加资源储量

2.2.1 重点成矿区带（第 1 层次）的划分原则

（1）突出重点矿种兼顾优势矿种

重点矿种包括：铁、锰、铜、铝、铅、锌、镍、钨、锡、金、钾盐、磷等。除重点矿种之外，还要考虑没列入重点矿种之列的优势矿种，如锑矿、稀土、菱镁矿等。

（2）兼顾基础性地质工作部署需求

全国重点成矿区带的划分的主要目的是为了从宏观层面上对勘查工作进行部署和管理，因此，区带的划分需要兼顾项目管理的需求。因此，全国重点成矿区带通常由多个

Ⅲ级成矿区（带）构成，界限参照地质Ⅲ级成矿区（带）界限，但不严格受其约束。

（3）边界划定的依据

划定全国重点成矿区带的边界主要参考以下几个因素：①参考成矿区带的边界，在区带内要有一次或多次有代表性成矿事件；②参考全国潜力评价成果，区带内成矿潜力巨大，要有一种或几种矿产在全国层次属优势矿产资源，且目前带内有大型、超大型矿床分布；③有找矿新进展，如：近年来有较大找矿突破，新发现了大中型以上矿产地、发现矿床新类型的等。

（4）面积

全国重点成矿（部署）区带的面积原则上不大于Ⅲ级成矿区带，不小于Ⅴ级成矿区带，可以为几万 ~ 几十万 km^2。

（5）不同工作程度的地区区别对待

不同的地区工作程度不同，部署研究时要区别对待。东部要强调应用新理论、新思路进行多元成矿信息的资料综合研究，开辟新类型、新矿种、新规模和深部勘查评价，开展隐（盲）矿床和难识别矿床的勘查，力争在接替资源勘查中有新突破；西部则要加强硬投入，加大调查力度，加快评价速度，以找到矿、找大矿为主要目标，提供新的矿产资源基地。

2.2.2　远景区（第 2 层次）的圈定原则

①成矿条件有利；

②有几个优势矿种，且具有一定的资源潜力；

③近年来取得重大的找矿进展；

④考虑国家主体功能区的划分及资源开发利用条件；

⑤远景区面积几千 ~1 万 km^2。

根据找矿工作部署需要，还可以进一步划分重点远景区与一般远景区，其中：重点远景区指地质工作程度较高（如预测资源量级别多数属 334-1），远景较大（预测资源量大型以上），区内有大中型矿产地或国家级整装勘查区（进展较好）等反映。一般远景区：工作程度稍低的（如预测资源量级别多数属 334-2 或 334-3）的远景区。

3　数据样本描述

全国重要固体矿产重点成矿区带数据主要包括以下几个方面（图 1）：区带概况、成矿地质条件、矿产特征、资源潜力分析、主攻矿种及主攻类型、勘查部署建议。其中，成矿区带数据总表（表 3）涵盖 26 个成矿区带的概况信息，如名称、地理位置、拐点坐标、典型矿床和新发现矿产地等；成矿区带数据分表（表 4）则针对每个成矿区带信息具体情况的不同，对各自预测资源潜力情况以及目前所圈定远景区等相关信息。

4　数据质量控制和评估

本次全国重要固体矿产重点成矿区带数据集是以全国重要矿产资源潜力评价成果为基础，系统收集已有的地质矿产、物探、化探、遥感等资料，总结矿产资源调查评价工作最新进展成果，划分 26 片“重点成矿区带”，完成“重点区带”的成矿地质条件总结、区域成矿规律分析、主要矿种的资源潜力分析、工作部署等研究成果。本数据集的数据

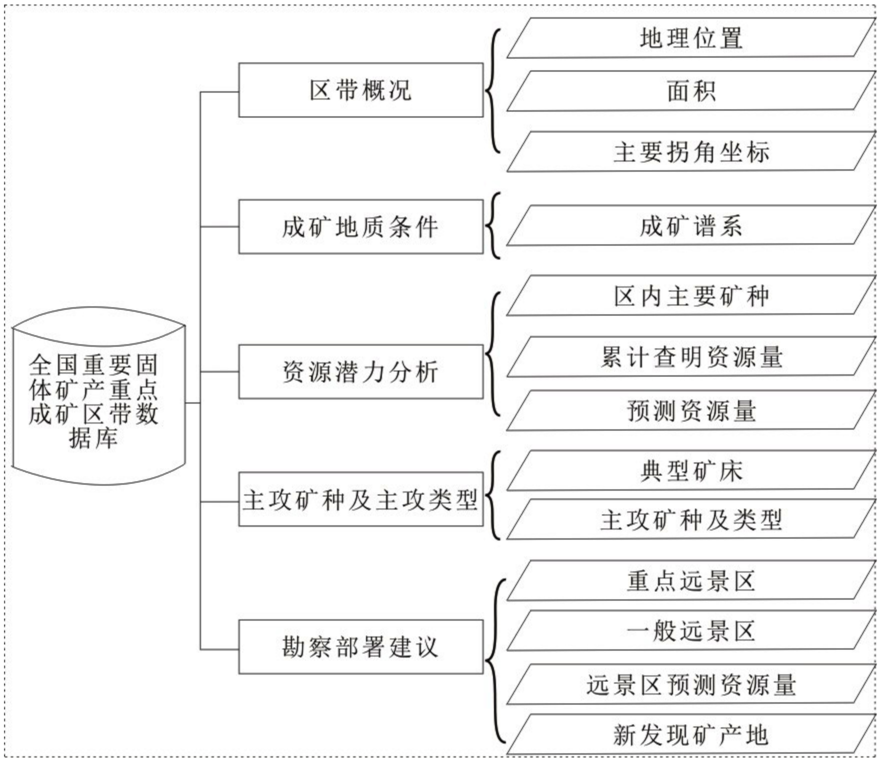

图 1　全国重要固体矿产重点成矿区带数据集结构图

质量具有适用性、完整性、规范性、准确性等。数据质量的控制，主要有数据收集和整理过程中可能产生的误差，对此可不定期开展调查验证和专家论证，控制数据在收集和整理过程中产生的质量问题。数据质量评估一方面可以检验所收集到的数据本身的质量，另一方面还可以检验数据搜集过程中质量是否得到有效控制。针对数据质量问题还需要进一步改进措施，应更具广泛性和可操作性，从而切实提高数据质量。

表 3　全国重要固体矿产重点成矿区带数据总表

序号	字段名称	单位	数据类型	实例
1	重点成矿区带名称	-	字符型	阿尔泰—准噶尔北缘成矿带
2	地理位置	-	字符型	新疆北部，呈北西西向展布
3	主要拐点坐标	度 (°)	字符型	E82.54° ，N45.26° ；E83.67° ，N44.98° ；E87.37° ，N46.88° ；E89.06° ，N46.27° ；E88.97° ，N45.03° ；E95.93° ，N43.14° ；E82.45° ，N46.13° ；E84.47° ，N46.97°
4	面积	万 /km^2	字符型	18.45
5	典型矿床	-	字符型	可可托海稀有金属矿床、阿舍勒铜锌块状硫化物矿床、可可塔勒海相火山岩型铅锌矿、蒙库海相火山岩型铁矿、喀拉通克铜镍矿、依求 I 号火山岩型金矿、多拉纳萨依海相火山岩型金矿、包谷图斑岩型铜金矿、卡拉麦里 1 号金矿、柯鲁木特稀有金属矿床 [共 10 个]

序号	字段名称	单位	数据类型	实例
6	主攻矿种及主攻类型	-	字符型	斑岩型铜矿、岩浆型铜镍矿、韧性剪切带型金矿、海相火山岩型铜锌矿和海相火山岩型铁矿、蛇绿岩型铬铁矿
7	新发现（或有重大进展）矿产地	-	字符型	新疆富蕴县麦兹铅锌金矿—大型，新疆阿勒泰乌吐布拉克铁矿—中型
8	预测资源量占全国预测总量的百分比	%	浮点型	Fe：0.34；Cu：7.62；Pb：3.86；…

表 4　全国重要固体矿产重点成矿区带数据分表

序号	字段名称		数据类型	实例
1	重要矿种预测资源潜力	矿种	字符型	铬铁矿
2		累计查明资源量	浮点型	245.66
3		500 m 以浅预测资源量	浮点型	2444.2
4		1000 m 以浅预测资源量	浮点型	2446.6
5		2000 m 以浅预测资源量	浮点型	-
6		单位	字符型	矿石 /10^4 t
7	远景区	远景区名称	字符型	阿勒泰市阿舍勒 Cu-Zn-Au-Ag-S 重点远景区
8		主攻矿种	字符型	Cu Zn Au Ag S
9		主攻矿种类型	字符型	海相火山岩型铜锌（银铅金）矿（如：阿舍勒型）；破碎岩蚀变型金银（如：萨热阔布型）；与花岗岩有关的斑岩—矽卡岩—角岩型铜矿（如：铁热克提东）

5　结论

（1）本次重点成矿区带的划分，虽然是在总结前人对成矿区带划分的经验、并充分利用全国矿产资源潜力评价数据基础上提出的，但也只是阶段性成果，仅反映目前的认知方案；同时就全国成矿区带的大地构造性质及其归属等问题仍存在争议，有些矿床的成因类型或者成矿时代不确定问题导致的成矿构造环境解释的争议，上述相关问题的不确定性都会影响成矿区带划分的结果。故基于现阶段划分方案所建立的重点成矿区带数据集仍有待进一步修正和完善。

（2）本次建立的全国固体矿产重点成矿区带数据集，根据重点成矿区带的划分原则，遵循成矿规律研究成果，划分重点成矿区带 26 片。不仅是对现阶段已经取得的矿产区划工作的整理和总结，同时也可以科学、高效地引导国家地质找矿部署工作。矿产区划工作是一个动态过程，比如，需要考虑国家矿产资源需求、市场经济发展需求等诸多因

素。因此，本数据集应具备动态更新的接口，便于数据集及时接收新理论、新成果，为矿产资源区划工作提供常态化支持，对降低勘查风险、保障地质找矿突破有着重要的现实意义。

致谢：本次工作是在全国主要矿产资源潜力评价工作基础上，由中国地质调查局资源评价部主导完成的找矿区带梳理工作，在此对参加全国成矿区带划分和预测评价的地质矿产各位专家表示衷心感谢。在本文完成过程中，涉及到全国重要固体矿产重点成矿区带的数据收集与整理工作，感谢李苍柏、邢建华等诸位同学提供的大力帮助。同时，感谢本文的审稿专家提出的宝贵意见建议。

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（责任编辑　杨艳　郭慧）

Received: 23-06-2017
Accepted: 07-07-2017

Fund support: Supported by China Geologic Survey Project of *dynamic assessment of mineral resources potential in China* (NO.121201103000150003) and the Public Welfare Industry Special Funds for Scientific *Research from Ministry of Land and Resources of China research and application of geotechnical data technology (Institute of Mineral Resource, Chinese Academy of Geological Sciences)* (NO.201511079-04).

doi: 10.12029/gc2017Z109

Article Citation: Song Xianglong, Xiao Keyan, Ding Jianhua, Fan Jianfu, Li Nan. 2017. Dataset of major mineralization belts of China's key solid mineral resources[J]. Geology in China, 44(S1): 89−99.
Dataset Citation: Song Xianglong, Xiao Keyan, Ding Jianhua, Fan Jianfu, Li Nan. 2017. Dataset of major mineralization belts of China's key solid mineral resources[DB]. Global Geology Data, DOI: 10.23650/data.E.2017.P1

Dataset of Major Mineralization Belts of China's Key Solid Mineral Resources

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Abstract: The mineralization belt is a mineralized geological unit with abundant mineral resources. The dataset of major mineralization belts of China's key solid mineral resources presented here is a complete set of data from previous metallogenic research, combined with the national assessment data of China's mineral resource potential. This dataset is supported by previous results for 23 mineral species and geophysical and geochemical anomaly data in key mineral resources, and is based on the latest 90 three-level metallogenic areas. This study has determined 26 metallogenic belts of key solid mineral resources all around China, of which the main aspects are as follows: main inflection coordinates, area, typical deposits, important mineral resource potential (mineral species, accumulated proved reserves, predicted mineral resources), metallogenic prospect areas (the name of the prospect, main mineral species, main deposit type), newly discovered (or significant progress on) mineral fields and data on other aspects. The dataset is not only the collation and summary of the metallogenic prospect regionalization and resource assessment, but also the basis for scientific guidance of the national geological prospecting deployment.

Key words: mineralization belts; metallogenic prospect; mineral resource potential; mineral exploration

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

1 Introduction

The mineralization belt refers to bulk deposits (or massive accumulations) of mineral material by tectonic evolution and mineralization (once or many times), where rich mineral resources develop, producing geologic units with prospecting potential (Xiao Keyan et al., 2016). The unit takes on the spectacular physicochemical field featured by known planar ore deposits and vertical zonal mineralization, as well as four-dimensional geologic space from remote sensing images (Zhu Yusheng et al., 2000, 2013). Mineralization belts provide the basic way to study the mineralization patterns and scientific bases to deploy mineral surveys, and there has long been a consensus on their importance and practical value, based on extensive research in this area (Xie Jiarong, 1936; Mitchell,1985; Hutchison,1987; Guo Wenkui, 1987; Routhier, 1990). The French geologist L. de Launay first proposed the concept of the mineralization belts as a key way to study the natural enrichment of metals in 1905, and put forward the concept of metallogenic provinces in 1913 to specify the

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spectacular ores in particular crustal areas. In China, Weng Wenhao first proposed ore belt distribution in 1920, and divided the Nanling area into four mineralization belts, including tin, zinc–lead–copper, antimony, mercury. From the middle 20^{th} century to the 1990s, research into mineralization belts underwent the maturation stage and exploration-practice combination stage, initiating theorization; the *Mineral resource prospecting evaluation in the major mineralization belts of China* compiled by Chen Yuchuan in 1999 divided the major mineralization units of China into five grades, grade I: global mineralization region or belt, usually represented by a "mineralization domain", which always corresponds to the global tectonic domain; grade II: the secondary mineralization belt in a grade I unit, corresponding to one or several geotectonic elements, and the mineralization happens during one or more tectonic-magmatic cycles; grade III: the secondary mineralization belt in a grade II unit, where one or more unique mineralized concentrate districts occur, and the mineralization is controlled by some structure–magma zone, lithofacies zone, regional tectonization or metamorphism. The grade III mineralization belt can be further divided into grade IV (mineralized concentrate district) and grade V (ore field) mineralization units. From 2000 to 2003, the "Chinese mineralization system" research led by Chen Yuchuan formally names mineralization regions (belts) as mineralization domains (grade I), mineralization provinces (grade II), mineralization region (belt) (grade III), mineralization sub-belt (grade IV) and ore field (grade V), and in combination with this multivariate information, there are five mineralization domains, 16 mineralization provinces and 81 mineralization regions (belts) divided in China, which becomes an important content of continental mineralization system in China (Chen Yuchuan et al., 2007; Xu Zhigang et al., 2008).

Since the proposal of the mineralization belt and after the development of this concept over more than a century of research, the concept constantly improves and deepens with the practice. Along with this scientific and technologic progress, the theory of mineralization belt has turned from the planar perspective into a 3D one. In recent years, research aimed at the subtle ore and deep ore constantly obtains new fruits and breakthroughs, and there is constant discovery of new minerals and new species inside and outside the previous major mineralization belts, bringing about a new round of research and recognition of nationwide mineralization patterns and zoning plans. Therefore, it is necessary to establish a set of complete major mineralization zoning datasets on the basis of previous research and in combination with new predictions and prospecting achievements, providing important scientific evidence for further mineral survey planning.

The major mineralization belt division in this paper is different from that reflecting geology and mineralization in terms of scientific meaning; the purpose of division is to serve the geologic mineral survey deployment of national strategy and tactics, considering the resource scale, prospecting potential, economic benefit and development exploitation. The divided mineralization belt can direct the exploration deployment, introduce commercial input, enhance the real profit and improve the resource security capability of China.

Table 1 Metadata table of dataset(s)

Items	Description
Database (dataset) name	The Dataset of Major Mineralization Belts of China's Key Solid Mineral Resources
Database authors	Song Xianglong, Xiao Keyan, Ding Jianhua, Fan Jianfu, Li Nan
Data acquisition time	2006—2015
Geographic area	Nationwide
Data format	*.xlsx*.wl*.wt*.wp
Data size	534.164 kB
Data service system URL	http://dcc.cgs.gov.cn
Database (set) composition	The information of 26 solid mineral major mineralization belts in China involve: belt name, major inflection coordinate, area, typical deposit, minerogenetic lineage, key mineral resource potential (mineral species, cumulative proved resource, predicted resource), prospect area (name, main species, main species type), new discovery (or significant progress) site etc. There are two types of dataset of major mineralization belts of China's key solid mineral: Data_China_SolidMineral_MMB_26_MapGIS vector data, data size 405.971 kB Data_China_SolidMineral_MMB_26_Xlsx attribute data, data size 128.193 kB

2 Data acquisition and processing method

2.1 Data basis

In recent years, along with the national land and resources survey, the mineralization prediction theory and technical method is fully employed to carry out deepened mineralization prediction and resource evaluation on the major mineralization belts (Li Houmin et al., 2012; Zuo Qunchao et al., 2012, 2013; Ding Jianhua et al., 2013; Wang Jiping et al., 2015), confirm the targets and delineate the potential area and deploy the mineral survey, resulting in great breakthroughs in geological ore exploration and more than 900 new discovery sites.

The national mineral resource potential assessment has covered 25 non-petroleum ore species, such as coal, uranium, iron, copper and aluminum, lead, zinc, manganese, nickel, tungsten, tin, potassium, gold, chromium, molybdenum, antimony, rare earth, silver, boron, lithium, phosphorus, sulfur, fluorite, magnesite and barite, delineated the 49,202 minimum prediction regions of each ore, quantitatively evaluated the potential resources above 500 m, above 1,000 m and above 2,000 m, and basically clarified the resource potential and spatial distribution of 25 minerals (Xiao Keyan et al. 2016). On the basis of the above data, according to the previous recognition of the mineralization belt division and resource evaluation of China (Chen Yuchuan et al., 1996; Ye Jinhua et al., 1997; Zhu Yusheng et al., 1999; Song Guoyao et al., 1999; Hu Shouxi et al., 2008) as well as new achievements and breakthroughs, there are 26 data sheets of major mineralization belts, covering a total area of 488×10^4 km^2.

The 26 data sheets of major mineralization belts are as follows:

(1) Altai—Junggar north margin chromite Cu−Au−Pb−Zn polymetallic ore belt (Ding Jianhua et al., 2016);

(2) West Tianshan Fe−Pb−Zn−Au−Cu ore belt (Wang Yan et al., 2016);

(3) East Tianshan—Beishan Cu−Ni−Au−Pb−Zn ore belt (Ding Jianhua et al., 2016);

(4) West Kunlun—Altun Fe−Pb−Zn−Au rare metal ore belt (Wang Yan et al., 2016);

(5) East Kunlun W−Pb−Ni−Cu−Au ore belt (Liu Jian'nan et al., 2016);

(6) Qilian Cu−Pb−Zn−Ni potassium salt ore belt (Liu Jian'nan et al., 2016);

(7) Qinling Au−Pb−Zn−Sb−Mo ore belt (Ye Huishou et al., 2016);

(8) Bangong lake—Nujiang river Cu−Au−Fe−Li ore belt (Cui Ning et al., 2016);

(9) Gangdise—Southern Tibet Cu−Au−Pb−Zn−Mo ore belt (Xi Weijie et al., 2016);

(10) Southwest threeriver Cu−Pb−Zn−Au−Sb ore belt (Gao Lan et al., 2016);

(11) Upper Yangtze west margin ore belt (Yangtze west and east margins called upper Yangtze Mn−Zn−Ag−Cu−Al ore belt);

(12) Upper Yangtze east margin ore belt (Cong Yuan et al., 2016);

(13) Nanpan river—You river Sn−Sb−Mn−Zn−Al−Au ore belt (Cong Yuan et al., 2016);

(14) Daxing'anling Cu−Mo−Agpolymetallic ore belt (Ma Yubo et al., 2016);

(15) Jilin-Heilongjiang east Au−Ag−Cu−Mo ore belt (Ma Yubo et al., 2016);

(16) East Liaoning—South Jilin Fe magnesite Cu−Au ore belt (Ma Yubo et al., 2016);

(17) North China craton north margin rare earth Mo−Pb−Zn−Au polymetallic ore belt (Zhang Yong et al., 2016);

(18) West Liaoning—Taihang Al−Fe−Au−Pb−Zn−Ag−Cu coal belt (Li Junjian et al., 2016);

(19) West He'nan bauxiteMo−W−Au−Pb ore belt (Li Junjian et al., 2016);

(20) Jiaodong Au−Fe diamond ore belt (Zhang Yong et al., 2016);

(21) Tongbai—Dabie Mo−Pb−Zn rare earth ore belt (Yin Jiangning et al., 2016);

(22) Middle−lower reaches of Changjiang river W−Cu−Mn−Fe−Sb ore belt (Yin Jiangning et al., 2016);

(23) Jiang'nan craton south margin Cu−Pb−Zn−W−Sn ore belt (Liu Yi et al., 2016);

(24) Nanling W−Sn−Pb−Zn−Ag polymetallic ore belt (Sun Li et al., 2016);

(25) Wuyi mountain Au−Sn−Pb−Mo−W polymetallic ore belt (Ding Jianhua et al., 2016);

(26) East Guangxi—West Guangdong Au−Ag−Fe−Mobauxite ore belt (Sun Li et al., 2016).

2.2 Division principle for major mineralization belt

The division of mineralization units/belts in the common scientific way mainly refers to the geotectonic environment of regional mineralization as well as the property, product (species), intensity and the other relevant information, in combination with the 3D spatial distribution of current crustal surface and the ore forming time, the mineralization tectonic environment and geodynamics (continental) as well as other relevant questions also highlighted. According to the mineralization rule analysis and prediction, the mineralization belts are delineated and divided (Ye Jinhua et al., 1997; Xu Zhigang et al., 2008).

The major mineralization belt concept of this discussion (Xiao Keyan et al., 2016) points out: for the mineral species needing key breakthroughs, on the basis of the mineralization rule and prospect division, the resource scale, prospecting potential, economic benefit and development exploitation should be comprehensively considered for mineralization belt division, which can direct the prospecting deployment, introduce commercial input, enhance the real profit and improve the resource security capability of China. The mineralization belt contains the meanings of both technology and management.

In the light of macro planning combined with strong emphasis, tactical deployment and key breakthroughs, the mineral survey deployment can be divided into four levels (Table 2) (Xiao Keyan et al., 2016):

Table 2 Description of key mineralization belts with four levels

Level 1	Level 2	Level 3	Level 4
Major prospecting region (belt)	Survey evaluation region (long−term plan region)	Exploration region	Stereoscopic exploration area
Nationwide deployment region (belt)	Basically prove the mineral resource distributing rule of major mineralization belts, submit a batch of long−term plan regions	Large and medium ore deposit target region confirmed by mineral prediction and survey as well as predicted discovery	Deep and peripheral deployment and evaluation of known mines and ores with resource potential
Mainly used to direct geologic survey project set and management to increase the national financial input, encourage and stimulate the commercial exploration investment, and establish a batch of important resource base	Mainly used for long−term resource survey and regional mineral survey evaluation. Aimed at the major mineralization belt and key ore species of China, the deployment should consider the mineralization geology and information anomaly of geophysics, geochemistry, remote sensing and heavy sand etc. The belt can be further divided into preferential key long−term regions and general long−term regions	Mainly used for further exploration and breakthroughs by key input	Find new ore bodies (species) by additional input, and increase resource and reserve

2.2.1 Division principle of major mineralization belts (level 1)

(1) Highlight the key mineral and take dominant mineral into account

Key minerals include iron, manganese, copper, aluminum, lead, zinc, nickel, tungsten, tin, gold, potassium salt and phosphorus, etc. Furthermore, the dominant minerals not included in the key minerals should be taken into account, such as antimony, rare earth and magnesite, etc.

(2) Give consideration to basic geologic deployment requirements

The purpose of national major mineralization belt division is to deploy and manage exploration from the macro level, thus the belt division should consider the requirements of project management. Therefore, the national major mineralization belt usually comprises multiple belts of grade III type whose boundary refers to geological grade III but not strictly constrained.

(3) Boundary delineation basis

The following factors to delineate the national major mineralization belt boundary include: ① refer to mineral belt boundary, with one or several representative mineralization events within the belt; ② refer to national potential evaluation results, with large potential within the belt and one or more dominant minerals at the national level, as well as large and super mine distribution; ③ refer to new progress, such as new breakthroughs in prospecting, new discovery of large to medium mineral sites and new minerals.

(4) Area

The area of national major mineralization (deployment) belt is no larger than grade III and no less than grade V in principle, from tens of thousands to hundreds of thousands of square kilometers.

(5) Differential treatment of the area with different work levels

For different areas with different work levels, the deployment should be differential. The east area should apply the new theory and new thought for multi−information research, break a path for new type, new mineral, new scale and deep survey evaluation, prospect the subtle (blind) and difficult ore deposits, and struggle to get breakthroughs in resource substitution; the west area should strengthen the hard input, intensify the investigation, speed up the evaluation, and set the discovery and large ore as targets to establish new mineral resource bases.

2.2.2 Division principle of long−term plan belt (level 2)

① Favorable mineralizing conditions;

② Some dominant minerals with a certain resource potential;

③ Significant prospecting breakthroughs in the recent years;

④ Considering the division of national principal function region and resource exploiting conditions;

⑤ Long−term plan area covering several to tens of thousands of square kilometers

According to the prospecting requirements, the long−term plan region is further divided into key and general areas, among which "key area" refers to high geologic work level (for example, the resource prediction grade mostly 334−1), great potential (resource prediction of large scale and above), large to medium mineral site or nation−level integrated exploration area, and so on. General area: slightly low work level (for example, the resource prediction grade mostly 334−2 or 334−3).

3 Data sample description

The data for national major mineralization belts of key solid minerals (Fig. 1) include: belt overview, mineralization geologic conditions, mineral characteristics, resource

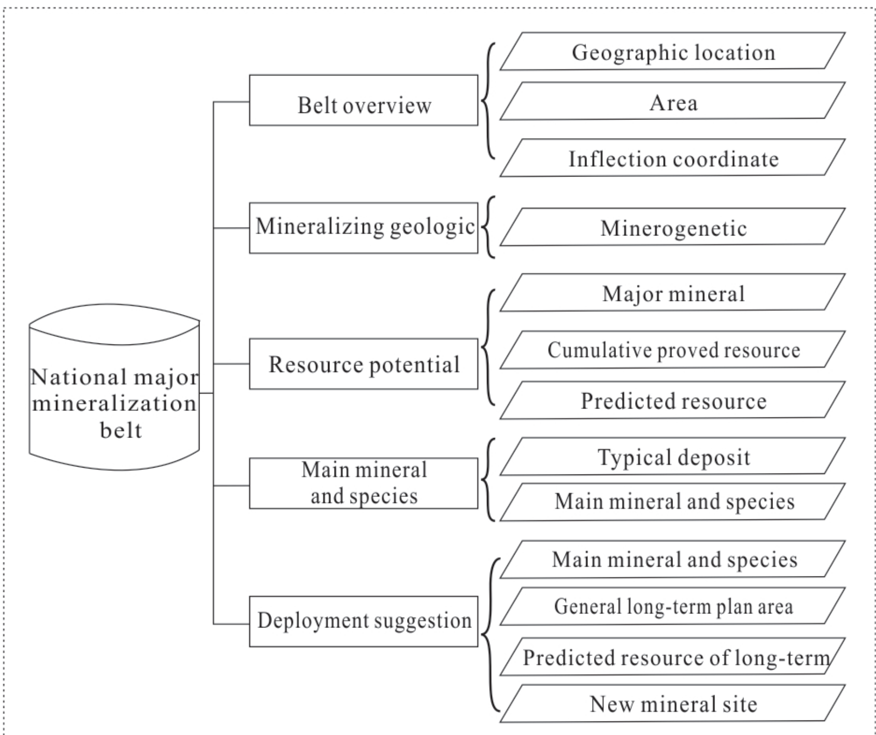

Fig. 1 Structure diagram of China's key solid major mineralization belts dataset

potential, main mineral and type, and deployment suggestion. The mineralization belt data sheet table (Table 3) covers the general information of 26 mineralization belts, such as name, geographic location, inflection coordinate, typical deposit, and new mineral site, etc.; and the mineralization belt data sheet sub-table (Table 4) covers the predicted resource potential and the delineated long-term plan for each mineralization belt.

Table 3 Summary table of China's key solid major mineralization belts dataset

Serial number	Field name	Unit	Data type	Example
1	Major mineralization name	-	Character	Altai-Junggar north margin belt
2	Geographic location	-	Character	North Xinjiang, trending along WNW
3	Major inflection coordinate	degree (°)	Character	E82.54°, N45.26°; E83.67°, N44.98°; E87.37°, N46.88°; E89.06°, N46.27°; E88.97°, N45.03°; E95.93°, N43.14°; E82.45°, N46.13°; E84.47°, N46.97°
4	Area	$\times 10^4/km^2$	Character	18.45
5	Typical deposit	-	Character	Keketuohai rare metal ore, Ashele Cu−Zn bulk sulfide ore, Keketale marine volcanic Pb–Zn ore, Mengku marine volcanic Fe ore, Karatungk Cu−Ni ore, Yiqiu I volcanic Au ore, Doranasai marine volcanic Au ore, Baogutu porphyry Cu−Au ore, Karamaili 1 Au ore, Kelumute rare metal ore (ten in total)
6	Main mineral and species	-	Character	Porphyry Cu ore, magmatic Cu−Ni ore, ductile shear zone type Au ore, marine volcanic Cu−Zn ore and Fe ore, ophiolite chromite
7	New discovery (or significant progress) mineral site	-	Character	Maizi Pb−Zn ore in Fuyun county, Xinjiang (large size), Wutubulak Fe ore in Altai, Xinjiang (medium size)
8	Predicted resource percentage in the national predicted gross	%	Float	Fe: 0.34; Cu: 7.62; Pb: 3.86; …

4 Data quality control and assessment

The dataset of national major mineralization belts of key solid minerals is based on the national key mineral resource evaluation achievements, and systematically collects the available geological, geophysical, geochemical and remote sensing data, etc., summarizes the latest progress of mineral resource surveys, divides 26 "key mineralization belts", and accomplishes the mineralizing conditions summary of "key belt" and regional mineralization rule analysis as well as major mineral resource analysis and deployment, etc. The data quality of the dataset is defined by applicability, integrity, normalization and accuracy, etc. The data quality control is mainly focused on the possible error during data collection and arrangement, and carries out casual survey demonstration and expert demonstration. The data quality can check the quality of the collected data on one hand, and also check whether the data quality is effectively controlled during the collection. Further improvements are needed to tackle the data quality problem, which should involve universality and operability in order to practically improve data quality.

Table 4 Sub-table of China's key solid major mineralization belts dataset

Serial number		Character name	Data type	Example
1	Key mineral resource prediction	Mineral	Character	Chromite
2		Cumulative proved resources	Float	245.66
3		Resource above 500m	Float	2444.2
4		Resource above 1000m	Float	2446.6
5		Resource above 2000m	Float	-
6		Unit	Character	Mine /×10^4 t
7	Long-term plan region	Long-term plan region name	Character	Ashele Cu−Zn−Ag−S key long-term plan area in Aleitai
8		Main mineral	Character	Cu−Zn−Au−Ag−S
9		Main mineral species	Character	Marine volcanic Cu–Zn (Ag−Pb−Au) ore (such as Ashele type); Fracture altered Ag−Au (such as Sarekuobu type); Porphyry−skarn−hornfels Au related to granite (such as Tiereketidong)

5 Conclusions

(1) This major mineralization belt division is just a periodical result and only reflects current recognition, although it is based on previous division experience and the national mineral resource evaluation data. Meanwhile, there is controversy on some issues such as geotectonic property and attributes of the mineralization belt as well as mineralizing tectonic environment interpretation caused by uncertain genetic type or mineralization time, which will affect the mineralization belt division results. Therefore, the established major mineralization belt dataset based on the current scheme still needs further revision and improvement.

(2) This major mineralization belt dataset of key solid minerals complies with the major mineralization belt division principle, refers to the research achievements of the mineralization rule, and divides into 26 major mineralization belts. It is not only the arrangement and summary on the mineral zoning plan achieved at the present stage, but also guides the direction of scientific and economical geologic survey deployment. The mineral zoning plan is dynamic, and should consider the national mineral requirement and economic development requirement. Therefore, the dataset should have an interface of dynamic upgrading, which facilitates new theory and achievement input into the dataset, and provides normalization support for mineral zoning plans, and it is of vital importance to reduce the exploration risk and safeguard prospecting breakthroughs.

Acknowledgements: this work is based on the national mineral resource potential evaluation and hosted by the Resources Evaluation Department of CGS, hereby we offer our sincere thanks to all the experts participating in the national mineralization zoning and prediction evaluation.

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