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长株潭城市群

地质资源环境图集

中国地质调查局武汉地质调查中心
湖南省地质矿产勘查开发局
湖南省地质调查院
编著

THE GEOLOGY RESOURCE ENVIRONMENT ATLAS OF
CHANG-ZHU-TAN CITY GROUP

中国地质大学出版社
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内 容 提 要

《长株潭城市群地质资源环境图集》是“长株潭城市群地质环境调查与区划”项目的主要研究成果。图集内容包括长株潭城市群序图、资源类图和环境地质问题类图三大类，对“长株潭城市群地质环境调查与区划”项目的研究成果进行了全面的展示。该图集基本阐明了长株潭城市群的地质环境条件；对长株潭城市群全区地下水、矿泉水、地下热水、矿产资源、地质遗迹景观等地质资源进行了系统调查评价；对长株潭城市群崩塌、滑坡、泥石流等地质灾害的分布进行了总结，并根据危险性进行分区，对岩溶塌陷、矿山环境地质问题进行了勘查评价；同时评价了长株潭城市群核心区地下空间的开发利用适应性；对长株潭城市群城镇与重要基础设施规划建设进行了适应性评价。

该图集可供从事基础地质、水文地质、工程地质和环境地质等专业的教学与科研人员使用，另外可供制定相关政策的政府部门作为参考。

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THE GEOLOGY RESOURCE ENVIRONMENT ATLAS OF CHANG-ZHU-TAN CITY GROUP
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前　言

长株潭城市群是长江经济带中游地区重点发展地域之一，涵盖长沙、株洲、湘潭三市，位于洞庭湖水系的湘江下游，面积2.8×10^4 km^2。2007年12月，长株潭城市群建设上升为国家战略，成为“全国资源节约型和环境友好型社会建设综合配套改革试验区”。2008年7月，国土资源部与湖南省人民政府签署了《关于共同推进湖南省国土资源工作促进长株潭城市群“两型”社会建设合作备忘录》和《合作开展湖南省地质调查工作协议》。自2009年起，国土资源部中国地质调查局、湖南省国土资源厅、长株潭三市人民政府为服务长株潭地区地质资料信息服务集群化、产业化，在长株潭城市群地区部署了环境地质调查工作，中央与地方投入经费分别为1.05亿元和1.17亿元。为了更好地服务国家重大战略，支撑服务长株潭城市群经济发展，中国地质调查局武汉地质调查中心会同湖南省国土资源厅、湖南省地质矿产勘查开发局等相关单位，系统梳理、总结了多年来的环境地质调查成果，联合编制了《长株潭城市群地质资源环境图集》。

《长株潭城市群地质资源环境图集》以长沙、株洲和湘潭三市所辖行政区为编图范围，以长株潭城市群环境地质调查与区划项目成果为主、区内其他项目成果资料为辅编制而成。图集主要包括3个部分，共24张图件。其中，介绍长株潭城市群概况的序图7张，主要内容包括遥感影像图、地势地貌图、水系及流域图、土地利用现状图、产业布局图、轨道交通规划图、长沙市地铁规划图。描述区内资源类型图件共10张，主要包括地下水资源分布图、工程地质图、后备（应急）地下水水源地分布图、主要矿泉水点分布图、地下热水资源分布图、地质遗迹资源分布图、矿产资源分布图、核心区地下空间（0~15m）资源质量评价图、核心区地下空间（15~40m）资源质量评价图、核心区地下空间（40~60m）资源质量评价图。反映区内主要环境地质问题图件共7张，主要包括崩塌滑坡泥石流等地质灾害分布图、崩塌滑坡泥石流等危险性分区图、岩溶塌陷分布图、岩溶塌陷危险分区图、矿山地质环境问题综合分区图、主要环境地质问题分区图、城镇与重要基础设施规划建设地质适宜性建议图。

作为地质工作支撑服务长株潭城市群发展的阶段性成果之一，《长株潭城市群地质资源环境图集》在编制过程中，一直得到有关部门领导的大力支持，以及众多相关领域专家和学者的热忱指导，相关专家提出了许多宝贵建议，在此一并表示感谢。由于图件涉及多专业、多学科，编者受专业知识所限，难免存在不妥之处，敬请各位读者不吝赐教，以便进一步修改和完善。

编委会

2017年10月

FORWORD

Chang-Zhu-Tan City Group is one of important development areas in the middle reaches of the Yangtze River Economic Belt, which covers Changsha City, Zhuzhou City, and Xiangtan City. It is located in the lower reaches of Xiangjiang River which belongs to Dongting hydrographic net, and its area is 2.8×10^4 km^2. In December 2007, Chang-Zhu-Tan City Group construction rose to the national strategy, which was regarded as "The National Resource-Saving and Environment-Friendly Society Building Integrated Support Reform Pilot Area". In July 2008, the Ministry of Land and Resources and the People's Government of Hunan Province signed *The memorandum about advancing land* and *resources work of hunan province and promoting the two-oriented society construction of Chang-Zhu-Tan City Group and The agreement of co-developed geological field work in Hunan Province.* From 2009, central and local governments separately invested 105 million yuan and 117 million yuan to support China Geological Survey, Department of Land and Resource of Hunan Province, and People's Government of Changsha City ,Zhuzhou City and Xiangtan City , to deploy environmental geological surveys for clusting and industrializied geologic information services in Chang-Zhu-Tan City Group.In order to serve to national major strategy and economic development in Chang-Zhu-Tan City Group, Wuhan Geological Center the branch of China Geological Survey: met some related units, such as Hunan Land and Resources Department and Hunan Bureau of Geology and Mineral Resource, teasing and summing years of achievements of environmental geological survey systematically together, compiling jointly *The geology resource environment atlas of Chang-Zhu-Tan City Group.*

The geology resource environment atlas of Chang-Zhu-Tan City Group regards Changsha City, Zhuzhou City, Xiangtan City administrative regions within the jurisdiction as compilation scope. This atlas centers on environmental geological surveys of Chang-Zhu-Tan City Group and results of compartmentalized projects, while it takes other project outcomes in the region as supplementary. The atlas mainly has three parts, which contains 24 drawings in total. The atlas has 7 introductory maps which are used to introduce the profile of Chang-Zhu-Tan City Group, such as topographic and geomorphic map, remote sensing image map, water system and basin map, present landuse map, industrial distribution map, rail transit planning map, and metro planning map of Changsha City. There are 10 maps which describe the types of geological resource in the region, such as ground water resources distribution map, engineering geological map, reserving (backup) groundwater source field distribution diagram, main mineral water spots distribution map, geothermal water resources distribution map, geological vestiges resources distribution map, mineral resources, underground space(0-15m) resources quality map of core area ,central underground space(15-40m) resources quality map of core area,central underground space(40-60m) resources quality map of core area. There are also 7 drawings which reflect main environmental geological problems and suggestions in the region, such as geological hazards distribution map of collapse-landslide-debris flow ect., risk zoning map of collapse-landslide-debris flow ect., karst collapse distribution map, karst collapse risk zoning map, mining geo-environmental problems integrated zoning map, main environmental geological problems zoning map, geological adaptability of towns and important infrastructure planning and construction suggested map .

As one of phased objectives about Chang-Zhu-Tan City Group, during the composition of *The geology resource environment atlas of Chang-Zhu-Tan City Group,* we thanks the strong support from the relevant departments, the enthusiastic guidance of many experts and scholars in the relevant fields, and valuable suggestions which was put forward by the relevant experts and teachers. Because these maps involve many multi-specialities and multidisciplinary, editors are constrained by some professional knowledge, which will exist something wrong inevitably. We will be glad to get your generous instruction, so that the atlas will be further modified and perfected.

The Editorial Committee

2017/10

地理底图图例

省级行政中心

地级行政中心

县(市、区)行政中心

乡、镇、街道

祝融峰 1300.2 山峰及高程

衡山 山脉

省级界

地级界

县级界

工作区范围界

常年河及湖泊

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GENERAL MAPS

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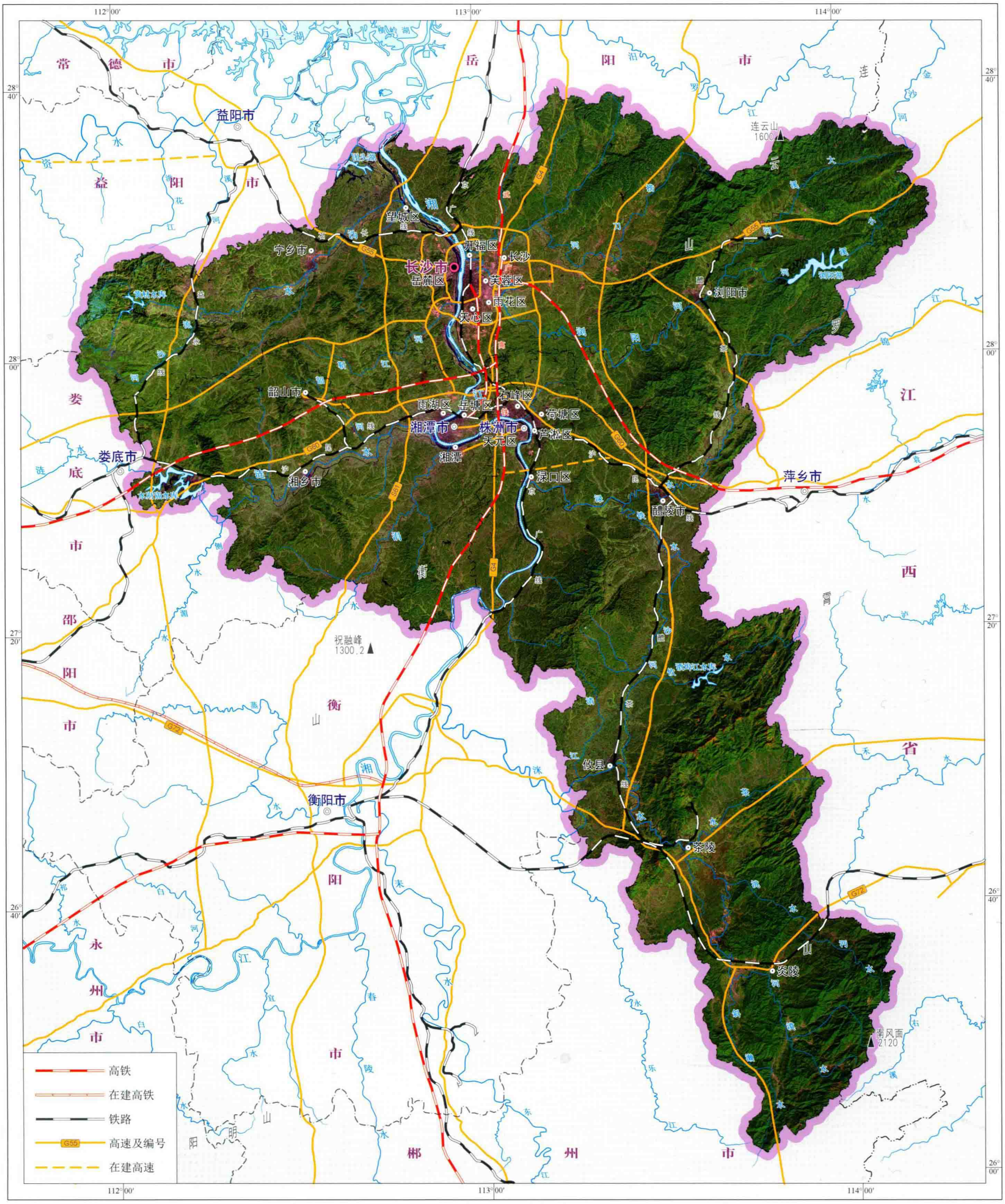
1.1 长株潭城市群遥感影像图

The Remote Sensing Image Map of Chang-Zhu-Tan City Group



资料来源：影像数据来源于Landsat7卫星的ETM+数据，分辨率为15m。

备　　注：本图集地理底图中株洲市渌口区原为株洲市株洲县。2018年6月19日国务院正式批复同意撤销株洲市株洲县，设立株洲市渌口区。本图集全部使用最新行政批复名称。

1 : 1 100 000　0　11　22　33　44 km

长株潭城市群遥感影像图基本反映了当前区域的地形地貌特征、地表水系、土地利用、交通干线等情况。长株潭城市群是长江中游城市群的重要组成部分，位于湖南省中东部，主体区包括长沙、株洲、湘潭三市，面积为$2.8\times10^4km^2$，三市沿湘江下游呈“品”字形分布，距离紧凑，是湖南省经济发展的核心增长极。

长株潭城市群地处湘江下游、长浏盆地（又称湘浏盆地）西缘。地形地势总体上沿湘江两岸向外依次为低平的冲积—冲湖积平原、红土岗地、丘陵。绝大部分地区海拔低于300m，一般处于50～200m。

长株潭城市群均属一级长江流域、二级洞庭湖流域，三级流域以湘江流域为主，仅该地区北部一角为汨罗江流域。该区域四级流域共14个，五级流域共计23个，构成错综复杂的水系网络格局。区内大型水库有4个，即宁乡市黄材水库、湘乡市水府庙水库、醴陵市官庄水库和攸县酒埠江水库。

长株潭城市群交通便利，铁路、公路纵横交错。区内铁路交通线路有京广铁路、沪昆铁路、醴茶铁路、石长铁路，其中还包括武广高速铁路（又称武广客运专线）、沪昆高速铁路（又称沪昆客运专线）。公路交通线路有京港澳高速公路（G4）、沪昆高速公路（G60）、泉南高速公路（G72）、长张高速公路（G5513）、长韶娄高速公路（S50）、岳临高速公路（S61）、长株高速公路（S21）、长潭西线高速公路（S41）、平汝高速公路（S11）等国家（省内）高速公路，以及国道106线、国道107线、国道319线、国道320线4条国道和若干条省道贯通的交通网络线路。

截至2016年底，长沙市、株洲市、湘潭市三市总人口达1 444.9万，占全省的21.3%。2016年实现国民生产总值总计13 681.9亿元，占全省的43.8%，人均国民生产总值为9.44万元，城镇化水平为70%。长株潭城市群集中了全省3/4的研发人员以及80%的科技成果。

The Remote Sensing Image Map of Chang-Zhu-Tan City Group basically reflects topography and landform character, surface drainage, land utilization, arterial traffic etc. in current region. Chang-Zhu-Tan City Group is an important part in the City Group of the Middle Yangtze River. It is located in the middle east of Hunan Province. The main areas include three cities,like as Changsha, Zhuzhou, Xiangtan, covering area of $2.8\times10^4km^2$. The three cities are distributed along the lower reaches of Xiangjiang River with the shape of “top and twin-side bottom”, and the distance is compact, which is the core growth pole of Hunan Province economic development.

Chang-Zhu-Tan City Group is located in the lower reaches of Xiangjiang River, and the western margin of Changliu Basin (also called Xiangliu Basin). Generally speaking, from the two sides of the Xiangjiang River to outward the terrain and topography is low-level alluvial-alluvial plain, red clay down load, hilly landscape. The altitude of the majority area is below 300m, which is generally between 50 and 200m.

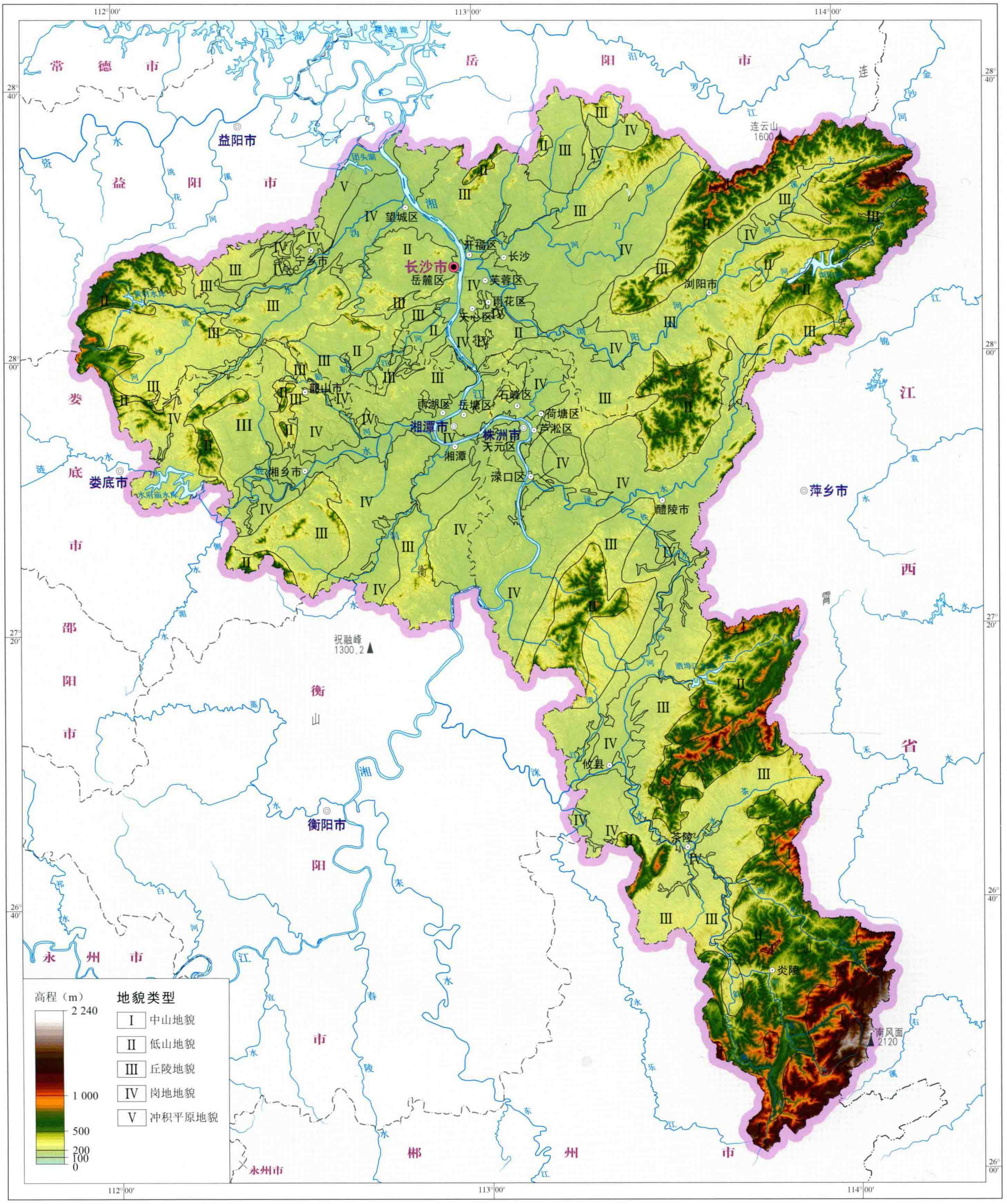
Chang-Zhu-Tan City Group belongs to Yangtze River first-order basin and Dongting Lake second-order basins.The third-order drainage centers on Xiangjiang River and it also includes Miluojiang River occupying in the northern part of the area. The whole drainage can be classified into 14 fourth-order basins and 23 fifth-order basins.In the region there are four large reservoirs,such as Huangcai Reservoir of Ningxiang City, Shuifumiao Reservoir of Xiangxiang City, Guanzhuang Reservoir of Liling City, Jiubujiang Reservoir of You County.

The transportation of Chang-Zhu-Tan City Group is convenient. Railways and highways crisscross. In the region,the railway lines have the Beijing-Guangzhou Railway, Shanghai-Kunming Railway,Liling-Chaling Railway,Shimen-Changsha Railway,among which there are Wuhan-Guangzhou High-speed Railway (also called Wuhan-Guangzhou Passenger Dedicated Line), Shanghai-Kunming High-speed Railway(also called Shanghai-Kunming Passenger Dedicated Line).The expressway lines have many national and provincial expressway,such as Beijing-Hong Kong-Macau Expressway(G4), Shanghai-Kunming Expressway(G60), Quanzhou-Nanning Expressway(G72), Changsha-Zhangjiajie Expressway(G5513), Changsha-Shaoshan-Loudi Expressway(S50), Yueyang-Linwu Expressway(S61),Changsha-Zhuzhou Expressway(S21),Changsha-Xiangtan Westline Expressway(S41),Ping-Ru Expressway(S11)etc.There are also four state roads ,such as State Road 106, State Road 107, State Road 319, State Road 320 ,and several provincial through highway traffic network lines.

By the end of 2016, the total population is 14.449 million, accountting for 21.3% of the whole province, in Changsha City, Zhuzhou City and Xiangtan City.In 2016, the GDP reached 1,368.19 billion yuan, accounting for 43.8% of the whole province, and the GDP per capita was 94,400 yuan. The level of urbanization reached 70%. There are three quarters of the entire province’s researchers, and eighty percent of the entire province's scientific and technological achievements in the Chang-Zhu-Tan City Group.

1.2 长株潭城市群地势地貌图

The Topographic and Geomorphic Map of Chang-Zhu-Tan City Group



资料来源：影像数据为ASTER-GDE，基准面为WGS1984，垂直精度为20m，水平精度为10m。

1 : 1 100 000　0　11　22　33　44 km

长株潭城市群地区整体地势东、西部高，中部低。高程一般在500m以下，坡度较缓。最高峰为株洲市炎陵县罗霄山脉鄱峰，高程2 115m。地貌可分为冲积平原、岗地、丘陵、低山和中山地貌。

高程0～100m地区：为冲积平原地貌，面积6.6km^2，主要分布在望城区西北的南洞庭平原，地势平坦。

高程100～200m地区：为岗地地貌，面积14 176.8km^2，主要分布在湘江及其支流两岸阶地，地势较平坦。地形坡度一般小于15°，相对高程50m。

高程200～500m地区：为丘陵地貌，面积12 374.0km^2，主要分布在中部的长沙－浏阳、浏阳－株洲、茶陵－攸县、湘潭－韶山几大红层盆地，地形坡度20°～28°，相对高程100～150m，山丘浑圆，沟谷宽阔。

高程500～1 000m地区：为低山地貌，面积502.1km^2，主要分布在浏阳市、醴陵市、攸县、茶陵县及西部的宁乡市和湘乡市等地。地形坡度相对较陡，冲沟发育，相对高程大于100m。

高程1 000～2 000m及以上地区：为中山地貌，面积940.5km^2，主要分布在浏阳市北部幕阜山、茶陵县和炎陵县东部的罗霄山脉南麓。

The overall topography of Chang-Zhu-Tan City Group is high in the east and west, low in the middle. The elevation is generally below 500m, and the slop is gentle. The highest mountain, Ling Mountain which is 2,115m ,is located in the Luoxiao Mountains in Yanling Couty of Zhuzhou City. The landform can be divided into alluvial plains, downland,hilly landscap, low mountain and middlemountain.

Elevation 0-100m area:It's alluvial plain with the area of 6.6km^2. The main distribution is in the southern Dongting Plain of northwestern Wangcheng District. The terrain is flat.

Elevation 100-200m area: It's downland with the area of 14,176.8km^2.The main distribution is in the Xiangjiang River and its tributaries crossstrait terrace. The terrain is flat. The terrain slope is generally less than 15°, and the relative elevation is 50m.

Elevation 200-500m area: It's hilly landscape with the area of 12,374.0km^2. The main distribution is in red beds basins, such as the middle of Changsha-Liuyang, Liuyang-Zhuzhou, Chaling-You County, Xiangtan-Shaoshan. The terrain slope is generally 20°-28°, and the relative elevation is 100-150m. The hill is round, and the ravine is wide.

Elevation 500-1,000m area: It's low mountain with the area of 502.1km^2. The main distribution is in Liuyang City, Liling City, You County, Chaling County, western Ningxiang City and Xiangxiang City. The terrain slope is relatively steep with gully development. The relative elevation is more than 100m.

Elevation 1,000-2,000m and above area: It's middle mountain with the area of 940.5km^2. The main distribution is in the Mufu Mountain of northern Liuyang City and the south piedmont of Luoxiao Mountains, which is in the eastern of Chaling County and Yanling County.

1.3 长株潭城市群水系及流域图

The Water System and Basin Map of Chang-Zhu-Tan City Group

资料来源：湖南省水文资源勘测局。

1.3.1 主要地表水系

长株潭城市群地区地表水系发育，河流主要有湘江及其支流捞刀河、浏阳河、渌水、沩水、靳江河、涟水、涓水等。

地表水系还包括宁乡市黄材水库、湘乡市水府庙水库、醴陵市官庄水库和攸县酒埠江水库4座大型水库。

1.3.2 水系及流域基本情况

长株潭城市群均属一级长江流域与二级洞庭湖流域，三级流域以湘江流域为主，仅该地区北部一角为汨罗江流域，共分为14个四级流域，流域总面积$2.8\times10^4km^2$，占湘江流域总面积的29.6%，水系长度2 323.69km，多年平均年径流量达$1\,030.22\times10^8m^3/a$，为我国水资源丰富的区域（表1）。4座大型水库集水面积为$4\,211.8km^2$，有效库容为$5.705\times10^8m^3$，可以有效调节地表资源的合理利用（表2）。

表 1 长株潭城市群水系及流域分级表

二级流域	三级流域	四级流域	年平均径流量（$\times10^8m^3/a$）	流域面积（km^2）	水系长度（km）
洞庭湖流域	汨罗江流域	车对河流域		83.58	
	湘江流域	湘江干流流域	771.00	3278.98	211.89
		烂泥湖撇洪河流域		317.72	12.29
		沩水流域	18.30	2673.30	278.67
		梅溪滩流域		178.19	26.61
		靳江河流域		776.44	71.86
		涟水流域	43.20	2710.11	169.09
		涓水流域	12.28	1041.93	91.74
		向东渠流域		277.53	28.69
		捞刀河流域	16.29	2438.36	288.31
		浏阳河流域	35.62	4219.70	314.34
		白石港流域		221.44	18.85
		渌水流域	48.90	3486.69	275.66
		沔水流域	84.63	6296.03	535.69

表 2 长株潭城市群四大水库基本情况表

水库名称	黄材水库	水府庙水库	官庄水库	酒埠江水库
建成时间	20 世纪 50 至 60 年代	1960 年	1958 年	1958 年
集水面积（km^2）	240.8	3160	201	610
正常库容（$\times10^8m^3$）	1.26	3.7	1.02	2.17
最大库容（$\times10^8m^3$）	1.56	5.6	1.07	2.95
有效库容（$\times10^8m^3$）	1.26	2.6	0.715	1.13
正常蓄水位（m）	166	95	123.6	164
死水位（m）	—	85.5	—	—

1.3.1 Main Surface Water System

The surface water system of Chang-Zhu-Tan City Group is well-developed, which mainly contains Xiangjiang River and its tributaries, such as the Laodaohe River, Liuyanghe River, Lushui River, Mishui River, Weishui River,Jinjianghe River, Lianshui River and Juanshui River.

The surface water system also includes four big reservoirs, such as the Huangcai Reservoir of Ningxiang City, the Shuifumiao Reservoir of Xiangxiang City, the Guanzhuang Reservoir of Liling City, the Jiubujiang Reservoir of You County.

1.3.2 Basic Situation of Water System and Basin

Chang-Zhu-Tan City Group belongs to the Yangtze River first-order Basin and the Dongting Lake second-order Basin.The third-order Basin centers on the Xiangjiang River and it also includes the Miluojiang River occupying in the northern part of the area. The whole basin can be classified into 14 fourth-order basin with the basin area of $2.8\times10^4km^2$, accounting for 29.6% of the total area of the Xiangjiang River Basin. The length of them is 2,323.69km, and the annual average runoff reaches $1,030.22\times10^8m^3/a$. They are rich area of water resource in China (Table 1). The catchment area of the four reservoirs are $4,211.8km^2$, the effective storage capacity is $5.705\times10^8m^3$, which can effectively adjust the rational use of surface resources (Table 2).

Table 1 The Table of Water System and Basin Classification in Chang-Zhu-Tan City Group

Second-Order Basin	Third-Order Basin	Fourth-Order Basin	Amount of Annual Average Runoff ($\times10^8m^3/a$)	Basin Area (km^2)	Basin Length (km)
The Dongting Lake Basin	The Miluojiang River Basin	The Cheduihe River Basin		83.58	
	The Xiangjiang River Basin	The Xiangjiang River Trunk Stream Basin	771.00	3,278.98	211.89
		The Lanni Lake-Piehonghe River Basin		317.72	12.29
		The Weishui River Basin	18.30	2,673.30	278.67
		The Meixi Hirst Basin		178.19	26.61
		The Jinjianghe River Basin		776.44	71.86
		The Lianshui River Basin	43.20	2,710.11	169.09
		The Juanshui River Basin	12.28	1,041.93	91.74
		The Xiangdong Canal Basin		277.53	28.69
		The Laodaohe River Basin	16.29	2,438.36	288.31
		The Liuyanghe River Basin	35.62	4,219.7	314.34
		The Baishi Port Basin		221.44	18.85
		The Lushui River Basin	48.90	3,486.69	275.66
		The Mishui River Basin	84.63	6,296.03	535.69

Table 2 The Basic Situation Table of Four Reservoirs in Chang-Zhu-Tan City Group

Name of Reservoir	Huangcai Reservoir	Shuifumiao Reservoir	Guanzhuang Reservoir	Jiubujiang Reservoir
Completed Year	1950s-1960s	1960	1958	1958
Catchment Area(km^2)	240.8	3,160	201	610
Normal Storage Capacity($\times10^8m^3$)	1.26	3.7	1.02	2.17
Maximum Storage Capacity($\times10^8m^3$)	1.56	5.6	1.07	2.95
Effective Storage Capacity($\times10^8m^3$)	1.26	2.6	0.715	1.13
Normal Water Level(m)	166	95	123.6	164
Level of Dead Water(m)	—	85.5	—	—