

Geological data for the Sustainable Development Data Ecosystem

Towards nationally integrated geospatial information management

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中国地质调查局
CHINA GEOLOGICAL SURVEY



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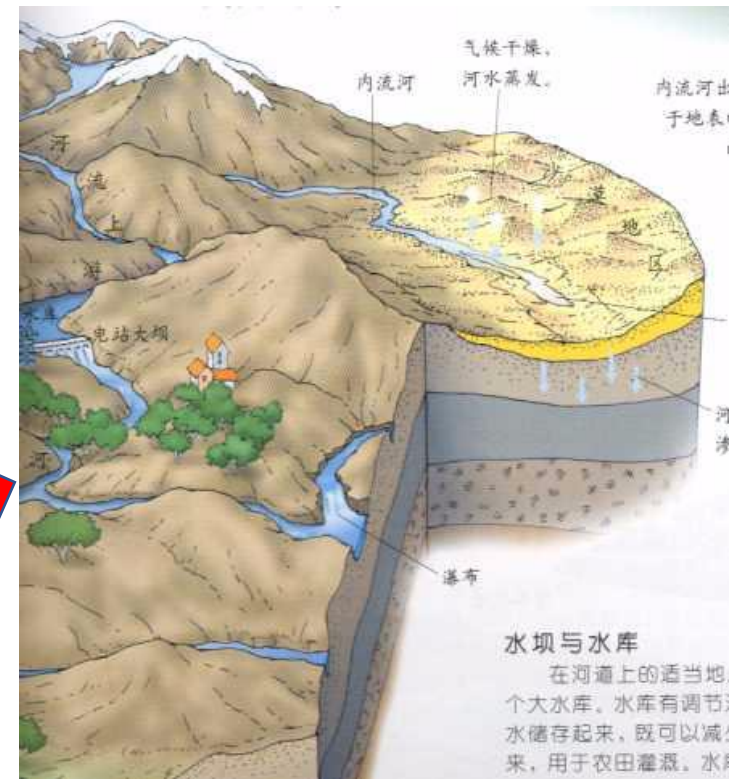
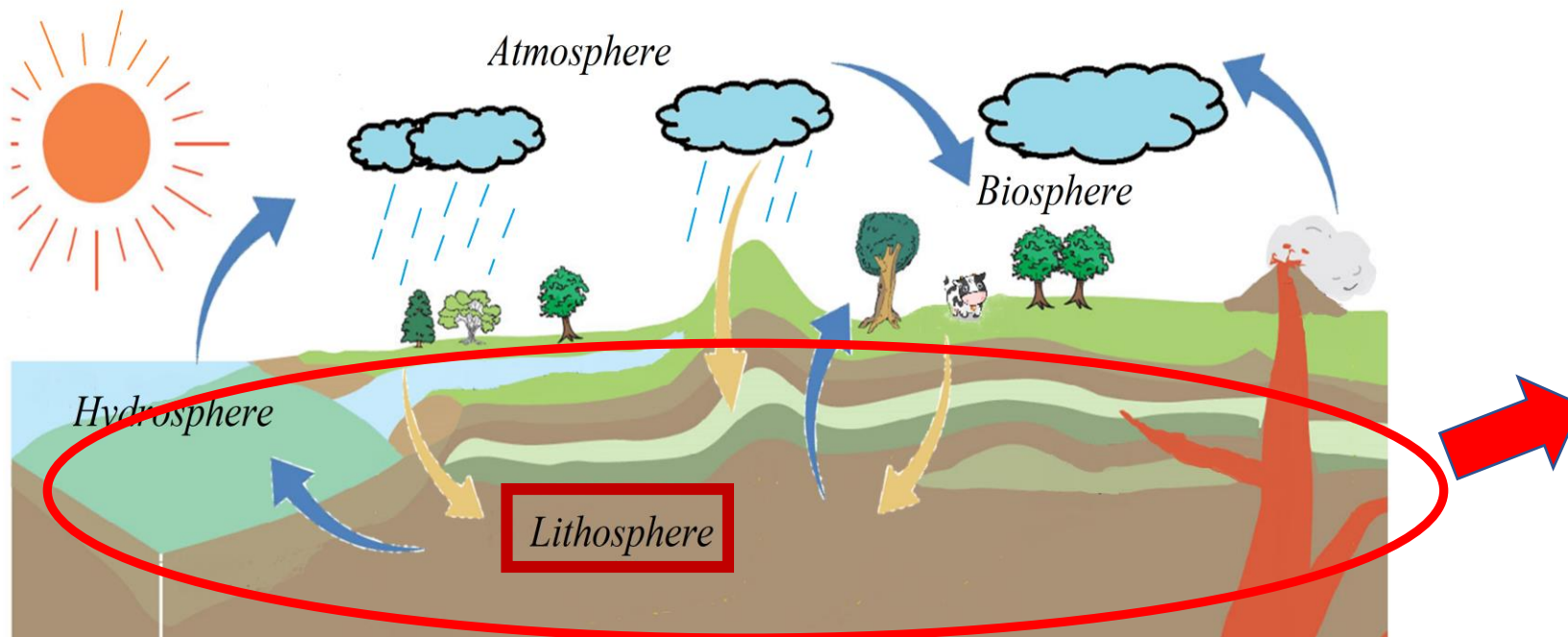


Geological Works and Data

Object: Crust, Earth (lithosphere)

Mission: Determine the composition, structure and evolution of Earth. To obtain the information about resources and environments for our living

The geological work is a complete process of the data ecosystem.





Geological Works and Data

Field Route Data Collection

Sample analysis test

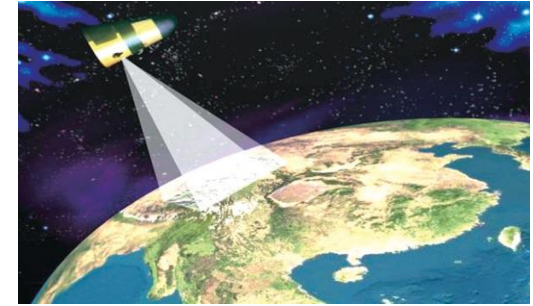
Remote sensing

Geophysical Exploration

Geochemical Exploration

Geological disaster monitoring

Comprehensive analysis and results report





Geological Works and Data

Spatial



minerals, geophysics,
geochemistry,
mathematical geology,
geomechanics,
environment,
paleontology

Reusable

Describes the
spatial structure
and attributes
below the
surface



全国地质资料馆
NATIONAL GEOLOGICAL ARCHIVES OF CHINA

Historical

Long time
formation
and impact



Complex

Various methods
and multi-level
acquisition
platform

description as
reports, videos,
images, etc.

Cost highly, and
requires long term
field working

Precious



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Sustainable resources and energies providing

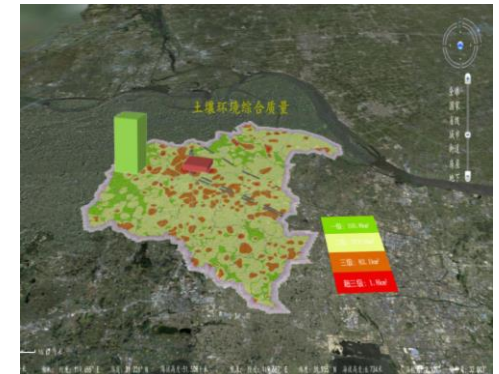
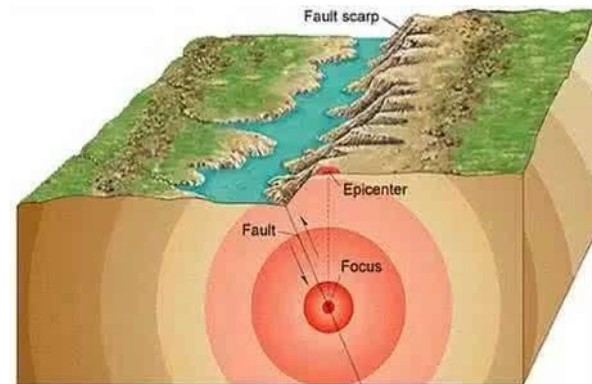
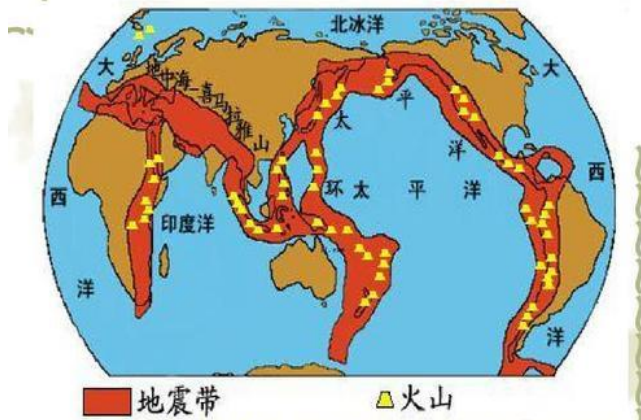
- Mineral resources: lithium battery (using lithium mine), shale gas, oil, natural gas and clean energy— geothermal
- Groundwater and shallow geothermal energy



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Evidence of resource exploitation、 disaster and diseases prevention **providing**

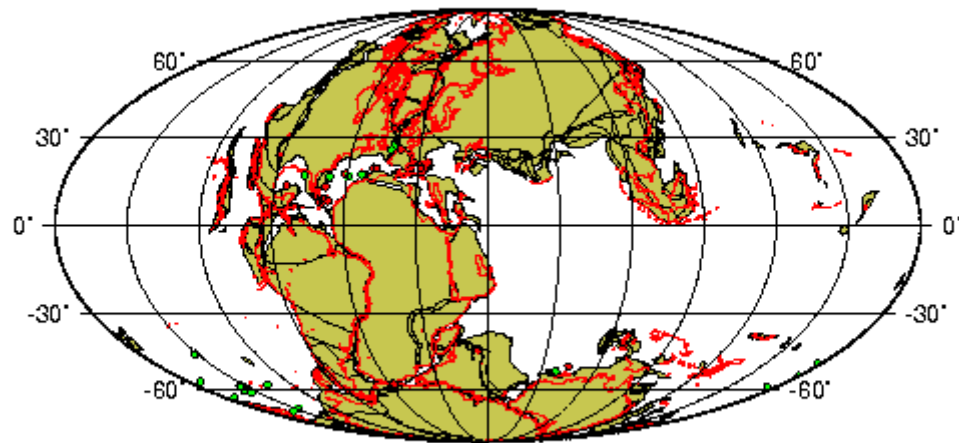
- Resource and disaster predication: the space - time distribution and the mechanism of forming of material and disaster
- Relationship between subsidence and lung disease caused by resource exploitation and
- Endemic diseases, which is mainly caused by certain soil elements



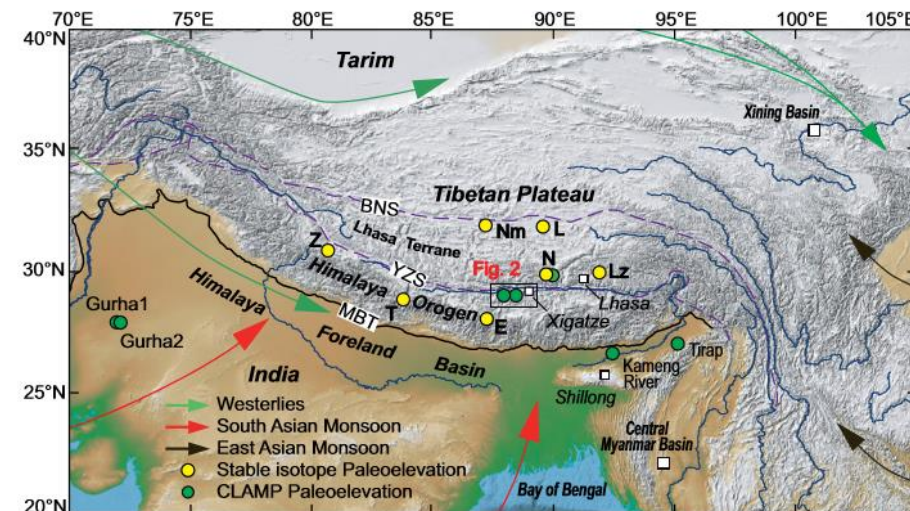
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Evidence of earth condition and global climate prediction providing

- The occurrence of geological events based on the time of geological bodies formation
- Paleogeography, paleoclimate, paleontology, and geochemistry
- Quantifying the rise of the Himalaya orogen and implications for the South Asian monsoon



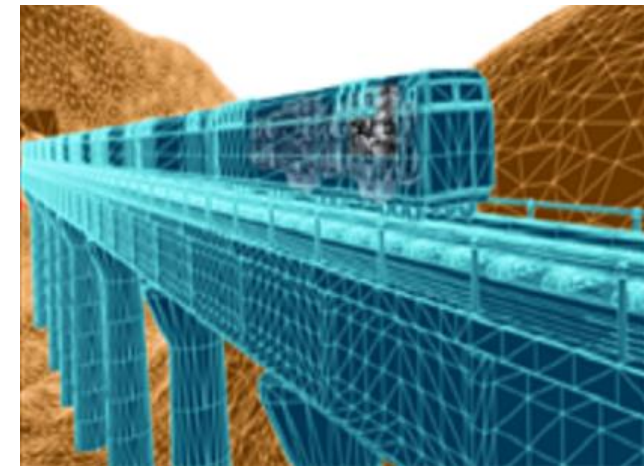
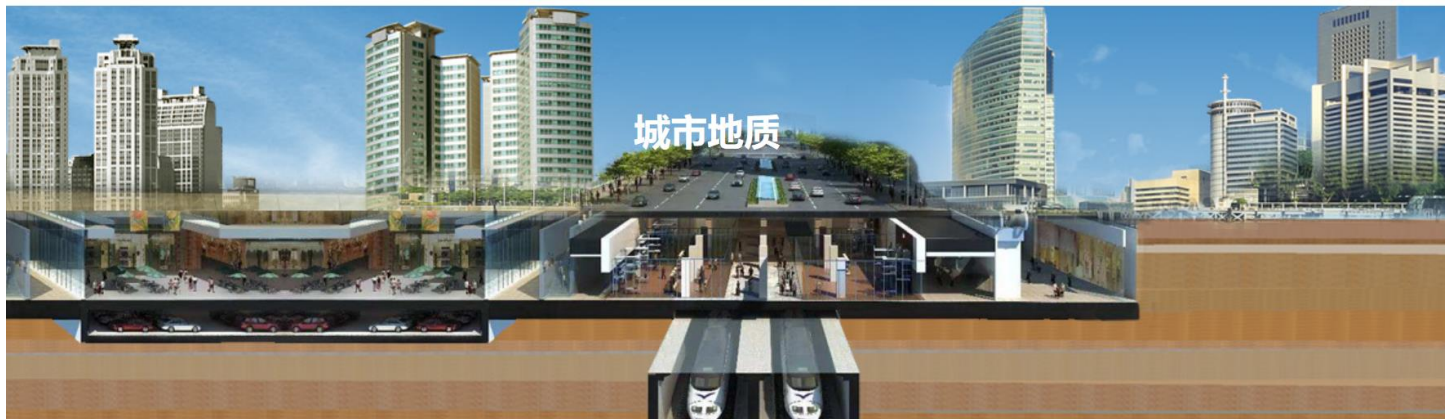
150 My Reconstruction



9

Evidence of urban and national critical infrastructure build providing

- Provides data from the underground
- Underground space planning
- 3D modeling with digital Twins





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Geopark, Geological Relics and Characteristic Agriculture



National Geopark



Geological Relics



Characteristic Agriculture





International Karst Data Hub



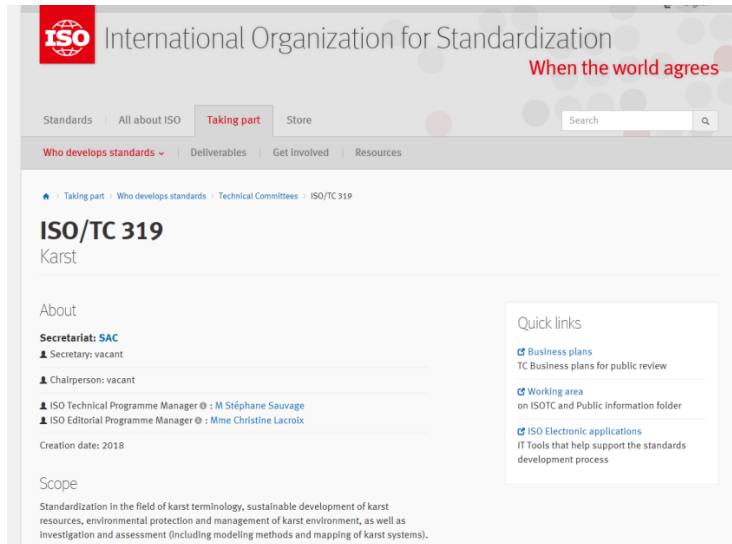
United Nations
Educational, Scientific and
Cultural Organization



2008-International Research Center on Karst



- 6 major fields
1. carbon cycle
 2. karst water
 3. karst landscape
 4. ecology
 5. karst geological disaster



2018-ISO/TC 319 - Karst

Resources and Environmental Effects of Global Karst Dynamics Systems



World Karst Map (2018)



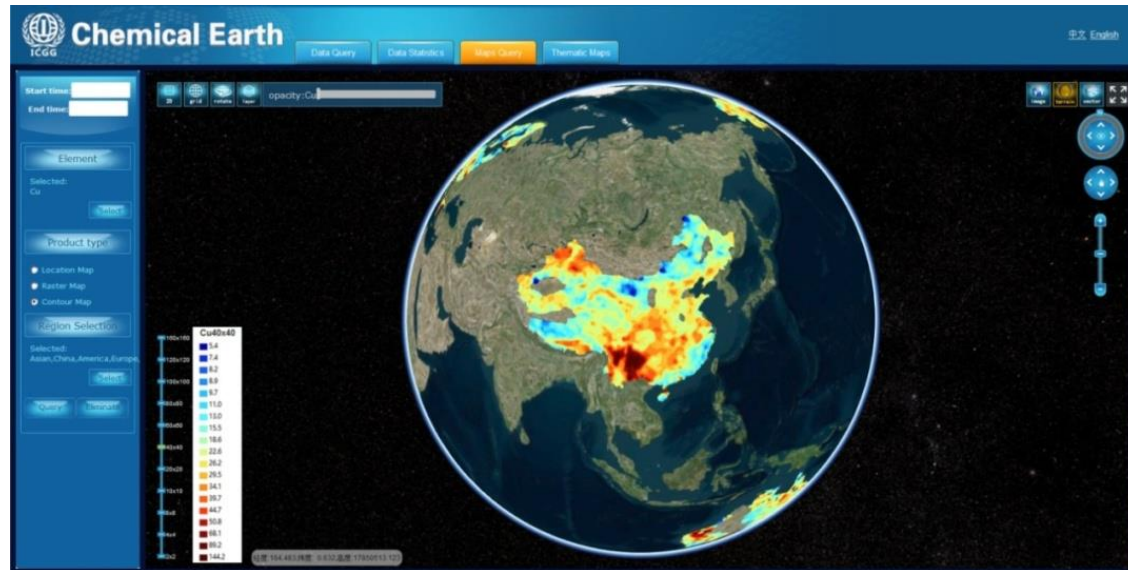
Karst landscapes



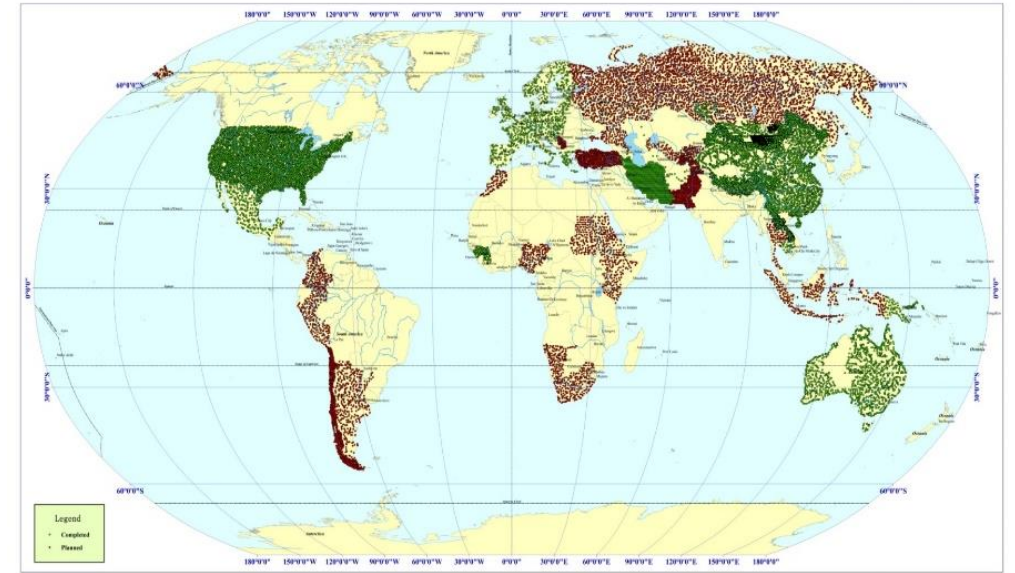
International Geochemistry Hub



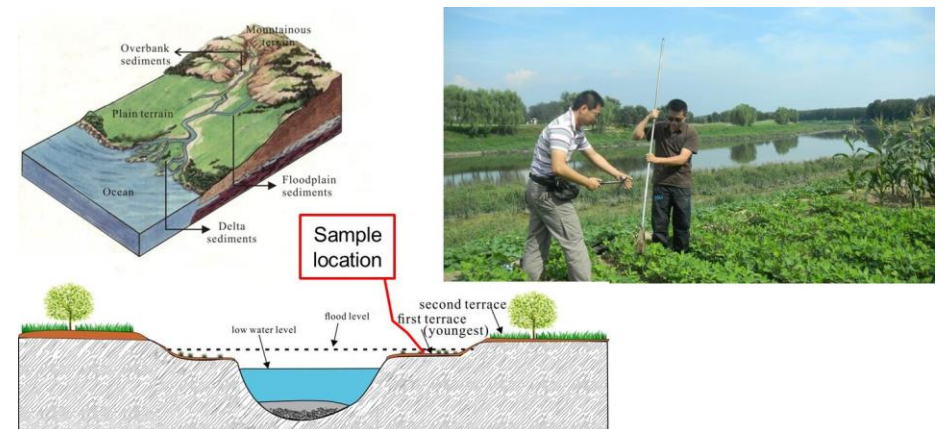
2016-International Centre on Global-Scale Geochemistry



Chemical Earth Platform on the website



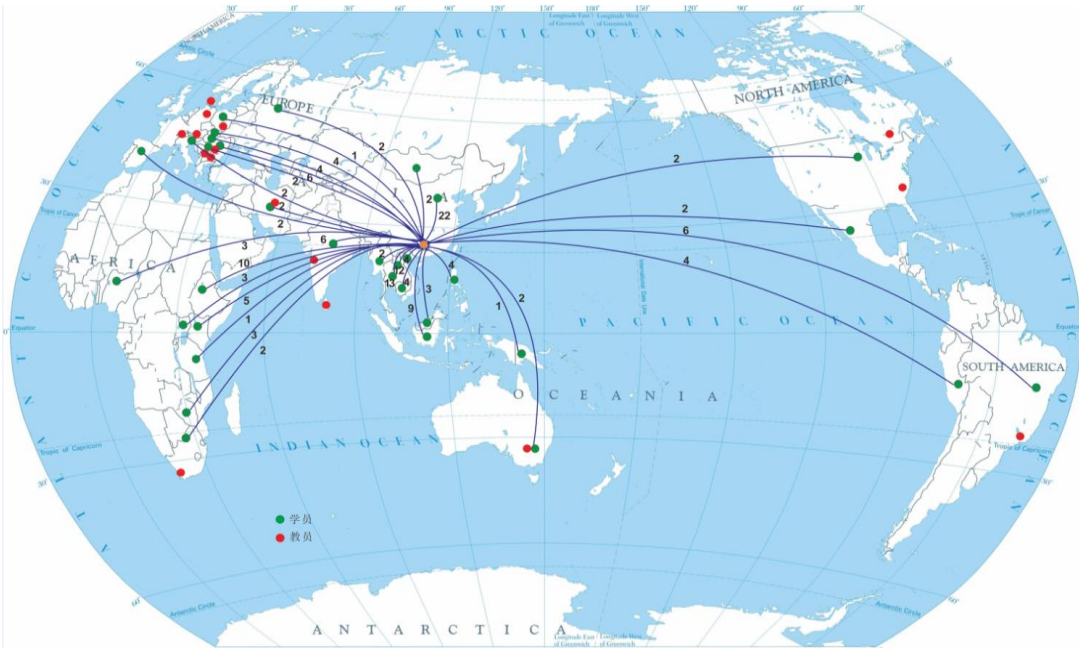
Baseline of World Geochemistry



Develop and standardize methods



Training and international geological survey



More than **1,000 trainees** from the world participated in the training course host by CGS. The training topic covers water resources, basic geology, karst, geochemistry, map compilation, and other fields of geology. **Much data was got during this communication**

International Geological Survey in 27 countries, including 11 in Asia, 10 in Africa, 2 in Oceania and 4 in South America. Many fields were involved in the international geological survey

Minerals

Geochemistry

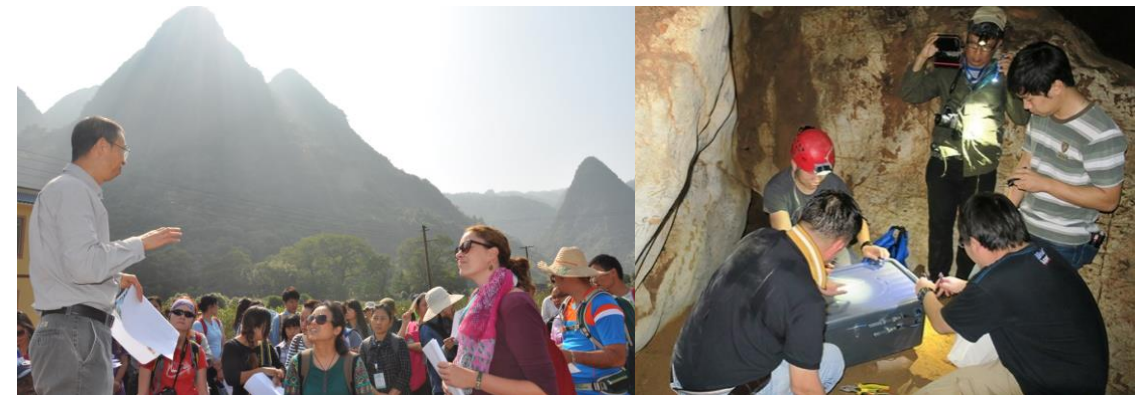
Ocean

Water

Soil

Digital Geology

Other Fields



Training and international geological survey



A National Geological Big Data Hub



Geological maps

- Basic geological maps
- Energy geological maps
- Mineral geological maps
- Hydrogeological maps
- Geological hazard maps
- Environmental geological maps
- Marine geological maps
- Geophysical, geochemical and remote sensing maps
- Global geological maps

Geoscientific popularization

- Popular science books
- Popular science articles
- Multi-Media
- Geological survey popular science website
- Others

Publications

- Published journals
- Journals of geological survey
- Thematic reports
- Geological survey monographs
- Geoscientific literatures
- Chorographic books and Yearbooks

Software

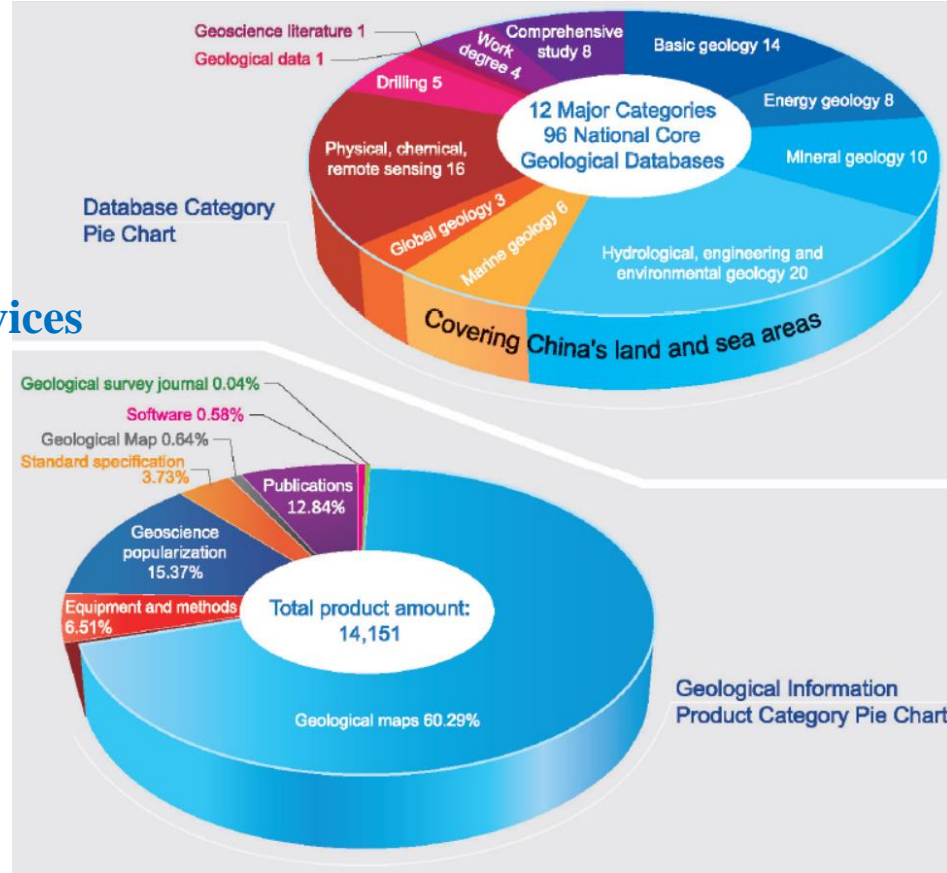
- Professional application software
- Comprehensive Analysis software



International Sharing and Service



Application services

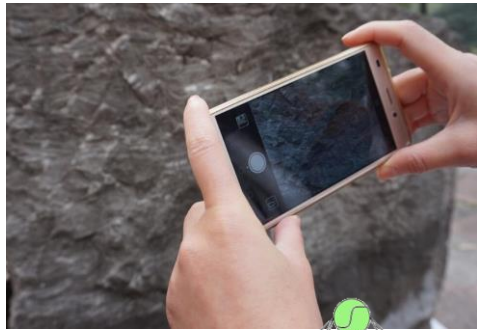


Data services

Internal information sharing by GeoCloud(<http://geocloud.cgs.gov.cn/>)



Intelligent application services



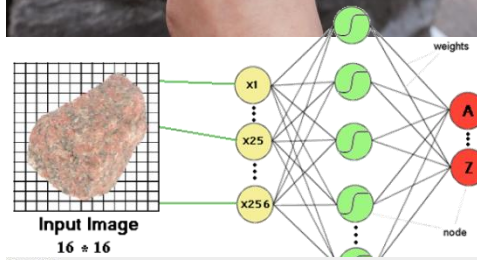
矿物识别 岩石识别

结果仅供参考 查看原图

孔雀石 透视石
CuSiO₃ · H₂O

尖晶石
MgAl₂O₄

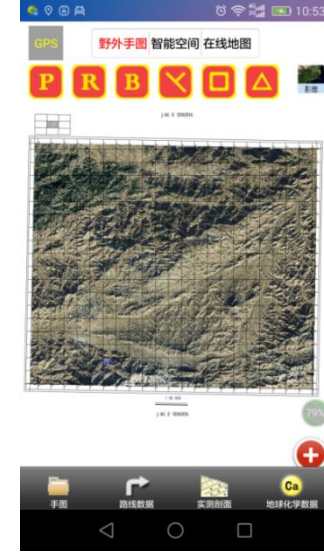
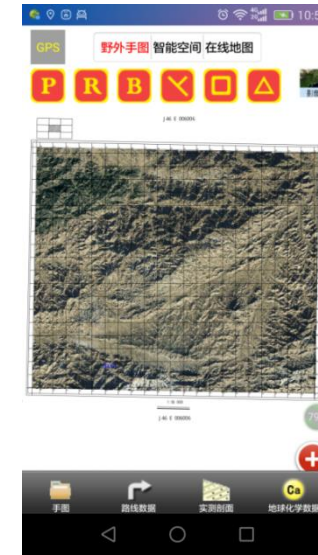
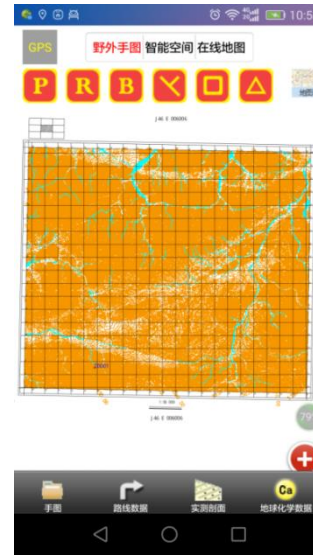
绿松石
Cu₂(CO₃)(OH)₂



矿物图像识别

矿物分析结果及图片展示

尖晶石	99.33%
透视石	0.15%
绿松石	0.05%
方解石	0.05%
黄铁矿	0.01%



1/111 25万连平县幅区域地质调查报 下一页

甲-中元古代地层主要由麻云斜长变粒岩、麻云斜长片麻岩、麻云片岩、麻云石英片岩和麻云石英岩组成，局部夹灰岩透镜体，称桃溪岩组，总体上为一套片状无序中深变质岩系。从其局部保留的结构构造特征看，属泥砂质细碎屑沉积，为次深海复理石泥砂质建造。1.5万鹤仔埔区调时在侵入于其中的片麻状花岗岩中获取1848±20Ma、996±22Ma的两个同位素年龄值（锆石-Pb-Pb法），报告中的岩体采用996±29Ma的年龄值。在区域上，福建省永定县光坑的细碧岩、变质中性火山岩Sm-Nd全岩等时线年龄值1825±129Ma，永定县古木的麻云斜长变粒岩和地溪的变质火山岩混合锆石U-Pb一致曲线年龄值分别为1777 Ma和1678.5 Ma（据《福建省岩石地层学》，1997）。综合以上信息，地层时代跨度较大，归属于早-中元古代。地层沉积后经历褶皱回返，因为地层沉积时间不确定，褶皱形成时间也无法确定。据区域地质资料，即县内未发生褶皱运动，扬子陆块东南缘与华夏陆块发生碰撞。

南华-震旦纪为裂谷带，华夏板块边缘持续裂陷，区内主要位于华夏板块的大陆斜坡，沉积建造为半深海砂泥质、硅质岩组合，反映地壳在拉张、裂解的背景上持续下降。南华纪火山岩组以流纹、灰绿色石英岩、云母石英片岩、石英岩为主，夹炭质千枚岩、硅质岩、凝灰岩；震旦纪泥质岩组以千枚岩、变质长石石英砂岩为主，夹炭质千枚岩、硅质岩；震旦纪老虎塘组以含硅质岩为特征，夹板岩、泥岩、长石石英砂岩、岩屑长石石英砂岩等。板块内部的裂陷引起岩浆活动，在龙川细砂岩一带见海华纪花岗岩，岩性为条带状石英闪长岩（锆石SHRIMP年龄74±9Ma），岩体侵入到早-中元古代地层中，构造上位于寻乌古陆的边部，连平震旦系北东侧的南华纪火山岩组中发现较多的流纹质凝灰岩。

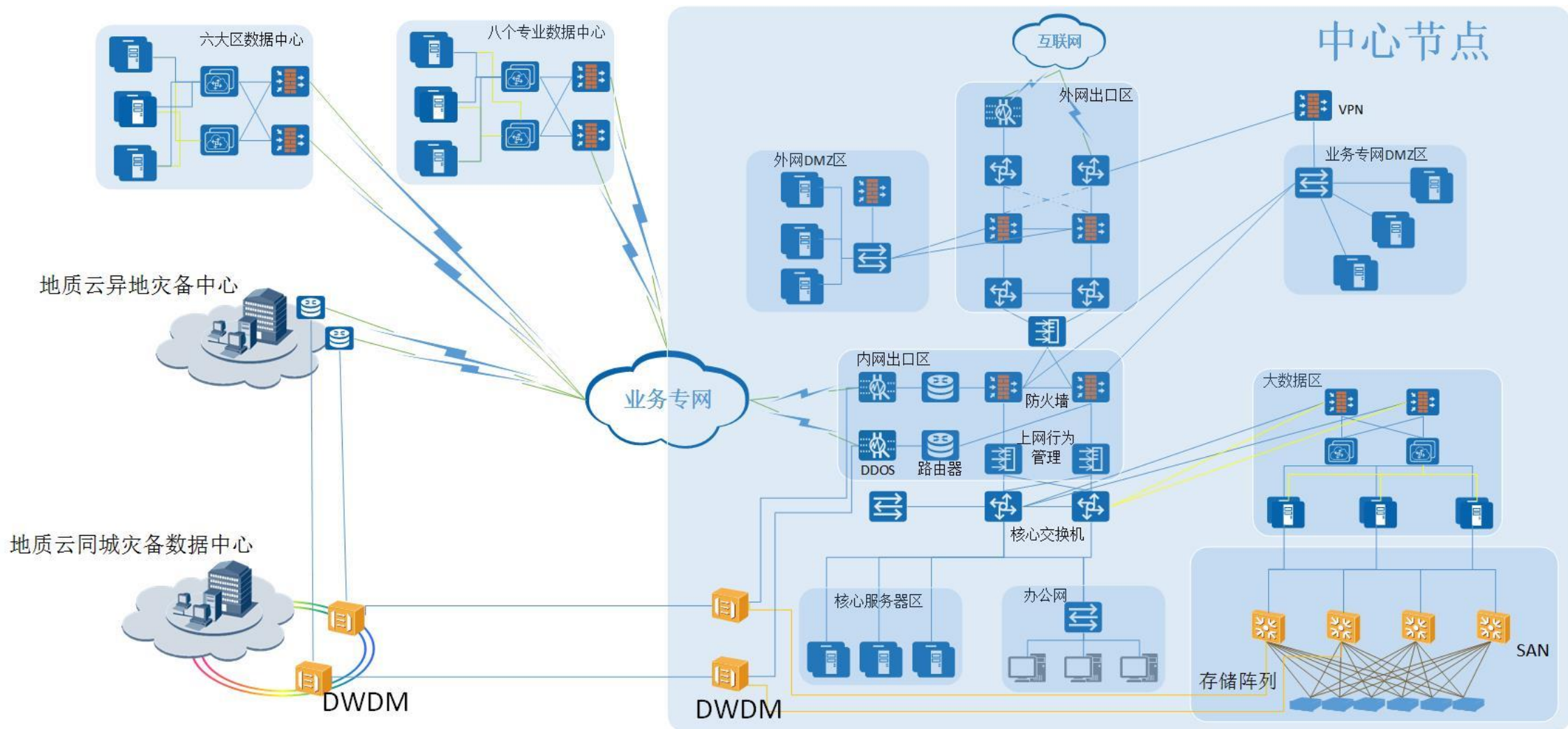
甲-古生代地壳继续沉降，寒武纪八村群是以灰绿色长石石英岩

大栗山倒转背斜轴迹NNE走向，向两端倾伏。背斜长38km，宽约20km。北西翼岩层产状总体倾向北西，倾角一般40°-60°；南东翼自核部往翼部方向岩层产状由倒转(倾向NW，倾角70°左右)渐趋正常(倾向SE，倾角60°左右)。轴面倾向NW，倾角55°左右，为一大型倒转背斜，反映自北西向南东的逆冲推覆运动过程。自核部往两翼依次为南华纪长安组-奥陶纪白垩组-泥盆纪跳马湖组-志留组。背斜中发育大震旦系NNE向断裂。背斜特征以龙口溪一带NE向剖面最为典型(图7-37-5)。受岱水桥断裂逆冲影响，背斜南东翼自核部至翼部岩层产状由倒转渐变为正常，显示大栗山背斜具断裂传播特征。背斜北西翼走向倒转断裂发育，反映其受逆冲自北西向南东的挤压推覆作用。

Nh1c: 早南华世长安组; Nh1Ad: 早南华世震旦组和大塘组; Nh2n: 晚南华世南沱组; Z1: 早震旦世金家洞组; Z2: 晚震旦世震旦组; c1-2x: 寒武纪小塘组; c2: 3w: 寒武纪泥盆组; D2: 中二叠世跳马湖组; D2y: 震旦系; D2-3q: 中-晚泥盆世梓潼组。断裂名称: F1: 大栗山断裂; F2: 震旦系断裂; F3: 肖家山断裂; F4: 黄毛塘断裂。

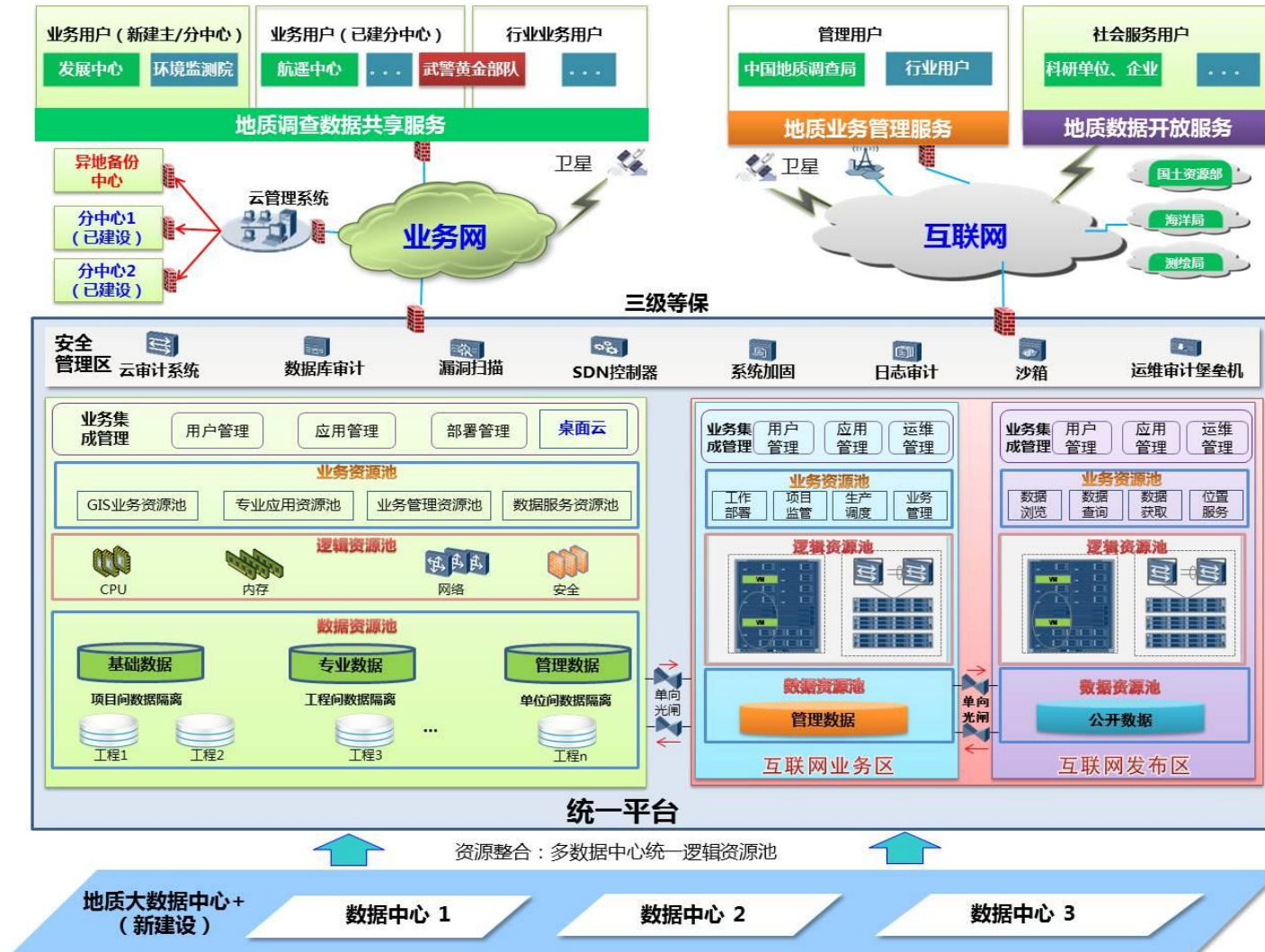


Distributed Structure



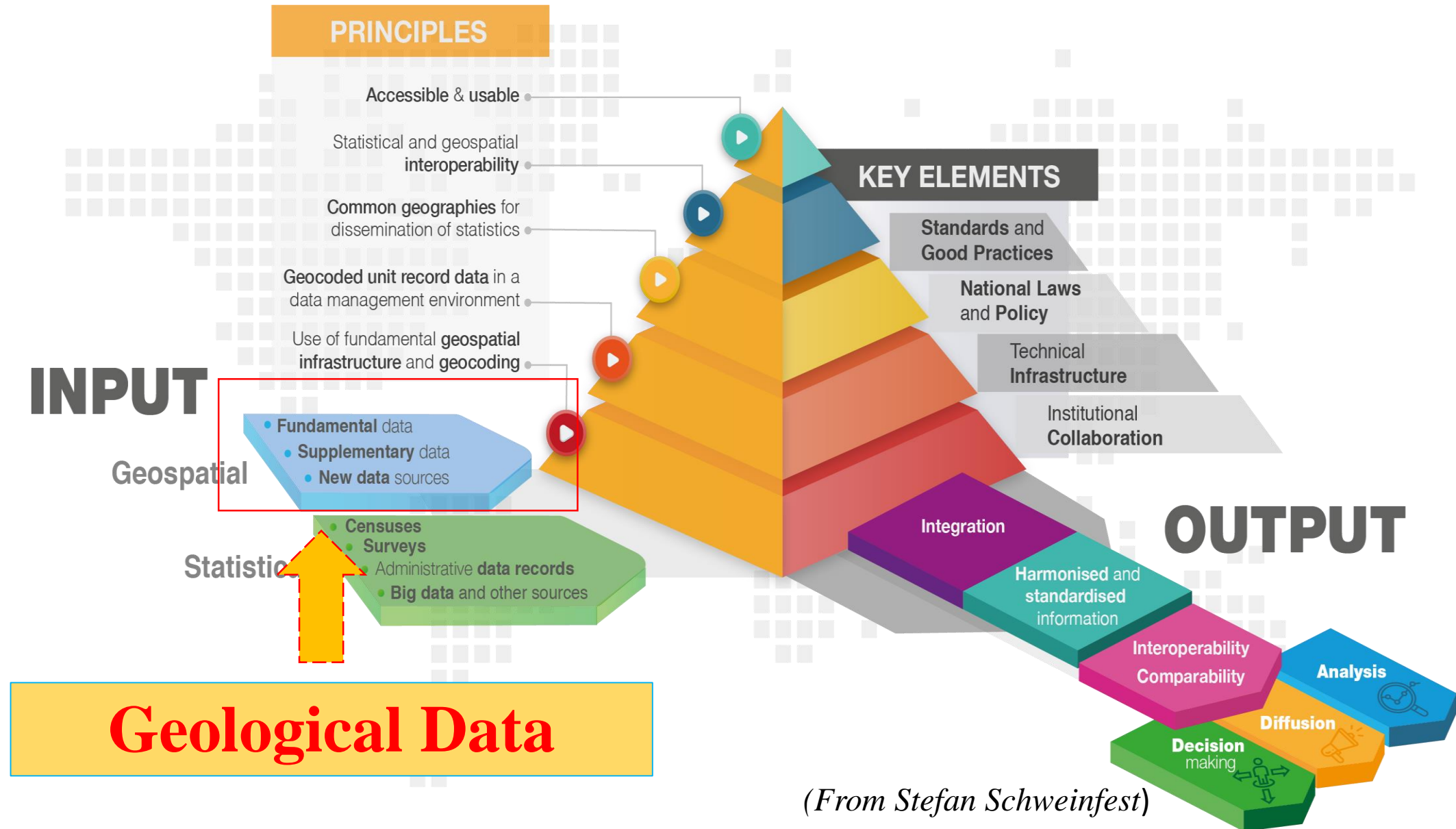


Framework and Achievements



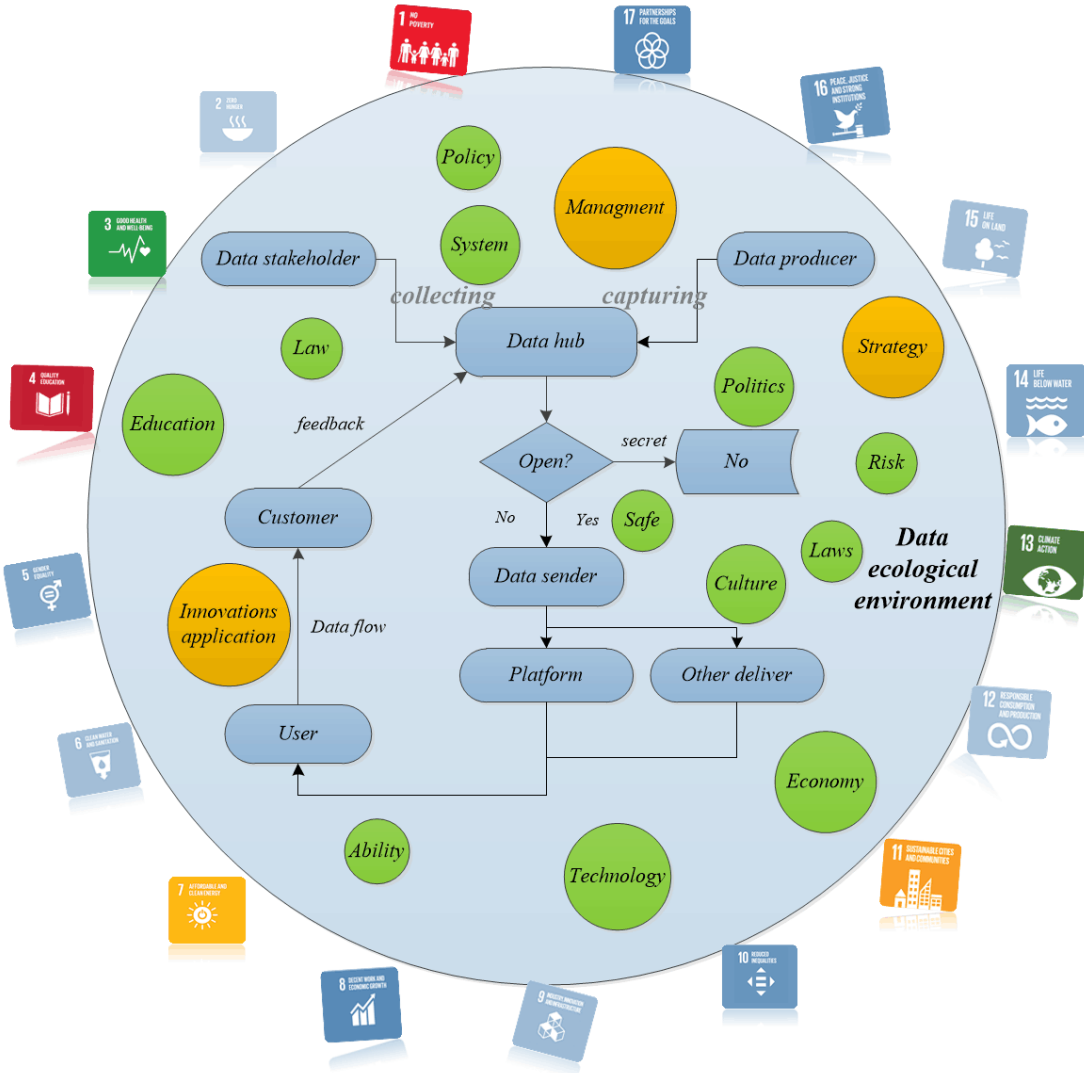


Conclusion and Suggestions





Conclusion and Suggestions



Technology :

Management processing, and description, as well as data **integration**, expression, simulation, dissemination, interpretation, reuse, and long-term preservation
AI, Distributed cloud architecture, Blockchain

Policy :

Data Sharing: Incentive and enforcement policies

Intellectual Property: Data publishing

Data Interoperability: Global data model and describe model

Mechanism: Working Group



A Geological Big Data Working Group:

- To provide a general geological information framework and platform
- To play a leading role at the national level by raising political awareness and highlighting the importance of geological big data with the features including reliable, timely and fit-for-purpose, to play an important role for geological big data in decision making processes, to improve the integration of geological data and the global fundamental geospatial data.



Conclusion and Suggestions

- **To strengthen national capacity for geological survey and geodata processing to stimulate green development and digital economy.**
- **To share or exchange the experience among all member states for some crucial global problems, which may have potential solutions from geological big data to support 2030 SDG.**



Conclusion and Suggestions

Surface and underground

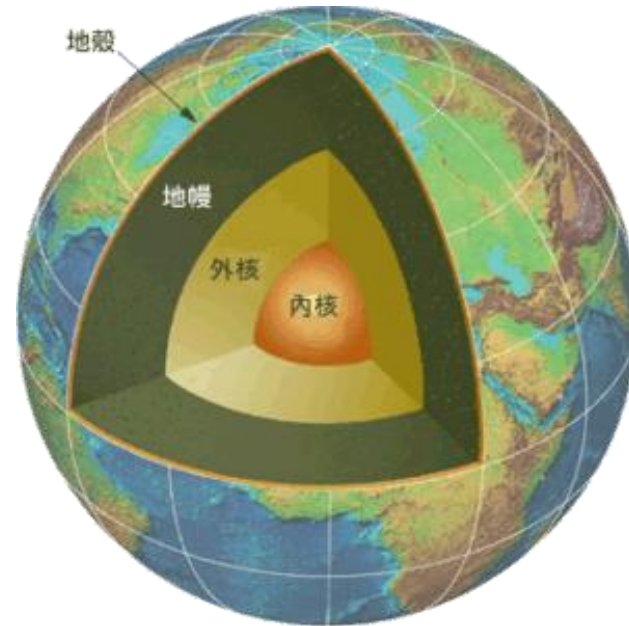
Integration of the Geography geospatial data and Geological data



Geography

Geographic spatial data

+



Geology

Geological spatial data

=



Digital of our world

Geospatial data of earth



Conclusion and Suggestions

Geological Data is of importance and Cannot be Separate from the process of sustainable development, and it requires participation from everyone that lives on the same planet earth.

**Thanks for your listening
谢谢!**