



6TH ASIA-OCEANIA GROUP ON EARTH OBSERVATIONS (AOGEO) WORKSHOP

MACAU CHINA 5.29-31 2023

Earth Observation Satellite Data Sharing and Knowledge Hub

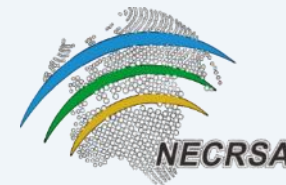
A Knowledge-Driven Algorithm Service Framework for China High-resolution Earth Observation System (CHEOS)

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Chinese Academy of Sciences (CAS)



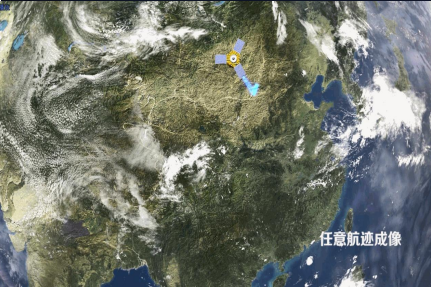
遥感卫星应用国家工程研究中心

National Engineering Research Center of
Satellite Remote Sensing Applications

June 25, 2023

About NECRSA

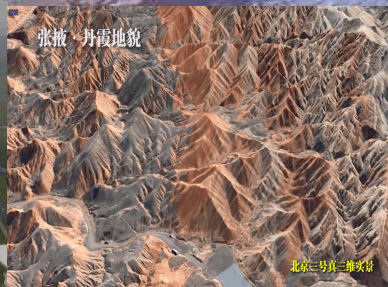
- **The National Engineering Research Centre of Satellite Remote Sensing Applications** is administered by the National Development and Reform Commission (NDRC). It is dedicated to achieving breakthroughs in common RS technologies & products, establishing a Cal/Val environment, and building a national infrastructure to support the development of remote sensing applications and industries.



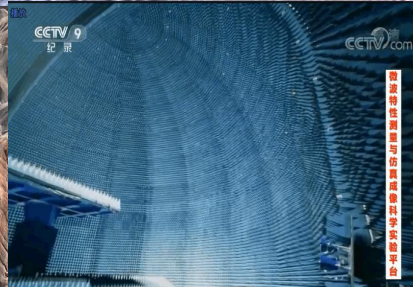
Gap Analysis



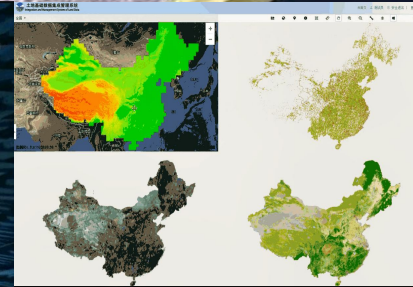
TT&C



Data Processing



Cal/Val



Products R&D



Data Service



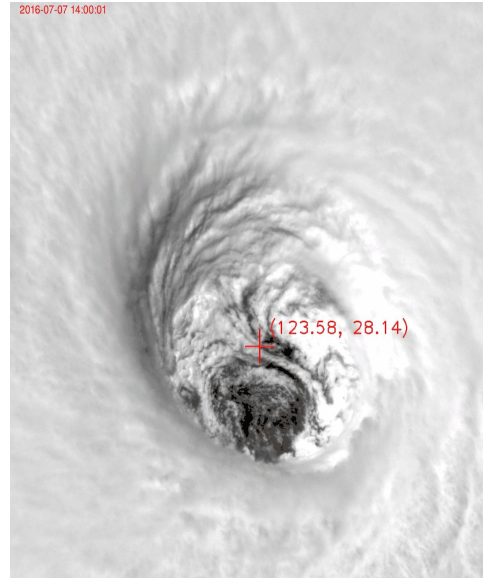
/01 Motivations



About CHEOS

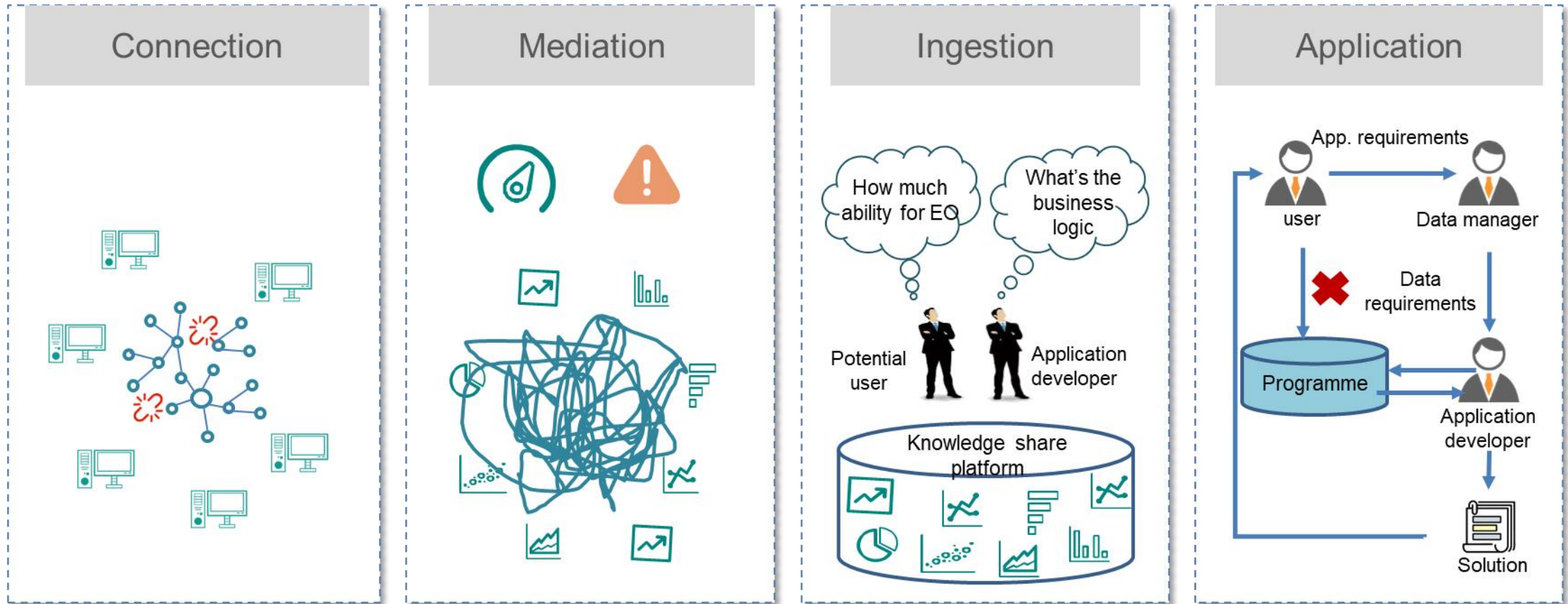
China High-resolution Earth Observation System (CHEOS) is one of the 16 major projects deployed in the “National Medium and Long Term Science and Technology Development Plan (2006-2020)”.

It aims to provide an all-weather, all-day, global coverage Earth observation capability with hyper-spatial and spectral resolutions.



1 MOTIVATIONS

- What to do for a payload?
- What payloads are needed for a business?
- How to do it?
- How are things making out? ?

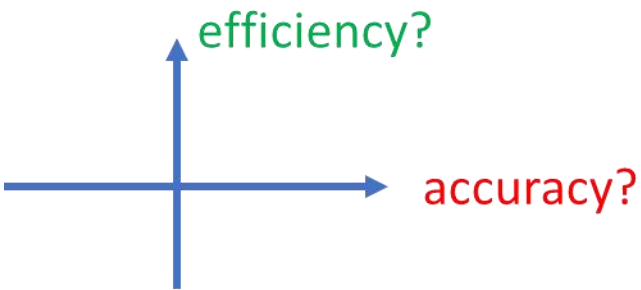


1 MOTIVATIONS

Make a effective choice —

Different application solutions embedded with hundreds of methods.

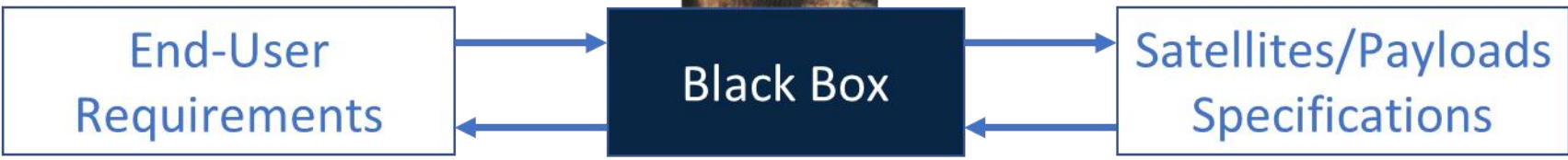
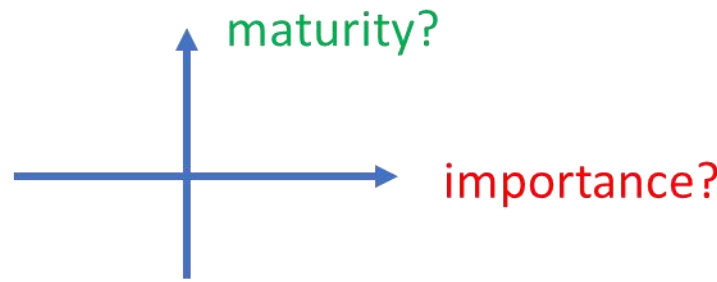
Which way is better?



Make a brilliant decision —

Various satellites equipped with hundreds of payloads.

What specifications are required?

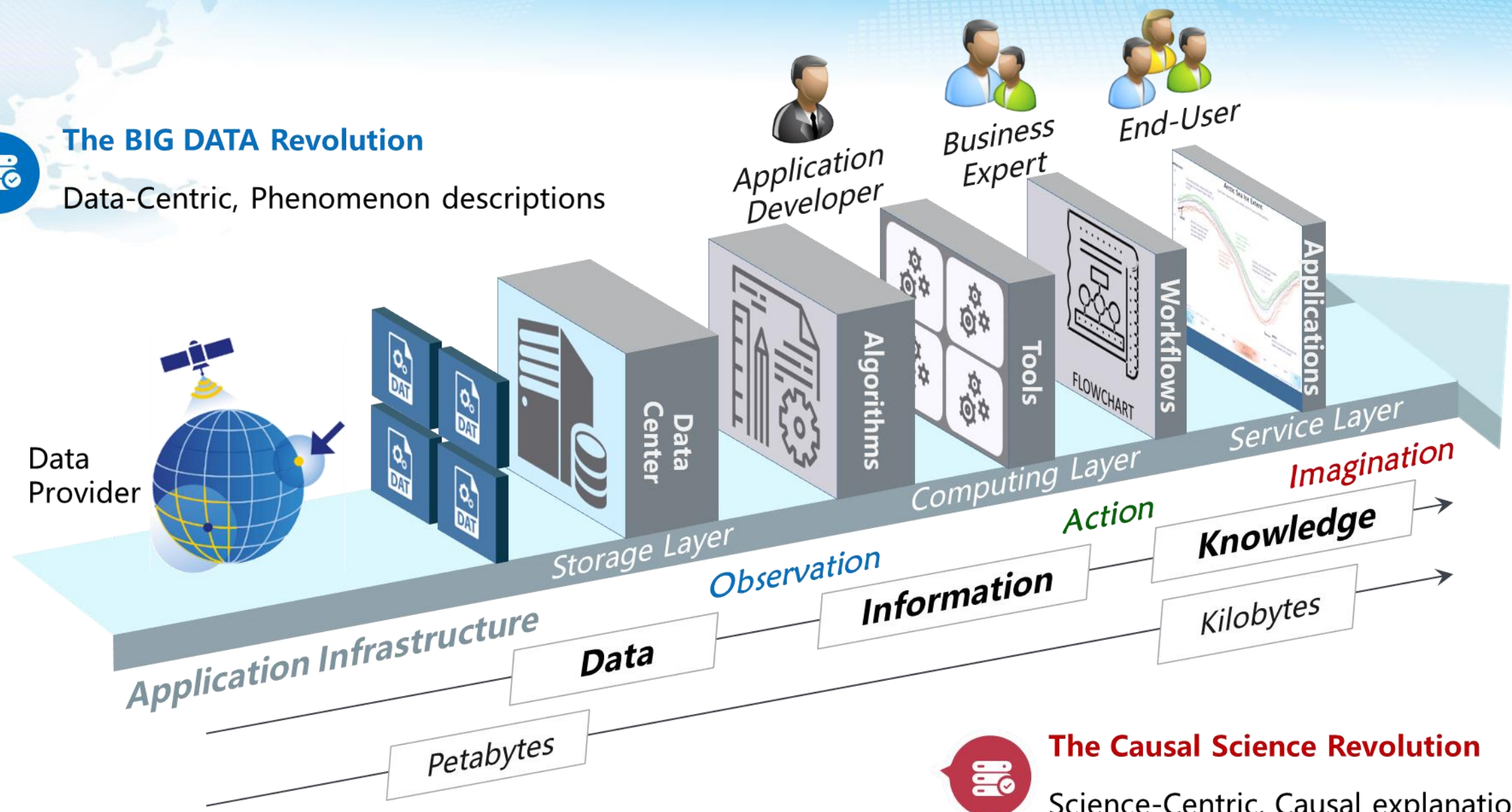


1 MOTIVATIONS



The BIG DATA Revolution

Data-Centric, Phenomenon descriptions



The Causal Science Revolution

Science-Centric, Causal explanations



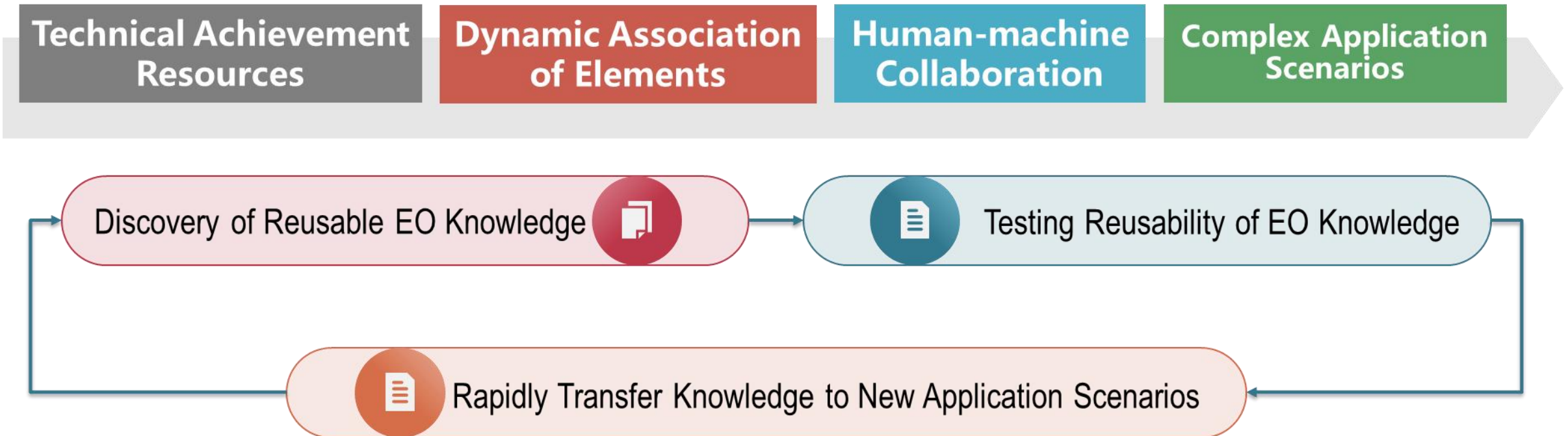
/02 Overall Design



2 Overall Design

Knowledge-driven Earth observation applications

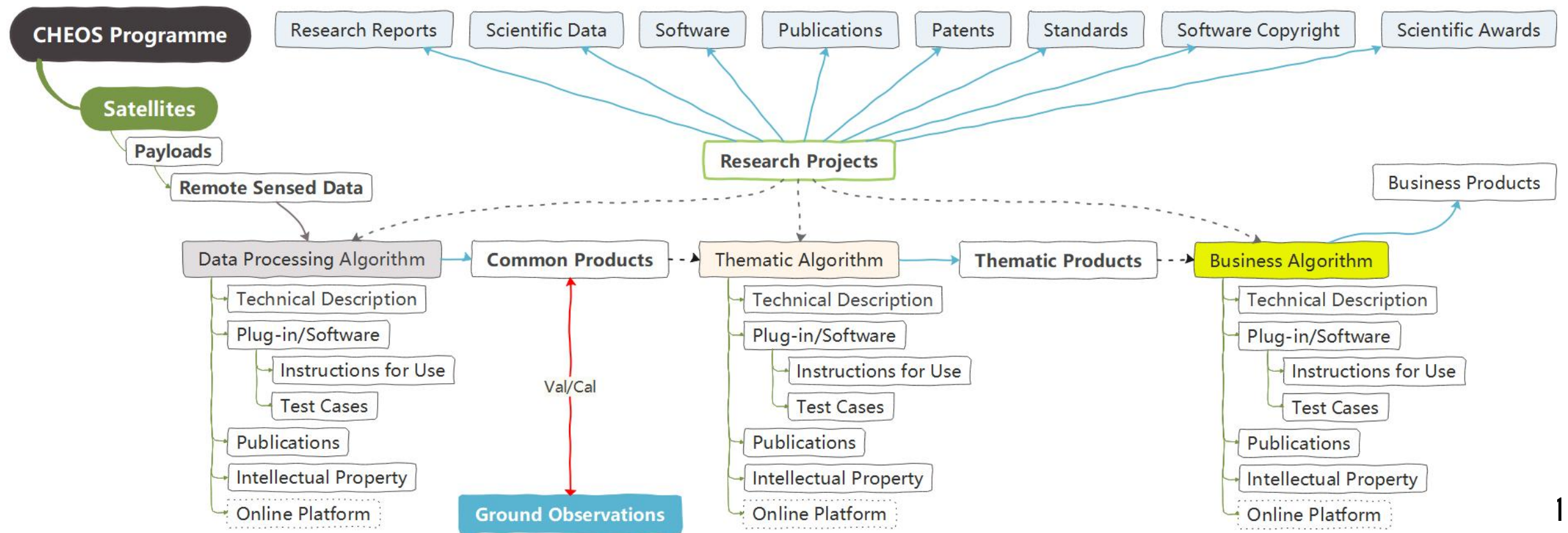
- Organize technical results arising from application practices in an orderly manner
- Developing new applications by reusing these resources where humans are in the loop



2 Overall Design

Linking human-cyber-physical systems at the semantic level

- Abstracting heterogeneous human-cyber-physical objects into symbol sets that can be stored and computed by computers
- Integrating human decision-making into the process of knowledge generation, management, and transfer



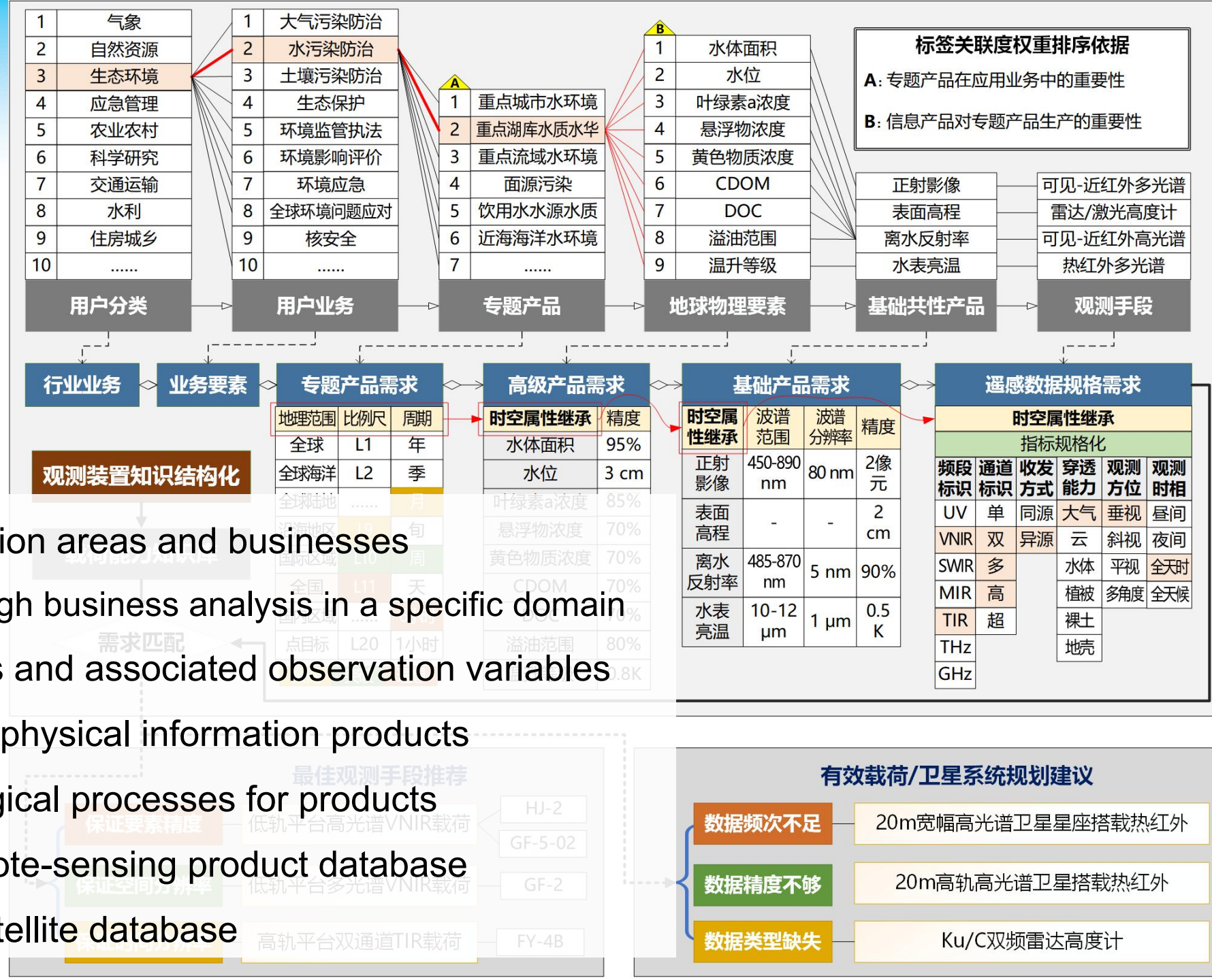
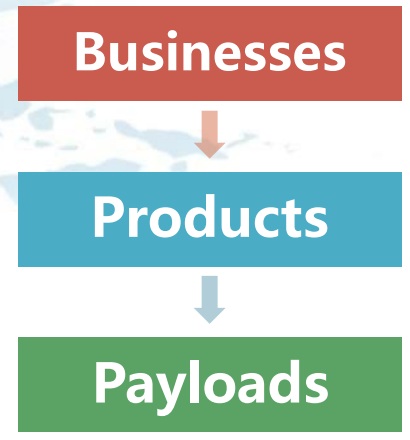
A stylized world map in light blue tones, composed of a grid of dots, serves as the background for the top half of the slide.

/03 Methodologies



3 Methodologies

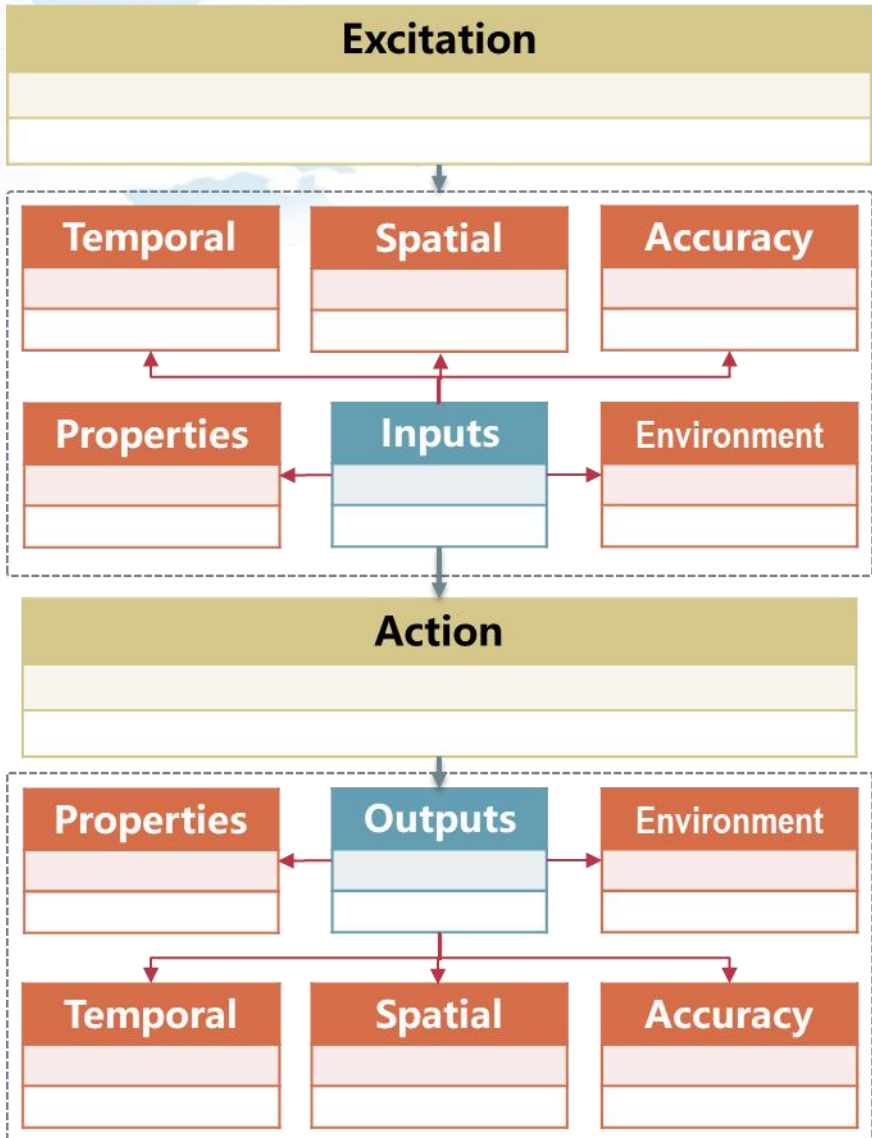
(1) Data collections



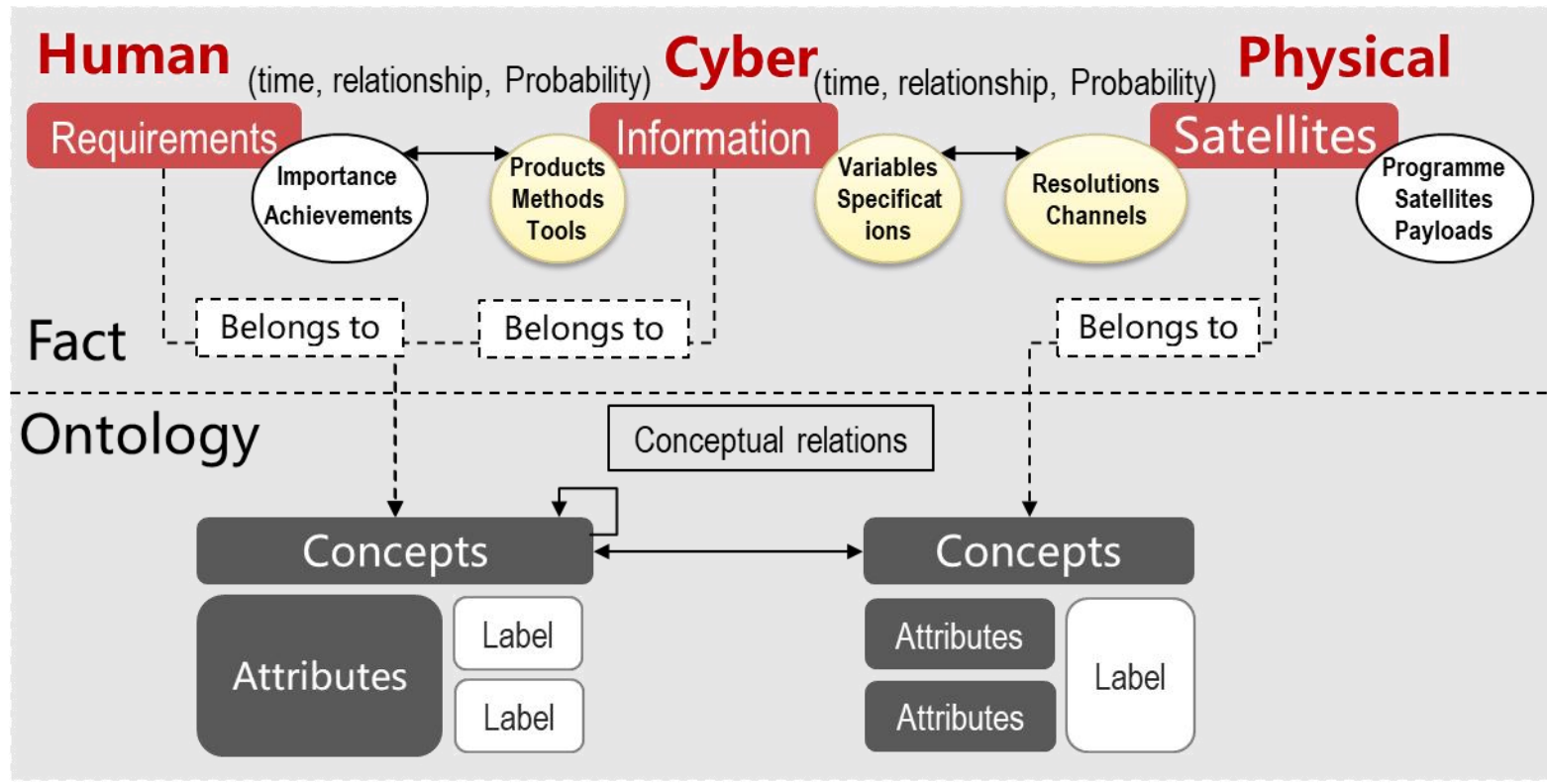
- Survey benefited application areas and businesses
- Gather requirements through business analysis in a specific domain
- Identify thematic products and associated observation variables
- Create a database of geophysical information products
- Collect/develop technological processes for products
- Establish a common remote-sensing product database
- Establish payload and satellite database

3 Methodologies

(2) Ontology Modelling



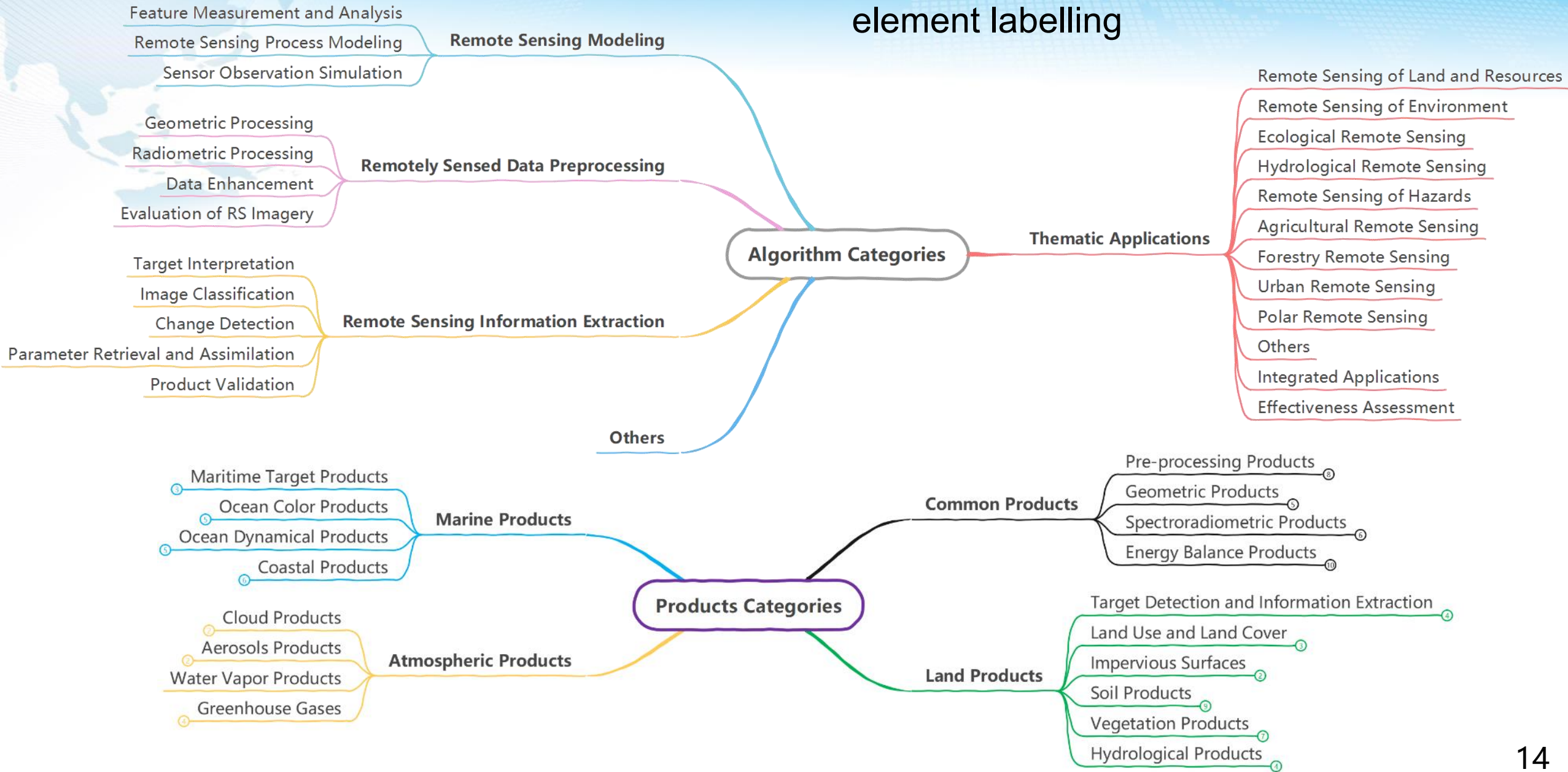
Uniform representation of entities, concepts, relationships, and rules of requirements, payloads, data, methods, and other elements based on the level of processing of information products.



Demonstration of CHEOS Ontology

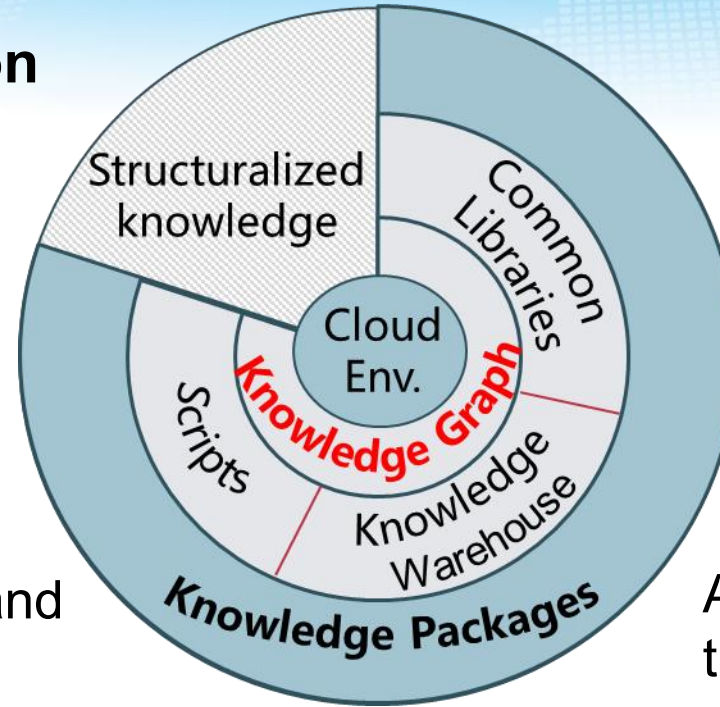
3 Methodologies

Classifications of the CHEOS algorithm and products for element labelling



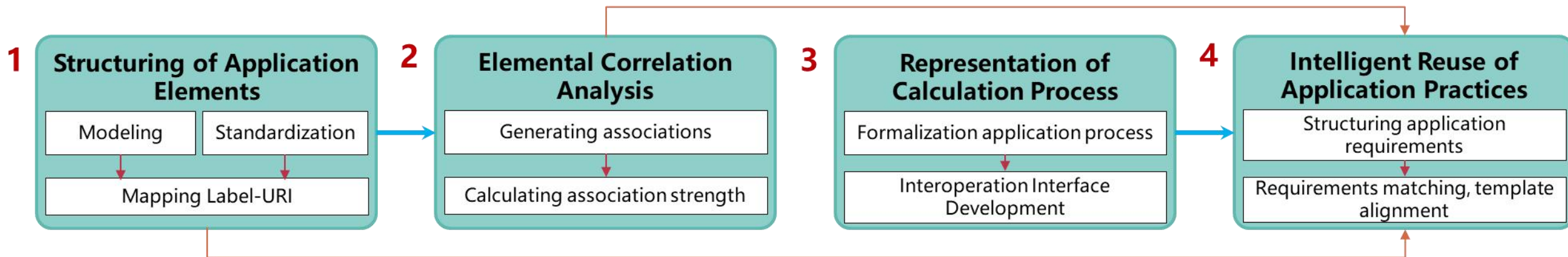
3 Methodologies

(3) Interoperation & formalization



Linking data, algorithms, processes and other elements at the semantic level

Achieve orderly organisation and high throughput transfer of EO knowledge

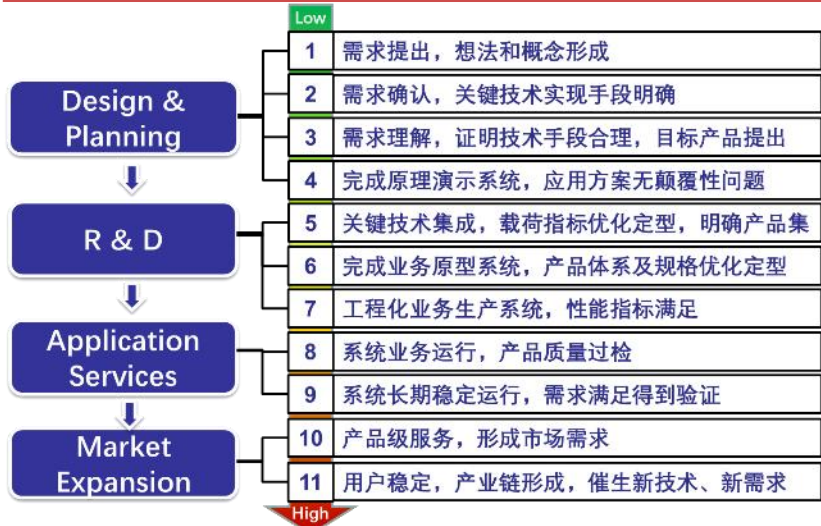


3 Methodologies

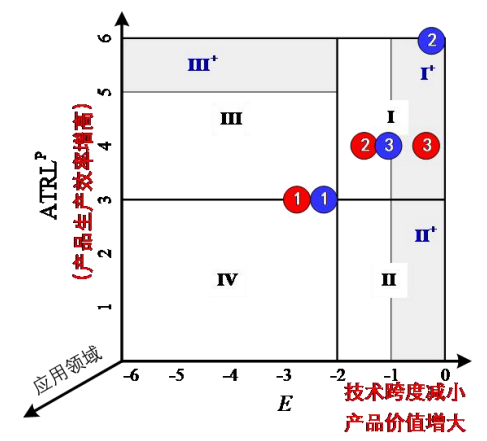
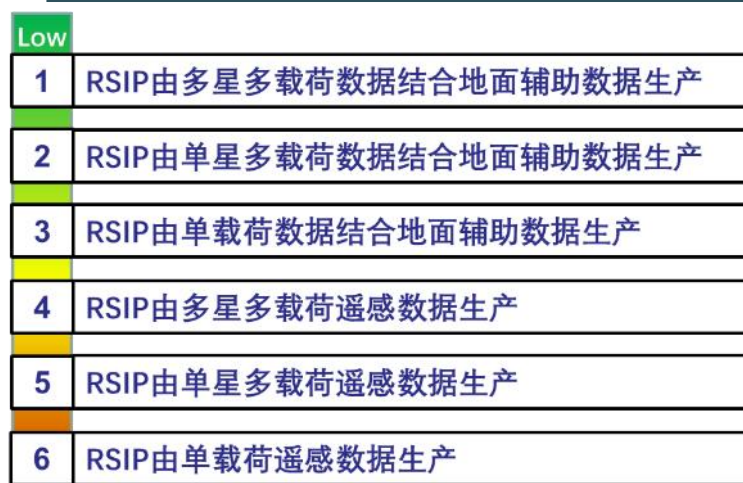
(4) Rules for correlation strength calculation of CHEOS elements

- **Application Technology Readiness Level (ATRL)** is defined to quantify the development stage of the application technology and to identify the proper knowledge package
- We employ **the production capacity of qualified RSDP** to scale the ATRL. This measurement is separated into two dimensions: Productivity ($ATRL^P$) and Reliability ($ATRL^R$)

$ATRL^R$: describes the reliability and accuracy



$ATRL^P$: describes the automation capabilities



Application Readiness Matrix

E : Application Development Cost Index

$$E = \Delta \times e^{-PIV}$$

$$\Delta = L_{cur} - L_{aim}$$

| | | Δ | | | | | | | |
|-----|------------|----------|-------|-------|-------|-------|-------|-------|-------|
| PIV | e^{-PIV} | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 |
| 0.4 | 0.67 | -0.67 | -1.34 | -2.01 | -2.68 | -3.35 | -4.02 | -4.69 | -5.36 |
| 0.6 | 0.55 | -0.55 | -1.10 | -1.65 | -2.20 | -2.75 | -3.30 | -3.85 | -4.40 |
| 0.8 | 0.45 | -0.45 | -0.90 | -1.35 | -1.80 | -2.25 | -2.70 | -3.15 | -3.60 |
| 1.0 | 0.37 | -0.37 | -0.74 | -1.11 | -1.48 | -1.85 | -2.22 | -2.59 | -2.96 |
| 1.2 | 0.30 | -0.30 | -0.60 | -0.90 | -1.20 | -1.50 | -1.80 | -2.10 | -2.40 |

A stylized world map in light blue tones, composed of a grid of dots, serves as the background for the top half of the slide.

/04 The Pilot System



4 The Pilot System



卫星分类 | 算法类型



数据处理



信息提取

成果: 110条



综合分析

4 The Pilot System

- Provide a multi-dimensional portrait of CHEOS algorithms and their associated plug-ins, technical documents and other elements
- Enable exploratory visualization of algorithm information



用户空间

- 注册算法
- 创建算法
- 我的收藏

资源导航

- 返回卫星
- GF-1
- GF-1-02
- GF-1-03
- GF-1-04
- GF-2
- GF-3
- GF-3-02
- GF-3-03
- GF-4
- GF-5

算法推荐

- 极冰冰川外缘线变化检测**
基于GF-3 SAR数据进行冰水分离并提取冰川外缘线信息
[信息提取] [目标解译] [GF-3]
- 高分辨率、多极化数据的固定目标识别技术**
基于GF-3 SAR高分辨率、多极化数据识别海上...
[信息提取] [目标解译] [GF-3]
- 高分辨率图像海上中小型移动目标(船只)识别...**
基于GF-3 SAR高分辨率数据判定海上船舶位置和身份
[信息提取] [目标解译] [GF-3]
- 海洋内波检测与信息提取**
基于GF-3 SAR数据检测海洋内波特征信息
[信息提取] [目标解译] [GF-3]
- 海洋中尺度涡检测与信息提取技术**
基于GF-3 SAR数据检测识别海洋中尺度涡信息
[信息提取] [目标解译] [GF-3]

近期更新

- GF-5卫星高光谱图像质量综合改善技术-装调偏...
GF-5卫星高光谱图像质量综合改善技术-装调偏...
[数据处理] [辐射处理] [GF-5]
- GF-5卫星高光谱图像质量综合改善技术-地形...
GF-5卫星高光谱图像质量综合改善技术-地形...
[数据处理] [辐射处理] [GF-5]

算法画像 全部材料 (2)

基本信息

作者: 任华忠
作者单位: 北京大学、中国农业科学院农业资源与农业区划研究所
算法描述: 基于GF-5城市地表温度反演模块
算法简介: 无
适用卫星和载荷: GF-5, VIMS
算法类型: 像素级数据计算
技术规格: 无
技术处理: 无

算法图谱

详细技术文档
GF-5城市地表温度反演模块

F-5基于全波段多光谱影像和热红外相机的生态系统碳源分型和目标识别技术

技术流程说明: 利用地表温度-发射率分离算法, 对城市地表、自然地表、角表和水体温度进行反演
所属项目: GF-5基于全波段多光谱影像和热红外相机的生态系统碳源分型和目标识别技术

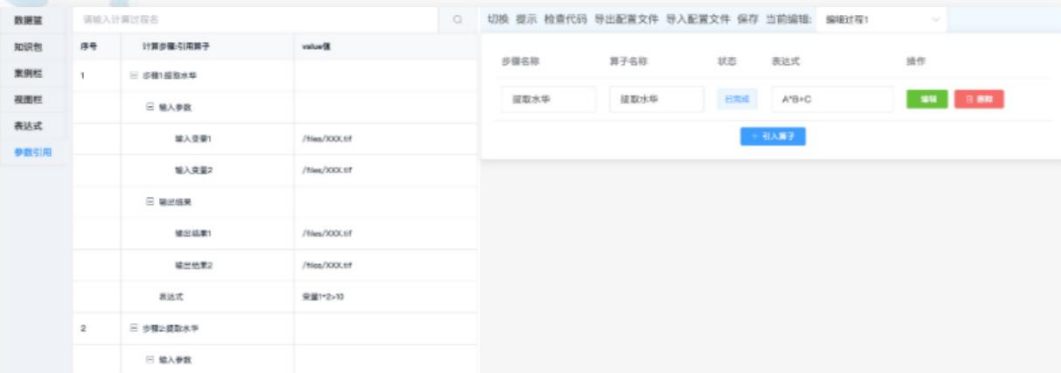
详细技术文档 >>>

算法插件 (1) >>>

推荐论文 (4) >>>

4 The Pilot System

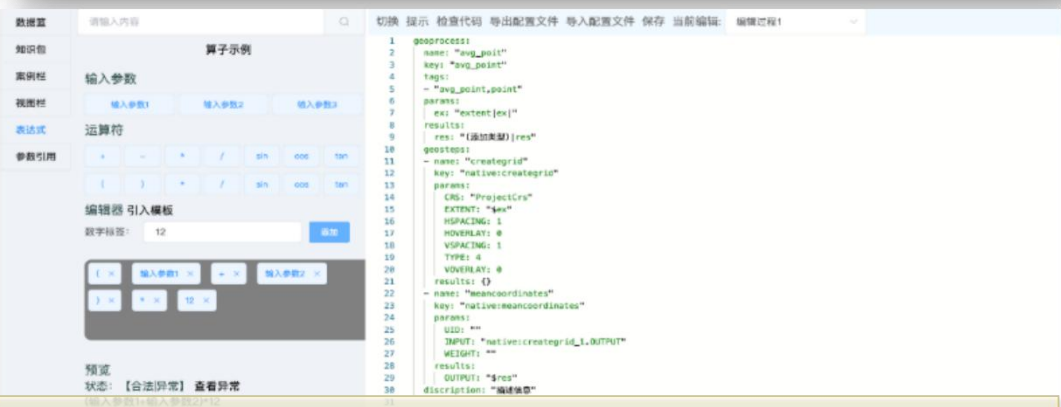
- Provides an interactive online integration, compilation, and publishing environment
- Enables dynamic reuse of good application practices



For beginners
Interactive table calculation interface



For end users
Automatic generation of algorithm execution reports



For advanced users
Spatial programming interface

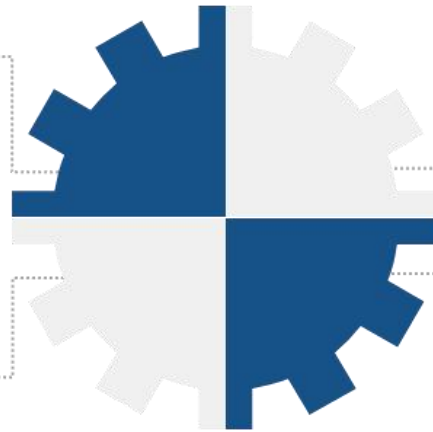


输入创建知识库的基础信息

Conclusions

Uniform Metadata of CHEOS

Re-use Scientific
Achievements



Label Elements at Semantic Level

Reduce Data Governance Costs



Thanks

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National Engineering Research Center of Satellite Remote Sensing Applications

www.aircas.ac.cn

www.cpeos.org.cn