Big-Data-Driven Resource Discipline Innovation Platform and Application Scenarios

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Abstract. Based on the development of resource disciplines and their conformity with the demand of sustainable development, this paper analyzes the framework of a big-data-driven resource discipline innovation platform, as well as big data-driven scenarios with the application of typical resource discipline scientific research activities. The three typical application scenarios of this paper are as follows: (1) the ecological risk prevention and control of traffic and pipelines in the China-Mongolia-Russia Economic Corridor; (2) a resource and environmental carrying capacity assessment in Beijing-Tianjin-Hebei; and (3) a big-data-driven panoramic evaluation of beautiful China.

1. Introduction
The era of big data has hastened various scientific research tools related to the acquisition, storage, sharing, and analysis of massive data, namely the data-intensive research paradigm [1], which considers data as the core driver of scientific discovery and research activities. Resource science emphasizes not only the relationship and overall effect of the internal elements of a resource system, but also coupling between the resource and environmental systems; it also emphasizes the integration of research methodology and technology. With this demand in mind, a big data driven discipline innovation platform was built and its application scenarios were investigated.

2. The big-data-driven resource discipline innovation platform
Our big-data-driven resource discipline innovation platform (www.data.ac.cn) is an online application platform based on a Web + WebGIS model. The platform integrates the basic data of resource disciplines at four scales: local, national, regional and global, including 43 basic resource discipline databases including water, land, climate, forest, grassland, animal and plant, fishery, energy, and other resources. A data association network and knowledge graph is also constructed. Moreover, the platform investigates the classification system of a resource scientific computing model, realizes the integration and sharing of more than 200 models in resource discipline fields, and forms the system and framework of big data management and data processing in resource discipline fields, which can process scientific data above terabyte levels and manage data above petabyte levels. This platform also provides users with data thematic services. As of June 2019, the platform website had attracted 3,040,702 visitors, with a cumulative download of 2800.97 GB.
3. Typical big-data-driven application scenarios

3.1. Scenario 1
The first scenario involves ecological risk prevention and control of traffic and pipelines in the China–Mongolia–Russia Economic Corridor of the Belt and Road Initiative. Using the remote sensing images of Landsat 8 as the basic data, the desertification distribution data along the China-Mongolia railway (Mongolia section) were obtained by combining the platform's remote sensing big data processing and information extraction system, according to the applicability relations of the three feature space models (Albedo-NDVI, Albedo-MSAVI, Albedo-TGSI) to different geographical regions. We then analyzed the land degradation pattern and change characteristics along the China-Mongolia railway from 1990 to 2015 to further understand the overall spatial distribution characteristics of desertification in this region [2].

3.2. Scenarios 2
The second scenario involves a resource and environmental carrying capacity assessment in Beijing-Tianjin-Hebei. This scenario involves three main elements: (1) an evaluation index of big data analysis and mining for a resource network with high spatial and temporal resolution is constructed leveraging Internet big data. (2) By constructing multi-scale, multi-factor, and time-series dynamic resources-environment and economic-social data, an evaluation index system for the sustainable development of resources and the environment is established. (3) Selecting the key influencing factors, a series of mathematical models for simulating the process of regional sustainable development are built to comprehensively evaluate resources and the environmental carrying capacity. Finally, we developed a prototype system of the Beijing-Tianjin-Hebei resources and environmental carrying capacity evaluation.

3.3. Scenarios 3
The third scenario involves a big-data-driven panoramic evaluation of China. This will provide data, methods, and models based on the requirements of the evaluation indexes of China [3]. This scenario is divided into three parts: (1) the first step is to collect basic geographic, network mining, and socio-economic data as well as remote sensing data products, etc. (2) Next, we produce a forest type map with 10 m spatial resolution for the Qinling Mountains based on spectral-spatial-temporal features derived from multi-source data including Sentinel-1/2, the Shuttle Radar Topography Mission Digital Evaluation Model (SRTM DEM), forest type inventory and field samples, etc. with the support of Google Earth Engine (GEE) and machine learning algorithms. (3) Finally, the developed system integrated basic geographic, socio-economic, and remote sensing data products will be used to cover different scales such as China and its related regions for their evaluation.

4. Future
Big data drives organic synergy among innovation units to form a new modes of scientific research and innovation. Future work will focus on the comprehensive research information chain of resource disciplines driven by big data.

References
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