Objective 1: DDE cyberinfrastructure framework constructed based on existing knowledge base and data standards and is serving the global geoscience community

Implementation	Outcomes	Deliverables		
		Year 1	**Years 2-3**	**Years 4-5**
Data: (i) an energy efficient technology system for obtaining research data and improving their reusability; (ii) multi-source heterogeneous geological data grabbing tools, including the development of "picture-literacy- data", multimodal data grabbing and other tools. **Knowledge:** (i) collaborative, sharing technology of distributed knowledge graphics based on geoscience characteristics; (ii) reward incentive mechanism driven by knowledge quality; (iii) a collaborative knowledge addition and audit system for global scientists to jointly promote geoscience knowledge graphics construction.	DDE advocacy of data-driven scientific discovery leads to DDE cooperation with international data organizations, e.g., the Committee on Data for Science and Technology (CODATA) as well as businesses based on digital data resources. Such cooperation will strengthen and enrich its data policies in line with international standards, improve DDE's ability to implement data standards, and promote the mutual access of its scientific databases with other international databases. DDE's Policy on Intellectual Property (IP) is widely shared with partner organizations engaged with DDE on data sharing and data-driven discovery and	(i) Overall design and key technology of DDE platform DEEP Platform – version 1 tested; **(ii)** DDE big data integration and sharing mechanism and standards and specifications for deep time earth big data; and **(iii)** Integrated communication strategy and communication standards	(i) Reconstructed geoscience knowledge system ready for treatment by big data analytics, artificial intelligence and machine learning; **(ii)** Model for generation of knowledge graphics in the geosciences; **(iii)** DEEP central engine ready for serving as the DDE digital earth collaborative research platform;	(i) 10-15 WGs generate knowledge graphics through the application of DDE group intelligent cooperation model; (ii) DDE data authentication center; (iii) DDE professional/ thematic databases, including regional, national, professional, industry and interest node networks;

Platform: (i) The DDE Enabling and Empowering Platform (DEEP) will be a one-stop platform for geoscience data preprocessing and analysis for researchers to access and analyze existing data using a wide range of algorithms and models to tackle significant questions of earth sciences on evolution of life, geodynamics, materials and climate as elaborated by the WP. **Scholar: P**rovides multiple knowledge information visualization applications, including academic literature evaluation, analysis, and recommendations. It will develop some paper submission tools, including paper x-ray, paper similarity check system, and keywords trend analysis. Functions such as machine-reading of papers and knowledge graph Q&A system will be developed.	regularly refined and improved to meet international standards and expectations. DDE big data system, as an open data storage system is able to support the storage, access, retrievability and use of data from scientific and technological journals and provide scientists with more convenient data storage services. Technologies and mechanisms of the DDE international data center are certified to build trust in its data storage capability and serve as one of the influential, international public storage platforms in the field of geosciences. DDE professional teaching and educational as well as science popularization modules developed and widely used. Conceptual basis and approaches to DDE's data		**(iv)** Communication activities and products for professionals, educators and deep-time geoscience popularizers; and **(v)** At least 3 organizations with vision and missions similar to DDE become new members of DDE.	(iv) DDE digital earth integration, exchange and collaborative research platform; (v) DEEP Platform for professional applications such as Deep Earth, Deep Map, Deep Scholar, etc., and (vi) At least another 3 organizations become new DDE members.	

DDE cyberinfrastructure will enable DDE to build educational and science popularization modules in collaboration with internationally reputed geological educational institutions and scholars	sharing is made public including through at least 1 paper in a well-known data sciences journal.			