OneStratigraphy: harmonizing global stratigraphic data

Junxuan Fan*†[1], Jiao Yang[1], and Xudong Hou[1]

[1]School of Earth Sciences and Engineering, Nanjing University, Nanjing 210023, China – China

Abstract

The Deep-time Digital Earth (DDE) is the IUGS-recognized Big Science Program that aims to develop a platform to connect geoscience informatics efforts with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles. This innovative, ten-year program plans to harmonize global deep-time geodata describing the various spheres of our globe (e.g., biosphere, lithosphere, hydrosphere) and further stimulate data-driven discoveries in our understanding of the deep-time Earth history (Wang et al., 2019). More specifically, new tools or services for data mining, knowledge discovery, and artificial intelligence will be developed to fulfill the multifaceted vision of DDE: open data, open infrastructure, open research, and open service.

OneStratigraphy, as part of the DDE system, was developed in early 2019 to share stratigraphic data and tools. To date, 1.3 million fossil occurrences from ~13,000 sections/drill cores have been digitized and stored in the OneStratigraphy online platform, covering the major continents and oceans of the present. All data come from literature, stratigraphic reports or unpublished work and are digitized according to consistent standards to control data quality. Many tools have been integrated into the system, such as TS Creator for stratigraphic visualization and PaleoGIS and GPlates for paleogeographic visualization. The new system supports quantitative stratigraphic methods such as Graphic Correlation (Fan et al., 2013), Constrained Optimization (CONOP, Sadler et al., 2009), and Horizon Annealing (Sheets et al., 2012). Therefore, with its rapidly increasing data volume and efficient data analysis tools, OneStratigraphy can be used for innovative studies such as refined geologic time scales, high-resolution macroevolutionary history of life, and biotic/abiotic factors affecting the evolution and distribution of life.

References

Fan, J.X., Chen, Q., Melchin, M. J., Sheets, H. D., Chen, Z.Y., Zhang, L.N. & Hou, X.D., 2013. Quantitative stratigraphy of the Wufeng and Lungmachi black shales and graptolite evolution during and after the Late Ordovician mass extinction. Palaeogeography, Palaeoclimatology, Palaeoecology, 389: 96-114.

Sadler, P.M., Kemple, W.G. & Kooser, M.A., 2003: Contents of the compact disk-CONOP9 programs for solving the stratigraphic correlation and seriation problems as constrained optimization. In P.J. Harries (ed.): High resolution approaches in stratigraphic paleontology, 461–465. Topics in Geobiology, 21. Kluwer Academic Publishers, Dordrecht.

*Speaker

†Corresponding author: jxfan@nju.edu.cn

Sheets, H. D., Mitchell, C. E., Izard, Z. T., Willis, J. M., Melchin, M. J. & Holmden, C., 2012. Horizon annealing: a collection-based approach to automated sequencing of the fossil record. Lethaia, 45: 532-547.

Keywords: Deep, time Digital Earth (DDE), Stratigraphy, Big data, Quantitative stratigraphy