Paleomagnetism.org 2.0: an online multiplatform, open source and FAIR paleomagnetic data management software

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Scientific communities are placing an increasing emphasis on the implementation of data management protocols concerning data archiving and distribution. For instance, every proposal submitted to the European Horizon 2020 program, as well as to the National Science Foundation in the USA, requires a dedicated section that outlines project data management and accessibility. The widely adopted FAIR data guidelines identify four fundamental principles concerning the Findability, Accessibility, Interoperability and Reproducibility of data. They form a cornerstone of modern data infrastructures and are being increasingly adopted by scientific communities. FAIR data means that data sets are effortlessly searched and discovered, freely downloaded, shared, usable between multiple disciplines, and that derived results and the applied methodology are fully transparent. The wide variety of data formats, the low data volume, and the general lack of a culture of data sharing makes that the paleomagnetic community rarely follows any of the FAIR principles. Most institutions define their own data formats and use inhouse software to analyse their demagnetization data, which are critical to Paleomagnetic research. In this presentation we present the second iteration of Paleomagnetism.org, an online multiplatform open source environment for paleomagnetic data analysis. Paleomagnetism.org provides an interactive environment where paleomagnetic data can be interpreted, evaluated, visualized, and exported. The Paleomagnetism.org application is split in to an interpretation portal, statistics portal, geography portal, and a portal for miscellaneous paleomagnetic tools. In the interpretation portal, principle component analysis can be performed on visualized demagnetization diagrams. Interpreted directions and great circles can be combined to find great circle solutions. These directions can be used in the statistics portal, or exported as data and figures. The tools in the statistics portal cover standard Fisher statistics for directions and VGPs, including other statistical parameters used as reliability criteria, foldtest, bootstrapped common true direction test reversal and correction of inclination shallowing in sediments following TK03.GAD. The geography portal provides a module to visualize VGPs and expected paleolatitudes, declinations, and inclinations relative to widely used global apparent polar wander path models in coordinates of major continent bearing plates. The 2.0 update of Paleomagnetism.org comprises a full overhaul of the application to satisfy the increasingly demanding data management requirements. The application now facilitates a workflow that respects FAIR guidelines by documenting data provenance. All data analysed through the application are easily submitted to a public data library which distributes data and results through an HTTPS web service that lives up to modern data management standards.

Keywords: Paleomagnetism, FAIR data principles, Open Access, Data sharing, Software

