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FAIR Convergence using FAIR Implementation Profiles and the FAIR evolution pathways concept: lessons learned from the WorldFAIR Geochemistry Work Package

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Interdisciplinary science missions rely on the ability to combine data from across many research domains. Convergence of data can be achieved through adoption of the FAIR principles for data assets, making them Findable, Accessible, Interoperable and Reusable. In order to make data FAIR beyond a limited number of researchers, a broader research community has to declare which schemas, data standards, protocols and other resources are used for metadata and data. These resources, when published, are FAIR Enabling Resources (FERs). Listing which FERs are used to make a dataset FAIR helps the community towards interoperability between datasets. FAIR Implementation Profiles (FIPs) list FERs for each FAIR principle through a systematic question and answer based form and can be the basis for comparing FERs used in different data assets.

Through comparison of different communities' FIPs, mappings and crosswalks can be developed between datasets, resulting in interoperability between datasets. Employing a FIP comparison strategy enables a group to grow the FAIR data asset size. Comparing FIPs with regards to a specific community can help grow it in both size and complexity, adding additional community members and their related interoperable datasets. FAIRness here evolves both on data asset size as on the community complexity level.

Elaborating on this; intercommunity agreement on FER usage, or the development of mappings and crosswalks between FERs, increases the communities FAIRness, growing its complexity and size. Growth of FAIR data assets can be achieved when multiple datasets use the same FERs and become a FAIR data collection. Additionally, complexity of the FAIR community goes hand in hand with growth of the FAIR data asset as multiple groups are generally involved in the collation of multiple datasets. FAIRness also increases if FERs are aligned for data types from different instruments, resulting in their various methodologies also becoming interoperable. With FAIRness increasing between methodologies the community complexity generally increases as for the combining of datasets.

Here we will present key outcomes from the WorldFAIR Geochemistry Work Package on how FAIRness of a community and its constituent data assets can evolve along three pathways. FAIRness can be increased for the community (complexity), for data assets (size) and between methodologies or (sub)disciplines with FIPs as a means to document FERs used for community, data or methodologies in a structured manner, the comparative FIPs approach can form the basis

for convergence and FAIR evolution on either of the three pathways.