

THE FUTURE OF COSMOCHEMICAL DATABASES: METBASE AND THE ASTROMATERIALS DATA SYSTEM (ASTROMAT) STARTED A COMMON FUTURE.

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Introduction: MetBase is the world's largest database for meteorite compositions [1], currently hosted in Germany. MetBase started more than 20 years ago with collecting cosmochemical data by a private collector. Among others, the database consists of more than 500,000 individual data of, for instance, bulk and component chemical, isotopic and physical properties. Further, the database holds more than 90,000 references from 1492 until today. In 2006, the high value of the database was acknowledged by the Meteoritical Society with its Service Award. MetBase has seen substantial transitions in the past years from a purely commercial to a donation, free-of-charge database. The technical foundation has been completely modernised.

More recently, the Astromaterials Data System (AstroMat) has been developed as a data infrastructure to store, curate, and provide access to laboratory data acquired on samples curated in NASA's Astromaterials Collections. AstroMat is intended to host data from past, present, and future studies. AstroMat is developed and operated by a team that has long-term experiences in the development and operation of data systems for scientific samples – System for Earth Sample Registration SESAR and the Internet of Samples (iSamples) – and for geochemical, petrological, mineralogical, and geochronological laboratory data acquired on physical samples – EarthChem and PetDB.

Astromat and MetBase are two initiatives with two very different histories – but a shared goal: advancing the reuse of lab analytical data from astromaterials samples to maximize their value and impact for science. Astromat and MetBase therefore agreed on a plan for a common future. This will be achieved in two distinct steps:

- (i) We just started a pilot project funded by the NFDI4Earth [2], in which we will make MetBase data fully FAIR (findable, accessible, interoperable and reusable, [3]). We will adapt the recently established Astromat database schema [4], which is based on the EarthChem data model. This means, a user will be able to understand both databases in the same way, thereby finding and working with a large set of cosmochemical data much more easily.
- (ii) In a separate, second step, MetBase will be transferred and integrated into the Astromaterials system. This requires an even higher level of integration of both databases, which will be achieved during this phase. In its final stage of this migration and merge, both databases will become one, making working with formerly two databases entirely seamless. MetBase will then be hosted in the same backbone as the Astromat synthesis database, AstroDB, and be reachable by machines via a single API, and by humans via a single search application, AstroSearch.

The current MetBase graphical user interface will be modernised as an additional part within the NFDI4Earth pilot project. While MetBase itself will be migrated to Astromaterials, one of its interfaces will be developed and maintained at the GU Frankfurt. It will be expanded, so that various cosmochemical and geochemical databases can be accessed through this interface. MetBase data access, however, will also be provided directly through Astromat.

Both MetBase and Astromat participate in the OneGeochemistry initiative [6], to contribute to the development of community endorsed and governed standards for FAIR lab analytical data that will allow seamless data exchange and integration.

References: [1] <http://www.metbase.org>. [2] <http://nfdi4earth.de> [3] Stall et al. 2019. Make scientific data FAIR. Nature 570(7759): 27-29. [4] <https://www.astromat.org> [5] <https://conference.eresearch.edu.au/events/onegeochemistry-a-proposed-international-framework-to-enable-online-interchange-of-globally-distributed-geochemical-data/>

