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A GIS-based circum-Arctic zircon U-Pb age database

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The timing and kinematics of the opening of the Amerasia Basin are poorly understood but have significant implications for the geological histories and petroleum systems of sedimentary basins within the circum-Arctic region. This lack of understanding is in part due to the paucity of direct evidence and subsequent overprinting by the High Arctic Large Igneous Province. Uranium-lead detrital zircon geochronology is a well-established tool for reconstructing sedimentary provenance, which can provide insights into the opening of the Amerasia Basin by constraining the pre-rift configuration of Arctic tectonic terranes and sediment transportation pathways. The fundamental approach is a comparative one, requiring potential sources of sedimentary detritus within adjacent areas to be characterised with respect to U-Pb isotopic age. Such information is routinely extracted from literature sources, which is both time-consuming and can yield a massive amount of data. The circum-Arctic region, whilst comparatively remote, is no exception; a large volume of published U-Pb age data exists from onshore areas (Figure 1), driven by the popularity of U-Pb detrital zircon studies and the proliferation of rapid *in situ* U-Pb analytical techniques. Furthermore, rigorous comparison between sample and literature U-Pb age data is seldom straightforward because of differences in data treatment and presentation; for example, there is a lack of consistency regarding the calculation of concordance / discordance values and their usage in filtering U-Pb datasets. Likewise, probability density plots, which are arguably one of the most common ways of representing U-Pb age data, are typically constructed using $^{206}Pb/^{238}U$ ages for young grains and $^{207}Pb/^{206}Pb$ ages for older grains; however, in practice there is little consensus regarding the switchover age, with ages of 800 – 1200 Ma used in different studies. It is, therefore, often necessary to redraw literature U-Pb age data in an identical manner to sample data, which can be challenging, particularly for non-specialists, because of dissimilarities in the content and format of published U-Pb data tables.

To address some of these issues, CASP has been developing a geographical information system (GIS) database of published zircon U-Pb age data from circum-Arctic rocks using ArcGIS®. The database serves as both a repository for large volumes of U-Pb age data and as a platform for users to interrogate the dataset. Interrogation of the data is facilitated by custom tools developed within ArcGIS® using Microsoft Visual Studio®. These enable the searching of the database and the visualisation of U-Pb age data as probability density and cumulative density plots within the GIS environment. Compilation of such a database is a considerable undertaking. So far we have focused predominantly on compiling zircon U-Pb age data from igneous and metamorphic rocks within the circum-Arctic region (Figure 1), although compilation of detrital zircon U-Pb age data is ongoing. It is hoped that we will be able to demonstrate the database during this presentation.

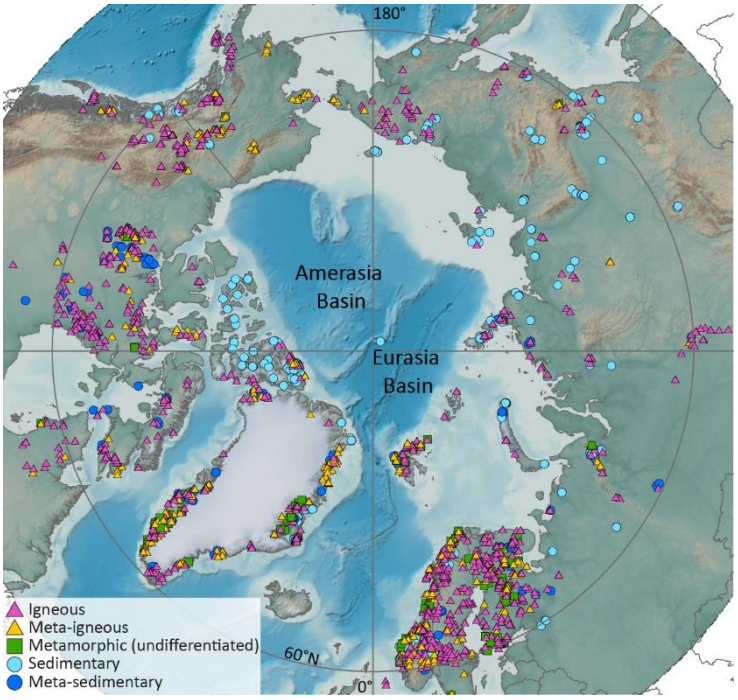

Figure 1: CASP circum-Arctic zircon U-Pb age database.

Each coloured shape is a sample.