Geophysical Research Abstracts, Vol. 8, 10145, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10145

Developing community data sets for calibration of the time scale: A perspective on the required lithostratigraphic, biostratigraphic, geochronologic, and chemostratigraphic data

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The "calibration of Earth's History", the underlying theme for this session, is a notable goal, but perhaps that goal is better stated by understanding that this is a two step process – to calibrate the rock record via various chronometric techniques and from that record, discern the Earth's history. More importantly however, our goal should be to better understand the processes responsible for this historical record. Regardless, one major requirement for this calibration is correlation from locality to locality, both regionally and globally. One of the most ubiquitous approaches to correlation is the use of the international geologic time scale, and therefore any discussion of Earth history calibration must include discussion of the geologic time scale and more importantly, the development of a highly resolved time scale in terms of radiometric ages and the calibration of this time scale to other chronometers. For over 25 years, the International Commission of Stratigraphy (ICS) has been developing a standard, international geologic time scale. The ICS has been charged by the IUGS to complete the task of defining all stage and system boundaries by 2008. It is now time to increase discussion of what the "completed" geologic time scale will be used for, and therefore, what is necessary to make it an even more useful tool. In essence, we are talking about a community-based system for the calibration and continued refinement of the geologic time scale. One critical need is to develop a platform or system to help link detailed data for existing or proposed stratotype, reference, and other key stratigraphic sections and all the data associated with them. Since our goal is a more highly refined time scale that goes beyond what the global

time scale presently provides, these "other key sections" become of paramount importance. It is envisioned that this will be a web-based system of linked databases (e.g., www.PaleoStrat.org, www.SedDB.org, www.Stratigraphy.net, and others). However, this data system is not only about geochronologic data or even biozonation. Neither the time scale nor the rock record can be "calibrated" unless the ages provided by radiometric and other chronometric methods are accurately registered within the complete geologic context of the stratigraphic succession from which those data are derived. This requires detailed measured sections where each such section should be characterized by precise and detailed data on lithostratigraphy, biostratigraphy (most importantly, biozones), taxonomy, stratigraphic range, litho- and biofacies, chrono-, sequence, chemo-, magneto- and cyclo-stratigraphy, and geochronology. Since many stratotype sections do not encompass a long stratigraphic range, it will be important to correlate these to longer reference sections in order to build composite sections, and both marine and terrestrial data are equally important. Key to all of this will be data reproducibility, data attribution (metadata), detailed, precise, and accurate measured sections, and well located samples (bed numbers are insufficient). Finally, so the community can assess these data, access to all of the data must be universal and easy. Tools for correlation and assessment must be provided on-line. Once built, such a system will provide significant impetus for future research on a variety of issues such as: extinction and radiation processes, global correlation, paleogeography, paleoclimatology, space-time pattern of the assembly and break-up of the supercontinents, and numerous other time-related issues of regional and global interest. The project is supported by the NSF grants EAR-ITR 0312392, EAR-ITR 0410548, EAR 0418703, and EAR-ITR 0539061.