The Geological Timescale

Global and local aspects

Marking the 2012 update of 'The Geological Time Scale', the Geological Society of Denmark and Maersk Oil hereby announces a thematic meeting with talks by two of the main editors of the time scale and representatives of the geological academia and industry in Denmark.

October 11th 17.00–19.00 (with drinks and snacks after the meeting)

University of Copenhagen, Department of Geography and Geology

- Felix Gradstein (Oslo University): Improving the geological timescale.
- Frans van Buchem (Maersk Oil): Detailed stratigraphic correlation – Does industry really need it?
- Sofie Lindström (GEUS): The Triassic–Jurassic boundary of the Danish Basin.
- Karen Dybkjær (GEUS): Identification and characterisation of the Oligocene-Miocene boundary in the North Sea Basin.
- Nicolas Thibault (University of Copenhagen): A synthetic chronostratigraphical scheme for the Maastrichtian stage.
- James Ogg (Purdue University): Geologic Time Scale 2012 - an overview.

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Felix M. Gradstein (Oslo University): Improving the Geologic Time Scale.

Arthur Holmes, the Father of the Geologic Time Scale once wrote: "*To place all the scattered pages of earth history in their proper chronological order is by no means an easy task*". Ordering these scattered and torn pages, and understanding the physical, chemical and biological processes that acted on these pages since Earth appeared and solidified requires a detailed and accurate time scale. Geologic Time Scale 2012 (GTS2012) is more detailed and more accurate than GTS2004. Calibration to linear time of the succession of events recorded in the rocks on Earth has three components: (1) the standard stratigraphic divisions and their correlation in the global rock record, (2) the means of measuring linear time or elapsed durations from the rock record, and (3) the methods of effectively joining the two scales, the stratigraphic one and the linear one.

Frans van Buchem (Maersk Oil), Paul Ventris (Maersk Oil): Detailed stratigraphic correlation – Does industry really need it?

Biostratigraphy is one of the key components in the construction of a predictive sequence stratigraphic framework, essential towards understanding the distribution and timing of the elements of a petroleum system. Siliciclastic and carbonate examples will be used to demonstrate the power of a fully integrated approach in exploration, involving biostratigraphy, chemostratigraphy, seismic stratigraphy, sedimentology, palaeo-climatic interpretation and its link to glacio-eustacy. These integrated models, and their link to the seismic data, provide the predictive foundation required for the evaluation of an area for hydrocarbon exploration and development. Clearly the answer to the question posed in the title is – yes!

Sofie Lindström (GEUS): The Triassic–Jurassic boundary of the Danish Basin

During the Late Triassic to Early Jurassic the Danish Basin was situated along the northern margin of a large epicontinental sea that covered most of northwestern Europe. The basin preserves both marine and terrestrial sections across the T-J boundary allowing high resolution correlation of both marine and terrestrial biotic and depositional events. Integration of biostratigraphy and geochemistry, primarily organic carbon isotopes, have allowed correlation with other T-J boundary successions globally. The Danish Basin data also has implications on the causal mechanisms of the end-Triassic mass extinction event and the timing of both the extinction and recovery intervals.

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Nicolas Thibault (University of Copenhagen): A synthetic chronostratigraphical scheme for the Maastrichtian stage.

Recent results on upper Campanian-Maastrichtian cyclostratigraphy, nannofossil biostratigraphy and carbon-isotope stratigraphy now allows neat correlations between the Boreal and Tropical realms. Discrepancies between the two realms in the different criteria chosen for the Campanian/Maastrichtian boundary and lower/upper Maastrichtian boundary can now be calculated with precision and new criteria can be suggested to improve the formal stratigraphy of this stage.

Karen Dybkjær (GEUS), Chris King and Emma Sheldon (GEUS): Identification and characterisation of the Oligocene-Miocene boundary in the North Sea Basin.

For the first time a combined palynological and $\delta^{13}C$-isotope study has identified the Oligocene–Miocene boundary – and thus the base of the Neogene - within the North Sea Basin. Correlating the Oligocene–Miocene boundary of the Tethyan stratotype section with the North Sea Basin is problematic using biostratigraphy alone. Factors such as differing climatic and depositional environments result in different assemblages of microfossils with only a few species in common. Combining biostratigraphy with isotope stratigraphy facilitates correlation between these far removed sections. New dinocyst, nanno - and micropalaeontological data from Frida-1 has further provided a series of bioevents and abundance variations which can be used to locate and to correlate the Oligocene–Miocene boundary within the North Sea Basin in future studies.

James Ogg (Purdue University), Felix Gradstein (Oslo University), Mark Schmitz (Boise State University) and Gabi Ogg (Purdue University): Geologic Time Scale 2012 - an overview

Earth's surface history is a complex interplay of climate, evolution and other processes framed within a geologic timescale with numerical ages. The Geologic TimeScale 2012 program involved over 60 geoscientists, including officers of most subcommissions of the International Commission on Stratigraphy, working to integrate paleontology, radio-isotopic dating, cycle stratigraphy, geochemical trends, and other stratigraphic information. This synthesis includes detailed summaries of each geologic period with full-page graphics (map, section, photos) of each GSSP (international stage boundary) and age scales derived from a re-evaluation of radio-isotopic ages (including new monitor standards for Ar-Ar) coupled with astronomical cycle tuning. Additional components are a synopsis of our state of knowledge and formal geologic subdivisions of lunar and Martian stratigraphy, a massive synthesis for Precambrian subdivisions, extensive sets of geochemical curves, and a summary of stages of humanoid evolution. Even though some periods are still lacking international agreement on all stage definitions and reliable high-precision age models, this compilation will be the reference standard for the remainder of this decade.