Outcome of the vote on Unit-Stratotype and Astrochronozone proposal

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Abstract

Last year, we submitted a dual proposal on Unit-Stratotypes and astrochronozones to the ISSC (International Subcommission on Stratigraphic Classification). The main reason for doing so was that the current Global Stratotype Section and Point (GSSP) approach leaves the unit or body of the stage undefined. At the same time, arguments against unit-stratotypes had been invalidated through the revolutionary advance in integrated high-resolution stratigraphy and astronomical dating. Combined these provide unprecedented age control and ensure continuity of sedimentary successions. We proposed that such unit- stratotypes should comprise the entire stage in an astronomically age calibrated deep-marine succession, preferably containing the GSSP. Cycles used for tuning can be formally defined as chronozones, i.e. chronostratigraphic units of either unspecified rank or of a smaller scale than the stage, and independent of the standard hierarchy of global chronostratigraphy. In this way, both the standard Geological Time Scale (GTS) as well as the Global Chronostratigraphic Scale will be brought in harmony with the significant progress made in integrated high-resolution stratigraphy and astronomical dating.

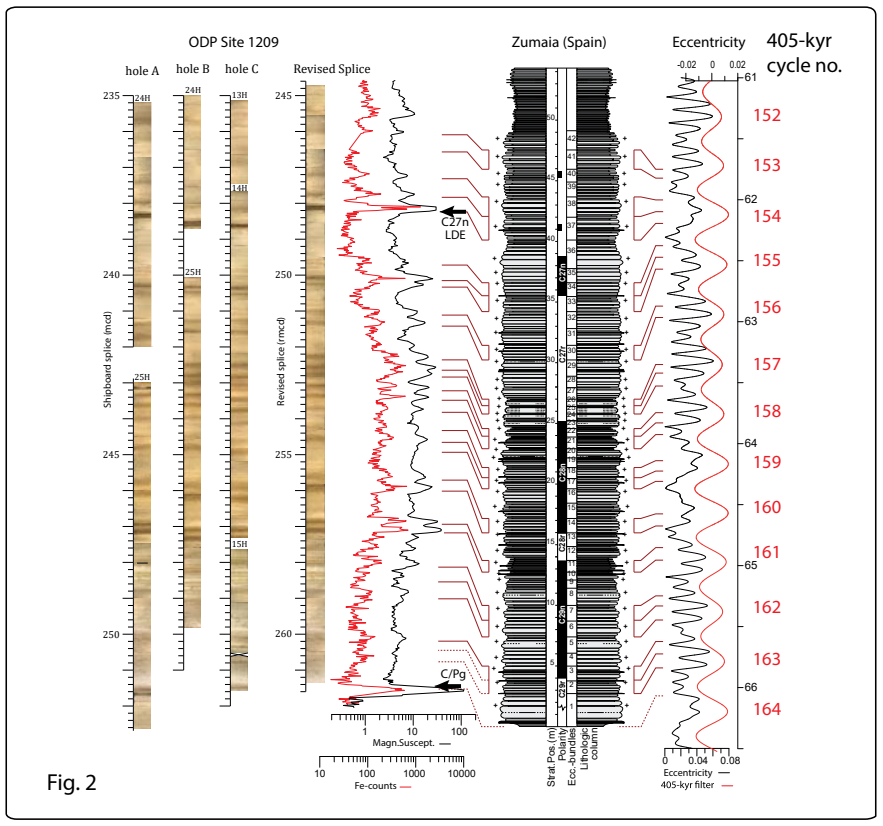

Fig. 2

Outcome of the ISSC vote

In Gradstein et al. (2012) the question was asked whether chronostratigraphy would "not be served best if suitable sedimentary sections could be identified on Earth that harbour both the complete body of rock and the upper and lower boundaries of stages in one and the same section". They state that "astrochronology invalidates arguments against unit-stratotypes", and "at the same time, it elegantly combines chronostratigraphy with geochronology". The outcome of the voting was circulated to ISSC members on April 30 and later to ICS. Unfortunately, the Unit-Stratotype proposal was declined as it received 57.14% of the votes just below the required supermajority of 60%. The Astrochronozone proposal was accepted with 64.29% of the votes. However, we did not procede with this part of the proposal separately as it is tighly linked to that of the Unit-Stratotype.

Future

As a 10-year moratorium does not apply, we aim to resubmit the proposal (Hilgen et al., 2019), although likely after Strati2019 and the publication of GTS2020, as these are expected to underpin the increasingly important role of astrochronology in building global chronostratigraphy and our standard geological time scale, and in understanding Earth history.

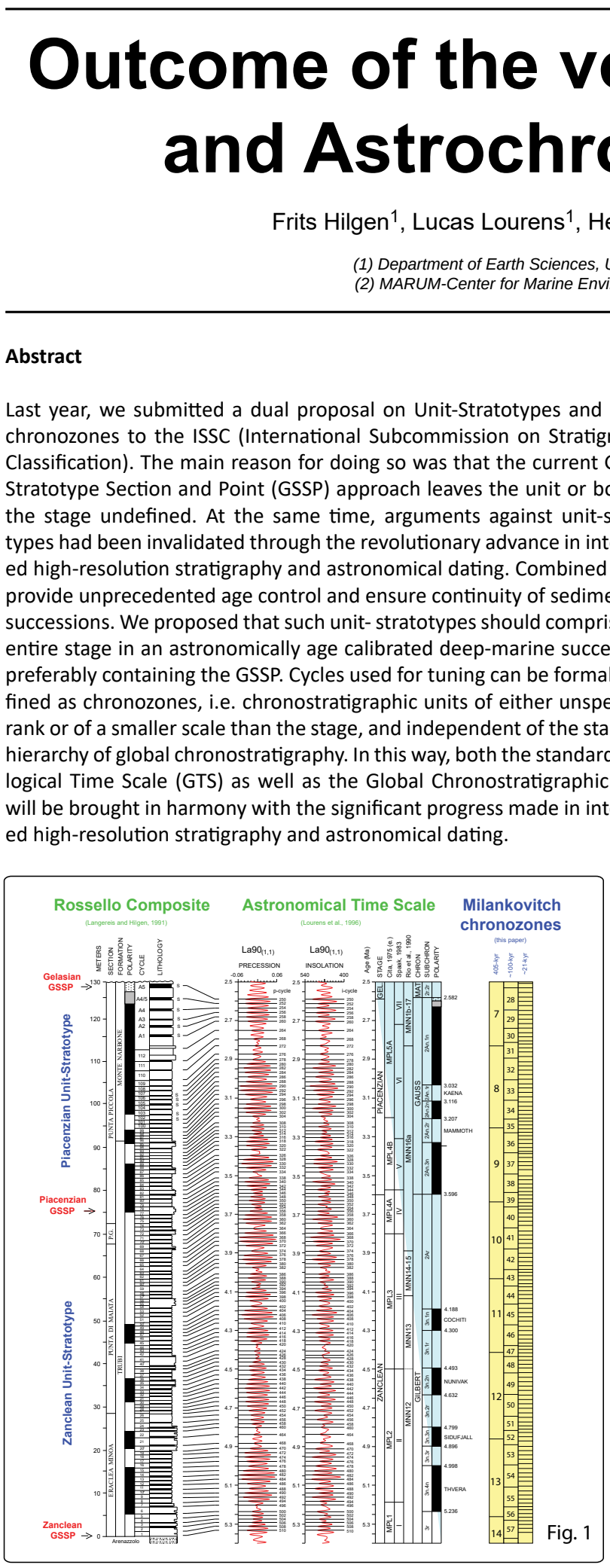

Fig. 1

Unit-stratotypes and astrochronozones

At present, only boundaries of formal chronostratigraphic units are formally defined via the standard GSSP approach of the International Commission on Stratigraphy (ICS), as boundaries best define the time interval of a chronostratigraphic unit, which is its main characteristic (e.g., Walsh et al., 2004). However, astronomical dating combined with integrated high-resolution stratigraphy increasingly underlies our GTS, asking for a re-evaluation of unit-stratotypes (Hilgen et al., 2006). Such unit-stratotypes cover the entire range of a chronostratigraphic unit in a demonstrably continuous succession. The progress paves the way for the formal definition of unit-stratotypes based on astronomically age calibrated chronozones. Clear examples of such unit-stratotypes are the Rossello Composite section for the Pliocene stages of the Zanclean and Piacenzian and, thus, for the Pliocene Series (Fig. 1) and the Zumaia section for the Danian stage (Fig. 2, Dinarès-Turell et al., 2014; Hilgen et al., 2015). In addition, deep-sea cores should be considered, as convincingly shown by the integrated stratigraphy of ODP Site 1264, covering the interval between 30 and 17 Ma (Fig. 3, Liebrand et al., 2016).

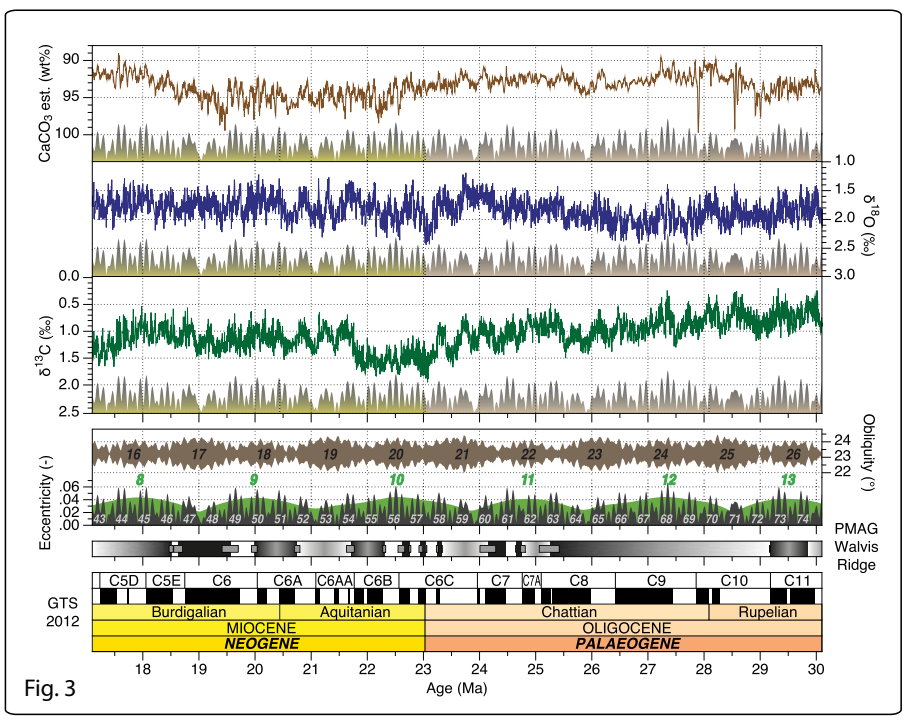

Fig. 3

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