

Integrating calcareous plankton biostratigraphy (EU-Earthtime)

Participants:

Paul N. Pearson, Cardiff University, UK (foraminifera)

Bridget S. Wade, University College London, UK (foraminifera)

Jan Backman, Stockholm University, Sweden (nannofossils)

Isabella Raffi, University of Chieti-Pescara, Italy (nannofossils)

1. Purpose of the visit;

Biostratigraphy of two groups of calcareous plankton (foraminifera and nannofossils) provides a vital backbone for the Cenozoic (last 66 million years) geological timescale and has immense practical application in academia (e.g. deep sea drilling, palaeoclimatology) and industry (e.g. hydrocarbon exploration). Indeed all of the stratotypes of the Cenozoic geological epochs depend partly on calcareous microfossils in their definition and recognition. Much progress has been made in recent years at increasing the resolution offered by this technique, including by the four participants listed above (e.g. Wade et al., 2011; Backman et al., 2012), but problems remain in 1) standardizing working practice, nomenclature etc., and 2) inter-calibrating the two biostratigraphic schemes in certain parts of the record. The purpose of the visit is to standardise approaches and develop a combined biostratigraphic scheme consistent with the most up-to-date information from recent ocean drilling cruises.

2. Description of the work carried out during the visit;

The four biostratigraphers assembled daily to discuss plans for the day's agenda including developing principles and nomenclature, progress at working through the stratigraphical column and identification of problematic intervals. Discussion of advanced correlation techniques and inter-correlation between astrochronologic and magnetostratigraphic reference frames was necessary to achieve our stated aims. We alternated between working in pairs and group discussion. Three documents were developed: two draft manuscripts and one master spreadsheet of biostratigraphic datums.

3. Description of the main results obtained;

The principles of biostratigraphy were debated extensively with a manuscript drafted and prepared (Manuscript 1) which will be circulated among the wider EARTHTIME-EU biostratigraphic community for further comment before submission for publication. We started to organize the combined calibration

and ordination of nannofossil and planktonic foraminifera using a common approach. Key sections were identified. Worked examples were produced for sites where both the nannofossil and planktonic foraminiferal biostratigraphy was conducted at high resolution. We identified parts of the record where new study / sampling is required to achieve better inter-calibration of the biostratigraphic schemes. All biozone boundary markers of the Cenozoic were individually assessed on a common scale to determine their potential and present reliability. Figures and tables were prepared for the second projected publication (Manuscript 2).

4. Future collaboration with host institution (if applicable);

All participants will continue to collaborate on the research goals. A second meeting / Workshop is proposed for Spring 2014, again as part of the EU-EARTHTIME collaboration, with the goal to work further on the integration of the nannofossil and planktonic foraminiferal biozonations and complete the second publication (Manuscript 2).

5. Projected publications / articles resulting or to result from the grant (ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant);

- Manuscript 1. Calcareous plankton biostratigraphy: Principles and nomenclature
- Manuscript 2. Cenozoic calcareous plankton biostratigraphy and biochronology: synthesis, calibrations, principles, challenges

6. Other comments (if any).

References.

Backman, J., Raffi, I., Rio, D., Fornaciari, E., and Pälike, H. 2012. Biozonation and biochronology of Miocene through Pleistocene calcareous nannofossils from low and middle latitudes. *Newsletters of Stratigraphy*, 45:221-244.

Wade, B.S., Pearson, P.N., Berggren, W.A., and Pälike, H. 2011. Review and revision of Cenozoic tropical planktonic foraminiferal biostratigraphy and calibration to the Geomagnetic Polarity and Astronomical Time Scale. *Earth Science Reviews*, 104: 111-142.