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Editorial

Foreword for the thematic volume of 12th INA. Recent advances in living coccolithophores and calcareous nannofossil studies

In modern oceans, calcareous nannoplankton (< 63 μm) is mainly represented by coccolithophores (calcifying, unicellular marine algae). Together with calcareous dinoflagellates, they play a major role in the biological carbon pump and in the carbonate counter-pump (Rost and Riebesell, 2004). Fossil coccoliths are commonly and continuously recorded in sediments since the Late Triassic (Bown, 1987), along with *incertae sedis* that can massively occur in rocks (schizospheres, nannoconids, discoasters, sphenoliths, etc.).

Scientific advances on calcareous nannoplankton ecology and physiology, and nannofossil records are presented during the biennial meeting of the International Nannoplankton Association (INA). The last INA meeting was held in the University of Lyon from the 7th to 13th September 2008. About 120 participants from 28 countries and five continents attended this meeting (Figs. 1 and 2). During the three days of talks and poster presentations, new insights into coccolithophore (paleo)oceanography and their contribution to pelagic sedimentation processes were presented as well as new developments in biostratigraphy. Two other challenging sessions were: coccolithophore biology (genomic, physiology and ecology) and coccolithophores in a high-CO_2 world. These two sessions were introduced by three invited keynote speakers: Prof. Colin Brownlee reported on the physiological mechanisms involved in the coccolithophore calcification; Drs. Ross Rickaby and Gerald Langer presented results and modeling on coccolithophore response to the ongoing ocean acidification. The INA12 scientific committee attributed the INA Foundation awards to six Ph.D. students (Cristina Emanuela Casellato, talk; Mariem Saavedra-Pellitero, talk; Guillaume Suan, talk; Alejandra Meja-Molina, poster; Letizia Reggiani, poster; Damien Carcel, poster) for the quality of their presentations.

During the three days of postconference fieldtrip in the Vocontian basin (southeast France), stimulating discussions occurred about the contribution of calcareous nannofossils to the origin of limestone-marl alternations, as well as on the importance of nannofossils as indicators useful in deciphering environmental conditions during anoxic events. The fieldtrip visited some Cretaceous stratotype sections (for instance La Charce, the proposed Global Stratotype Section and Point for the base of the Hauterivian; Reboulet, 2008) where nannofossil biostratigraphy represents an important contribution to improve age resolution.

This thematic issue arises from some of the contributions presented during the meeting. The 12 papers published in this issue are a good sample of the diversity of topics discussed during this event, and reflect the richness in terms of methods and studied time intervals. Six papers deal with different applications of high-resolution nannofossil biostratigraphy. **Di Stefano and Sturiale**, **Fernando et al.** and **Tiraboschi and Erba** show how nannobiostratigraphy can improve the age control of stage boundaries, namely at the Miocene/Pliocene, Cenomanian/Turonian and Bajocian/Bathonian. The last study is also important for the definition of the Bas Auran section GSSP (SE France). The papers of **Perilli et al.** and **Reggiani et al.** also improve the nannobiostratigraphy for the Lower Jurassic, allowing a good calibration to ammonite biohorizons (Perilli et al.) or correlation between proximal and distal sections in the same basin (Reggiani et al.). This last paper also shows a different distribution of nannofossil taxa in unstable, proximal settings with respect to areas distal from emerged lands. The contribution of **Waga et al.** is important to increase our knowledge about stratigraphy in a region that represents one of the most important oil and gas exploration areas, the northwestern part of the Black Sea region, which is still poorly known by the international community. The regional stages defined there are correlated to the international stages thanks to nannofossil stratigraphy.

Coccolith biometry has been analysed with two different goals. **Triantaphyllou et al.** studied extant *Emiliania huxleyi* in order to understand if the coccolith calcification is ecophenotypic or genotypic. **Tiraboschi and Erba** studied the pool *Watznaueria communis*-*W. barnesiae* and they identified *Watznaueria* aff. *communis*, intermediate between the two former species. They interpret the succession in time of these three species as an evolutionary trend. Previous works related *W. barnesiae* to *W. fossacincta*: Lees et al. (2004, 2006) consider these two species as being the end-members of a

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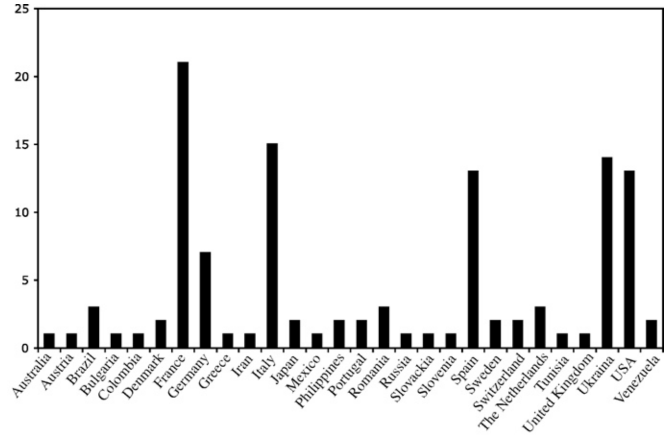

Fig. 1. INA12 demographics.

morphological continuum, and Bornemann and Mutterlose (2006), on the basis on biometric studies, recommend that *W. barnesiae* and *W. fossacincta* should not be distinguished at the species level. However, the first occurrence (FO) of *W. fossacincta* is earlier than the FO of *W. communis* (Mattioli and Erba, 1999). The results of Tiraboschi and Erba demonstrate that further studies are still needed to clarify the taxonomy within the *Watznaueria* genus.

Very informative data were obtained from the combined study of nannofossils and foraminifers (**Incarbona et al., Lozar et al.**) in the Mediterranean area. This integration permits to describe in detail the transition from interglacial to glacial conditions during the last climatic cycle (Incarbona et al.), and paleoenvironmental events during a major perturbation in the geological record: the Messinian Crisis (Lozar et al.).

Alvarez et al. and **Saavedra et al.** focused on the Pacific area and studied, respectively, two ODP sites covering the last

Fig. 2. Attendees in the INA12 Meeting at the main entrance of Darwin building (University Lyon 1), where sessions took place in September 2008. **1**. Alicia Kahn; **2**. Richard Howe; **3**. Channarayapattana Prabhu; **4**. Rakia Mechmeche; **5**. Giuliana Villa; **6**. Svetlana Mizintseva; **7**. Allan Fernando; **8**. Kyoko Hagino; **9**. Jeremy Young; **10**. Patrizia Ziveri; **11**. Agata Di Stefano; **12**. Alyssa Peleo-Alampey; **13**. Mara Cortès; **14**. Elisabetta Erba; **15**. Cristina Emanuela Casellato; **16**. Bianca De Bernardi; **17**. Mariem Saavedra-Pellitero; **18**. Sandra-Milena Restrepo; **19**. Anne-Marie Bellegeer; **20**. Joanna Cubillos; **21**. Jacmira Rosa Ramirez; **22**. Monique Bonnemaison; **23**. Lucio Tokutake; **24**. David Bord; **25**. David Rutledge; **26**. Eleonora Bolla; **27**. Simon Cole; **28**. Christian Linnert; **29**. Olga Rodriguez; **30**. Maria del Carmen Alvarez; **31**. Elena Colmenero-Hildago; **32**. Sandra Herrmann; **33**. Alejandra Meja-Molina; **34**. Mihaela Melinte-Dobrinescu; **35**. Angela Fraguas; **36**. Emanuela Mattioli; **37**. Lia Auliaherliaty; **38**. Margarita Buitrago-Reina; **39**. Kristalina Stoikova; **40**. Babette Boekel; **41**. Christina Fink; **42**. Letizia Reggiani; **43**. Shirley Van Heck; **44**. Gioconda Sturiale; **45**. Fatemeh Hadavi; **46**. Silvia Gardin; **47**. José-Abel Florès; **48**. Kevin Cooper; **49**. Francesca Lozar; **50**. Gatsby-Emperatriz Lopéz-Otalvaro; **51**. Simonetta Monechi; **52**. Emma Sheldon; **53**. Jean Self-Trail; **54**. Jackie Lees; **55**. Tom Dunkley Jones; **56**. Jorijntje Henderiks; **57**. Andrea Fiorentino; **58**. Mario Cachao; **59**. Chiara Fioroni; **60**. Claudia Lupi; **61**. Lluïsa Cros; **62**. Michael Styzen; **63**. Andrew Bowmann; **64**. Laura Pea; **65**. Stjepan Coric; **66**. Katharina Stolz; **67**. Karl-Heintz Baumann; **68**. Harald Andruleit; **69**. Fabienne Giraud; **70**. Martine Couapel; **71**. Carmen Chira; **72**. Frédéric Ricciardi; **73**. Bernard Pittet; **74**. Damien Carcel; **75**. Woody Wise; **76**. Nicolas Thibault; **77**. Sorry, but we could not identify this person; **78**. Dennis Daniel Waga; **79**. Alessandro Incarbona; **80**. Teodora Blaj; **81**. Seirin Shimabukuro; **82**. George Yordanov; **83**. Cleber Alves; **84**. Milos Bartol; **85**. Ramona Balc; **86**. Eric De Kaenel; **87**. Sebastian Meier; **88**. Richard Jordan; **89**. Luc Beaufort; **90**. Baptiste Sucheras-Marx; **91**. Guillaume Suan; **92**. Julien Plancq; **93**. Sergio Bonomo; **94**. David Jutson; **95**. Paul Bown; **96**. Mitch Covington; **97**. Jeremy Gould; **98**. Liam Gallagher; **99**. Philippe Fortin; **100**. James Bergen; **101**. Matt Hampton; **102**. Sudeep Kanungo (partly hidden). And also (not in the photo): Mahadi Bendif, Jamie Bennet, Colin Brownlee, Mascha Dedert, Larisa Galovina, Vincent Grossi, Eva Halasova, Gerald Langer, Ian Probert, Lianou Vassiliki.

800 kyrs and a suite of core-top sediment samples. Alvarez et al. report on coccolithophore assemblages as a clue to understand paleoenvironmental conditions in the two most significant (paleo)upwelling zones in the tropical and equatorial Pacific. Saavedra et al. present a detailed frame of coccolithophore biogeography in the equatorial and southeastern Pacific.

Nowadays, an increasing number of studies focuses on geochemical and isotopic analysis on isolated fractions of coccoliths. **Fink et al.** report on Sr/Ca-ratios, $\delta^{13}C$ and $\delta^{18}O$ of coccolith-enriched fractions in surface sediment samples from the South Atlantic, allowing the authors to discuss surface water productivity and temperature. This approach is very promising in paleoceanographic studies, even if coccolith isolation techniques may be improved in the future.

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