

Luc BEAUFORT, Born 1962

Address:

CEREGE

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Professional Experience

Director of Research, CNRS, CEREGE, Aix-en-Provence

2015–Present: Director of Research (1st Class)

2002–2015: Director of Research (2nd Class)

1996–2002: Researcher, CNRS, CEREGE, Aix-en-Provence

1991–1996: Researcher, CNRS, Laboratoire de Géologie du Quaternaire, Marseille

Visiting Appointments

1987–1990 (40 months): Visiting Student, Woods Hole Oceanographic Institution, USA

1998–1999 (12 months): Visiting Assistant Professor, Oregon State University, Corvallis, USA

2006 (1 month) Visiting Assistant Professor, Okkaido University, Sapporo, Japon

2007-2012 Visiting Professor (5 months) at Tongji University, Shanghai, China

2016-2107 Professor (5 months) at Chinese Academy of Science, Yenta (CAS President's International Fellowship (PIFI Fellow))

Education

- **2001:** Habilitation à Diriger des Recherches (HDR), Aix-Marseille III University
Thesis: Dynamics of Pleistocene Primary Productivity in Tropical Oceans
Specialization: Environmental Geosciences
- **1991:** PhD, Université Lyon I
Thesis: Dynamics of Neogene Calcareous Nannoplankton: Climatic and Oceanographic Implications - Supervision Marie-Pierre Aubry
Specialization: Paleontology
- **1987:** DEA (MSc), SEDIPAL, Université Lyon I
- **1986:** BSc in Geology, Université Lyon I

Honors & Awards

- **2024:** Union Fellow, American Geophysical Union (AGU)
- **2024:** EGU Outstanding Editor Award (Bronze)
- **2017:** ECORD Distinguished Lecturer
- **2017:** President's International Fellowship Initiative (PIFI), Chinese Academy of Science
- **1998:** NATO Fellowship

Research Interests

- Phytoplankton Ecology & Paleoecology
- Marine Geology
- Paleoceanography
- AI in Microorganism Recognition

Career Research Highlights

My contribution to Biogeosciences encompasses the fields of paleoceanography (e.g. *dynamics of past ENSO and monsoon revealing the importance of precession*); biologic evolution (e.g. *first demonstrations of the role of orbital cycles on phytoplankton evolution*), and plankton ecology (e.g. *quantifications of the effect of ocean acidification and seasonality on the morphological characteristics of certain species*).

Over the past three decades, I have been involved in exploring the environmental history of Neogene-Quaternary marine sequences, primarily in the tropical Pacific and Indian Oceans. Among the seven international pelagic oceanographic cruises I have led, I would like to highlight IMAGES 3 and 13, which recovered key cores from the Western Pacific Warm Pool (WPWP), which was then unexplored in terms of paleoceanography. These cores have enabled a better assessment of WPWP paleoclimatology and revealed of its importance in global climates.

I was involved in pioneering efforts and developments of several new analytical approaches, (e.g. 1- *Use of Artificial Neural Network in microfossil species recognition since the mid 90's* – 2- *invention and further improvement of optical methods for measuring calcite thickness and mass*)

I contributed, as team leader, to the construction of a large micropaleontology laboratory, pioneer in automated microscopy and species recognition of different groups (coccolithophores, radiolarians, pollens, diatoms and foraminifera) by artificial intelligence.

Key Roles & Academic Service

CEREGE

- **Present–2017:** Scientific Head, Automated Microscopy Platform, CEREGE
- **2017-2006 :** Team Leader of the « Bioindicateurs et Paléoécologie » team (CEREGE)
- **2006-2001 :** Head of the Climatology and Paleoecology theme (CEREGE)
- **2001-1996 :** Team leader of the Bioindicateurs CEREGE
- **2017-1996 :** Member of the different Scientific Comities at CEREGE
- **2022-2017 :** Member of Laboratory Conceal

National

- **2024–2020:** Evaluation Committee, IRD, CSS1
- **2023–2019:** Co-President, "Carottage" Working Group, French Oceanographic Fleet
- **2019–2017:** ANR Scientific Evaluation Committee CES01
- **2017–1997:** Head, Bioindicators & Paleoecology Team, CEREGE
- **2019-2015 :** Evaluation Committee, CNU Section 36
- **2016-2013:** Member of the conseil of the Observatoire de Lyon
- **2012 :** Comité AERES: UMR 7093 (LOV) et UMS 829 (OOV)
- **2011-2006:** LEFE Comity (INSU)
- **2008 :** Comité AERES: UMR 8157 (Géosystèmes),
- **2007-2003:** Commission Nationale Géosciences Marines (IFREMER)
- **2007-2003:** Comité scientifique ECLIPSE(II)
- **2006-1999 :** ECLIPSE (CNRS)
- **2006-2002 :** Commission Spécialisé Sciences de la Terre (CSST)
- **2002-1999 :** Ad'hoc Océan (INSU)
- **1999-1997 :** VARIANTE (INSU)

International

- **2006-2002:** IMAGES Representative for France
- **2019-2015:** Member of evaluation comity of Research Council of Norway (KLIMAFORSK)

Editing / conference

- **Present -2006:** Associate Editor at Climate of the Past (EGU - Copernicus)
- **2022:** Organizer, 18th International Conference on Calcareous Nannoplankton, Avignon

Publication Metrics

- **115** peer-reviewed publications indexed in WoS
- **H-Index:** 45 (WoS) / 55 (Google Scholar)
- **Citations:** 9,881 (Google Scholar)
- **i10-index:** 107

Selected Publications

- **Beaufort, L., et al.** (2022). Cyclic evolution of phytoplankton forced by changes in tropical seasonality. *Nature*, 601(7891), 79-84.
- **Beaufort, L., et al.** (2011). Sensitivity of coccolithophores to carbonate chemistry and ocean acidification. *Nature*, 476, 80-84.
- **Beaufort, L., et al.** (2001). ENSO-like forcing on Oceanic Primary Production during the late Pleistocene. *Science*, 293, 2440-2444.
- **Beaufort, L., et al.** (1997). Insolation cycles as a major control of Equatorial Indian Ocean primary production. *Science*, 278, 1451-1454.

Supervision of PhD Students

- **2024–Present:** Josué Dauvié, *Coccolithophore Calcification & $\delta^{13}C$ Dynamics*
- **2022–Present:** Guillaume Lassus (CIFRE), *AI & Microfluidics in Coccolithophore Sorting*
- **2020–Present :** Majd Habib** (France/Lebanon – Ocean acidification in the Mediterranean Sea)
- **2017:** Martin Tetard, *Paleo-Oxygenation Dynamics in the Pacific (now at GNS Science NZ)*
- **2017 :** Benjamin Bourel, Neural Network pollens (now postdoc LIRMM, Montpellier);
- **2014:** Nicolas Barbarin Neural Network, coccoliths (Now at TOTAL E&P); Fabienne
- **2014 :** Fabienne Regoli Foraminifera Mg/Ca Warm Pool;
- **2013 :** Xiang Su (2013) with Tongji University) Paleocoenography South China Sea (now at South China Sea Institute of Oceanology, Guangzhou, China);
- **2008:** Michael Grelaud, *Multi-Scale Climate Variability from the Late Pleistocene to Present (Now at Universitat Autònoma de Barcelona, Spain)*
- **2001:** Thibault de Garidel-Thoron, *Climatic dynamics of the Western Equatorial Pacific Ocean during the Late Pleistocene (now at CNRS-CEREGE, France)*
- **1997:** Denis Dollfus, *Recognition of Natural Forms Using Artificial Neural Networks (now at London Stock Exchange Group)*

Professional Contributions

- **Thesis Defense Jury:** Participated in 56 thesis defenses (PhDs and HDRs).

Sea Experience

Led or participated in 16 oceanographic campaigns, 8 as co-chief scientist.

- SEYMAMA, RV Marion-Dufresne, Indien Ocean, 1990.

- ODP Leg 145, RV Joides Resolution, North Pacific, 1993 (nannofossil specialist).
- SEDORQUA, RV Suroît, Tropical Atlantic Ocean, 1994.
- IMAGES I, Marion-Dufresne, North Atlantic Ocean, 1995.
- MOZAPHARE, Marion-Dufresne, Indien Ocean, 1996 (Assistant Chief scientist)
- IMAGES III, IPHIS- Marion-Dufresne, Western Pacific, 1997 (Chief scientist)
- IMAGES IV, WEPEMA- Marion-Dufresne, Western Pacific, 1998 (co-Chief scientist)
- IMAGES VIII, MONA- Marion-Dufresne, Eastern Pacific, 2002 (Chief scientist)
- IMAGES XIII, PECTEN- Marion-Dufresne, Western Pacific, 2005 (Chief scientist)
- DRAKE 2009, Polarstern, Drake passage, (living coccolithophores)
- PACENPAL, SONNE, Southern Pacific, 2010 (Chief scientist)
- MONOPOL, Marion-Dufresne, Indien Ocean, 2012 (co-Chief scientist)
- CARCALHIS Atalante, December 2015 Caribbean Sea (Chief scientist).
- IODP Exp 363, RV Joides Resolution, Equ. Pacific, 2016 (nannofossil specialist).
- SCRATCH, -Marion-Dufresne, Equ. Indian Ocean, 2021.
- MASC, Marion-Dufresne, Equ. Indian Ocean, 2024 (co-Chief scientist)

Costal cruises for phytoplankton collection often as chief scientist: Numerous - One day trip 6 time a year during the last 12 years in the Gulf of Lion (CALHIMED) on board the Antédon II, in Peru (4 time one-week campaigns, with IMARPE), Papua New Guinea and Mexico...

Recent Grants awarded

- ANR:
 - ITCH (Bolton - PI Work Package) 2023-2026
 - MIOCARB (Sucheras-Marx) 2019-2024
 - MedSens (Tachikawa) 2019-2022
 - CALHIS (Beaufort) 2012-2016,
 - ELPASO (Braconnot, PI Work Package) 2010-2014
 - MONOPOLE (Bassinot)2011-2016
 - FIRST (de Garidel-Thoron) 2015-2018
 - iMONSOON (Bolton) 2016-2019
- INSU- Tellus : SCRATCH (Beaufort) 2022
- Fondation pour Recherche sur la Biodiversité /Ministère de la transition écologique et solidaire – Programme sur l’Acidification Océanique :
 - COCCACE – 2017-2020 (Beaufort)
- Belmont Forum/JPI-Climate – PACMEDY (Braconnot - PI Work Package)
- IODP France : - Exp363 (Tetard -PI Post doctorat) – 2018-2020
- Industry :
 - TOTAL spa– Automated Nannofossils- (Beaufort) (2011-2020)

Publications (Organized by speciality : Orbital cycles (7 p.), Paleoceanography (82 p.), Ocean acidification (5 p), Phytoplankton ecology (15 p), Artificial Intelligence (8p), Methodology (7 p)

1-Orbital cycles,

Beaufort, L. and A. C. Sarr (2024). "Eccentricity forcing on tropical ocean seasonality." *Clim. Past* 20(6): 1283-1301.

Beaufort, L., L, C. Bolton, A.-C. Sarr, B. Sucheras-Marx, Y. Rosenthal, Y. Donnadieu, N. Barbarin, S. Bova, P. Cornuault, Y. Gally, E. Gray, J. C. Mazur and M. Tetard (2022). "Cyclic evolution of phytoplankton forced by changes in tropical seasonality." *Nature* 601(1): 79–84.

- Beaufort, L., Y. Lancelot, P. Camberlin, O. Cayre, E. Vincent, F. Bassinot and L. Labeyrie (1997). "Insolation cycles as a major control of the Equatorial Indian Ocean primary production." *Science* 278: 1451-1454.
- Beaufort, L. (1994). "Climatic importance of the modulation of the 100 kyr cycle inferred from 16 m.y. long Miocene records." *Paleoceanogr.* 9(6): 821-834.
- Beaufort, L. (2007). Precession and ENSO-like variability in the Equatorial Indo-Pacific Ocean. Global climate change and response of carbon cycle in the equatorial Pacific and Indian oceans and adjacent landmasses. H. Kawahata and Y. Awaya. Amsterdam, Elsevier. Elsevier Oceanography Series, Vol. 73: 283-304.
- Beaufort, L., F. C. Bassinot and E. Vincent (1999). Primary production response to orbitally induced variations of the Southern Oscillation in the Equatorial Indian Ocean. *Reconstructing Ocean History : a window into the future.* F. Abrantes and A. C. Mix. New York, Kluwer Academic/Plenum Publisher: 245-272.
- Giraud, F., L. Beaufort, L. and P. Cotillon (1995). "Periodicities of carbonate cycles in the Valanginian of the Vocontian Trough: a strong obliquity control." *The Geological Society, London, Special Publications* 85(1): 143--164.

2-Paleoceanography

- Aiello, I. W., L. Beaufort, L. T. Goldhammer, V. B. Heuer, K.-U. Hinrichs and M. Zabel (2020). "Anatomy of a 'suspended' seafloor in the dense brine waters of the deep hypersaline Urania Basin." *Deep Sea Research Part II: Topical Studies in Oceanography* 171: 104626.
- Aubry, M. P., D. Bord, L. Beaufort, A. Kahn and S. Boyd (2005). "Trends in size changes in the coccolithophorids, calcareous nannoplankton, during the Mesozoic: A pilot study." *Micropaleontology* 51(4): 309-318.
- Barron, J. A., I. A. Basov, L. Beaufort and e. al. (1995). Biostratigraphic and magnetostratigraphic summary. *Proc. ODP, Scient. Results*, 145. D. K. Rea, I. A. Basov and e. al. College Station, TX, Ocean Drilling Program. 145: 559-576.
- Bassinot, F. C., L. Beaufort, E. Vincent and L. Labeyrie (1997). "Changes in the dynamics of western equatorial Atlantic surface currents and biogenic productivity at the "mid-pleistocene revolution" (~930 ka)." *Proceedings of the Ocean Drilling Program*, 154: 269-284.
- Bassinot, F. C., L. Beaufort, E. Vincent, L. D. Labeyrie, F. Rostek, P. J. Müller, X. Quidelleur and Y. Lancelot (1994). "Coarse fraction fluctuations in pelagic carbonate sediments from the tropical Indian Ocean : a 1500 kyr record of carbonate dissolution." *Paleoceanogr.* 9(4): 579-600.
- Baturin, G. N., I. O. Murdmaa, L. Beaufort and G. N. Alekhina (2016). "Comparative geochemistry of quaternary carbonaceous sediments from the continental slope of the Baja California and the Miocene Monterey formation." *Lithology and Mineral Resources* 51(2): 93-106.
- Beaufort, L. (1992). "Paleoceanographic implications of a 17-M.Y. long record of high-latitude Miocene calcareous nannoplankton fluctuations." *Proc. ODP. Sci. Res.* 120: 539-549.
- Beaufort, L. and Aubry (1990). "Fluctuations in the composition of late Miocene calcareous nannofossil assemblages as a response to orbital forcing." *Paleoceanogr.* 5(6): 845-865.
- Beaufort, L., L. and M.-P. Aubry (1992). Paleoceanographic implications of a 17-my long record of high-latitude Miocene calcareous nannoplankton fluctuations. *Proceedings of the Ocean Drilling Program, Scientific Results*. 130: 539--549.
- Beaufort, L., T. Garidel-Thoron, De, B. Linsley, D. Oppo and N. Buchet (2003). "Biomass burning and oceanic primary production estimates in the Sulu Sea area over the last 380 kyr and the East Asian monsoon dynamics." *Marine Geology* 201(1): 53–65.

- Beaufort, L., L and M. Grelaud (2017). "A 2700-year record of ENSO and PDO variability from the Californian margin based on coccolithophore assemblages and calcification." *Progress in Earth and Planetary Science* 4(1).
- Beaufort, L. (1996). "Dynamics of the monsoon in the Equatorial Indian Ocean over the last 260,000 years." *Quatern. Intern.* 31: 13-18.
- Beaufort, L., T. de Garidel-Thoron, B. Linsley, D. Oppo and N. Buchet (2003). "Biomass Burning and Oceanic Primary Production Estimates in the Sulu Sea Over the Last 380 kyr and the East Asian Monsoon Dynamics." *Mar. Geol.* 201(1-3): 53-65.
- Beaufort, L., T. de Garidel-Thoron, A. C. Mix and N. G. Pisias (2001). "ENSO-like forcing on Oceanic Primary Production during the late Pleistocene." *Science* 293(5539): 2440-2444.
- Beaufort, L. and G. Olafsson (1995). Upper Cretaceous and Paleogene calcareous nannofossils from the North Pacific. *Proc. ODP, Scient. Results*, 145. D. K. Rea, I. A. Basov and e. al. College Station, TX, Ocean Drilling Program. 145: 633-638.
- Beaufort, L., L, S. van Der Kaars, F. C. Bassinot and V. Moron, C (2010). "Past dynamics of the Australian monsoon: precession, phase and links to the global monsoon concept." *Climate of the Past* 6: 695 - 706.
- Bentaleb, I., M. Fontugne and L. Beaufort (2002). "Long-chain alkenones and Uk'37 variability along a south-north transect in the Western Pacific Ocean." *Glob. Planetar. Chang.* 34: 173-183.
- Blanchet, C., N. Thouveny, L. Vidal, G. Leduc, K. Tachikawa, E. Bard and L. Beaufort (2007). "Terrigenous input response to glacial/interglacial climatic variations over southern Baja California: a rock magnetic approach." *Quaternary Science Reviews* 26: 3118–3133.
- Bord, D., A. Kahn, S. Boyd, M. Aubry and Beaufort, L.(2005). "Trends in size changes in the coccolithophorids, calcareous nannoplankton, during the Mesozoic: A pilot study." *Micropaleontology* 51(4): 309-318.
- Bertrand, P., G. Shimmield, P. Martinez, F. Grousset, F. Jorissen, M. Paterne, C. Pujol, I. Bouloubassi, P. Buat Menard, J.-P. Peypouquet, L. Beaufort, M.-A. Sicre, E. Lallier-Verges, J. M. Foster and Y. Ternois (1996). "The glacial ocean productivity hypothesis: The importance of regional temporal and spatial studies." *Marine Geology* 130(1-2): 1-9.
- Blanchet, C. L., N. Thouveny, L. Vidal, G. Leduc, K. Tachikawa, E. Bard and L. Beaufort, L (2007). "Terrigenous input response to glacial/interglacial climatic variations over southern Baja California: a rock magnetic approach." *Quaternary Science Reviews* 26(25-28): 3118-3133.
- Bolliet, T., A. Holbourn, W. Kuhnt, C. Laj, C. Kissel, L. Beaufort, L, M. Kienast, N. Andersen and D. Garbe-Schoenberg (2011). "Mindanao Dome variability over the last 160 kyr: Episodic glacial cooling of the West Pacific Warm Pool." *Paleoceanography* 26(1): PA1208.
- Cayre, O., L. Beaufort, L and E. Vincent (1999). "Paleoproductivity in the Equatorial Indian Ocean for the last 260,000 yr: a transfer function based on planktonic foraminifera." *Quaternary Science Reviews* 18(6): 839--857.
- Chen, M., L. Beaufort and S. S. P. I. I.-. Iphis (1998). "Exploring quaternary variability of the east Asia monsoon, Kuroshio Current, and western Pacific warm pool systems: High-resolution investigations of paleoceanography from the IMAGES III (MD106) IPHIS cruise." *Terrestrial Atmospheric and Oceanic Sciences* 9(1): 129-142.
- Chivas, A., A. García, S. van Der Kaars, M. Couapel, S. Holt, J. Reeves, D. Wheeler, A. Switzer, C. Murray-Wallace, D. Banerjee, D. Price, S. Wang, G. Pearson, N. T. Edgar, L. Beaufort, L, P. de Deckker, E. Lawson and C. B. Cecil (2001). "Sea-level and environmental changes since the last interglacial in the Gulf of Carpentaria, Australia: an overview." *Quaternary International* 83-85: 19-46.
- Dannenmann, S., B. Linsley, D. Oppo, Y. Rosenthal and L. Beaufort (2003). "East Asian monsoon forcing of suborbital variability in the Sulu Sea during Marine Isotope Stage 3: Link to Northern Hemisphere climate." *Geochemistry, Geophysics, Geosystems* 4.

- Duchamp-Alphonse, S., G. Siani, E. Michel, L. Beaufort, L. Y. Gally and S. Jaccard (2018). "Enhanced ocean-atmosphere carbon partitioning via the carbonate counter pump during the last deglacial." *Nature Communications* 9: 2396.
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- Fraser, N., W. Kuhnt, A. Holbourn, T. Bolliet, N. Andersen, T. Blanz and L. Beaufort, L (2014). "Precipitation variability within the West Pacific Warm Pool over the past 120ka: Evidence from the Davao Gulf, southern Philippines." *Paleoceanography* 29(11): 1094-1110.
- Garidel-Thoron T. -de, Y. Rosenthal, F. Bassinot and L. Beaufort, L (2005). "Stable sea surface temperatures in the western Pacific warm pool over the past 1.75 million years." *Nature* 433(7023): 294-298.
- Garidel-Thoron, T., De, L. Beaufort, F. Bassinot and P. Henry (2004). "Evidence for large methane releases to the atmosphere from deep-sea gas-hydrate dissociation during the last glacial episode." *Proceedings of the National Academy of Sciences of the United States of America* 101(25): 9187-9192.
- Garidel-Thoron, T., De, L. Beaufort, B. Linsley and S. Dannenmann (2001). "Millennial-scale dynamics of the East Asian winter monsoon during the last 200,000 years." *Paleoceanography* 16(5): 491-502.
- Garidel-Thoron, T., Y. Rosenthal, L. Beaufort, L, E. Bard, C. Sonzogni and A. C. Mix (2007). "A multiproxy assessment of the western equatorial Pacific hydrography during the last 30 kyr." *Paleoceanography* 22(3).
- Giraud, F., L. Beaufort, L and P. Cotillon (1995). "Controle astronomique de la sedimentation carbonatee dans le Cretace inferieur du Bassin vocontien (SE France)." *Bulletin de la Société Géologique de France* 166(4): 409--421.
- Giraud, F., L. Beaufort and P. Cotillon (1995). "ASTRONOMICAL CONTROL OF CARBONATE RECORD IN THE LOWER CRETACEOUS OF THE VOCONTIAN BASIN (SE FRANCE)." *Bulletin de la Société Géologique de France* 166(4): 409-421.
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- Leduc, G., L. Vidal, K. Tachikawa, F. Rostek, C. Sonzogni, L. Beaufort, L and E. Bard (2007). "Moisture transport across Central America as a positive feedback on abrupt climatic changes." *Nature* 445(7130): 908-911.
- Lupi, C., M. Bordiga, R. Sacchi, P. Galinetto, L. Beaufort, L and M. Cobianchi (2016). "Do sample preparation techniques affect the relative abundance of *Florispheera profunda*?" *Marine Micropaleontology* 127: 42-49.
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- Ohkushi, K., J. P. Kennett, C. M. Zeleski, S. E. Moffitt, T. M. Hill, C. Robert, Robert, L. Beaufort and R. J. Behl (2013). "Quantified intermediate water oxygenation history of the NE Pacific: A new benthic foraminiferal record from Santa Barbara basin." *Paleoceanography* 28(3): 453-467.
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- Phelps, S., R. H. Stoll, M. C. Bolton, L. Beaufort, L and P. Polissar, J (2021). "Controls on Alkenone Carbon Isotope Fractionation in the Modern Ocean." *Geochemistry, Geophysics, Geosystems* 22(12): e2021GC009658.
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