Dr Fanny Monteiro
MSc (ENS Lyon, Paris 6), PhD (MIT)

Senior Lecturer

Area of research

Linking marine ecosystem, biogeochemical cycles and climate

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Summary

I look at what drives marine ecosystem, biogeochemical cycles and climate to interact. I am interested in particular in the role of marine plankton and nutrients on the carbon cycle. My work combines mathematical and numerical modelling in comparison with observations.

Recent projects have focused on understanding the controlling mechanisms for coccolithophore ecology, marine nitrogen fixation and the spread of anoxic conditions during the Oceanic Anoxic Events of the Cretaceous.

- **Diversity of coccolithophores:** I test different ecological trade-offs for a diverse population of coccolithophore to analyse the causes and consequences of diversity and calcification on the carbon cycle and climate in the global ocean.
- **Cretaceous Oceanic Anoxic Events (OAEs):** I analyse the interactions between the nutrient cycles (phosphorus, nitrogen and iron), climate and the cycling of carbon, oxygen and sulphur in an Earth System model (GENIE). In doing so, I evaluate the sensitivity of marine biogeochemistry to warming, increased stratification and decreased dissolved oxygen concentration.
- **Marine nitrogen cycle:** I investigate how the marine nitrogen cycle (including nitrogen fixation, denitrification and nitrification) can regulate marine productivity and thus climate for modern (using MITgcm) and past climates (using GENIE).

  Diversity of nitrogen fixers: Using a self-assembling ecosystem model (Darwin project), I reconstruct diverse population of nitrogen fixers of the modern ocean to assess the impact of diversity on the nitrogen cycle and climate.

Biography

I moved to Bristol in 2009 with a Marie Curie Fellowship to work on the Oceanic Anoxic Events of the Cretaceous. With this work, I investigated the role of the nitrogen cycle, marine ecosystem and palaeogeography on paleo-biogeochemistry. I am now a NERC Research Fellow and lecturer working on exploring the relationships between plankton community structure and the carbon cycle for present and past climates.

I did my undergraduate studies in France at the Universities of Grenoble (studying Physics and Chemistry), Lyon (Planetary and Earth sciences) and Paris (Meteorology, Oceanography and Environment).

I graduated in 2009 from a Ph.D. in Climate Physics and Chemistry at MIT under the supervision of Mick Follows. During my Ph.D. I developed models of the biogeochemistry of the modern ocean to assess the distribution, ecology and regulation of nitrogen fixation, a main source of nitrogen to the marine ecosystem.

Teaching

I teach Y1 Key Concepts in Human and Physical Geography (Ocean), Y2 Spatial Modelling and Y3 Icean and Ocean in the Global Carbon Cycle.

Keywords

- Biogeochemistry modelling
- Complex ecosystem modelling
- Marine nitrogen cycle
- Marine ecosystem
- Plankton evolution and diversity
- Nitrogen fixers
- Coccolithophores
- Foraminifera
- Geochemical tracers
- Oceanic oxygen content
- Palaeoclimate
- Oceanic Anoxic Events
- Cretaceous climate

Memberships

Organisations

School of Geographical Sciences

Research groups

- Bristol Research Initiative for the Dynamic Global Environment (BRIDGE)
- Cabot Institute

Teaching

- Academic teaching staff

Links

- Personal webpage

Selected publications

- Monteiro, FM, Bach, LT, Brownlee, C, Bown, P, Rickaby, RE, Poulton, AJ, Tyrrell, T, Beaufort, L, Dutkiewicz, S, Gibbs, S, Gutowska, MA, Lee, R, Riebesell, U, Young, J & Ridgwell, A, 2016, 'Why marine phytoplankton calcify'. *Science Advances*, vol 2.
- Monteiro, FM, Pancost, RD, Ridgwell, AJ & Donnadieu, Y, 2012, 'Nutrients as the dominant control on the spread of anoxia and euxinia across the Cenomanian-Turonian oceanic anoxic event (OAE2): Model-data comparison'. *Paleoceanography*, vol 27.
- Monteiro, F, MJ, F & S, D, 2010, 'Distribution of diverse nitrogen fixers in the global ocean'. *Global Biogeochemical Cycles*, vol 24., pp. 1 - 16
- Death, RM, Wadham, JL, Monteiro, FM, Le Brocq, AM, Tranter, M, Ridgwell, AJ, Dutkiewicz, S & Raiswell, R, 2014, 'Antarctic ice sheet fertilises the Southern Ocean'. *Biogeosciences*, vol 11., pp. 2635-2643

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Recent publications

- Remmelzwaal, S, Dixon, S, Parkinson, I, Schmidt, D, Monteiro, F, Sexton, PF, Fehr, MA, Peacock, C, Donnadieu, Y & James, R, 2019, 'Investigating Ocean Deoxygenation During the PETM Through the Cr Isotopic Signature of Foraminifera'. *Paleoceanography and Paleoclimatology*, vol 34., pp. 917-929
- Grigoratou, M, Monteiro, FM, Schmidt, DN, Wilson, JD, Ward, BA & Ridgwell, A, 2019, 'A trait-based modelling approach to planktonic foraminifera ecology'. *Biogeosciences*, vol 16., pp. 1469-1492
- Grigoratou, M, Monteiro, FM, Schmidt, DN, Wilson, JD, Ward, BA & Ridgwell, A, 2018, 'A trait-based modelling approach to planktonic foraminifera ecology'. *Biogeosciences Discussions*., pp. 1-36
- Wilson, J, Monteiro, F, Schmidt, D, Ward, B & Ridgwell, A, 2018, 'Linking Marine Plankton Ecosystems and Climate: A New Modeling Approach to the Warm Early Eocene Climate'. *Paleoceanography and Paleoclimatology*.
- Ward, B, Wilson, J, Death, R, Monteiro, F, Yool, A & Ridgwell, A, 2018, 'EcoGEnIE 1.0: plankton ecology in the cGEnIE Earth system model'. *Geoscientific Model Development*, vol 11., pp. 4241-4267
- Carmichael, M, Inglis, G, Badger, M, Naafs, D, Behrooz, L, Remmelzwaal, S, Monteiro, F, Rohrssen, M, Farnsworth, A, Buss, H, Dickson, AJ, Valdes, P, Lunt, D & Pancost, R, 2017, 'Hydrological and associated biogeochemical consequences of rapid global warming during the Paleocene-Eocene Thermal Maximum'. *Global and Planetary Change*, vol 157., pp. 114-138

View complete publications list in the University of Bristol publications system

Courses

Dr Monteiro currently teaches 2 courses: