15 Early-Stage Researcher (ESR) positions are available as part of the MSCA ETN '4D-REEF'

PAST, PRESENT AND FUTURE OF TURBID REEFS IN THE CORAL TRIANGLE

We are pleased to advertise 15 Early-Stage Researcher (PhD) positions to begin in Oktober/November 2019, as part of the MSCA Innovative Training Network "Past, present and future of turbid reefs in the Coral Triangle (4D-REEF)". All the positions correspond to three or four years hiring depending on the institute, and require the enrolment in a PhD programme enhancing their career perspectives in both the academic and non-academic sector. Each ESR will crucially gain inter-sectoral experience in an individual ESR research project. In addition to their individual doctoral projects, all ESRs will benefit from an **exciting training programme** comprising an integrated curriculum of local and network wide training activities related to the development of scientific knowledge and the enhancement of transferable skills. At the core of the training programme lie the research projects conducted by the ESRs, which are enhanced by all other training events and activities the consortium provides during the project's life span.

Project Objectives

Using a variety of paleo-ecological and present-day data, 4D REEF investigates the hypothesis that turbid coastal environments provide a refuge for coral reefs in periods of warm climate. The key questions are:

1) What was the biodiversity of turbid reefs in the past and in what habitats did the reefs grow in past warmer periods of the Earth's history, and how does this compare to the present?

2) What are the environmental constraints on ecosystem functions of turbid reefs?

3) How can we use information from past reefs to better understand the future trajectories of modern coral reefs, and apply this towards reef restoration actions?

By answering these questions, we aim to understand the role of turbid reefs for the future of marine ecosystems in the Coral Triangle as they respond to anthropogenic environmental change.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Eligibility criteria

EU eligibility criteria for candidates: Candidates can be of any nationality, but in order to be eligible for the positions the following criteria apply to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidates profile

Candidates most hold a master degree in Earth and/or Life sciences or other relevant topic for the project. Specific selection criteria are indicated with the individual projects.

- Applicants can be of any nationality.

- Applicants must have an ability to understand and express themselves in both written and spoken English to a level that is sufficiently high for them to derive the full benefit from the network training.

- Applicants must be eligible to enrol on a PhD programme at the host institution (or at a designated university in case the host institution is a non-academic organisation).

Benefits

The benefits of this project for you and the future of your career are manyfold, here's a few key aspects that 4D-REEF can offer you:

- Working on the forefront of many aspects of the (paleo)ecology of turbid reefs and the environments they develop in, applying innovative techniques.

- You will be employed by the host organisation for 36 or in some cases 48 months.

- A competitive salary plus allowances. Moreover, funding is available for technical and personal skills training and participation in international research events.

- You will benefit from the designed training programme offered by the host organisation and the consortium.

- You will participate in international secondments to other organisations within the 4D-reef network and in outreach activities targeted at a wide audience.

- You will be part of an international research consortium of over > 25 researchers

Application

To apply, visit our website https://www.naturalis.nl/en/4d-reef, and go to the specific ESR profile and follow specific instructions provided. Some positions will open later than others, depending on the start date.

For further information please contact Dr Willem Renema (programme coordinator) (willem.renema@naturalis.nl) or the contact persons indicated with the positions.

| Available position | Host | Project title |
|--------------------|--|---|
| ESR 1 | University of Aveiro (Portugal) | Composition and function of sediment microbial communities in coral reef environments (will open soon) |
| ESR 2 | Naturalis Biodiversity Center (the Netherlands) | Temporal dynamics in benthic foraminifera assemblages in Holocene to modern turbid coral reefs: integrating morphological with molecular techniques |
| ESR 3 | The Natural History Museum (United Kingdom) | Composition and ecology of microgastropod assemblages in relation to reef habitat quality |
| ESR 4 | Max Planck Institute for Marine Microbiology (Germany) | Habitat structure and spatial ecology in modern turbid reefs (position already closing 26 august 2019) |
| ESR 5 | Leibniz Centre for Tropical Marine Research (Germany) | Ecological implications of shifts from hard corals to turf algae in modern turbid reefs |
| ESR 6 | University of Bristol (United Kingdom) | Modelling environmental controls on coral species distribution in the Coral Triangle |
| ESR 7 | Naturalis Biodiversity Center (the Netherlands) | Quantifying Neogene habitat variability in the Coral Triangle |
| ESR 8 | Ocean-Maps | Visualizing scientific data of the underwater in three and four dimensions |

Host institutes and sub-projects

| | GmbH (Austria) | |
|--------|--|---|
| ESR 9 | The Natural History Museum (United Kingdom) | Growth rates, bioerosion, and the diversity of reef corals |
| ESR 10 | Leibniz Centre for Tropical Marine Research (Germany) | Depositional modelling and sequence stratigraphy of greenhouse Pliocene reefs |
| ESR 11 | University of Granada (Spain) | Historical assessment of coralline algae as triggers for coral settlement |
| ESR 12 | Naturalis Biodiversity Center (the Netherlands) | Assessing current and past reef accretion rates in turbid reefs off Makassar (Sulawesi, Indonesia) |
| ESR 13 | Goethe Universität Frankfurt (Germany) | Seasonally-resolved palaeoenvironmental time-series from microsampled corals, molluscs and foraminifera |
| ESR 14 | Deltares (the Netherlands) | Using past and current reef response to physical stressors for model- based forecasting of reef distribution |
| ESR 15 | University of Bristol (United Kingdom) | Modelling climate, oceanography, and carbonate production of corals in the Pliocene |

Project title: Composition and function of sediment microbial communities in coral reef environments

Host: Laboratory for Molecular Studies of Marine Environments (LEMAM), Department of Biology & CESAM, University of Aveiro (Aveiro, Portugal)

Supervisors: Dr Daniel F. R. Cleary (University of Aveiro), Dr Newton C. M. Gomes (University of Aveiro), Prof. Nicole de Voogd (Naturalis Biodiversity Center, the Netherlands)

Marine sediment microbial communities are highly diverse and can vary at small spatial scales in heterogeneous environments. The environmental heterogeneity of the sediment depends, among other things, on micro-structure and composition (chemical and biological) and contributes to differences in nutrient cycling. Here we will use state of the art molecular technologies (DNA/RNA based analyses), field surveys and laboratory experiments (microcosms) to provide a quantitative and mechanistic understanding of how turbidity and different types of coral reef sediment (fine- and coarse-grained sediment) contribute to microbial processes and coral reef health and resilience. In addition to the above, we will predict how sediment microbial composition and function will change under future UVR and ocean acidification scenarios. Parallel to the microcosm experiments, we will sample and analyse sediment microbial communities across pronounced in-to-offshore environmental gradients in the Spermonde Archipelago (Indonesia).



Objectives of the individual project

- 1) Characterise the active microbial communities inhabiting fine- and coarse-grained sediments exposed to different turbidity, and OA parameters using microcosm experiments.
- 2) Evaluate how sediment biogeochemical cycling is influenced by different sediment types and the impact of turbidity, and OA by estimating the metabolic activity of the microbial communities.
- 3) Assess variation (together with ESR2 tasks) of sediment microbial composition and function across in-to-offshore gradients from turbid to clear water conditions.

Expected results

This project will provide novel insights about the role of sediment composition and structure (fine and coarse grained), water turbidity, UVR and OA on the composition and functioning of sediment microbial communities in coral reef ecosystems. In addition to this, the microcosm experiments will allow us to predict how future scenarios of OA and UVR will affect microbial composition and biogeochemical cycling of coral reef sediments.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: University of Granada (Spain); MPIMM/ZMT Bremen (Germany); Naturalis (The Netherlands)

Field training: Cebu (Philippines), Southwest Sulawesi

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a master's degree in Earth and/or Life sciences. We are looking for highly motivated students that have excellent English writing abilities and ample fieldwork experience, preferably in marine environments and including SCUBA diving. Experience with molecular biology is an important plus.

Special remarks: European diving license required; related training provided in case qualification is lacking.

For any queries you may have, please contact:

Please feel free to contact Daniel Cleary (cleary@ua.pt) or Newton Gomes (gomesncm@ua.pt)

How to apply?

This position will open soon.

Are you fascinated by the biodiversity of coral reef ecosystems, and how this has changed in the past and might change in the future? Are you accurate and fast in processing data? Do you have the drive to communicate and connect to different kinds of people all over the world? Is travelling for fieldwork a welcome addition to your daily job? We are looking for an Early Stage Researcher working on the following project:

Project title: Temporal dynamics in benthic foraminifera assemblages in Holocene to modern turbid coral reefs: integrating morphological and molecular techniques.

Host: Marine Biodiversity Research group, Naturalis Biodiversity Center (Leiden, The Netherlands)

Supervisors: Dr Willem Renema (Naturalis), Dr Owen Wangensteen (University of Tromsø)

Together with corals and coralline algae, large benthic foraminifera are the main calcifiers in coral reef ecosystems. Due to their abundance, small size and sensitivity to changes in water quality they are ideal model organisms to independently assess the environmental conditions in which coral reefs grow. Their calcite tests have a high fossilisation potential, which make them extremely suited to reconstruct past environmental change, and place current reef condition in a historical perspective. Data covering the past 30 years from the Spermonde Archipelago (Southwest Sulawesi) are available, and in this project we will use morphological and NGS molecular techniques to quantify



benthic foraminiferal communities in relation to environmental conditions. These data can be used to assess changes in environmental conditions. We aim to extend this record by using ancient eDNA from sediment cores.

Objectives of the individual project

- 1) Acquisition of expertise with respect to molecular and morphological techniques to identify large benthic foraminifera. Specific question: Can we use DNA techniques to assess LBF species composition and (relative) abundance?
- 2) Design and execute (together with ESR3) a standardised sampling network to quantify species richness and where possible abundance in reef ecosystems on the Spermonde Shelf (Southwest Sulawesi). Specific question: Are species richness patterns observed in fossilisable taxa representative for total species richness over the carbonate shelf
- Gain experience in coring, describing and subsampling reef sediments, including exploring the opportunities for ancient DNA analysis. Specific question: How did community composition of LBF change over the past 1000-2000 years

Expected results

This project will allow comparison between environmental changes in modern day reefs and results observed in the fossil record. By including temporal variability, we expand 40 year existing time series, bridging the gap from Holocene reef dynamics to conservation palaeobiology.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments:

University of Tromsø (Norway): to be trained in molecular biodiversity assessment techniques, develop novel metabarcoding primers for benthic foraminifera and generate high-throughput sequencing data from recent and ancient sedimentary samples.

Field training: Southwest Sulawesi

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a master degree in Earth and/or Life sciences. We are looking for highly motivated students with good communication skills. Experience with molecular biology (DNA extraction from environmental samples and/or high throughput sequencing) is required. Affinity with coral reef ecology, microscopy techniques, biodiversity databases, and/or bioinformatics is desirable.

European diving license required; related training is provided in case qualification is lacking.

This is a 4-year project, the ESR will be enlisted in the University of Amsterdam PhD-programme.

For any queries you may have, please contact:

Willem Renema (willem.renema@naturalis.nl)

How to apply?

Applicants are invited to submit their application, including a cover letter and CV before 1 October 2019 via this link: <u>https://www.naturalis.nl/over-ons/early-stage-researcher-esr2-4-years-in-h2020mcsitn-4d-reef</u>

Project title: Composition and ecology of microgastropod assemblages in relation to reef habitat quality

Host: Natural History Museum, London (UK)

Supervisors: Dr Jon Todd (Natural History Museum, London), Dr Owen Wangensteen (University of Tromsø)

Benthic gastropods are among the most diverse and abundant macro-organisms of tropical reefs, both recent and fossil. Molluscs are frequently used as indicators for habitat degradation in aquatic ecosystems but they have yet to be widely used in reef habitats.

In this ESR project we will quantify change in Coral Triangle microgastropod assemblages in space (along degradation transects) and deep time to test their potential role as indicators of reef health.

In Neogene to recent tropical reef-associated sediments, gastropods and microgastropods (<4mm), in particular, have been neglected despite being the most species-rich, free-living, skeletonized taxon. Reefal habitats can be finely discriminated by their micromolluscan assemblages in the fossil record, where fossils are abundant and excellently preserved. Microgastropod taxa show a wide range of ecological traits, but are dominated by carnivores that are often highly co-evolved with their reef prey. Feeding and other traits are conserved at high levels in snail taxonomy, allowing them to be equally accessible in Recent and fossil assemblages. Because microgastropods have short lifespans we expect changing assemblages to reflect environmental change with great fidelity.

Healthy reefs are expected to contain a higher diversity of benthic organisms than impacted ones and therefore a greater diversity of microgastropods living across the wide range of niches available. Stressed reefs are hypothesized to show reduced species richness and increased assemblage volatility.

We also aim to explore the application of molecular assessment techniques, both on recent and ancient sedimentary DNA (sedaDNA) to reconstruct living and past microgastropod assemblages along present gradients of anthropogenic impact and through the Holocene.

Objectives of the individual project

- 1) Sample molluscan shell assemblages from comparable habitats in the Pliocene, Holocene and Recent to characterise them taxonomically and ecologically.
- Uncover the unsampled component of Holocene reefs through sedaDNA and compare to Recent reefs to establish anthropogenic impact on the entire gastropod fauna over the past few thousand years.
- 3) Determine assemblage, taxic, and funtional response along gradients of anthropogenic impact in the Spermonde Archipelago.
- 4) Establish a monitoring tool for reef health using microgastropod taxa and assemblages.

Expected Results

- 1) Quantify changes in turbid reef microgastropod assemblages through deep time.
- 2) Establish the response of Recent microgastropod assemblages to natural and anthropogenic impacts.

3) Identify the unrecovered taxonomic component of Holocene gastropod assemblages by developing novel molecular assessment techniques based on sedaDNA.

4) Identify novel snail-based metrics for measuring reef health.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments:

- Naturalis Biodiversity Center (Leiden, the Netherlands): to sample existing mollusc collections from the Spermonde Archipelago & to be trained in quantifying taphonomic processes translating modern communities into the fossil record.
- 2. University of Tromsø (Norway) to be trained in molecular biodiversity assessment techniques, develop novel metabarcoding primers for gastropods and generate high-throughput sequencing data from recent and ancient sedimentary samples.

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a Bachelor or Master degree in Life or Earth Sciences (Marine Biology, Palaeontology or similar subjects). We are looking for a highly motivated researcher, willing and able to contribute to interdisciplinary research within the network and with good communication skills. Advanced SCUBA certification is desirable but not essential (training will include obtaining a European Scientific Diving License. Experience with molecular biology (DNA extraction, high throughput sequencing), coral reef or molluscan ecology, microscopy techniques, biodiversity databases and/or bioinformatics, are desirable.

For any queries you may have, please contact:

Please feel free to contact Jon Tod (j.todd@nhm.ac.uk)

How to apply?

Please apply here before 16 September 2016:

https://careers.nhm.ac.uk/templates/CIPHR/jobdetail_1766.aspx

Project title: Ecological implications of shifts from hard corals to turf algae in modern turbid reefs

Host: Leibniz Centre for Tropical Marine Research (Germany) and University of Bremen (Germany)

Supervisors: Dr Sebastian Ferse, Dr Sonia Bejarano, Prof. Christian Wild

In many modern reefs, hard corals as classical reef ecosystem engineers are replaced in a process that is called phase shift by other organisms including other invertebrates and algae. In this context, turf algae potentially play a major role, because they are opportunistic, fast-growing, and often highly competitive against corals. An increase in benthic cover by turf algae is reported from a growing number of locations particularly in the Indo-Pacific, and likely poses major consequences for reef functions and services, particularly calcification. However, related knowledge on the controls and consequences of turf algal increase on reefs is scarce.



Figure: Competition between massive hard corals and filamentous turf algae (likely dominated by cyanobacteria) in a coral reef (copyright: Christian Wild).

Objectives of the individual project

- 1) Assessment of spatiotemporal benthic community patterns in Spermonde Archipelago with a focus on hard corals, turf algae, and their interactions over time using monitoring tools and in-situ temporal observations
- 2) Identifying bottom-up controls (light and nutrient availability) on turf algae occurrence, identity, and competitiveness against corals using monitoring tools and manipulation experiments
- 3) Evaluating top-down controls on turf algae occurrence and competitiveness against corals using monitoring tools, observations and manipulation experiments
- 4) Assessing the effects of coral-turf algae phase shifts on reef calcification rates

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Expected results

ESR 5 allows comparison of the relative importance of bottom-up versus top-down factors for turf algae occurrence and competitiveness with hard corals along environmental gradients in the Spermonde Archipelago, Indonesia. In addition, results provide information regarding effects on reef calcification and potential consequences of phase-shifts to turf algae. Assessments of turf communities will be linked to the results of ESRs 1, 2 and 9 for a better understanding of anthropogenic activities on reef benthic communities and calcification.

Secondments: Naturalis Biodiversity Center (Leiden, the Netherlands), Natural History Museum (London, UK)

Field training: Southwest Sulawesi

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Eligibility criteria

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Candidates must be eligible to be accepted as doctoral candidates at University of Bremen. Applications should include copies of Bachelor and Master certificates including grades and number of credit points.

Candidate profile

Candidates most hold a master degree in Earth and/or Life sciences. We are looking for highly motivated students with good communication, project management, and scientific writing skills. Experience in environmental monitoring and conducting ecological field and laboratory experiments are an asset. Willingness for extensive work stays in Indonesia is required.

Special remarks: European Scientific Diving (ESD) license required; related training provided in case qualification is lacking. Candidates that do not have an ESD license, need to fulfil the minimum requirements to be admitted to the training course, which can be found here: <u>www.leibniz-</u><u>zmt.de/en/marine-tropics-research/organisation/infrastructure/scientific-diving-centre.html</u>.

For any queries you may have, please contact:

Please feel free to contact Dr Sebastian Ferse (sebastian.ferse@leibniz-zmt.de)

How to apply?

Please send a motivation letter and CV before 15 September 2019 to: <u>bewerbung@leibniz-zmt.de</u> reffering to '4D-REEF ESR 5'

See also: https://www.leibniz-zmt.de/en/vacancies.html

Project title: Modelling environmental controls on coral species distribution in the Coral Triangle

Host: School of Earth Sciences, University of Bristol (Bristol, UK)

Supervisors: Dr Erica Hendy (Bristol; <u>http://www.bris.ac.uk/earthsciences/people/erica-hendy/index.html</u>), Dr Elena Couce (CEFAS; Lowestoft, UK; <u>https://www.cefas.co.uk/</u>), Dr Susanna Jenkins (Earth Observatory of Singapore; <u>https://earthobservatory.sg/people/susanna-jenkins</u>)



The "Coral Triangle" is recognised globally as a conservation priority. Although representing just 1.6% of the world's ocean (dark blue outline on map), this region contains over 75% of known coral and coral reef fish species, and in total ~20% of all known marine species. Yet the region has experienced dramatic climatic and geological changes since the late Neogene. Assessing these past environmental controls on coral species distribution within the Coral Triangle is critical for future risk analysis and management of the regional biodiversity and marine resources.

Objectives of the individual project

- To use probabilistic hazard and risk assessment tools to quantify spatial patterns of geological processes that will impact coral reefs across the Coral Triangle. Specific question: How are species richness patterns correlated with rates of disturbance?
- 2) To model the spatial distribution of coral species by applying ecological niche models (ENMs), using the environmental data outputs from the climate and oceanographic modelling (ESR15) and probabilistic hazard maps (Obj. 1), trained and validated against the largest available dataset of collection records of extant coral taxa (ESR 9).
- 3) To hindcast late Neogene and Holocene coral taxa distributions and explore biogeographic patterns and environmental controls.

Expected results

This project will map geological hazards that need to be considered in regional conservation policy and marine resource management, as well as provide information drivers of past species richness, biogeographic patterns, and species turnover.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: EOS (Singapore), CEFAS (Lowestoft, UK), Natural History Museum (London, UK)

Eligibility criteria

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Candidate profile

This project would ideally suit a candidate with strong quantitative and computing capabilities, a passion for marine science and a flair for data visualisation. The project will heavily rely on the application of R, Matlab and ArcGIS, so some prior experience is very desirable, however, training will be provided. This is an interdisciplinary project requiring strong networking and communication skills. Candidates must hold a degree in either physical (e.g. Earth Sciences, Geography) or life sciences (specialising in ecology and statistical methods).

For any queries you may have, please contact:

Please feel free to contact Dr Erica Hendy (E.Hendy@bristol.ac.uk)

How to apply?

Candidates applying have to apply through the official university system. The candidate applies for a PhD in Geographical Sciences. In the application the candidate should mention that they are applying for the 4d-REEF ESR6 position. Please apply via this link before 15 September 2019:

http://www.bristol.ac.uk/study/postgraduate/apply/

for more general background information see this link:

http://www.bristol.ac.uk/study/postgraduate/2019/sci/phd-geographical-sciences/

and

http://www.bristol.ac.uk/geography/courses/postgraduate/physphd.html

4D-REEF early stage researchers will not have to pay the tuition fees.

Are you curious about the geological history of carbonate producers in the geological past? Are you accurate and fast in processing data? Do you have the drive to communicate and connect to different kinds of people all over the world? Is travelling for fieldwork a welcome addition to your daily job? We are looking for an Early Stage Researcher working on the following project:

Project title: Quantifying Neogene habitat variability in the Coral Triangle

Host: Marine Biodiversity Research group, Naturalis Biodiversity Center (Leiden, The Netherlands)

Supervisor: Dr Willem Renema

Carbonate production on modern tropical carbonate shelves is dominated by coralline algae and *Halimeda*, large benthic foraminifera, and corals. Each of these have different characteristics with respect to optimal environmental conditions, including depth and nutrient availability. Reduction in coral cover on modern reefs, and therefore carbonate production by corals, begs the question whether production by the other groups is similarly depressed, or that there will be shifts in the carbonate production. To do so, it is essential to look at the entire systems, including coral reefs and the inter-reef sea floor.



Objectives of the individual project

- Acquisition of expertise with respect to automated identification of carbonate producers in carbonate sediments using AI. Specific question: Is it possible to identify the different components in thin sections?
- 2) Use this tool in Pliocene, Holocene and modern sediments.
- 3) Apply this new tool for a quantitative analysis of the relative contribution of carbonate producers over time and space. Specific question: Have there been shifts in dominance of carbonate producers in the past?

Expected results

This project will allow quantifying shifts in carbonate producers across environments in the past 10 Million years. In combination with environmental and change change scenarios we aim to predict the future of calcification in tropical shelf seas.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: Natural History Museum (London, UK); University of Granada (Spain)

Fieldtraining: Cebu (Philippines), Southwest Sulawesi

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates most hold a master degree in Earth and/or Life sciences, or equivalent. Experience with carbonate sedimentology, coral reef (paleo)ecology and/or dataprocessing is desired. A good level of written and oral English is required. We are looking for a highly motivated student with good communication skills and a keen interest in fieldwork in remote areas.

This is a 4-year project, the ESR will be enlisted in the University of Amsterdam PhD-programme.

For any queries you may have, please contact:

Please feel free to contact Willem Renema (willem.renema@naturalis.nl) with questions about the position.

How to apply?

Applicants are invited to submit their application, including a cover letter and CV before 1 October 2019 by using the application form via: <u>https://www.naturalis.nl/over-ons/early-stage-researcher-esr7-</u> <u>4-years-in-h2020mcsitn-4d-reef</u>

Project title: Visualizing scientific data of the underwater in three and four dimensions

Host: Ocean Maps GmbH (Salzburg, Austria)

Supervisor: Klemens Svetitsch

The scientific descriptions of coral reefs contain a wealth of information, but are difficult to provide in a form easily understood by the general public. This project will bring together data and results from the other 4D-REEF projects that will provide new insights into the dynamics of turbid coral reefs, and integrate them with bathymetric, topographic, multi-dimensional and time series data. Interactive and immersive visualizations will be created to engage the public and communicate the essential questions and outcomes of the 4D-REEF research.



Collecting and processing data from various sensors

under and above water, in test environments and on-site, will be part of this project as well as fusing together various spatial data types and applying state-of-the-art algorithms to gain insight into past, present and possibly future developments.

Objectives of the individual project

- 1) Collect, synthesize and integrate survey data to generate life-like 3D models of underwater environments
- 2) Generate interactive visualizations of key reef sites for public dissemination
- 3) Develop new methods of integrating various types of mapping data
- 4) Create data products for public online and physical display

Expected results

New ways of making underwater environments available interactively shall be developed, for scientific use as well as public engagement and outreach.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: Max Planck Institute for Marine Microbiology

Field training: extensive field-training in Austria/Europe; Southwest Sulawesi (optional, to be decided)

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute (Austria) for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a master's degree in 1) computer science, software engineering or a related field, or 2) a natural science or engineering with significant experience in software development. We are looking for highly motivated students with experience in algorithm development and implementation (e.g. in C#, Python, C++, etc).

Highly beneficial is experience in any of the following: 3D computer graphics, 3D point cloud and mesh processing, machine learning / artificial neural networks / deep learning (e.g. Matlab, TensorFlow, R, etc), computer vision (e.g. visual odometry/SLAM, photogrammetry, etc), sensor fusion (e.g. GNSS, SLAM, USBL, INS etc), numerical modeling, geographic data.

Highly appreciated are good communication skills and an interdisciplinary, solution-oriented way of approaching new challenges.

For any queries you may have, please contact:

Please feel free to contact Klemens Svetitsch, k.svetitsch@ocean-maps.com

How to apply?

Applicants are asked to provide: motivation letter, CV, one file with additional relevant documents such as academic records and job references. Please send your application to before 1 October 2019 to:

office@ocean-maps.com

See also: <u>https://www.ocean-maps.com/</u>

Project title: Coral growth and reef function on ancient and modern reefs from turbid water settings in the Coral Triangle

Host: Natural History Museum, London (UK)

Supervisors: Ken Johnson (Natural History Museum), Erica Hendy (University of Bristol), Tilo Burghardt (University of Bristol)



Reef corals are one of the main actors in reef carbonate budgets, with their net contribution controlled by environmental factors influencing both coral growth and bioerosion of coral skeleton. Where growth rates exceed erosion coral can maintain the high level of rugosity that provides critical habitat for high biodiversity. In this study the ESR will reconstruct rates of growth and bioerosion of common massive corals from Pliocene, Holocene, and modern reefs to understand the contribution of corals to reef budgets in these systems. X-ray computed tomography (CT) will be used to quantify the density, distribution, and size of skeletal elements and to visualise annual density bands that can be used to estimate linear growth rates. Similarly, the numbers and sizes of void space left by internal bioeroders can be visualised and quantified from CT data. Both growth rates and bioerosion are notoriously variable among habitats and taxa, so in this project we will process large numbers of smaller colonies that provide decadal-scale records. An innovation of this project will be the development of a new high-throughput workflow and data pipeline to efficiently collect and process data from hundreds of CT scans. This workflow will subsequently be applied to extract useful information from natural history collections and cores from modern reefs to develop a large-scale database of coral growth rates for use in reef budget modelling.

Objectives of the individual project

- 1) Develop a new high-throughput analysis pipeline to visualise and measure annual density banding and bioerosion intensity in massive reef corals using CT
- 2) Test growth rates estimated using CT with rates obtained from traditional plane x-ray methods
- 3) Measure growth rates in the massive merulininds from a range of mesophotic and euphotic reef habitats from fossil deposits and along a gradient of highly to less-impacted present-day reefs
- Quantify bioerosion rates as estimated by the size and frequency of boring within massive corals using CT
- 5) Estimate alpha diversity and compare the community composition of coral assemblages at the reef sites

Expected results

A comparison of present-day growth and bioerosion rates from highly impacted reef habitats with: 1) less impacted present-day sites; 2) Holocene reefs that developed in environments similar to the present-day

but with no human impact; and 3) a range of Pliocene reef habitats that developed during a globally warm interval that might be a useful proxy for future climates.

More information about 4D-REEF is available at: <u>https://www.naturalis.nl/en/4d-reef</u>

Secondments: University of Bristol, Naturalis Biodiversity Center

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates most hold a degree in Earth or Life Sciences and demonstrate a strong interest in advancing their skills in quantitative analysis of large datasets. Previous experience with Artificial Intelligence applications is desirable. We are looking for researchers willing and able to contribute to interdisciplinary research within the network and with good communication skills. Advanced SCUBA certification is desirable but not essential.

For any queries you may have, please contact:

Please feel free to contact Ken Johnson (K.Johnson@nhm.ac.uk)

How to apply? Please apply here before 16 September: <u>https://careers.nhm.ac.uk/templates/CIPHR/jobdetail_1767.aspx</u>

Project title: Depositional modelling and sequence stratigraphy of greenhouse Pliocene reefs

Host: Leibniz Centre for Tropical Marine Research (ZMT; Bremen, Germany)

Supervisors: Prof. Hildegard Westphal (ZMT) and Dr Alessio Rovere (University of Bremen)

The PhD project focuses on the Pliocene as an analogue for potential future greenhouse conditions. The target study areas are in the Philippines. This project will model Neogene carbonates based on terrestrial mapping, using classig geologic fieldwork, Unmanned Aerial Vehicles and analysis of satellite-derived Digital Elevation Models. The outcomes of the project will shed new light on dimension and geometry of carbonate bodies, lateral dimensions of facies belts and palaeowater-depth. Attention will be given to the presence, in the geologic record, of facies that indicate rapid climatic or sedimentary changes, and to the relationship between the geological facies observed in the field and modern reefs. Data will serve as key data to integrate other data of the project, such as facies distribution, distribution of large benthic foraminifers and sedimentological features at outcrop scale.

Objectives of the individual project

- to produce stratigraphic logs and digital reconstructions of the different outcrops of Pliocene reefs;
- to quantify extension of facies belts and size and form of geobodies
- to quantify geometrical changes of reef growth patterns.

Expected results

The project will develop "virtual outcrops" for each locality. Sequence stratigraphy, for example controlled by sea-level changes or uplift / subsidence, will be quantified with respect to changes in accommodation (base-level fluctuations). Spatial models further will allow the extension of facies belts to be quantified by ESR7.



More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates most hold a master degree in Earth and/or Life sciences, or equivalent. Ability to conduce geological fieldwork is required. Expertise in geological mapping and with sea level reconstructions is preferred. A good level of written and oral English is required. We are looking for highly motivated students with good communication skills who is willing to do fieldwork and to follow the logics of an ITN and be highly mobile.

For any queries you may have, please contact:

Please feel free to contact Prof. Hildegard Westphal (hildegard.westphal@leibniz-zmt.de) or Dr Alessio Rovere (arovere@marum.de) for more information about this position.

How to apply?

Please send a motivation letter and CV before 15 September 2019 to: <u>bewerbung@leibniz-zmt.de</u> reffering to '4D-REEF ESR 10'

See also: https://www.leibniz-zmt.de/en/vacancies.html

Project title: Historical assessment of coralline algae as triggers for coral settlement

Host: Departamento de Estratigrafía y Paleontología, Universidad de Granada (Spain)

Supervisors: Dr Juan C. Braga (co-supervisor Dr Viviana Peña Freire, Universidade da Coruña, Spain)

Coralline algae (CCA) are main builders in coral reefs. Certain species of CCA enhance coral recruitment by chemically inducing coral settlement and subsequent development. Total CCA cover might be used to indicate reef health and management effectiveness. However, the CCA diversity in turbid reefs is poorly known and only few data exist about the importance of CCA in maintaining coral recruitment and reef accretion. In a historical perspective, Pliocene to Holocene fossil reefs will provide the opportunity to quantitatively evaluate the relevance of CCA crusts in the accretion of healthy reef frameworks in large-scale time intervals.



Objectives of the individual project

Acquisition of expertise with respect to molecular and morphological techniques to identify CCA. Specific question: Which is the CCA diversity in turbid reefs and how does it compare with that of reefs growing in clear waters?

To quantitatively assess the CCA cover and identify the CCA assemblages in space and time in Pliocene to Holocene reefs. Specific question: Is the CCA in turbid reefs significantly different from that of clear-water ones?

To identify the inductive CCA in turbid reefs and to quantitatively assess their relevance in these reefs, both modern and fossil. Specific question: Is the role of inductive CCA relevant in turbid reefs?

Expected results

Understanding the long-term significance of inductive CCA in growth and maintenance of coral reefs might help in predicting future scenarios for different degrees of reduction of CCA cover due to ecosystem alteration. CCA assemblages will help to interpret palaeoenvironments and their changes throughout time.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: Natural History Museum (London, UK), ZMT (Bremen, Germany)

Field training: Sulawesi (Indonesia), Cebu (Philippines)

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality. In order to be eligible for the position the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in Spain for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a master degree in Life sciences or other relevant topics for the project. We are looking for highly motivated students with good communication skills. Experience with molecular biology (high throughput sequencing) will be highly valued.

Special remarks: European diving license required; related training is provided in case qualification is lacking.

For any queries you may have, please contact:

Please feel free to contact Juan C. Braga. jbraga@ugr.es

How to apply?

Please send your application to Juan C. Braga before 1 October 2019: <u>jbraga@ugr.es</u> And to: <u>http://ofpi.ugr.es</u>

Are you fascinated by how future reefs will function, and have a keen interest in exploring past changes in coral reef ecosystems? Are you accurate and fast in processing data? Do you have the drive to communicate and connect to different kinds of people all over the world? Is travelling for fieldwork a welcome addition to your daily job? We are looking for an Early Stage Researcher working on the following project:

Project title: Assessing current and past reef accretion rates in turbid reefs off Makassar (Sulawesi, Indonesia)

Host: Marine Biodiversity Research group, Naturalis Biodiversity Center (Leiden, the Netherlands)

Supervisor: Dr Willem Renema

Natural and anthropogenic drivers are likely to drive large-scale changes in the distribution of calcifying organisms in turbid coral reefs. Turbid reefs are characterised by low availability of light for photosynthesis and the presence of corals, sponges and algae as the dominant structural components. The depth window where these reefs are thriving hinders direct and extensive observation and mapping through conventional SCUBA diving. Therefore, little is known of deeper reef distribution. Knowledge on deeper parts of the



reef, however, is a crucial aspect to understand what neritic shelf carbonates may look like in a world subjected to climate change.

Objectives of the individual project

- Gain expertise with the tools needed to quantify the carbonate production in the modern reef system at large, i.e. including reefs and inter-reef sea floor, for example, portable multibeam system, multichannel sparker seismics, high-resolution single channel seismics, and targeted visual sea-floor observation.
- 2) Relate (changes in) reef geomorphology to environmental change. Specific question: What are the implications of loss of coral cover on the morphology of the reef and the distribution of calcifying organisms.
- **3)** Quantify the chronostratigraphic framework of the reef cores. Specific question: what is the main driver of accumulation rates?
- 4) Place these findings into context of current and past climate change.

Expected results

This project will allow to predict changes in geomorphology with ongoing natural and anthropogenic, locally and globally driven environmental change.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: University of Sydney (Australia)

Field training: Spermonde Archipelago (Southwest Sulawesi, Indonesia)

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates most hold a master degree in Earth and/or Life sciences, or equivalent. Experience with (carbonate) sedimentology, (underwater) remote sensing and software to analyse those data is disrable. Ability to conduce fieldwork is required. A good level of written and oral English is required. We are looking for highly motivated students with good communication skills who is willing to do fieldwork.

Special remarks: European diving license is desirable; related training can be provided in case qualification is lacking.

This is a 4-year project, the ESR will be enlisted in the University of Amsterdam PhD-programme.

For any queries you may have, please contact:

Please feel free to contact Willem Renema (willem.renema@naturalis.nl) with questions about the position.

How to apply?

Applicants are invited to submit their application, including a cover letter and CV before 1 October 2019 by using the application form via: <u>https://www.naturalis.nl/over-ons/early-stage-researcher-esr10-</u> 4-years-in-h2020mcsitn-4d-reef

Project title: Seasonally-resolved palaeoenvironmental time-series from microsampled molluscs, foraminifera, or corals

Host: Palaeoenvironmental Research Group, Institute of Geosciences, Goethe-University, Frankfurt am Main, Germany

Supervisors: Prof. Wolfgang Müller, Dr David Evans

Seasonally-resolved records of past climate states provide an important means of assessing climate models. They also allow an evaluation of any seasonal bias in non-seasonally resolved climatic parameters. This is important as secular changes in the amplitude of seasonality are a driver of environmental and climatological change under different greenhouse gas regimes. However, past seasonality is poorly constrained, to be addressed here as advances in analytical techniques allow (sub-)seasonal to daily time resolution in a variety of proxy archives.



Objectives of the individual project

- 1) Fieldwork and sampling of long-lived molluscs (e.g. *Tridacna*), large benthic foraminifera or corals in Pliocene and Holocene strata; sample characterization including diagenetic overprint
- 2) Acquisition of decade-long, continuous time series of temperature, salinity, upwelling etc. at seasonal or even daily resolution, utilizing geochemical proxies from spatially-resolved analysis such as laser-ablation mass spectrometry (LA-ICPMS) or micromilling, including clumped-isotope (Δ₄₇) analysis. This will provide constraints on the secular temperature evolution of the Pacific Warm Pool (PWP), and how that is related to seasonality.
- 3) Evaluation and application of recently-developed proxies such as Mg/Ca or Sr/Ca in *Tridacna* (Warter, Müller et al. 2018) as indicators of light intensity, crucial in turbid reef settings.

Expected results

The datasets produced in this project will provide a better quantitative understanding of past tropical seasonality, including the possible reconstruction of past turbidity. This project will also provide input for climate modelling (ESR15) and facilitate comparison between seasonally-resolved palaeoenvironmental parameters and Earth System models.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: University of Bristol (U.K.)

Field training: Cebu (Philippines), Southwest Sulawesi (Indonesia)

Eligibility criteria

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a master degree in Earth and/or Environmental sciences. We are looking for a highly motivated student with good communication skills. A keen interest in fieldwork in remote areas is necessary. Experience with geochemical techniques such as stable isotopes or laser-ablation mass spectrometry and data processing is desired. Training in techniques will be provided.

For any queries you may have, please contact:

For scientific questions: Prof. Wolfgang Müller w.muller@em.uni-frankfurt.de

For administrative matters: Ms Svenja Lubs <u>lubs@em.uni-frankfurt.de</u>

How to apply?

Applications should be sent as a single pdf-file by email to <u>lubs@em.uni-frankfurt.de</u>; informal inquiries about the position can be directed to <u>w.muller@em.uni-frankfurt.de</u>. Documents cannot be returned. Deadline 1 October 2019.

Your application should contain

- Curriculum Vitae
- Letter of motivation & research interests
- Names and contact details of up to three people who can provide references upon request
- Summary of relevant experience (1 page)
- · Course transcripts and copy of submitted thesis upon request only

Project title: Using past and current reef response to physical stressors for model-based forecasting of reef distribution

Host: Coastal and Marine Systems Unit, Deltares (Delft, The Netherlands)

Supervisors: Prof. Peter Herman, Dr Bregje van Wesenbeeck

Are you fascinated by forecasting models for complex reef systems? Are you accurate and fast in processing data? Do you have the drive to communicate and connect to different kinds of people all over the world? Is travelling for fieldwork a welcome addition to your daily job? Our Coastal and Marine Systems Unit is looking for an

Early Stage Researcher (ESR) for a period of 3-4 years

As an Early Stage Researcher you will work on a project that is part of the MSCA Innovative Training Network "Past, present and future of turbid reefs in the Coral Triangle (4D-REEF) You will collaborate with 14 other ESRs and their supervisors in this international network.

Objectives of 4D-REEF

"Using a variety of paleo-ecological and present-day data, 4D-REEF investigates the hypothesis that turbid coastal environments provide a refuge for coral reefs in periods of warm climate".

The key questions to be addressed by the network are:

- What was the biodiversity of turbid reefs in the past, in what habitats did the reefs grow in past warmer periods of the Earth's history, and how does this compare to the present?
- What are the environmental constraints on ecosystem functions of turbid reefs?
- How can we use information from past reefs to better understand the future trajectories of modern coral reefs, and apply this towards reef restoration actions?

By answering these questions, we aim to understand the role of turbid reefs for the future of marine ecosystems in the Coral Triangle as they respond to anthropogenic environmental change.

What can you expect as an Early Stage Researcher (ESR) for a period of 3-4 years?

The aim of the MSCA ESR positions is to enhance the career perspectives of young researchers in both the academic and non-academic sector. You will be enrolled in a university PhD programme, but in addition the international network will provide you with secondments, prolonged periods of research at two other institutes in the network, and with diverse training activities. These consist of local and network-wide training in scientific knowledge and transferrable skills, as well as profound immersion in intersectoral research, communication and application activities. Your individual research programme is at the core of the training, but the consortium will provide you with the broader background needed to develop a fruitful career in (applied) science.

In this individual project; you are using past and current reef response to physical stressors for modelbased forecasting of reef distribution. Reefs respond non-linearly to physical stressors, such as currents, waves, temperature, nutrients and turbidity. You will statistically analyse these responses from palaeontological reef records integrated with records of the abiotic environment from climate archives in shells and foraminifera, as well as from present-day monitoring data. This will be used to develop a prognostic model, incorporated into a hydrodynamical model setting, of reef response to changes in external parameters. The model will predict reef persistence under a range of future scenarios, including direct anthropogenic stressors such as dredging and wastewater discharges, but also long-term climate change.



You will perform both lab and field work in two secondments at Goethe University Frankfurt and University of Bristol. Field work takes place in Southwest Sulawesi.

- Working on the forefront of many aspects of the (paleo)ecology of turbid reefs and the environments they develop in, applying innovative techniques;
- You will participate in international secondments to other organizations within the 4D-reef network and in outreach activities targeted at a wide audience;
- You will benefit from the designed training programme offered by the host organization and the consortium;
- You will be part of an international research consortium of over > 25 researchers.

What does Deltares expect from you as an Early Stage Researcher (ESR) for a period of 3-4 years?

- You have not been awarded a doctoral degree;
- You shall at the time of recruitment be in the first four years of your research career;
- At the time of recruitment, you have not resided or carried out your main activity (work, studies, etc.) in The Netherlands for more than 12 months in the 3 years immediately prior to the reference date.

Furthermore, Deltares requires that:

- You have a master's degree in Earth and/or Life sciences or engineering;
- You have affinity with mathematical modelling of hydrodynamic or ecological processes and with data exploration;
- You have some experience with both laboratory work and modelling;
- As this project requires close collaboration within the consortium you need to be an excellent team player and communicator;
- You are a creative and independent thinker;
- You are fluent in English (reading, writing and speaking).

Working at Deltares

Deltares is an independent institute for applied research in the field of water, subsurface and infrastructure. Worldwide we work on smart solutions, innovations and applications for people, environment and society. To achieve our goals, we develop our own expertise, innovative software and services. We have special facilities on our campus in Delft, like the Delta Flume and our iD-lab (Interactive data research laboratory) and the Geochemical and Microbiological laboratory in Utrecht.

Deltares supports governments, industries, water boards, and municipalities in their ambitions to reduce water and energy consumption and to develop and implement sustainable energy technologies. Deltares places high demands on the quality of its knowledge and advice. Enabling Delta life is our core business.

We offer an informal, dynamic and challenging working environment. Your personal development and building on your resume is important to us. Therefore we offer excellent training opportunities and future perspective. Deltares will pay ESRs in conformity with the Deltares CAO (collective labour agreement) compliant with H2020 MSCA ITN conditions.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Interested?

Are you interested in this job and do you fit the job qualifications? Apply directly by uploading your CV and motivation letter, before the 1st of October. We will get in touch with you within three weeks after the closing date. Only applications via our website will be considered. See: <u>https://www.deltares.nl/en/</u>

For more information you may contact Dr. Peter Herman (<u>peter.herman@deltares.nl</u> or +31883357862) or Dr Bregje van Wesenbeeck (<u>Bregje.vanWesenbeeck@deltares.nl</u> or +31651594127).

Project title: Modelling climate, oceanography, and carbonate production of corals in the Pliocene

Host: School of Geographical Sciences, University of Bristol (Bristol, UK)

Supervisor: Prof. Dan Lunt

An Earth System modelling approach will be used to investigate global change through Pliocene, and the implications for carbonate production of corals will be explored. A suite of palaeogeographic maps with a temporal resolution of ~1 million years (including the Holocene as a baseline) will provide the basis for a set of global climate model (HadCM3 and/or UKESM) simulations. Sensitivity studies to the palaeogeography, particularly in the region of the Coral Triangle, and orbit and CO_2 will be carried out, in order to fully explore the uncertainties in the Pliocene climate.

Objectives of the project:

 To produce a Pliocene climate "Atlas", generated from output from a climate model, and evaluated using proxy climate data.



- To explore the sensitivity of this modelled climate to uncertainties in atmospheric CO₂ and palaeogeography, and the envelope of orbital variability.
- 8) To explore in detail the oceanography (in particular, its variability on multiple timescales from seasonal to orbital) of south-east Asia in the Pliocene.
- 9) To study implications for carbonate production of corals.

Expected results:

It is expected that the model results will provide a fascinating insight into the global oceanographic state in the Pliocene, with an emphasis on the sensitivity of the system to the various drivers. Analysis will focus on modes of variability, such as ENSO, and its expression in the Coral Triangle. An expected result is a prediction of the time-varying magnitude and frequency of ENSO, and other modes, through the Pliocene.

More information about 4D-REEF is available at: https://www.naturalis.nl/en/4d-reef

Secondments: GUF and/or Deltares.

Eligibility criteria:

EU eligibility criteria for candidates: Candidates of any nationality, but in order to be eligible for the positions the following criteria applies to all applicants: 1) The applicant shall at the time of recruitment be in the first four years of his/her research career and have not been awarded a doctoral degree. 2) The applicant must not have resided or carried out his/her main activity in the country of the host institute for more than 12 months in the 3 years immediately prior to the recruitment.

Candidate profile

Candidates must hold a degree in the physical sciences (e.g. Physics, Mathematics, Earth Sciences, Geography). We are looking for highly motivated students with good communication skills. Experience with climate modelling is desirable but not essential.

For any queries you may have, please contact:

Please feel free to contact Dan Lunt. <u>d.j.lunt@bristol.ac.uk</u>

How to apply?

Candidates applying have to apply through the official university system. The candidate applies for a PhD in Geographical Sciences. In the application the candidate should mention that they are applying for the 4d-REEF position. Deadline is 15 September 2019. Please apply via this link:

http://www.bristol.ac.uk/study/postgraduate/apply/

for more general background information see this link:

http://www.bristol.ac.uk/study/postgraduate/2019/sci/phd-geographical-sciences/

and

http://www.bristol.ac.uk/geography/courses/postgraduate/physphd.html

4D-REEF early stage researchers will not have to pay the tuition fees.