

Expedition 378 Southwest Pacific Paleogene Climate

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On the 4th of January 2020 the JOIDES Resolution (JR) set sail from Lautoka in Fiji with a crew of approximately one hundred people, including 27 scientists. The Expedition 378 team celebrated that ours was not only the first full IODP expedition of the decade, but also the first expedition in the history of IODP to be entirely led by women (both Co-Chiefs, Staff Scientist, and Lab Officer), with a science party comprising more than 70% women. However, one 'first' that cannot be claimed by this expedition is the drill site, for Exp. 378 marked a return to Site 277, previously drilled in 1973 by the Glomar Challenger during Leg 27 of the Deep Sea Drilling Project (DSDP).

We sailed from and to the tropics (the JR arrived in Papeete, Tahiti on the 6th of February), but the destination of Expedition 378 was actually the sub-polar Southern Ocean. We drilled in an area near New Zealand, at about 55° South, called the Campbell Plateau. This is made for one of the longest IODP expedition transits ever; each way we sailed a distance roughly equivalent to that from Lisbon to Moscow! Technical problems with the JR meant that IODP Expedition 378 was shortened to only 1 month and consequently on Site U1553 was occupied. The remaining sites have been postponed for now but will hopefully be rescheduled for drilling in a future expedition.

The scientific justification for the expedition was to recover sediments from the subpolar Southern Ocean dating back to the Paleogene (65-23 million years ago). During the Paleogene, Earth's climate was warmer than today, but may have been similar to what we will start to experience by the end of this century if anthropogenic



top: The authors (l-r Rosie Sheward, Flavia Boscolo Galazzo and Eleni Anagnostou).

bottom: Rosie and Flavia at work preparing micropalaentology samples in the shipboard prep lab (credit: U. Röhl & IODP).



top: The Expedition 378 Science Team on board the JOIDES Resolution (credit: Tim Fulton & IODP).
inset: The Expedition 378 logo.

emissions continue unabated. By studying ocean sediments deposited during this period we aim to discover the impact of a warmer climate on high latitude regions (such as the UK, which is at 55° N), in particular on ocean physical, chemical and ecological properties.

We drilled at Site U1553, which spans the early to middle-late Paleogene and is characterized by abundant microfossils in most of the recovered cores. We used Advanced Piston Coring (APC) to drill far less-disturbed, better quality cores than those recovered from the same site 47 years earlier by rotary coring.

The high latitude regions of the oceans are major regulators of Earth climate through ocean currents, deep water formation, and biological productivity. We want to test to what extent these ocean functions were different in a warmer climate to help us make better predictions about our future. The science party includes many early career scientists, and the cores recovered will enable us to push forward our scientific careers.

Our IODP Experience

Have you participated in an IODP expedition before?

Flavia: This was my first time sailing!

Rosie: Also my first time sailing!

Eleni: My first IODP expedition!

How did you learn about the expedition and what made you decide to apply to sail?

Flavia: I learned about the expedition on the IODP website. I decided to apply because I wanted to experience a scientific expedition. My role in the science party was of biostratigrapher, meaning I was part of the team training to establish live the age of the sediments which are being recovered, based on the microfossil content. This is kind of challenging if you are doing it for the first time, and I wanted to take on the challenge! I also saw this as a chance to establish research independence and start off my own research lines.

Rosie: Having worked on a lot of IODP, ODP and DSDP materials during my PhD research, I've always wanted to sail and see first-hand the excitement of being one of the first people to see a new core from the seafloor on deck and look at the microfossils in it. I decided to apply for this expedition particularly because the time period is really relevant to my research, so I hoped to become involved in lots of exciting research and for the opportunity to lead my own, more challenging research projects afterwards.

Eleni: It was my dream to sail on the JOIDES and collaborate in such a multi-cultural and interdisciplinary environment, expanding my research horizons.

Which science team are you working in on the ship and what does that entail?

Flavia: I'm in the biostratigraphy and micropaleontology team using fossil planktonic foraminifera, calcifying microzooplankton, to help constrain the age of our samples.



Rosie: I'm working as a calcareous nannofossil specialist, which means that when a new core comes on deck, I take a very small amount of that sediment and look for the fossil remains of a group of calcified marine phytoplankton under the microscope. Based on the species I can see in each sample, we can estimate how old the sediment is as we bring it up!

Eleni: I'm working as an inorganic geochemist. As part of the geochemistry team, I am responsible for collecting interstitial waters from the sediment cores, and performing analyses on board for major/trace elements, carbonate system parameters, and salinity.

What has been the most exciting part of this science expedition for you?

Flavia: Core on deck!

Rosie: Being one of the first people to see what microfossils were in our first core on deck!

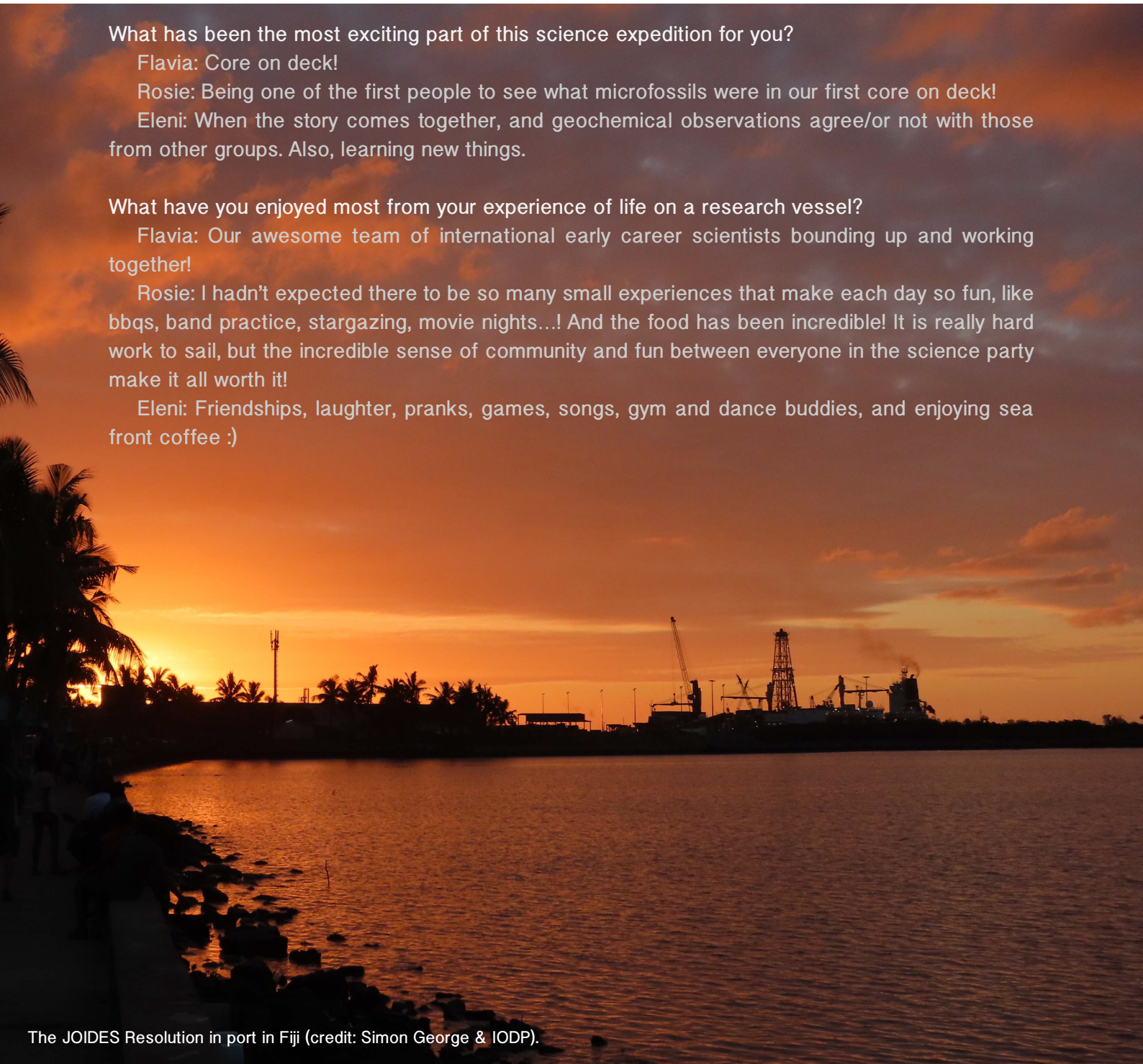
Eleni: When the story comes together, and geochemical observations agree/or not with those from other groups. Also, learning new things.

What have you enjoyed most from your experience of life on a research vessel?

Flavia: Our awesome team of international early career scientists bounding up and working together!

Rosie: I hadn't expected there to be so many small experiences that make each day so fun, like bbqs, band practice, stargazing, movie nights...! And the food has been incredible! It is really hard work to sail, but the incredible sense of community and fun between everyone in the science party make it all worth it!

Eleni: Friendships, laughter, pranks, games, songs, gym and dance buddies, and enjoying sea front coffee :)



The JOIDES Resolution in port in Fiji (credit: Simon George & IODP).