Ocean Gazing: Episode 41
A diary of dirt. Un cuento sobre el clima.
Frank Muller-Karger: University of South Florida

<intro music>

Muller-Karger: Bienvenidos a Ocean Gazing. Esto está buenísimo.

Ari: That's Frank Muller-Karger, welcoming us in Spanish to Ocean Gazing. It's the podcast where we fly just above the ocean, trailing our fingers and toes in the salty sea as we go. I'm Ari Daniel Shapiro.

Muller-Karger: If we're seeing something today that may have been similar to what we saw in the past, we can understand which way the planet is going to change in the future.

Ari: Muller-Karger is an oceanographer at the University of South Florida where he directs the Institute for Marine Remote Sensing. He's using both the seafloor and satellites to figure out our past and future climate. And he's working hand in hand with a country that's very special to him. Stay tuned.

<sustain music>

Ari: I notice that some of your work takes place in Venezuela, and that you're wearing a shirt from Venezuela, and so I'm just wondering what your connection to that country is.

Muller-Karger: My connection is deep. I was born in the US, but I grew up in Venezuela. My parents are Venezuelan. Then I came to the US to go to college. But I have ever since maintained, well, not only the family relationships but I have many friends.

Ari: And a lotta those friends are oceanographers.

Muller-Karger: And we put together a big program that we called the Cariaco Time Series. And that program is carried out entirely in Venezuelan waters in a place called the Cariaco Basin.

Ari: So can you give me a sense geographically where the Cariaco Basin is?

Muller-Karger: It's in the southeast corner of the Caribbean Sea, immediately off the northeastern coast of Venezuela, it's pretty famous because of the windsurfing and it's got some resorts, it's a beautiful place.

Ari: Do you go windsurfing?

Muller-Karger: I do windsurfing, yeah.

Ari: The Cariaco Basin is special.

Muller-Karger: Unique.

Ari: Yeah, unique. One reason is that it's intensely productive during certain times of the year. Not filing-your-tax-returns-early kind of productive. Rather, productive with life. When the trade winds blow over the ocean water at the surface, they churn up water from down below. Water that's filled with nutrients…

Muller-Karger: Phosphate, nitrate, the silicates, that sort of thing.

Ari: Which are eaten up by phytoplankton, or the tiny marine plants. Now, when the phytoplankton excrete waste, or when they die, organic material is released into the water.

Muller-Karger: When this material sinks, if it doesn't get eaten up by a zooplankton or a fish, it begins to decompose, it begins to rot. That is the process that is driven by bacteria. So these bacteria consume oxygen as the particles fall to the point where the whole water runs out of oxygen.

Ari: The technical term here is the water goes anoxic. Not something we'd recognize since we're completely dependent on oxygen. But that's what it's like at the bottom of the Cariaco Basin: anoxic.

Muller-Karger: It turns out that because it is anoxic, there's no animals digging up the bottom. So whatever falls to the bottom is pretty well preserved in the sense that there's little layers of sediment forming at the bottom depending on what material falls from the top.

Ari: And that depends on the amount and timing of rainfall, the intensity of the winds, the air temperature – in short, the phenomena that're connected to the Earth's climate.

Muller-Karger: And because nothing has been digging the bottom there for thousands of years, these layers have accumulated for tens of thousands of years. And it's become one of the primary places in the world's oceans where you can look at past climate. So our job – what we're trying to do – is understand how these layers form, how whatever process happens at the surface leads to changes that are then recorded at the bottom. And then use that to interpret the past.

Ari: And it's not just the sediments that Muller-Karger is digging through when he's out on his research cruises. He's also using satellites to gather information.

Muller-Karger: Yeah, the satellites are essential in this work.

Ari: Essential because they give a big picture view –both in terms of space and time – of what's happening in and around the Cariaco Basin: the currents, phytoplankton abundance, temperature…

Muller-Karger: Satellites are a critical element in what we do in oceanography, and it's because of that: it's because it allows us to see very large areas very quickly, repeatedly, and over long periods of time.

Ari: And this project, it extends over large areas too, and beyond just Muller-Karger.

Muller-Karger: We will not be able to do any of this work if we were not working directly very closely with our Venezuelan colleagues. They are good scientists, good friends. This makes the project a lot of fun because we know people personally. I cannot consider doing anything like this without involving local people. It is their patrimony that we're looking at. So we have to work with them.

But also more broadly even. The Cariaco program has become so visible that other countries in South America and Central America are paying attention to what we are doing. They ask us: how did you do this? Or can we learn from you? Can we come train from you? Can you come to our country and talk to us about how you do this, because we want to do something similar. So we have people in Argentina and Brazil and Chile and Colombia and Mexico that want to do similar things so you end up having a broad impact from the point of view that you are now setting up a network of colleagues that are measuring similar things in different places. And you can not only understand how things are changing locally, but how things are changing on a continental scale along the coasts of the Americas.

Ari: Muller-Karger loves working with other Central and South Americans, especially Venezuelans.

Muller-Karger: Well, it's this very, actually, from my point of view, it's quite simple. I enjoy the people. I enjoy Latin culture, I'm a Latin myself, so I enjoy speaking the language, I enjoy the food. I enjoy meeting with people on a social level as well as working with them.

Ari: So, and you're actually eating these foods while you're doing the science?

Muller-Karger: Well, one of the treats that we have is having one of the best cooks that I know onboard the ship. The *Hermano Gines*, which is the ship that we use to do our work in the Cariaco Basin, has a cook who was professionally trained. And he cooks so much food, and so good that you have no idea how he manages to do this in this small boat. But he cooks cakes and bread and you name it. And of course there's fish. So, yeah, we eat well onboard this ship.

Ari: The team plays hard and works even harder. Because there's a lot at stake when it comes to the science.

Muller-Karger: The ocean covers over 70% of the surface of the planet. It is so key in modifying climate, in modifying the air we breathe, in modifying the temperature of the environment on land as well as over the ocean. If we don't understand how the ocean moves, how it warms up, what the chemistry is like, we are not going to understand how we can change our own behavior to quote-unquote manage the planet. We can't manage

the planet: we manage our own behavior. So we need to understand how the ocean behaves, and the only way to do that is by making measurements.

Ari: Measurements from both satellites and sediments.

Muller-Karger: In the case of Cariaco, what we're trying to understand is how the surface of the ocean is changing, and how that signal is recorded in the sediment.

Ari: So it's like the ocean's writing a diary in the sediments.

Muller-Karger: Absolutely, that's exactly what it is. It's a book. And we're trying to interpret the book.

<fade up music>

Ari: Visit us online at oceangazing.org to hear Frank Muller-Karger talking about one of his colleagues and friends who's been impacted by the work in the Cariaco Basin. We've also got some photos of the team doing work at sea. If you've got a question for Muller-Karger, drop him a note or a voice mail. Instructions are at oceangazing.org.

Ocean Gazing is a product of COSEE. And we get our funding from the National Science Foundation.

<fade up music and sustain>