INTERVIEW OF

DR. MAURICIO PEREDO

Transcript: Edited by Carolyn Ng
Questions:

1. What is your primary area of research?
2. With what and when were you involved in space weather research?
3. What are some of the key events or turning points in space weather research?
4. Anything else? (in this case: concerted effort E/PO)

Conducted by Troy Cline

P R O C E E D I N G S

MR. CLINE: Could you just tell us who you are and a little bit about your area of research?

DR. PEREDO: Yes. Mauricio Peredo, and I work for Science Systems and Applications. I've been doing work with NASA Goddard for 23 years now, and I was part of the International Solar-Terrestrial Physics program, ISTP for short. That was one of the first programs to get into what's now known as space weather.

(Off the record.)

MR. CLINE: Okay. Thanks again for your time, seriously. And the first question we'd like to ask is what is your primary area of research and your interest in that area of research? And we might follow that up with some policy questions as well.

DR. PEREDO: Sure. I'd be happy to answer that. The primary areas that I worked on that were related to space weather was magnetospheric physics, where I was involved with a group here at Goddard that was modeling the magnetic field inside the magnetosphere. But also I did some work modeling some

of the boundaries of geospace; in particular, the magnetopause and the bow shock, generating three-dimensional models of those and how they move in response to changes in the solar wind.

MR. CLINE: How does that relate to the work that you've done? Apparently you've done quite a bit of work with policy and infrastructure that, prior to this, didn't really exist to the level that you and team members developed.

DR. PEREDO: Yes. I had the good fortune of getting on the ground floor when space weather really kind of took off. Here at Goddard, they established the Science Planning Office for the ISTP. That's the International Solar-Terrestrial Physics program. And I was the head of that office.

And we essentially were the first project that attempted to look at the Sun-Earth Connection in a global sense as a system of interconnected parts. The Science Planning Office did the coordination of all the measurements and analysis of the data from not only the NASA satellites that were part of the ISTP program, but also a large number of international and

ground-based and theory elements that all came together to try to study the whole propagation of disturbances from the Sun all the way to the Earth environment and how they created phenomena like the aurora and some of the disruptions of the magnetic environment near the Earth.

MR. CLINE: What is it that you like most about this type of research, and with that question, maybe you can list a few key pivotal moments that you think actually had even a larger impact on the future of space weather --

DR. PEREDO: Okay.

MR. CLINE: -- after that.

DR. PEREDO: Great. Yes. I think one of the things that was really exciting is that prior to ISTP, there had been a few missions that had attempted to do, you know, multi-satellite observations with two, or in a few cases, maybe three satellites, but ISTP was really the first time that we attempted to look at these with a fleet of satellites, so it was like -- if you go back, you know, 80 to 100 years in time, it would have been like trying to predict the

weather in New York by having observations from, you know, a handful of stations in Texas and Kansas and, you know, Alabama and trying to do that and figure out what was going to happen in New York.

Here, for the first time, we had satellites spanning the different areas of space around the Earth and trying to put them all together to predict what was going to happen. It was also the first time that these various science communities really started to work together.

You had solar physicists with magnetospheric physicists with ionospheric physicists that historically didn't interact a whole lot all of a sudden together in one room, trying to compare their data, trying to piece together how something that was propagating affected what their instrument was seeing. So it was a pretty exciting time to be part of that.

MR. CLINE: So an analogy to that would be a series of artists with different paintbrushes, each having a different color of paint, trying to create one masterpiece.

DR. PEREDO: Absolutely. And it was really

interesting to see all the personalities and, you know, the -- because of the international nature of the program, there were participants from many different countries, and so you had to not only get through the science exchanges, but also some of the cultural differences and the customs.

I remember, for example, going to Germany to represent the project at a meeting, and there were about 40 participants, not one of which was an English native speaker. I was representing the U.S. The English representative wasn't able to attend. Yet the meeting was held in English because it was the only common language. So, you know, it has a pretty interesting human aspect to it.

MR. CLINE: The next question, I think we might have already really touched on, is with what and when were you involved in space weather research? Is there more that you would like to add to that?

DR. PEREDO: Well, just for purpose of timing, I joined the project in around 1990, '90, '91, and essentially my first job was to stand set up the Science Planning Office, and then I, you know,

continued my involvement with the program for about 10, 12 years.

MR. CLINE: That's interesting to me because people think that the history of space weather would go way back; I mean, way further back. And there is some history, of course, to space weather, but not to what you're talking about. That really didn't get started until, what, the '80s, '90s?

DR. PEREDO: Probably the mid-'90s --

MR. CLINE: Mid-'90s.

DR. PEREDO: -- is really when it really took off. These event, I think it's -- what's the date for these -- April of '97 --

MR. CLINE: April of '97.

DR. PEREDO: -- is probably really the first fully documented case of -- you know, where you had a fleet of satellite data that was all available, and you had models and observations to compare to.

MR. CLINE: So in April of '97 is when this event occurred, and it was a solar event that you and a team of people came together to try to bring all of these pieces together to tell the story?

DR. PEREDO: Right. It was a -- you know, a CME, and there had been a failure of a communication satellite around the time, and there was a lot of speculation as to whether the CME had, you know, been the cause or the effect. Of course, we didn't have access to any of the data from the communication satellite, so we couldn't really establish that causal relationship, but we were able to document what the impact was to the environment near Earth, and then made that data available to, you know, the owner of the communication satellite to maybe help them in, you know, in better trying to assess the -- you know, what possible impact it might have had.

MR. CLINE: And today, that is the common question -- the first thing people ask. Was that a sunspot -- was there a CME or something that caused certain failures in satellites, or -- that's one of the questions, I know.

DR. PEREDO: I mean, I -- certainly the electronics in satellites are susceptible to discharges and to, you know -- you know, the electronics can get damaged. In terms of getting a

definitive answer for a particular satellite, you know, you would have to have access to the data from that satellite, from that instrument, to really see if they, you know, saw a spike in a signal. So, you know, without having access to the details, I couldn't comment on a specific case.

MR. CLINE: That's right. It's all remote sensing, really. I mean, it's not like you can just go to the satellite and check this out and see what happened.

DR. PEREDO: Right.

MR. CLINE: You're doing this all, clearly, from the Earth and from the ground from thousands of miles away.

DR. PEREDO: Right.

MR. CLINE: Our last question says, you know, what are some of the key events or turning points in space weather research? And we've already touched a little bit on that. Are there key points in your career in space weather that you'd like to bring up?

DR. PEREDO: Well, I think certainly that

event in April of '97 was one, because it was really the first time that we had an event that generated enough interest that it was covered worldwide and we had enough coverage to kind of put together a -- you know, a movie, if you wish, of how the event propagated from the sun through interplanetary space and then impacted the Earth's magnetosphere.

I think it brought to the attention the need for continuous coverage. Oftentimes we have, you know, a single satellite in a particular region, and that's really not enough. Many of these phenomena are interconnected, and what's happening in one region affects what happens in another. And if you have single points, you have an incomplete picture.

So I think ISTP was really the first example of just how much better you could do if you had a fleet of, you know, a dozen, maybe 20 spacecraft. And then, of course, if, instead of having a dozen, you could have a hundred, you could do even, you know, maybe a hundred times better, just like the weather models progressed over the years, and, of course, the more sensors you have, the better the models can get,

and then the better the predictions can get.

So I think ISTP is sort of in the adolescent phase; you know, that we've gotten past the initial stage where you've proven the concept, but really to take it to the next level, you'll really need a -- you know, a much larger fleet of spacecraft out there.

MR. CLINE: And this really touches on even a greater human point is the impact of humans within the technology and the communication that we do between each other, because as we move towards the future, many people are seeing how satellites and different computer systems and everything communicate with each other already, but in this case, it takes the scientists and the engineers and the people who are involved with each one of these pinpoints of information from their satellites to bring them together in conferences, meetings, events, papers.

DR. PEREDO: Yeah. They -- you know, they have to collaborate, and it's -- you know, it's not trivial. You have to agree on, you know, what data you're going to collect and what time resolution and what format so that you can easily compare; you know,

if you're taking your data every two minutes on the odd-numbered minutes and I'm taking mine on the even-numbered minutes, then when we try to compare, you know, we have to adjust to the fact that we're not synchronized.

Well, similarly, when you're talking about several tens of instrument with not just temporal or spatial and geometric effects, you know, you have to get everybody to play together and to agree how they're going to share their information so that you can make sense out of it. And, you know, the more pieces you have, the more important that coordination is.

(Off the record.)

MR. CLINE: You talked about collaborations, and some of them were international collaborations, if not many of them. Can you describe or tell us a little bit more about those people?

DR. PEREDO: Yes, certainly. You know, clearly, I -- well, I first joined the program at the request of Mario Acuna, who was the project scientist for NASA for the ISTP program. And Mario was

originally from Argentina, and I'm originally from Mexico, so he and I actually shared many of the stories in Spanish and often talked to the media and to school audiences in Spanish.

But one of the other exciting things about ISTP was that it was one of the first times that there was a concerted effort to reach out to the public. And there were several scientists associated with the various missions that were very actively engaging, kind of sharing that knowledge. On the SOHO spacecraft, Art Poland and Barbara Thompson gave a lot of the background and the information on the solar missions.

On the geospace missions, Nicky Fox (ph) and myself, and later on, we hired an outreach specialist, Mike Carlowicz. And so we kind of formed this little group of folks that would go out and talk to the media and talk to schools and kind of try to explain the science of space weather and how it propagated and what some of the impacts were. And we worked closely with some of the scientists at NASA headquarters, for example, Bob Carovillano and George Withbroe (ph) were very

supportive of helping us get the message out.

(Whereupon, the interview of Dr. Mauricio Peredo was concluded.)

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I, MARY E. YOUNG, hereby certify that I am not the Court Reporter who reported the following proceeding and that I have typed the transcript of this proceeding using the Court Reporter's notes and recordings. The foregoing/attached transcript is a true, correct, and complete transcription of said proceeding.

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Date Mary E. Young

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