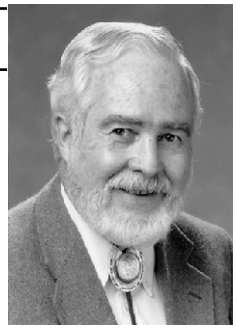
Interview: Dr. James O'Brien



Putting El Niño into perspective

Dr. O'Brien is a meteorologist and physical oceanographer who directs the Center for Ocean-Atmospheric Prediction Studies (COAPS) at Florida State University in Tallahassee. He was interviewed in May by Marjorie Mazel Hecht.

EIR: We've heard a lot about El Niño this year, in the United States, where just about every occurrence of bad weather is attributed to El Niño, and in the tropical areas, where El Niño-related droughts and floods have been wreaking havoc. How would you describe the El Niño phenomenon in scientific terms? What is going on?

In particular, I'd like you to comment on the report in *EIR* by one of your colleagues, oceanographer Robert Stevenson ["El Niño Does What? Surely You Jest!" *EIR,* Feb. 27, 1998], that the 1997 warm water temperatures in the eastern tropical Pacific were diminishing by early 1998, and therefore, that the U.S. storms this winter were not attributable to El Niño.

O'Brien: Well, before I go into what is El Niño, I think that the Stevenson report was a timing problem. In other words, El Niño had started to decrease, but then it went back up again. Currently, El Niño is dying fast.

But let's start off with: What's El Niño?

Normally, off the coast of Ecuador, along the equator, in the tropical Pacific Ocean south of the United States, we expect to see, for example, in wintertime, surface water temperatures around 65 to 75° Fahrenheit. These are created by the large trade winds systems that are very familiar to everybody, the Northeast Trades in the Northern Hemisphere, and similar Southeast Trades in the Southern Hemisphere, which blow and create kind of an upwelling of cold water along the equator, from Ecuador at 80 degrees west, all the way over to the dateline, which is about in the middle of the Pacific Ocean.

From time to time, these trade winds decrease, and upwelling does not occur, and we start to see warm anomalies in the Eastern Tropical Pacific. (By anomalies, I mean the difference from the normal expected meteorological variable at that time of the year.)

Now, if we look at a history record going back the last 50 years or so, we find that every three to eight years, there will be a warmer-than-normal sea surface temperature—we call this El Niño. And in between, we have a colder-than-normal sea surface temperature, and it is generally called La Niña. But I don't like that name, so I call it El Viejo, which means the old man—Old Man Winter.

Now, what is this shifting? We can think about the Pacific Ocean as a big pool of water which is sloshing back and forth. In normal times, there's a big warm pool of water in the western Pacific. And, when there is an El Niño, ocean dynamics occur which deepen the thermocline mixed layer in the Eastern Tropical Pacific, and allow it to acquire heat, because there is no upwelling of the cold water. And, in other cases, it's colder than normal when the winds blow much stronger, and bring up the cold water.

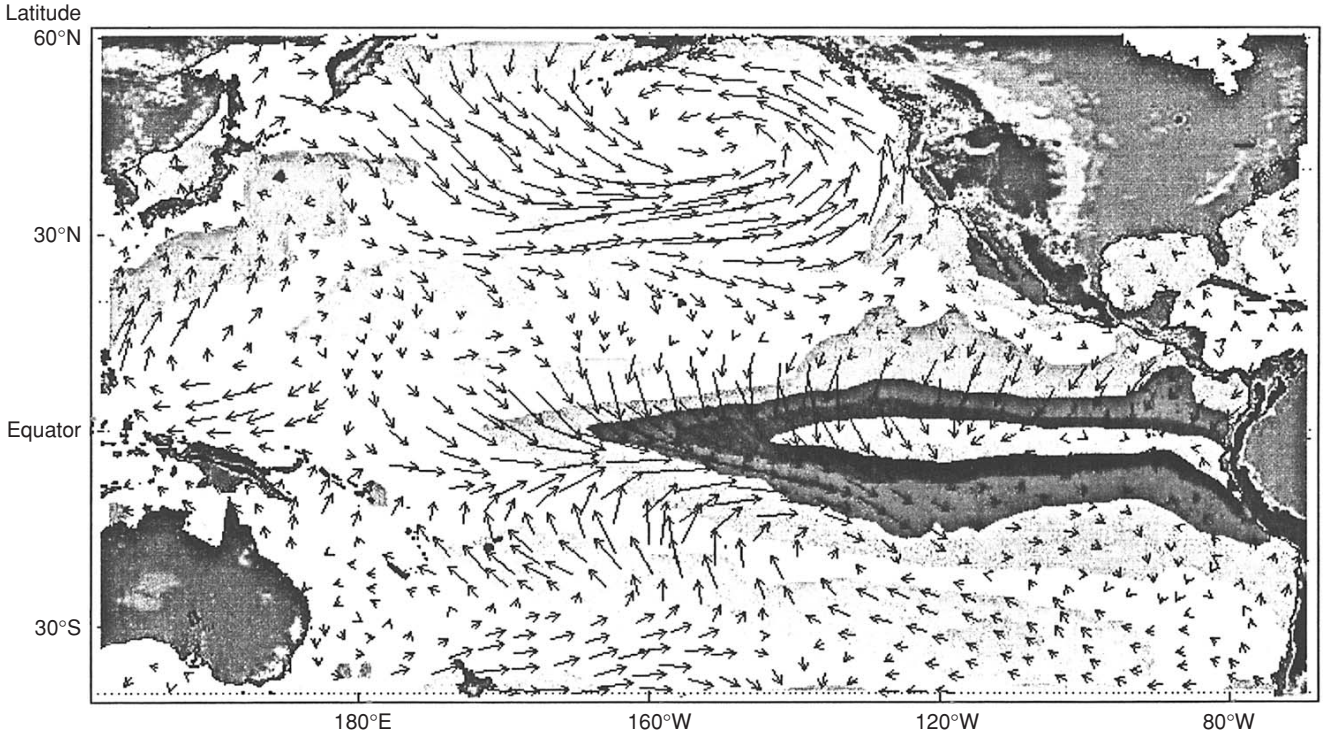
In order to understand how this affects how much rain falls, we need to look at the situation from another standpoint. Think about the Sun shining on the planet. Because of the shape of the planet, the Earth gets more heat in the tropics than at high latitudes. And, in particular, if we look at the planet from space, we'll see that in the western Pacific, west of the dateline, there's a big pool of warm water—called the warm pool—in which the temperatures are always up around 85 to 90°F. Many places on the Earth have water that warm in their summertime, but this warm pool in the western Pacific is there all the time. And from this warm pool, there is lots of convection, lots of typhoons—

EIR: How does the convection work?

O'Brien: This convection process is how the planet gets the heat from the ocean surface, up into the upper troposphere. Then this heat streams poleward in the Northern and Southern Hemispheres. And, because of the rotation of the Earth, this heat and water—mostly just water vapor that's up there—also goes eastward.

In normal times, this is a huge pumping of heat. And in the winter hemisphere—let's take the Northern Hemisphere, for example, in winter—it's the headwaters, or origin, of the 200-millibar tropical jet stream. This jet stream meanders around through the Pacific, but by the time it actually reaches the North American coast, it's not too strong. Occasionally, it will give rain in Southern California, or in Oregon, but it's not too strong.

Now, when El Niño happens, with all the shifting and warm water, then water warmer than 28° centigrade, or around 90°F, shifts east of the dateline. So now, instead of having all this convection occurring in the western Pacific, it



Surface wind anomalies in the Pacific Ocean on Dec. 15, 1982. Australia is at lower left; North America at upper right. The large shaded area near the equator indicates temperatures 6°F or warmer than usual.

occurs in the *central* Pacific. During an El Niño winter—our winter, for example—or in the previous summer, in the Southern Hemisphere's winter, then there is all this moisture, or heat, coming from the central Pacific. And when this 200-millibar jet stream hits the United States, it's quite strong. It comes in across Southern California, and it tends to go straight across the country.

During an El Niño, in the winter in the United States, our weather is dominated by the southern jet stream, and not the jet streams that come from Canada. Therefore, this past winter, Chicago and the mid-Plains were quite warm, and the southern part of the United States, from California all the way across to the Carolinas, was more rainy from all this water that has come from the Pacific. It also tends to be slightly cooler than normal, just because we have cloudiness.

Here in Florida, for example, this last winter, people said, "We had a warm winter," because they didn't get any real cold air from Canada. But, in actuality, when we checked it out, it actually was a cooler winter, because of all the rain.

So, this is El Niño.

When we have El Viejo, or the cold water near the Galapagos Islands, then the warm pool in the Pacific is pushed back into Indonesia, and the 200-millibar jet stream is farther away. It becomes a real wimp by the time it reaches the United States, and it doesn't really mean anything. So, the United States gets dominated by the polar jet stream: There are huge amounts of cold air plummeting down from Canada, and there is an entirely different weather pattern.

Now, let's look at what El Niño does in the tropics. Let's look first at the countries in Latin America. On the west coast of Latin America, that is, Colombia, Ecuador, Peru, and Chile, these are mostly rather desert countries—except for part of Colombia, because of its mountains. But El Niño changes the circulation, so that these countries end up getting rain. So, places in Peru, and in Chile, get lots and lots of rain where they're not used to it.

On the other side of South America, in Brazil, they tend to get droughts in northeast Brazil, and down in south Brazil—it's a big country—near Argentina, they get lots of extra rain.

If we go to the other side of the Pacific—because, in El Niño, the convection was shifted from north of Australia, to out in the middle of the ocean—the northern part of Australia, in Queensland, tends to have droughts. Indonesia, the Philippines, and South China also have droughts. This happens with the shift of the origin of the jet stream.

In the opposite case, with El Viejo, there is cold water, which pushes the warm pool over toward the west. Then Australia gets lots more rain, Indonesia goes back to being a tropical rain forest, and Taiwan and China and the Philippines all have a nice amount of water.

There are also teleconnections. This word refers to seeing something happening in one part of the planet, which seems

Scientists working on a Tropical Atmosphere Ocean (TAO) Array mooring. There are 65 such buoys along the equator, from the Galapagos Islands to New Guinea. They measure wind and water temperatures, rain, and solar radiation, and transmit the data to the United States via satellite.

to have consequences a long, long way away. There seem to be very strong teleconnections in southern Africa, which I won't try to explain now, because I don't really understand them. Historically, people have tried to link the rainfall in the Indian monsoon to El Niño, but this theory never holds up when you study it carefully. There's a relationship there, but it's kind of flaky.

EIR: So, broadly, these shifts are referred to as oscillations.
O'Brien: Yes. One of the reasons it's called a southern oscillation, is that historically, people were measuring the sea-level pressure between Tahiti and Darwin, Australia, which, basically, measures the strength of the Southeast Tradewinds. So, when the Southeast Trades are strong, the difference between Tahiti and Darwin would be very positive, and when it's weak, the difference would be negative. This has been the "landlubber," or atmospheric measure of what's happening. In the modern day, we've switched over to looking at the sea surface temperatures along the equator, to just the west of the Galapagos.

This southern oscillation has been studied by climatologists for a long time. Now its called the ENSO, which stands for the El Niño Southern Oscillation. And the reason it is called this, the most important reason, is that this is really a phenomenon driven by the ocean. The ocean has certain modes of oscillation. But, under the right circumstances, the atmosphere amplifies these oscillations, and they grow to be this big thing which now everybody knows—El Niño.

EIR: How does the southern oscillation come to affect the United States?
O'Brien: To come back to the United States, which is much more interesting to me: Because of the weakening of the trade winds, El Niño affects the low-level winds in the Atlantic. Therefore, you don't have a lot of hurricanes in the Atlantic, because the thunderstorms get knocked over by the winds in the high atmosphere, and don't form into hurricanes. For example, the probability of having two or more hurricanes hit the United States in the hurricane season prior to an El Niño winter, is about 20%. But if you have the El Viejo, the probability of two or more hurricanes hitting the United States goes up to 75%: This is an incredible difference.

We at COAPS have done some interesting studies on tornadoes in the United States. We found that there have been almost no tornadoes in the traditional Tornado Alley—as highlighted by the movie "Twister." So, from Dallas up through Oklahoma and Kansas and Illinois, it's been very quiet. This is a direct result of the fact that the southern 200-millibar jet stream came across the southern United States, and doesn't allow the moisture from the Gulf of Mexico to get up into Oklahoma. So, no tornadoes.

On the other hand, in El Viejo, the big north-south meandering jet streams allow lots of moisture to be pumped into the Tennessee and Ohio valleys, and they get a lot more tornadoes.

This year's El Niño started very early, and all El Niños tend to have two peaks. They tend to peak, die off, and peak again. So, this one peaked some time last summer, for the first time. This could have prompted some people to think it was going to die earlier, and to think that the wintertime storms in California, and the tornadoes in Florida and Georgia, were not due to El Niño.

But, unfortunately, the thing came back again, and as of right now, there are still 3°F warm anomalies sitting in the tropical Pacific.

EIR: Can you elaborate on why El Niño is associated with such different weather extremes, droughts and floods?
O'Brien: Well, I explained this with the 200-millibar jet stream. Let me put another spin on this, namely, that the Pacific Ocean is way out there—nobody lives out there.

There are currently scientists publishing papers which are saying that El Niño is happening more frequently, and that this is a definite fingerprint, or sign of global warming. I don't believe that at all.

EIR: And there's a lot of it.
O'Brien: And there's a lot of it. It's big, it's huge. We didn't have many scientific expeditions out there, and it's only really since the era of satellites, that we're beginning to really see the place, and see phenomena, and then encourage the governments to support further research.

We have this marvelous array of buoys, called the TOGA-TAO Array. That's about 65 buoys stretched, plus or minus a couple of degrees from the equator, from the Galapagos all the way to New Guinea, which take ocean and atmospheric data and send it back through satellites to the United States, so we can see what's happening.

But, 20 years ago, let's say the winter of 1966 or 1967, or the winter of 1957-58, you could have had just about the same kind of mess, and nobody could explain it. If we go back earlier than that, they would have blamed it on Russian atomic bomb tests. I remember, when I was a kid, they blamed all the strange weather on Russian atomic bombs, or American atomic bombs, too.

EIR: Yes, including the drop in SAT scores—
O'Brien: So, the real breakthrough that's happening now, is that we are able to identify the morphology, or life-cycle of ENSO, and we are able to measure it, and to anticipate what it's doing. This is a major technical breakthrough. The United States has tried to forecast the winter and the summer conditions in precipitation and temperature, since around 1950. And we've been singularly unsuccessful.

In the April 24 issue of *Science,* there is an article pointing out that the new weather models had some success in predicting El Niño this year. I think the author overplays it a little bit, although I think there has been some success. But certainly, even without the computer models, if we have all these observations in the middle of the Pacific, it's possible for us to look at what's going on out there, and, based on all our other studies, to anticipate what's happening.

This is very valuable information for many sectors of our economy. Right now, for example, insurance companies are actually providing policies that are weather-related. People in California, telecommunications people, telephone companies in California which are worried about El Niño's bringing so much rain that all the telephone lines are going to slide into the ocean, along with the houses on the hills above them, can actually buy insurance based on these kind of forecasts.

In the Northeast, people who supply natural gas or heating oil for homes, can actually take out an insurance policy that will cover whether or not they have to pay more on the spot market if they have not bought up enough fuel for the demand. One of my students works for a private company in Seattle, and in the El Viejo winter of 1995-96, his company advised their clients that it was going to be that kind of winter. It gets quite rainy, snowy, and cold in that area, and their clients saved lots of money by buying up the extra energy before anybody knew what was happening.

EIR: I think it would be particularly useful for farmers to have an idea of the weather in advance.
O'Brien: Also directly attributable to the warm winter, I can still buy gasoline for 97¢ a gallon here. There are other economic factors, of course. But the fact that this winter, all across the Midwest, and from Chicago to Boston, the typical average monthly temperatures were 3 to 7°C, almost 10°F, above normal. This meant that there were tremendous energy savings.

So, we have this new phenomenon—El Niño. We understand it, we have some ability to forecast it. But we still have a lot to learn.

EIR: If you look at the issue historically, there have been anecdotal accounts of El Niños going back hundreds of years.
O'Brien: The first mention of El Niño, it turns out, is in Lima, Peru, where it never rains unless there is an El Niño. The first priests came there in 1470, from Europe, and there are two things of note: The European priests never went home, and it only rains when there's El Niño. So, by going back and looking at the diaries of the priests back to 1500, we have actually gotten an excellent record of El Niños back to 1500.

Also, scientists have looked at corals in the Galapagos. The warm water near the Galapagos Islands tends to keep the coral from growing, so it's like tree rings as a record of the weather. By looking at the corals, scientists have been able to track El Niños back even farther than 1500.

The coral growths don't track the El Viejos, the big ones, but they do track the warm events.

EIR: I think it's extremely useful to have the historical perspective, because there's a tendency, as you well know, to attribute El Niño's weather extremes to man-made global warming.

O'Brien: Well, let me talk about that for a minute. There are currently scientists publishing papers which are saying that El Niño is happening more frequently, and that this is a definite fingerprint, or sign of global warming. I don't believe that at all.

We have a paper which we've submitted to *Nature,* which shows that the same kind of more frequent El Niños which we've had since 1990, occurred at the end of the last century, between 1885 and 1895. So, if you look at a long-enough record, you will find out that the same thing happened before.

I will say, however, that although I'm not a proponent of global warming—and you can print that—I don't think that the extra-radiatively active gas—that's a very scary word for everybody—or the CO_2, or methane extra, will manifest itself in necessarily warming us all up; it will manifest itself in some other way. But, that's another article.

The models do show, however, that if we go into that kind of warming scenario, then we will have a more El Niño-type warm ocean. Now, the good news is—that that is tremendously good news! People say it's bad news, but as I said, El Niños mean fewer hurricanes. Hurricane Andrew caused $30 billion of damage, and they're saying that if the next one comes in 100 miles north of Andrew, it would cost $60 billion. And, if we had more El Niños, we'd have nice warm winters like the one we had, and we will have many fewer hurricanes.

So, if this is the case, we should just get a couple of rows of people to move away from the beach in California, and maybe in Florida they can have better rules about living in aluminum boxes.

Why make El Niño into such a bad thing, when it's actually probably the biggest economic boost that's going on right now in the United States? There are many more positive sides to it than that.

EIR: There is also the broader issue of getting people to understand that man's industrial society is not what creates, or changes, the climate. People's thinking on this has really been skewed.

O'Brien: . . .You know, we have a web site with a tremendous amount of information on El Niño and related topics. The address is www.coaps.fsu.edu

This web site was created because we were getting about one e-mail a week from a highschool or junior highschool student, saying: "I've got to write about El Niño, tell me about it." So, in order to help those kids, we put a tremendous amount of bibliographic information on the web site. Before El Niño last year, late 1996, we were getting about 3,000 hits a day, and then, by last summer, it went up to about 40,000 hits a day. I think it's less than that now, but we are linked to other web-based publications.