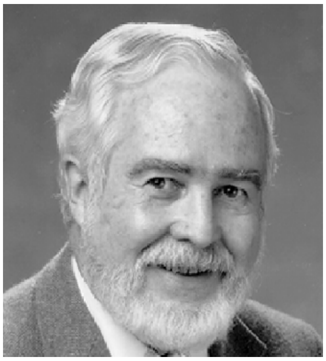
Interview: James O'Brien

Probing the unknowns of El Niño



Dr. O'Brien is the Director of the Center for Ocean-Atmospheric Prediction Studies (COAPS) at Florida State University, Tallahassee, Florida. In Part 1 of this interview (which appeared in last week's EIR, *Sept. 19, p. 25), Dr. O'Brien discussed the El Niño/Southern Oscillation (ENSO) as "an unstable but self-limiting oscillation between the atmosphere and the ocean." The collapse or weakening of the strong westerly winds allows the Sun to heat up the waters off Peru and the rest of the eastern tropical Pacific, which is called El Niño. The cool end of the oscillation, known as La Niña, occurs about two years later. Dr. O'Brien said that he has named this El Viejo, "The Old Man."*

As EIR *noted last week, both cause and effect in the El Niño phenomenon are under investigation; scientists still can't explain why the phenomenon occurs, and there are conflicting views. Dr. O'Brien, for example, ignores the involvement of aboveground volcanic activity as influencing El Niño. However, many scientists disagree with this view, and future interviews will pursue the volcanic hypothesis.*

Dr. O'Brien was interviewed by Elijah Boyd of 21st Century Science & Technology.

Q: Professor O'Brien, you were in the process of explaining what, exactly, constitutes an El Niño, or "Warm Event," and its opposite, the "Cold Event," also known as La Niña. More precisely historically, as you said, this should be called El Viejo, or, "The Old Man." Historically, the Cold Event follows the Warm Event, or the El Niño, which is currently causing damage worldwide from its locus now, in the Equatorial Pacific Ocean.

O'Brien: ENSO is a big oscillation, particularly the warm and cold phases. It's clear that there is something else at a longer time scale, modulating the oscillation, and nobody has a clue what that really is.

There are periods, as in the 1940s, where you can go almost 12 years without having a big one. You get periods, as in the 1970s and early 1980s, when the oscillation is in a regular, or almost regular, four-year mode, and then you get a flat period, as you had in part of the 1990s, and when you go back in the early 1970s, you see a flat period which is mostly cold. There are not even hypotheses on the table of what might be modulating this so that it isn't more regular.

ENSO is a basic oscillation in the Pacific Ocean that occurs, gets amplified, and blows up into an "event" which makes warm anomalies in the Eastern Tropical Pacific. The most important thing isn't that it makes warm anomalies; the most important thing is that it moves 28°C water east of the [international] date line, because that switches the convection zone. It pushes the warm water farther toward Indonesia. This is a very important fact, because in the equatorial Pacific Ocean is where you get more heat coming in from the Sun, the atmosphere has to get that up into the upper atmosphere, so that it can go poleward, and finally radiate out to space someplace.

When you have El Niño and you have the warm water, these anomalies don't drive convection; what drives convection is the temperature. So when you push 28°C water east of the date line, you then get a lot of convection east of the date line. This makes the subtropical 200-millibar [of air pressure] jet over the United States, the dominant jet stream over the United States in winter. In the opposite event, when the winds push the warm water way to the west, then the Polar Jet becomes the important one, and it has a big, meandering pattern, which ends up with Seattle, this year, being as dry as hell, and in the other oscillation, Seattle is wet.

It depends on whether the Southern Jet Stream coming in over the Pacific, or the Northern Jet Stream, is the dominant one.

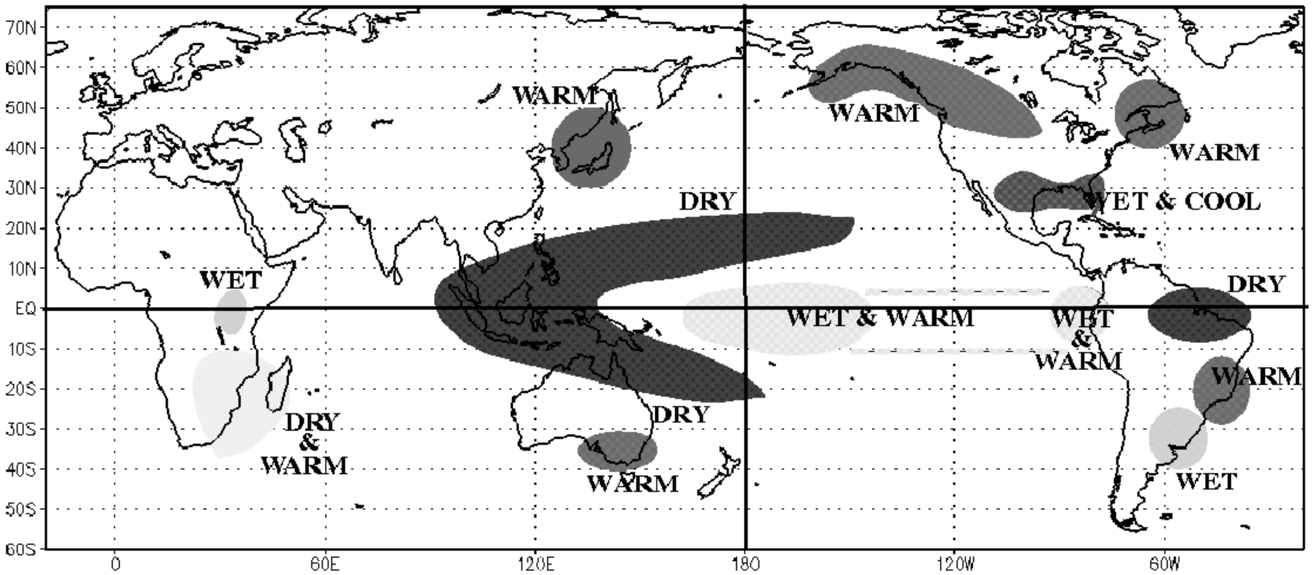
Q: Atmospheric scientist Hugh Ellsaesser dates the occurrence from the weakening of the winds.

O'Brien: There's *no question* that the first observation of the event from data is that—absolutely none at all. I personally believe that there is a basic four-year oscillation in the Pacific, and the oscillation comes around during the time that there's a temperature contrast between the middle of the Pacific and the Eastern Pacific, that the oscillation has an opportunity to amplify, and that the ocean is the basic driver.

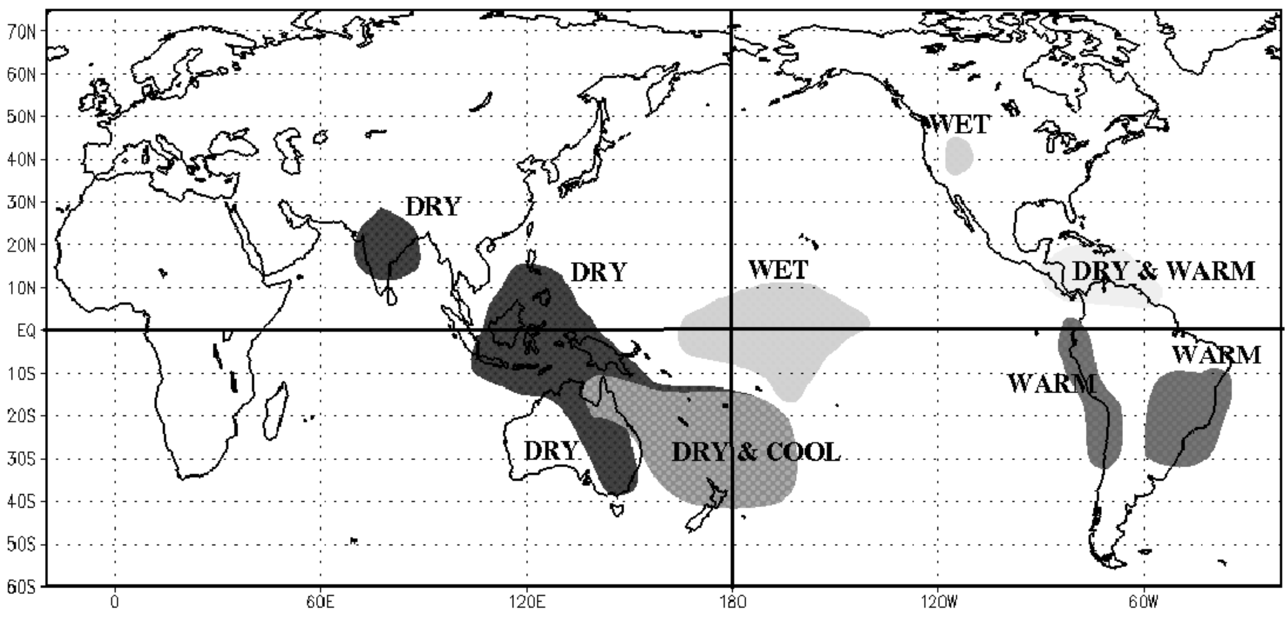
I have to admit that I do not have a definitive experiment which proves that.

Q: Let me throw another thing into the hopper. These latest investigations of the Sun looking at sound wave patterns have discovered plasma rivers, and large-scale electrodynamic movements that occur at the same time that you have the movements of the sunspots. These are the equivalent of bands of plasma, and plasma jet streams on the Sun. So, looking at this from the standpoint of completely invisible electrodynamic causes, which, of course, can organize winds and since the Earth is a great big electromagnet anyway . . .

Warm episode relationships (December-February)



Warm episode relationships (June-August)



O'Brien: I've been dealing with strange theories on this thing for the last 20 years. You know the guy at Illinois, thank God he's retired, who believed that aerosols from volcanoes did it. When he finally got investigated, it turned out he was cooking his data.

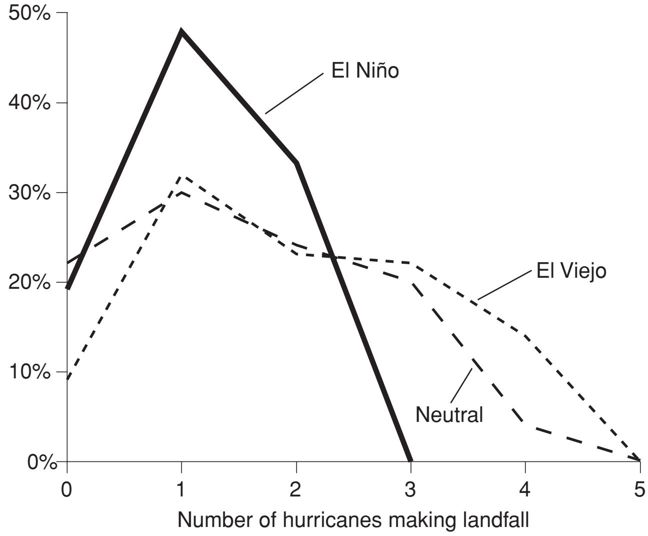
Now, on the magnetics for the Sun, I want to see the data, or I will think these guys are cooking it. The other guy we had to deal with, was the volcano-under-the-sea guy. This was a guy in Hawaii who believed that in the East Pacific rise, every now and then, the plates sort of opened their mouth and let out a huge pile of magma, which created warm water, which popped up to the surface.

The problem is, there is actually demonstration, first by simple [ocean only] models, then this year by coupled models [ocean-atmosphere, the "Coupled Ocean Atmosphere Response Experiment"]. The coupled models back in October 1996 were predicting that there was going to be an El Niño this year. They didn't predict that it was going to start up quite so soon and quite so strong, but it was done back in October.

But, I'm happy to look at whatever data people think they have, because I know the timings of these things. It reminds me of when I was a post-doc; during one of my first years as a post-doc at NCAR [National Center for Atmospheric Research], Walter O. Roberts called me in because he was being battered over the head by some of these guys, who had discovered correlations between these streams of plasma from the Sun and weather patterns over the United States. It turns out that the cause and effect was just nonsense, because its commonality was the positions of the oceans and the land.

Q: Two plasmas, Sun and Earth.
O'Brien: I understand, but I don't know enough about astrodynamics to comment.

FIGURE 1
Atlantic U.S. landfalling hurricanes, 1900-96
(relative frequency)



Source: COAPS.

Q: Now, can you say something about the ENSO effects?
O'Brien: Because of changes in the jet stream patterns over the Pacific Ocean, all the countries that border on the Pacific rim are affected, from Chile to Alaska, from Japan to Australia and New Zealand. We can come back to that, but basically ENSO changes the patterns of convection and the jet streams when you get out of the Tropics. People from time to time have tried to say that this is a cause. Now, this goes back a hundred years. It was first studied by Sir Gilbert Walker, about the phenomenon affecting the Indian Monsoon, which affects the food for a lot of people. It turns out that this idea is really flaky.

On the other hand, what I don't understand, not to my satisfaction, is what the physical mechanism is. It's obviously affecting Southern Africa, Zimbabwe, Botswana, and those places down there, and it's one that I don't quite put together. Basically, in North America, the dominant jet stream becomes a sub-tropical jet stream which comes across Mexico. So the biggest, consistent impact is that the southeast has a little extra rain and some slightly cooler temperatures, because of the cloud cover. Right now the government is warning all of California, and they are cleaning out all the drain ditches, because they are forecasting gigantic storms.

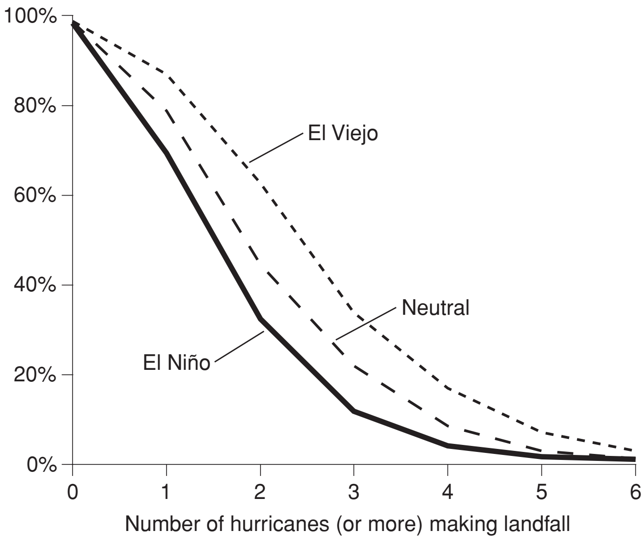
That's a real iffy one, because it's not a consistent impact. If the jet stream stays down in Mexico, California won't have it. If it comes to southern California, they are going to get it "big time." The fact that Seattle is going to be dry, is a "slam dunk" [certainty]. The other thing that we haven't finished publishing on yet is the reason there are no hurricanes this year, is because of El Niño.

Here, instead of looking at all the Atlantic hurricanes, we just looked at the ones that count, the land-falling hurricanes. The reason we did that is because before World War II, the record on all the storms is inconsistent; things happened that we didn't know about. We didn't have satellites or airplanes. We go back to 1900, we find out that when El Niño was going on, for the hurricane season prior to the winter, in none of those 16 or 17 years had three hurricanes hit the United States, and most of the years had only one, or zero [see **Figures 1** and **2**].

When the La Niña, or El Viejo, is going on, the probability goes way, way up. There is a huge, huge dichotomy. We have a chart that shows the empirical probabilities drawn for cumulative probability distributions, and one where we just fitted it to a Poisson Distribution.

We have work which is, unfortunately, a manuscript, submitted for an undergraduate thesis award, in the American Meterological Society, I would predict that in the normal "Tornado Alley" in Oklahoma, Texas, and Kansas, that they'll have big, significant decreases in tornados this year, based on our work, because it's El Niño. Forest fires will be suppressed all along the southern United States, particularly in Florida, and the coastal regions and Carolinas, and Georgia,

FIGURE 2
U.S. hurricane landfalls, cumulative frequency, Poisson distribution
(probability)



Source: COAPS.

because of the winter rain. Lots of good things. Of course, you read in the press about people catching fish off San Francisco that belonged to southern Mexico, and so on.

Q: Yes, the tripletails.
O'Brien: Obviously, in China and the Yangtze Valley, they are having gigantic droughts; Queensland in Australia is having droughts; Peru is having rain. The Peruvian situation is very interesting. If you read an encyclopedia about it, they always say the El Niño is associated with the Peruvian anchovy. Well, the Peruvians overfish the anchovies because the El Niño pushes them too close to the coast and they were too easy to catch in the little boats they had. But, right now, it's very interesting, the technology. In Ecuador, they have big shrimp farms, right near the ocean, and when they know El Niño is coming, they can build dikes, so that the farms don't get washed out with the extra rain; the benefit is that the shrimp larvae population in the ocean is much bigger, so they really benefit economically from this. The Ecuadorian shrimp get advected southward to Peru, now the people in northern Peru know they have the right boats, and nets, and stuff to go out and catch the shrimp.

They also plant rice in the riverbeds, instead of corn, and get a crop, and then in northern Chile, the Chileans—the Peruvians are angry—but the Chileans now have the nets to catch Peruvian anchovy, and they go out to catch the anchovy which have invected south.

So, there are huge consequences of El Niño. I know that, already, Chile has lots of heavy rain. We don't know about northeast Brazil yet, because the growing season is going to be in December, January, February—but drought is normally associated with it. But the Atlantic always affects that, and we're doing some analysis of southeast Brazil and northern Argentina, where they'll get rain. So, the marvelous thing about the whole story is that oceanographers learned how to forecast this phenomenon, proved that it could be forecasted, and the government then invested in this TOGA/TAO [Tropical Ocean and Global Atmosphere/Tropical Atmosphere Ocean] array, this huge array of buoys across the Pacific, that gives us measurements, and we have the satellite measurements. So even if the forecasts don't work, we know what's happening. We've studied some of the impacts.

I'll tell you a funny story, we had a satellite in 1982, we didn't have the research buoys, and in July and August the temperatures were already 6°C warmer than off Galapagos. At NOAA [National Oceanic Atmospheric Administration], where they were measuring all the satellites, they were throwing out all the data—quality control was throwing out all the data—because it could [allegedly] never get that warm! And . . . the young kid looking at the quality control data blamed that fact that the data were being thrown out because there was dust from El Chichón, the volcano, above the Pacific. But he got the sign wrong, because if it was dust from El Chichón, all the data should have been colder than normal, rather than warmer than normal. But, that will never happen again. We've had this revolution, and things are really rather marvelous, for lots and lots of aspects of human life in a lot of places.

Q: How in the world do we get hydrodynamic-spherical models of the earth, so that you can see the interaction of the jet streams and the convection?
O'Brien: I don't know if I'm taking your question wrong, but I'm always moaning at my colleagues for drawing these lousy graphs that are in grid point coordinates. You talk about spherical coordinates. It's actually trivial, with the map-drawing equipment we have to map things spherically. I have a student studying some aspects of the winds over the ocean related to the convection regions, and she was doing rectangular grid-point maps, where one-third of the world map is devoted to the Arctic and one-third to the Antarctic. It was horrible, and I told her to use another projection, and she got an absolutely beautiful one. It wasn't actually spherical, but it showed the projections aren't really a problem. . . .

I'm speechless about it. I told a first-year graduate student to draw her data in a different coordinate system, and the next day she had it done! The problem is that my colleagues are too lazy. . . . Their data is already in latitude-longitude coordinates, the model is in spherical coordinates, and they just draw it as a rectangular. It's not expensive, it doesn't cost any computer time, it's common—and they just don't do it.