

May 2015 SW Climate Podcast

Winter Recap Following a Mild Spring, El Niño Slotting into Place, and Looking Towards Summer - with Wildfire, Tropical Storms, and the Monsoon on Tap

In the May 2015 Southwest Climate Podcast, Zack Guido and Mike Crimmins reconvene to talk about the Winter patterns that fed into our current situation, and how it has actually been pretty moist and cool (for this time of year) after a very warm winter. They then turn back to El Niño - which despite being hard to predict, forecast, or describe - has given us a lot to think about. They exercise some warranted caution in putting too much stock in forecasts given the "excitement" surrounding a strong El Niño event, but the patterns in place are suggesting this enthusiasm might not be misplaced. They move on to talk about how El Niño may affect tropical storm activity and monsoon patterns looking into Summer and Fall 2015, as well as the impacts of last year's monsoon (and mild weather this Spring) on fire season. Drought and water availability present a less optimistic scenario - below average winter precipitation and above average winter temperatures for most of the Western U.S. mean snowpack is well below average heading into summer, with implications for water storage and availability.

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Zack: Welcome to all those tuning into May's edition of the Southwest Climate Podcast. As always I am here with Mike Crimmins. We missed a month but we have a lot to talk about. 00:35

Zack: When I think of May, I just go ughh. May does not rank up there as one of my favorite months. 00:47

Mike: April showers bring May flowers. 00:47

Zack: May reminds me of the onset of getting sick. You are running around like taking vitamin C. The hot June is coming, the apocalypse is on the way. Where does May rank for you? 00:56

Mike: Maybe the bottom half 01:14

Zack: What is your favorite month? 01:14

Mike: February or March. Actually I have a favorite day. It is the day the humidity retreats in October and it is that glorious day where it is 80 degrees and the humidity has crashed out. It is this beautiful time. 01:35

Zack: The great part of May is you are not that far away from the monsoon which is the most exciting part if you ask me. We are about 4 or 5 weeks out we just have to labor through June. 01:43

Mike: I don't know how much labor there is going to be this year. 01:48

Zack: Monsoon is in our sights; we will talk about forecasts going forward. But first lets do a recap of the winter because that is in the rearview. Then so much exciting stuff is going on with

El Niño! Where we stand now for most of Arizona is it has been about average precipitation. We had dry conditions in November, we had wet conditions in December and January, dry conditions again in February and then mixed in March and April. So that balance in Arizona and parts of New Mexico has been basically average. Now that doesn't do the nuances justice. California has experienced the 4th year of dry conditions. We can't not talk about temperature this winter because I think that is one of the big indices that has produced some outlier conditions. Average temperatures have been for the most part, record setting. 2014 was record warmth in most of the west and the first 4 months of this year have followed suit for the west. If you look at the continental United States, there is this huge juxtaposition between the dry and warm west and the cold east. 03:40

Mike: Giving rise to the very technical description called the Warm West Cold East pattern. 03:47

Zack: What is behind that pattern? 03:57

Mike: Again it is that jet stream pattern. We have talked about this for almost 2 years now. That broad jet stream pattern sweeping north over the western U.S. and diving south over the eastern U.S. So underneath and south of that jet stream is going to be the ridge of high pressure, you are going to have warm conditions and then north of that jet stream when it dives south is going to be that cold air pouring in from the arctic. That has been the story since it is such a dramatic break between the warmth and the cold, giving rise to that it is getting its own pattern name. 04:28

Zack: So related at all? 04:33

Mike: This has been pounded by the research community. They are trying to figure out what has been going on with this. We have talked about this too in earlier podcasts: pointing towards conditions in the west Pacific, driving a jet stream pattern, a very stable jet stream pattern across the entire Pacific that has caused that ridge in the West and the trough in the east to persist. To the point that people are calling it an ENSO precursor pattern. This idea that you get a pattern very similar to this and you have seen this in previous El Niño El Niño events, where you get this wave pattern set up prior to an El Niño. That is why I think we have been on the cusp of moving into this El Niño event in full play and then seeing the atmosphere on the edge of this El Niño event as well. 05:26

Zack: So last year at this time there was a lot of clamor because the sea surface temperatures were looking quite warm. They were looking very similar to the biggest event we have seen in 1997-1998. Now El Niño didn't materialize for many reasons we talked about, mainly because the atmosphere didn't quite respond. Now we never lost that background state of the warm sea surface temperatures and they are warmer now than they were at this time last year. 05:59

Mike: Exactly and that is the sort of interesting part, this El Niño took 18 months to get going. In a paper you sent me earlier this week they were looking at indeed had that warm water sloshed across that year ago, but there were a couple of other things that weren't in play. That paper you sent me suggested that there were these westerly wind bursts, these atmospheric events that help connect the atmosphere to it across the Pacific, they just were not lining up. They weren't quite in the right spot and we saw a few of those move across over the last year and now they are lined up in a really good spot. 06:55

Zack: Yeah that is interesting to point out. In that paper they were looking at those wind bursts in relation to all of the El Niño events and the El Niño that occurred, occurred concurrently at times with those westerly wind bursts. 07:08

Mike: So you had to have that coordination of them. You have this randomness of the weather going on above it and then this background state moving. 07:21

Zack: Part of the problem last year was that there just wasn't the sea surface temperature gradient in the tropical Pacific Ocean enough to instigate those. It was warm throughout and what you need is sort of colder in the west Pacific and warmer in the east Pacific to create that gradient. 07:45

Mike: A bit of chicken and egg, can you get those things to line up at the right time? Seeing that gradient set up and seeing that convection move over to the central Pacific and then seeing some of the signs of the atmosphere coupling. Like this idea of the break down in the Walker Circulation, you see the upper atmosphere change directions or have wind flow in different directions and at the bottom too. Didn't see that except for a couple times last spring. And there was a mismatch too between the time of the Kelvin wave coming over and the time of the westerly wind burst. Some of those things were actually like a month or two out of face from each other and that point things really did crater the next couple of months into summer. Another Kelvin wave and some more westerly wind bursts through the summer. But now you are at the point where everything is in lock step with each other and the atmosphere is very strongly coupled with the ocean. 08:45

Zack: It is early though! Could this dissipate? 08:44

Mike: Yeah! That is why it is way different than last spring, in the sense that it is much more favorable for conditions to continue. The models are going bonkers right now. But what they are cueing in on is that a lot of these features are fitting together much different this time of year opposed to last year. 09:49

Zack: There are also the above average temperatures below the sea surface that can help continue this ENSO forward. 11:20

Zack: I guess the other reason we are cautious and there is a great blog worth reading by NOAA.climate.gov and it is called the Spring Predictability Barrier and it is basically just difficult in this particular month to forecast outward. So if you are in October and you want to forecast what ENSO is going to do in November, December and January, the models do a very good job at forecasting what ENSO is going to do the next 3 months seasons. In April and May, projecting a month out it is very bad. But that I think is because they are looking at aggregate statistics and because the summer time in the tropical Pacific Ocean is transitioning there is no coherence in pattern and it is difficult to predict. But that is not to say in any one year you can't have better indications than others. 12:22

Mike: Super fair point. There is also so much signal this year that you would expect they are latching on to something that is a lot less ephemeral than maybe on a borderline situation. So you expect them to perform better when things maybe get to the threshold stage where there is just so much momentum towards El Niño with where the convection is in the central Pacific, the extent of the westerly wind bursts pushing east, the new kelvin wave coming to surface. I was listening to a call this morning where they compared the April of 1997, April of 2014 and April of

2015. 2014 when you look back, the really strong warm stuff came across in January, February March and then petered out. April of 1997 looks much similar to April of 2015 because the atmospheric coupling was there in 97 and is here in 2015. Again we are dragging that analog out again. We did it imperfectly last year but there are these things at play that seem to be different this spring. 13:35

Zack: But I think analogs are useful in this specific case. Going back to that paper we were referencing before, one of the things they were trying to do was look for more than 1 pattern. They were saying okay we know there are different characteristics of ENSO, we know there are different flavors, lets be a bit more detailed about different kinds of patterns. That of course slices an already small sample size, which is the problems with analogs, but it was we have to work with now. 14:13

Mike: When you try to dissect these things you need to have something to compare them too. That is why I think we have learned a ton. These papers that have come out in the last year, just looking at the last couple of years have shown all sorts of flavors we haven't been thinking about. Also the changes in the North Pacific all the way down to the east Pacific as far as warmth, there are different things going on here that make this a really interesting year coming up. 14:46

Zack: Do you recall last year at this time, was the sea surface temperature anomaly across the Pacific Ocean similar to how it is now? 14:54

Mike: Yeah it is, we had that warm horseshoe pattern from the gulf of Alaska down the west coast to the east Pacific and then that warmth across the whole equatorial Pacific was there as well. 15:07

Zack: So going forward one of the things we should be looking at is if that gradient that is present goes away. 15:18

Mike: You have already seen those pieces. I think the emergence of the cooler water in the far west Pacific is underway right now. That is because we have a reverse in wind flow basically. The gradient I think is setting up right now. Also I am looking at this sea surface temperature map and the temperatures are quite warm in the Caribbean or the Atlantic where the hurricanes form. Also in the region where the Pacific hurricanes form. 15:52

Zack: Those are actually related to ENSO events I believe in the Pacific oceans. More hurricanes occur in El Niño events in that particular area. I thought it was the opposite in the Caribbean? 16:11

Mike: My understanding is, if you think about the big global scale circulation along the equator is that, that shift of convection towards the central Pacific is going to enhance convection and rising air across the eastern Pacific. So it is sort of this idea of the Walker Circulation. You are going to have sinking air of the Atlantic and the Caribbean in response to having that shift in the Walker circulation. So you get this very local dipole moment of favorable east Pacific hurricanes and unfavorable Atlantic hurricanes. My expectation is we will see that kind of forecast come out for the upcoming season. 16:46

Zack: Kind of a zero sum game. El Niño brings wetter conditions to the Southwest, which is important for relieving some of the drought stress we have seen. Of course the Caribbean is in

a drought now too so it brings drier conditions there. 17:07

Mike: Exactly, with all of these big shifts when you shift away from your climatology, which is exactly what these things do, there is going to be winners and losers. The winners can sometimes be too much of a good thing and that's what these El Niño events sometimes bring is these flooding hazard issues that could happen in the fall or next winter. 17:29

Zack: So ENSO is going to increasingly get interesting to talk about. 17:34

Mike: Yeah I think so and boy wouldn't it be something if this thing fell apart again. It looks better here. 17:54

Zack: Paying attention to how this thing evolves is important too. 18:07

Mike: So we just mentioned too that the monsoon season June 15th start date. So what does a full-fledged atmospherically coupled El Niño event say about the monsoon? I am not sure because I think it is a bit noisy. I think it is a bit of a mixed signal. You see some research suggesting really onset with La Nina events and late onset with El Niño events. A lot of research that has come out of Chris Castro's group, it is a bit earlier with La Nina and a bit later with El Niño. Again it is not real strong. 18:51

Zack: But there haven't been many full-fledged El Niño's at the time that the monsoon.. 18:54

Mike: Right and what a lot of that work suggests too is that the state of the Pacific decadal variability it at play too. That looked way different last year, that horse shoe pattern in the warm water in the Pacific suggests we are at some place different with respect to the broader atmospheric pattern. The climate forecasting system dynamical models they paint wet conditions for every month through next spring for the Southwest. They are all above average. Can you believe them? No but that isn't something you see that often. 19:38

Zack: But I think the conversation about the monsoon is a good segue because the monsoon historically tamps down the fire season. I mentioned the evolution of the winter; we had sort of a mixed bag in terms of precipitation. We had some uncharacteristically wet conditions recently that has helped tamp down fire risk. 20:09

Mike: Right, it has been a weird winter with October rains; I think we had no precipitation in November and then snow in the valleys in December and then very warm conditions and then lack of snow for the rest of the spring. Then it gets humid and starts raining in late April and it has rained in much of Arizona and New Mexico has had epic rainfall in just the last week in May. So we are running in to the fire season, we are suppose to be at the peak climatologically, that has kind of been on hold because of drying out, increasingly dry conditions in May, increasing temperatures, decreasing relative humidity and the wind picking up. Right now we have high humidity, very wet fuels and cool temperatures. That can turn around on a dime and it can turn around with a week of above average humidity and that can dry out grasses and then you can have all of this standing fuel from last monsoon season. I think that is the main concern from the fire managers' standpoint but as far as big knock down in a national forest, I don't think that risk is here this year. 21:38

Zack: Yeah that big fire season of 2011, it looks like we won't have that. 21:45

Mike: Yeah that was so different in the terms of winter drought and then very windy, low relative humidity, no precipitation. By the time May and June rolled around the fire danger was extreme. You don't see that anywhere across Arizona and New Mexico except the low deserts with pine forests and California. 22:14

Zack: Part of that is because the snowpack hasn't stayed on the landscape as long. If you look at the snowpack today relative to the historical average, the map is red - it is below 50 percent. That is important because the less snowpack you have on the landscape, the longer that you have to dry out those fuels. 22:34

Mike: Yeah and you can think about what we have at play here in Arizona and New Mexico is we get this slug of relative humidity that comes in July and the rest of the West doesn't see that. I mean July and August for California is the peak of the hottest and driest part of the season. So their fire season can linger all the way into next November when it starts raining. 23:09

Zack: So what was the cause of the storm early this month and late April? So we have had high humidity for a while but that is related to the encouragement of that moist air. 23:21

Mike: Again it is the east Pacific is several degrees above average and has been giving off moisture to the atmosphere. It has always been on our doorstep and so anything that wanders by and has the right fetch, drags it up. The jet stream is what we call a split flow pattern right now, meaning there is the northern branch of the jet stream and then there is this kind of weaker subtropical branch and more of our storms have been interacting and coming out of this southern branch and when they are southern branch storms they don't have access to cold air but they have access to moisture. That has been the character of these. They have not been very cold, they have had the humidity with them, they have not been very strong, they have just been wandering around but we have seen trains of them through the spring. Again it is probably a bit early to say this but that has been very El Niño-ish in that pattern. 24:21

Zack: It is also worth talking about the stream flow projections. We have near average precipitation but a lot of that precipitation didn't fall as snow. So most of the monitoring stations at higher elevations recorded below average accumulation of snow. This has influenced the timing of the spring stream flows and in some of the headwaters it has been below average. If you look at the stream flow forecast for the Rio Grande, it is below 50 percent, which is bad news for that area. Also on the Colorado River it is below 50 percent. If I were a betting man I would bet that the Colorado River reservoirs are going to drop below the 1075 trigger that would cause some conservation measures relatively soon. I guess the upshot is, in terms of impacts it sure would be good if we do get that El Niño going forward. 25:31

Mike: That is the tricky part with these El Niños, if you look back on the statistics they are really good for southern California, Arizona and New Mexico and not the upper basin. I think that spells where this is heading. The Colorado basin recovering next winter is probably not possible.