

January 2010 Cold Spell

The weather pattern from late December into the first half of January was anything but what is expected during a typical El Niño winter (Figure 1). In general, winter El Niño episodes feature a strong jet stream and storm track across the southern part of the United States, and less storminess and milder-than-average conditions across the North. However, during December other factors began to take over and overshadowed the El Niño.

Now no one can say for sure what caused the cold spell, but there is one factor known as the Arctic Oscillation (AO), that has been shown to have a big influence on temperatures across the eastern two-thirds of the United States during the winter months. The AO is a rather short term change usually on the order of a few days to a few weeks, compared to El Niño/La Niña which last for months, sometimes years when it comes to La Niña. During mid-December into mid-January the AO dropped well into the negative phase and stayed there for over four weeks (Figure 2). It is known that there is a teleconnection, or strong statistical relationship between the weather in the Arctic and weather in the mid-latitudes, especially during the winter months. When the AO is in the negative phase there is higher-than-normal pressure over the polar region and lower-than-normal pressure at about 45 degrees north latitude. The negative phase allows cold air to plunge into the Midwestern/Eastern United States and Western Europe, and storms bring rain to the Mediterranean. The positive phase brings the opposite conditions, steering ocean storms farther north and bringing wetter weather to Alaska, Scotland, and Scandinavia and drier conditions to areas such as California, Spain and the Middle East. The correlation of negative AO to colder than normal temperatures in the Midwestern/Eastern United States can be seen in the bottom image of Figure 3.

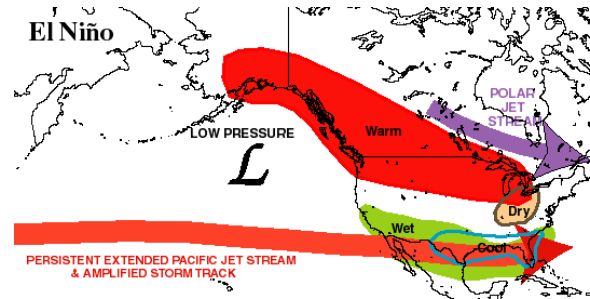


Figure 1: Typical Winter El Niño Pattern

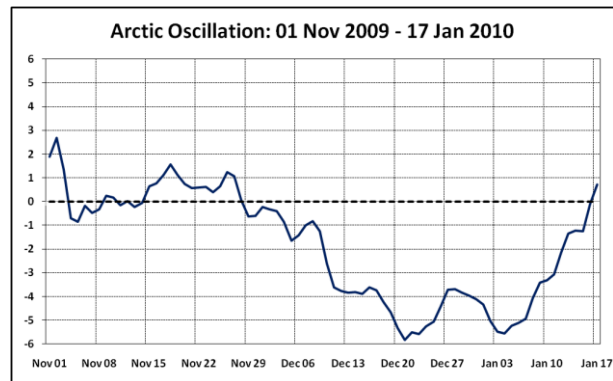


Figure 2: Observed Arctic Oscillation Index

DJF Temperature Anomaly (°C) by AO PHASE

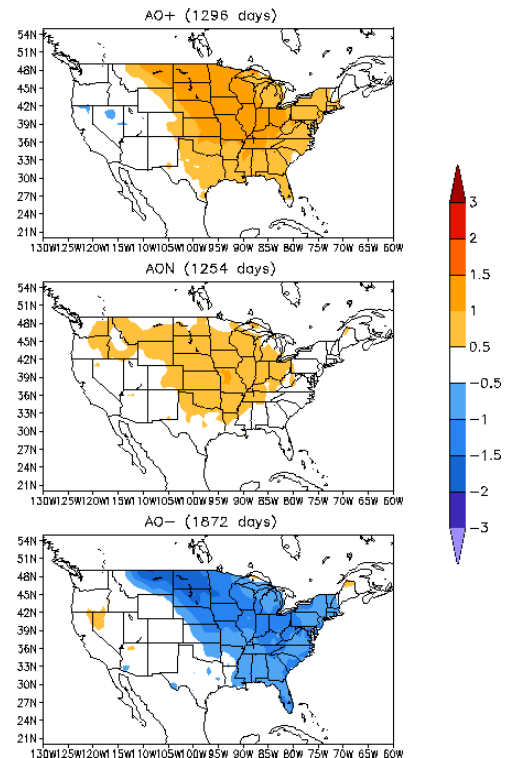


Figure 3: Temperature Anomaly by AO Phase for December through February

If we take a look back at the two previous record long cold spells, December 29, 2000 to January 5, 2001 and December 20 to 28, 1995, we can see in the graphs below (Figure 4 and 5) that the AO index during these time periods was well into the negative range for a few weeks.

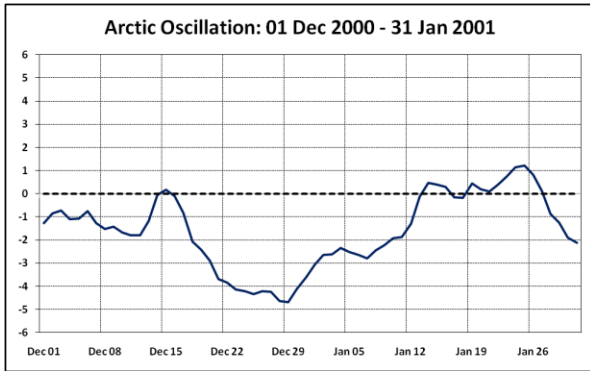


Figure 4: Observed Arctic Oscillation Index
December 1, 2000 through January 31, 2001

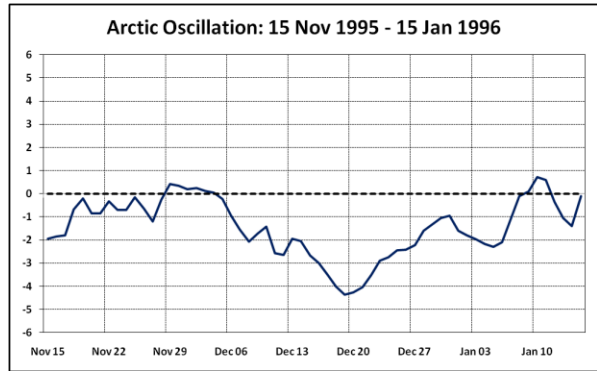


Figure 5: Observed Arctic Oscillation Index
November 15, 1995 through January 15, 1996

And of course anyone who has lived in West Central and Southwest Florida for any length of time has heard about the infamous day it snowed across much of the Florida peninsula, January 19, 1977. If we take a look back at the AO during this time period we see that the index had dropped well below zero, in fact to its lowest daily reading then and now of -7.433 on January 15, 1977. Along with the snow there were also five days in a row, January 18 to 22, where temperatures dipped below freezing in the Tampa area, the most consecutive number of days since records began in 1890.

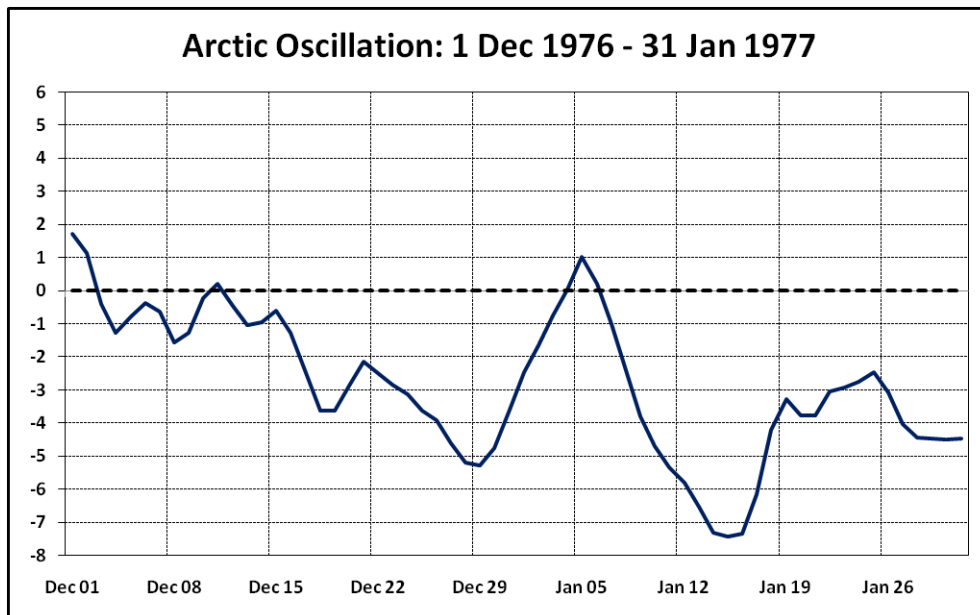


Figure 6: Observed Arctic Oscillation Index for December 1, 1976 through January 31, 1977

The effect on the weather pattern of the most recent negative AO can be seen in the 500 millibar charts (Figures 7-11) from a few days during late December 2009 into mid-January 2010. During this time a deep upper level trough setup across the eastern two-thirds of the United States with a series of cold fronts sweeping south across Florida.

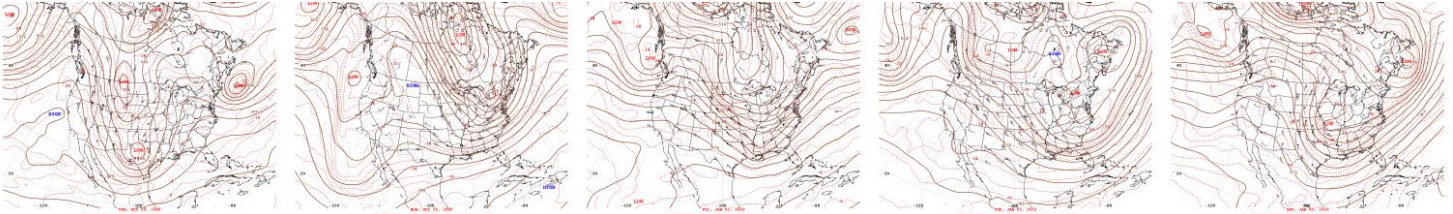


Figure 7: December 24, 2009 Figure 8: December 28, 2009 Figure 9: January 1, 2010 Figure 10: January 5, 2010 Figure 11: January 9, 2010

Although it is not unusual for West Central and Southwest Florida to see freezing temperatures each winter, it is rare that the cold weather last as long as it did. From January 2 through January 13 temperatures were anywhere from 10 to almost 30 degrees below normal across the region. The length of this cold spell, 12 days, set new records at many locations across the area with others only having one mild day in the middle of the streak right before another cold front moved across the region. This can be seen in the tables below that list the record number of consecutive days at or below 60 degrees (except at Fort Myers where 65 degrees was used) at a few sites across the region.

Tampa Consecutive Days Temperature <= 60 (° F) Years: 1890-2010		
Rank	# Days	End Date
1	12	01/13/2010
2	8	01/05/2001
2	8	12/28/1995
3	7	01/14/1956
3	7	02/02/1900
4	6	01/22/1977
4	6	01/29/1940
4	6	01/04/1918
4	6	12/21/1901
5	5	02/05/1980
5	5	12/23/1975
5	5	01/31/1966
5	5	01/24/1960
5	5	02/20/1958
5	5	12/24/1930

St. Petersburg Consecutive Days Temperature <= 60 (° F) Years: 1914-2010		
Rank	# Days	End Date
1	12	01/13/2010
2	8	01/05/2001
2	8	12/28/1995
3	6	01/14/1956
3	6	01/29/1940
4	5	12/26/1989
4	5	01/14/1981
4	5	02/10/1978
4	5	01/22/1977
4	5	12/23/1975
4	5	01/14/1973
4	5	01/24/1960
4	5	02/20/1958
5	4	02/18/2007
5	4	01/28/2000

Sarasota-Bradenton Consecutive Days Temperature <= 60 (° F) Years: 1911-2010		
Rank	# Days	End Date
1	8	01/05/2001
2	6	01/07/2010*
2	6	01/23/1977
3	5	01/13/2010*
3	5	12/26/1995
3	5	12/24/1975
4	4	12/27/1993
4	4	12/26/1989
4	4	01/15/1984
4	4	02/05/1980
4	4	01/31/1978
5	3	02/05/2009
5	3	02/17/2007
5	3	02/14/2006

* Would have been 12 consecutive days, but temperature climbed to 63° on January 8.

Fort Myers Consecutive Days Temperature <= 65 (° F) Years: 1902-2010		
Rank	# Days	End Date
1	8	01/31/1940
2	7	01/14/1956
3	6	01/07/2010*
3	6	02/24/1978
3	6	01/22/1977
3	6	01/24/1960
4	5	01/13/2010*
4	5	12/26/1989
4	5	12/23/1975
4	5	01/14/1973
4	5	01/11/1970
4	5	02/20/1958
4	5	01/29/1938
4	5	12/23/1927
5	4	02/18/2007

* Would have been 12 consecutive days, but temperature climbed to 71° on January 8.

Along with the long stretch of cold temperatures, there were also numerous daily record lows and a few daily record low maximums set during this time period. One of the coldest days we have seen in years occurred on January 9 when high temperatures were only in the upper 30s to lower 50s. These cold temperatures broke the daily record low maximums for the date set in 1970 at many sites. However, in reality a lot of the high temperatures for the day occurred at midnight with the actual daytime highs (7 AM to 7 PM) only in the mid to upper 30s. This was also the day that sleet and some snow was reported across many portions of West Central Florida, the first time since January 8, 1996.

The coldest morning across the region occurred on January 11 when readings dropped into the middle teens in some of the normally colder locations across the Nature Coast, with some readings around 20 even south into portions of eastern Hillsborough County and western Polk County. The following table lists the lows for January 11, most of which were new records for the date.

Location		Lows on Jan 11	Old Record Low	Records Began
Archbold Bio Stn	:ACHF1	21*	22 in 1970	1969
Avon Park 2 W	:AVPF1	26*	28 in 1970	1901
Bartow	:BARF1	27*	28 in 1978/1970	1892
Brooksville Chin Hill	:BROF1	24*	26 in 1942	1892
Chiefland 5 SE	:CHIF1	15*	21 in 1982/1959	1956
Fort Myers - Page Field	:FMY	31*	32 in 1959	1902
Inverness 3 SE	:INVF1	18*	25 in 1959	1948
Lakeland Linder Field	:LLDF1	23*	31 in 1977	1948
Mountain Lake	:LWLF1	24*	25 in 1970	1935
Plant City	:PLCF1	24*	25 in 1959	1892
Punta Gorda 4 ESE	:PNTF1	28*	30 in 1970	1965
Sarasota-Bradenton	:SRQ	28*	29 in 1959	1911
St Leo	:STLF1	27	26 in 1927	1895
St Pete - Albert Whitted	:SPG	33*	34 in 1977	1914
Tampa	:TPA	25*	27 in 1982	1890
Venice	:VNCF1	32	28 in 1959	1955
Winter Haven	:WHNF1	27*	28 in 1970	1941

* New Record Low for January 11

Below are some other low temperatures on January 11 from sites across the region.

Location	County	Low Jan 11	Location	County	Low Jan 11
Bronson (FAWN)	Levy	17	MacDill AFB (KMCF)	Hillsborough	27
Lower Suwannee River (RAWS)	Levy	20	Plant City Municipal (KPCM)	Hillsborough	27
Cedar Key (CMAN)	Levy	28	Peter O. Knight (KTPF)	Hillsborough	30
Holder (CW1327)	Citrus	14	Egmont Key (COMPS)	Hillsborough	36
Crystal River (KCGC)	Citrus	16	Kathleen (CW6582)	Polk	16
Inverness (KX40)	Citrus	18	Lakeland Highlands (NZ40)	Polk	22
Floral City (CW7082)	Citrus	24	Polk City (WC4PEM-9)	Polk	22
Brooksville (KBKV)	Hernando	14	Lake Alfred (FAWN)	Polk	26
Brooksville (FAWN)	Hernando	18	Bartow (KBOW)	Polk	27
Brooksville (K4TR)	Hernando	21	Dundee (WC4PEM-15)	Polk	27
Hernando Beach (CW6533)	Hernando	29	Frostproof (FAWN)	Polk	28
Bushnell (CW8067)	Sumter	22	Fort Green 12 WSW (FTGF1)	Manatee	24
The Villages (KVVG)	Sumter	23	South Bradenton (CW7601)	Manatee	27
North Dade City (CW2672)	Pasco	23	Bradenton (KB4SYV)	Manatee	31
Wesley Chapel (KB1ATL)	Pasco	24	Anna Maria (COMPS)	Manatee	36
Dade City (PMSFL)	Pasco	25	North Port (FAWN)	Sarasota	27
Aripeka (COMPS)	Pasco	27	Venice (CMAN)	Sarasota	31
Port Richey (COMPS)	Pasco	28	Ona (FAWN)	Hardee	25
Hudson (DW0745)	Pasco	30	Wauchula (Hardee Co EOC)	Hardee	28
Anclote Gulf Park (COMPS)	Pasco	31	Arcadia (FAWN)	Desoto	24
Palm Harbor (CW5072)	Pinellas	26	Venus (CW7827)	Highlands	23
Kenneth City (KF4KUL)	Pinellas	27	Desoto City 8 SW (DSOF1)	Highlands	28
Oldsmar (CW2932)	Pinellas	27	Lake Wales (RAWS Nr Sebring)	Highlands	29
Clearwater (N4BSA)	Pinellas	28	Sebring (FAWN)	Highlands	31
Clearwater Beach (Pier 60)	Pinellas	32	Port Charlotte	Charlotte	23
St Petersburg/Clearwater (KPIE)	Pinellas	32	Lehigh Acres (DW1790)	Lee	28
Tampa Executive (KVDF)	Hillsborough	19	North Fort Myers (CW0445)	Lee	29
Bloomingtondale (WX4DAN)	Hillsborough	19	Cape Coral (CW3609)	Lee	30
Dover (FAWN)	Hillsborough	22	Fort Myers - SW Int'l (KRSW)	Lee	30
Lithia (DW1923)	Hillsborough	22	Ding Darling NWR (RAWS)	Lee	33
Gibsonton (DW10460)	Hillsborough	23	Big Carlos Pass (COMPS)	Lee	34
Balm (FAWN)	Hillsborough	25	St James City (CW3181)	Lee	34
Ruskin (NWS Office)	Hillsborough	26	Bokeelia (DW2928)	Lee	35
Sun City Center (N1ZK)	Hillsborough	26			

So in general it would appear that if we watch the trend in the Arctic Oscillation index during the winter months we may be able to forecast extended periods of cold weather with pretty good accuracy. However, the AO is a rather short term oscillation with forecasts only go out two weeks into the future, and like most things in weather forecasting the further out into the future you go the less reliable the information can become.

