

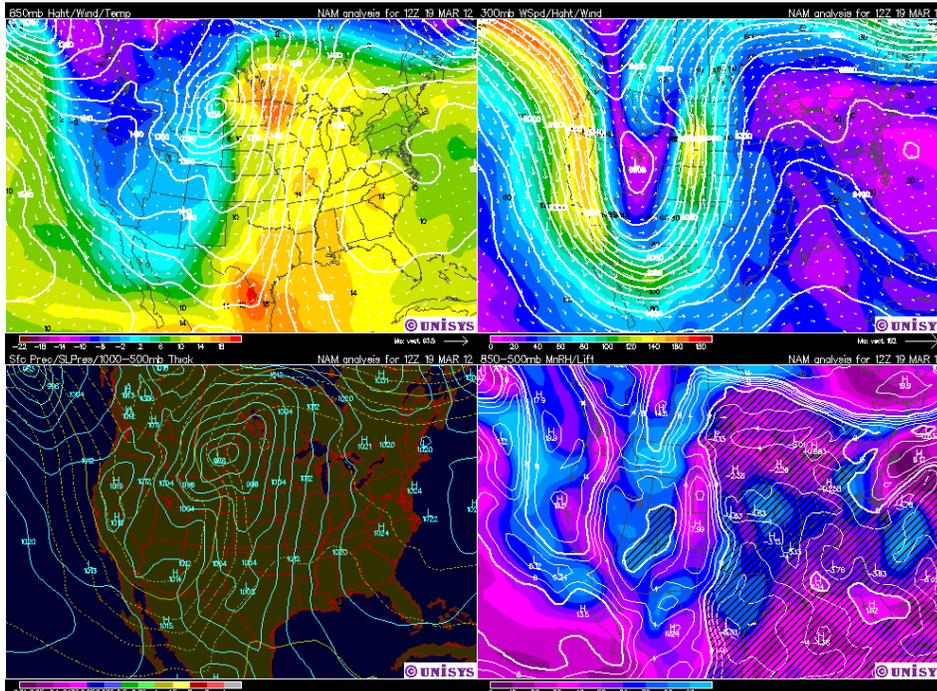
OKX's "Spring Fog"

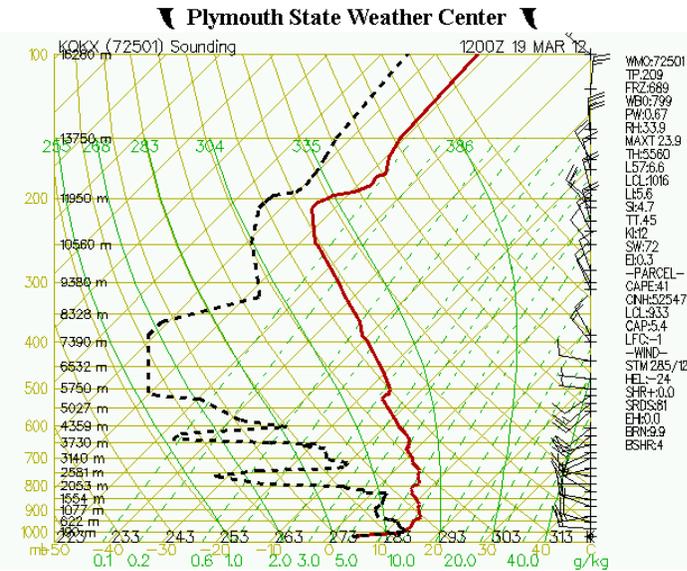
**Lauren Nash, NWS Upton, NY
2012 April 20**

As a new forecaster here at the New York, NY NWS office (OKX), I was warned about the dense fog over Long Island during the spring. Coming from completely land locked states growing up, I never experienced any extremely dense fog cases, especially when they originate from a combination of radiation and advection fog like we experience on Long Island. The first time I experienced this fog, which usually starts moving in as a low stratus deck, I was on the north shore of the island where the temperature was 75 degrees and sunny. I was looking to the south and saw what looked like a wall of smoke moving north. By the time I got to my apartment, on the south shore, it was 45 degrees, low visibility and mist! As you can imagine, forecasting the exact timing of the onset and retreat of this fog layer is very difficult. It is also difficult to predict how far inland this fog will advance and how deep it will be. For this paper, I will first take a look at the synoptic and microscale conditions that lead to the fog formation using a dense fog event on March 20-23, 2012 and then add a few local "tips" from the forecasters here at the office that I have learned. For reference, OKX is GMT -4 at this time.

On March 19, we can see a typical set up begin, although this event was more extreme due to the trough and cut off low in the west. A large upper ridge and a broad surface high pressure provides the CWA with large scale sinking motion, light winds and clear skies. On the morning of March 19, there was patchy localized dense fog reported. The 12z OKX sounding shows a dry atmosphere with calm winds, a strong surface inversion and plenty of low level moisture, making a perfect set up for fog.

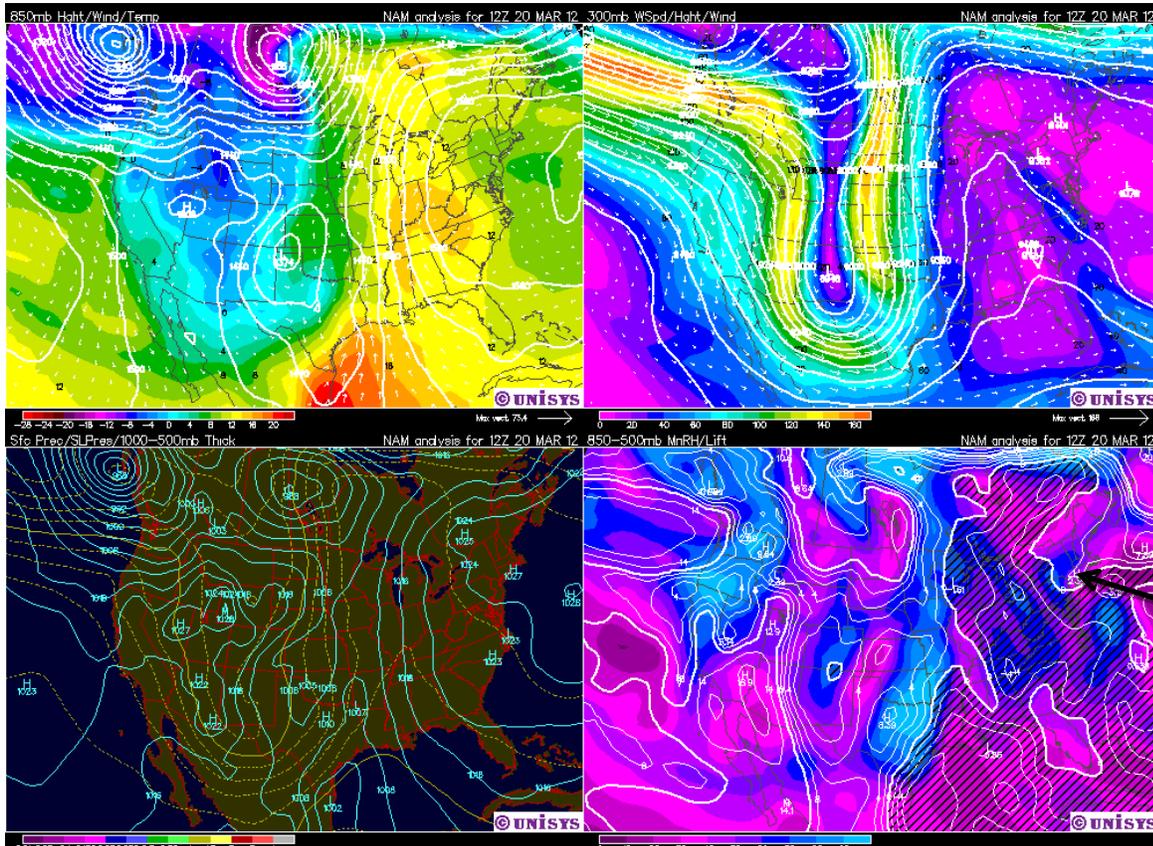
March 19 12z



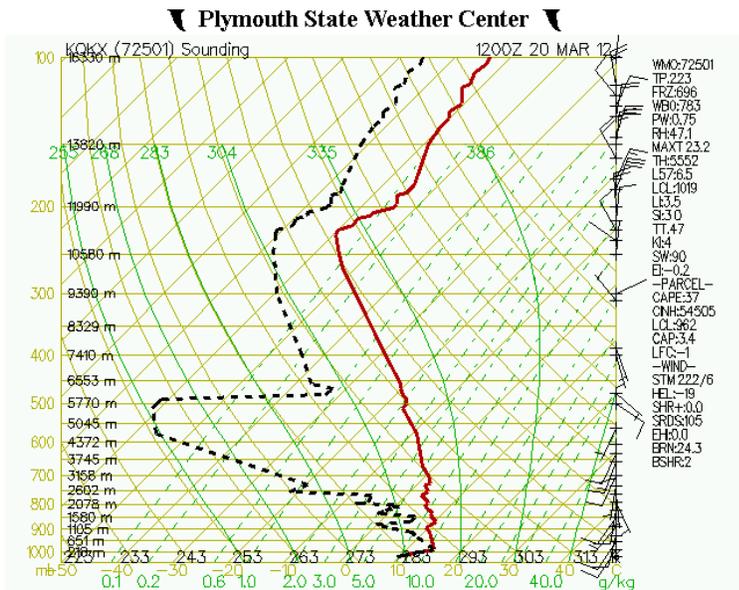


Tuesday March 20, was the first day of widespread dense fog. The upper ridge and surface high pressure were still in place and we begin to see a “back building” of the surface high pressure over our area which helps advect in and “pool” additional low level moisture for the fog development. This can be seen in the lower right panel which contains low to mid level moisture.

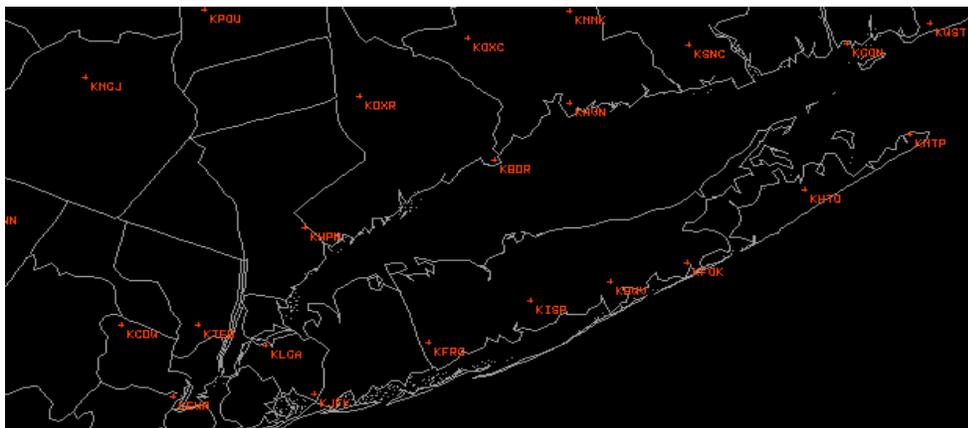
Tuesday March 20- 12Z



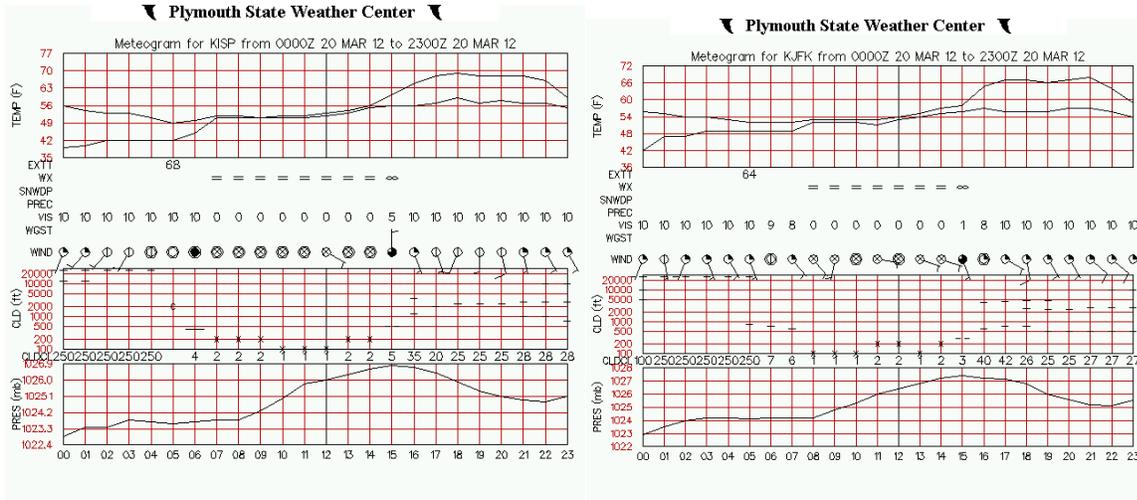
The 12z OKX sounding on March 20 showed, once again, sufficient low level moisture, a dry sounding, strong inversion and light winds. The key with this sounding was the light southwesterly winds, which was directly off the ocean, providing moisture to the coastal locations. Fog began being reported across the coastal locations around 3am and dissipated around 10am on March 20. Below are a few METAR reports of fog the morning of March 20 and an accompanying map indicating the locations of the stations.



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SPECI KJFK 201231Z 12003KT 0SM R04R/0500FT FG VV001 13/12 A3032 RMK
AO2 SFC
VIS 1/16
KISP 201235Z 0000KT 1/8SM R06/1000V1400FT FG VV002 12/12 A3031 RMK
AO2
(far interior)KMGJ 201245Z AUTO 21004KT 2SM BR OVC002 12/11 A3029 RMK
AO2 TSNO
KHPN 201237Z 0000KT 1SM R16/2400VP6000FT BR BKN002 OVC012 13/12 A3030
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Here are meteograms from March 20 for Islip (KISP) and Kennedy Airport (JFK).

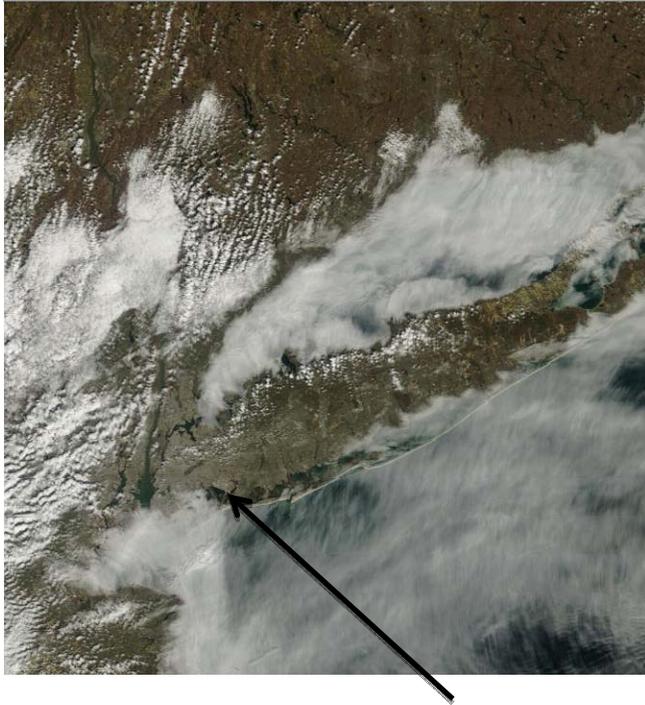


Another key aspect of these events is the water temperature. Once the dewpoint temperature gets above the water temperature with the described scenario, there is a very high chance for fog. One forecaster said that when this is forecast to occur, it is when he has high confidence in a widespread fog event. This is why these events are common in the spring. With the water temperature relatively warm and the air temperature beginning to warm up, this scenario is likely to happen more often than other seasons.

Looking at a buoy in New York Harbor, just south of JFK, the water temperatures at 12z on March 19, before the event was 8C or 46.4F. The dewpoint at JFK at this time was 46.9F. At 12z on March 20, the day of the first widespread fog, the water temperature was 9.3C and the dewpoint at JFK was 12C. This would have been a good indicator to forecasters that the fog potential was high. Below is a satellite image at 1345Z (945am EDT) and we can see on this day the fog penetrated a good distance inland.

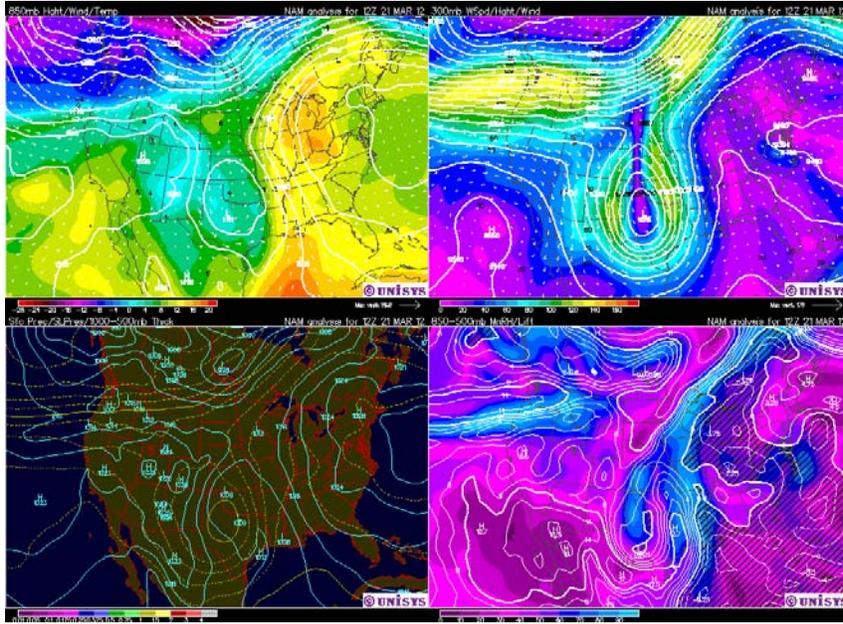


Also from March 20, here is a photo of the 1540Z MODIS satellite image after the fog dissipated over the land. I was working aviation this day and the fog basically ‘hung around’ along the shores like this all day. It was very difficult trying to figure out if it was going to stay there and if JFK (where the arrow is pointing) was going to be affected. Since the fog stayed just offshore, once the sun began to set, the fog quickly moved in again.

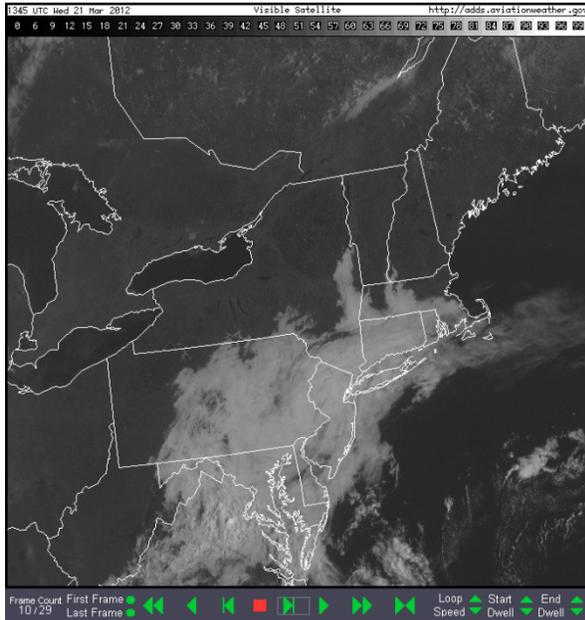


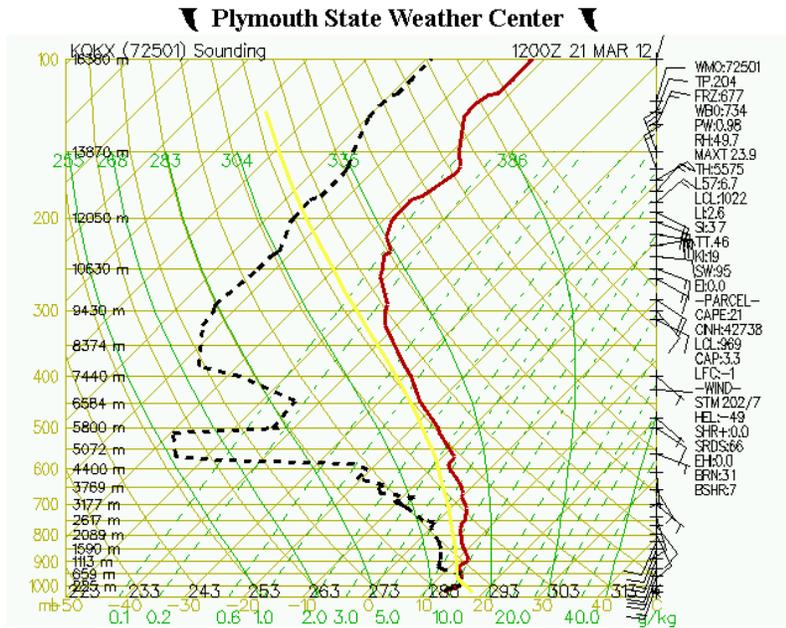
On Wednesday, March 21, we saw a similar set up once again with large scale ridging, surface high pressure and light winds. The fog on this day pushed the farthest inland. The fog began just after sunset on March 20 (a little earlier than the day before) and persisted until about 9am on March 21. Ocean temperature near JFK was 9.9C at 12z and we can see at JFK at this time, the dewpoint temperature was 12C so we still had dewpoints above water temperature on this day.

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KJFK 221151Z 25005KT 0SM R04R/1200V1400FT -DZ FG VV002 13/12 A3027
KJFK 221151Z 23006KT 3/4SM BR OVC003 14/12 A3025
KISP 221224Z 24008KT 1/8SM R06/2200V2800FT -DZ FG VV002 13/13 A3024
RMK AO2
      SFC VIS 1/4 DZB17 P0000
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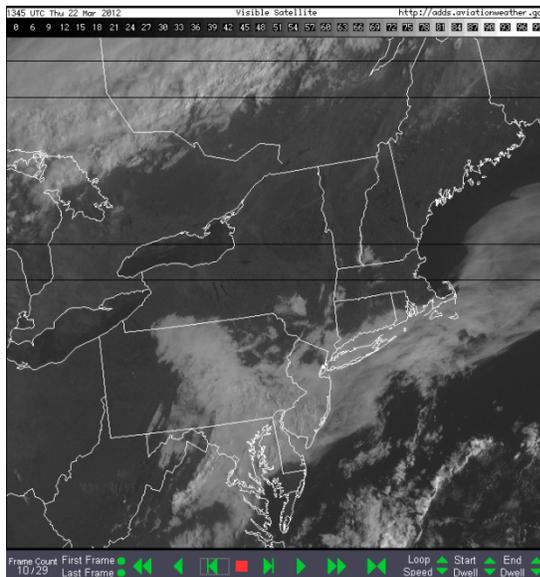
Here is a satellite image from 945AM on March 21.





A minor difference with this day was the strength of the southwest wind. On the 12z OKX sounding, surface winds were around 15 knots, compared to less than 10 knots or calm the previous two days. This most likely helped spread the fog farther inland.

Thursday March 22 was the final day of the widespread fog, as shown in the 945AM image below.



A key forecasting “rule of thumb” that I have always heard here is that on the second night of a persistent southerly flow, we see widespread dense fog events. Forecasters have said that for these events, persistence is the key. The first fog day is difficult to forecast but on the second, use persistence for start and end times. On the next day, try to start it earlier and end it later if conditions are still favorable. As for predicting how far inland the fog will penetrate, forecasters look at how strong the southerly flow is and the stronger the flow, the farther inland it pushes in. If there is an advection fog component to it is as well,

the fog will push farther inland. In regards to model guidance, all do not handle these scenarios well. For this particular event, the regional CMC model did well but this is not always the case. The NAM MOS guidance typically brings the ceilings down too low, too fast on the first night and is typically too aggressive through the event. A lead forecaster told me that if both the NAM and GFS MOS guidance is hinting at it, along with the dewpoints forecast to be above water temperatures and a persistent southerly flow, this is a “slam dunk” fog event. The question of timing, however, is consistently a problem especially with timing of the fog deck lifting due to the increase of operations at the NYC airports!

Every spring this is a common forecasting challenge for our local area. Our complex coastlines combined the microscale influences of the wind direction and temperatures, makes this a difficult situation to forecast!