

## **IC4.3: Two Airports, One City: Documenting the Microclimates of D.C.**

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17 March 2010

### **Overview of Microclimates:**

Two major airports fly travelers back and forth from the Nation's capital, Ronald Reagan Washington National Airport and Washington Dulles International Airport. Less than 30 miles separate these hubs, yet they reside in two different microclimates. Most of the time, the weather at each airport is similar, varying only by a few degrees in temperature or a slight difference in cloud cover; however, occasionally the conditions can be unexpectedly different. The airports differ in all three of the terrain features discussed in Lesson 4.3 of Winter Weather AWOC, which includes elevation (mountains or valleys), land cover, and bodies of water.

Reagan National is located just outside the District of Columbia. It is surrounded on three sides by highly populated metro areas of Arlington, Alexandria, Crystal City, etc. Directly to the east of the airport is the Potomac River, followed by even more urban areas of downtown D.C. (Figure 1). Dulles, on the other hand, is located almost 30 miles to the west-northwest of downtown D.C. in a far less populated and developed area than Reagan National. A few suburbs and highways immediately surround the airport, but just to the airports west is mostly farmlands and forest (Figure 2). Also, being 30 miles to the west of D.C., puts Dulles just in the foothills of the Appalachians. Dulles has an elevation of 312 feet, compared to Reagan National's mere 15 feet.

As mentioned previously, for the majority of forecasts, these separate microclimates will not drastically affect the weather at the two airports. Strong radiational cooling events, however, are an example of a situation when the weather, or at least the temperature, can be significantly different between Reagan National and Dulles.

### **Ingredients for Ideal Radiational Cooling:**

The ingredients for optimal radiational cooling are quite simple. They include clear skies, low dew points, and calm winds. These conditions are most prevalent in the D.C. area when the Mid-Atlantic region is under a large area high pressure. Fresh snow pack will also enhance radiational cooling, so having all these ingredients just after a snowstorm is another ideal setup. In addition to the present weather conditions, the local land use, elevation, or proximity to water will also have an effect on just how low the temperatures will drop during significant radiational cooling events.

### **Specific Example of Radiational Cooling:**

A prime example of just how different overnight low temperatures can be between Reagan National and Dulles can be because of their separate microclimates occurred in the early hours of Monday, February, 1<sup>st</sup>. There was a large area of high pressure controlling the Mid-Atlantic region (Figure 3). Skies were clear, winds were calm, and dew points were low at both Reagan National and Dulles. Also, a storm had recently dropped 2-6 inches of fresh snow over the D.C. area. Reagan National managed to stay at a balmy 20°F that night, while the temperature at Dulles dropped to an overnight low of 6°F (Figures 4 and 5). This 16°F

difference in temperature can be explained by the microclimates at each airport. The relatively warm waters of the Potomac River combined with the nearby urbanized areas prevented Reagan National's temperature from dropping as low the temperature at Dulles.

### How and Why to Accommodate These Microclimates:

Large differences in temperature between Reagan National and Dulles do not just occur in the middle of winter. Throughout the year, low temperatures at Dulles can drop 10°F to 15°F degrees lower than the temperatures only 30 miles away at Reagan National. Although forecasting the exact temperature does not seem like a major hazard, it becomes critical when trying to forecast around the frost or freezing levels. Correctly forecasting the low temperature in the Mid-Atlantic region becomes especially important during the late summer and fall months, when large amounts dollars are put into protecting crops from frost and freeze events.

As a forecaster, it is important to be aware of the microclimates at Reagan National and Dulles. When conditions are ideal for radiational cooling in the D.C. area, the overnight temperatures will fall faster and lower than MOS guidance and most other model guidance. During calm and clear nights, the temperature at Dulles can fall 10°F or even 15°F below MOS's forecast. Temperatures at Reagan on the other hand, will not need to be adjusted as much. Although conditions might be ideal for significant radiational cooling, the overnight temperatures at Reagan will not be able to get that low because of the airport's proximity to the Potomac River as well as multiple developed metro areas of D.C. and northern Virginia.

### Images:



Figure 1: Ronald Reagan National Airport (indicated by blue marker) located near metro areas of D.C. and the Potomac River. Image provided by Google Maps.

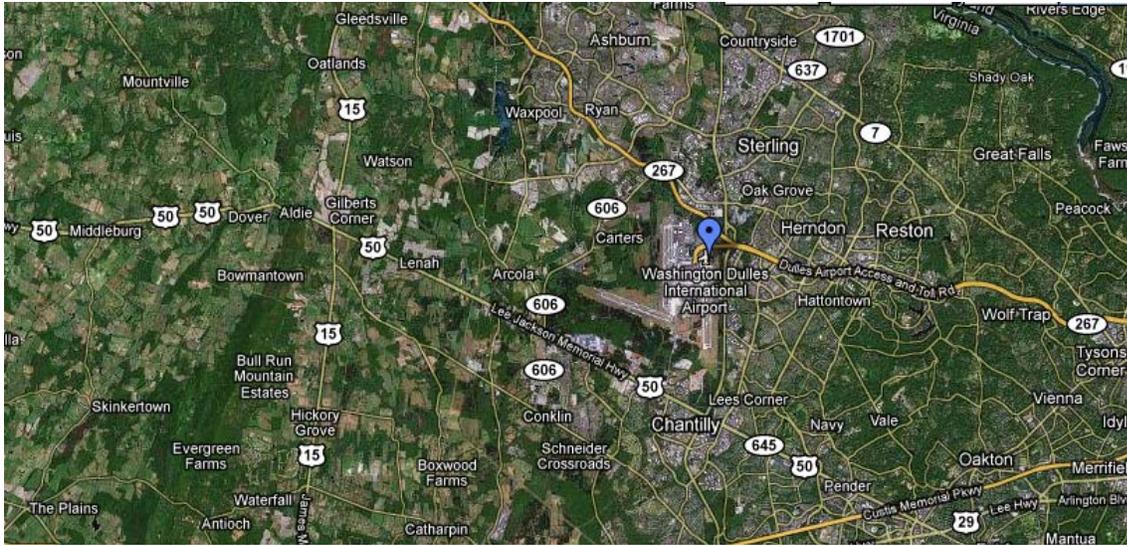


Figure 2: Washington Dulles International Airport (indicated by the blue marker) located near fewer urban areas and more farmlands than Ronald Reagan National Airport. Image provided by Google Maps.

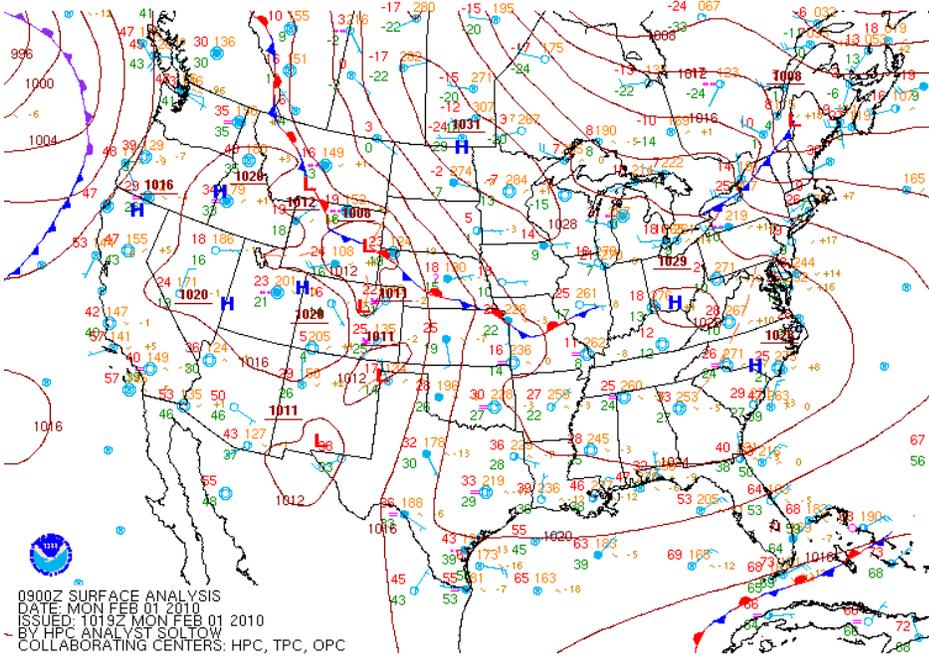


Figure 3: Surface map depicting a large area of High Pressure over the D.C. area. Figure provided by the Hydrometeorological Prediction Center.

Station: WASHINGTON REAGAN AP									
			State: VA		County: ARLINGTON Standard Time: EASTERN				
Observation Time Temperature: Precipitation: 9900									
(LST)			Evaporation:		Soil:				
P r e l i m i n a r y	Y e a r	M o n t h	D a y	Temperature (?F)			Precipitation (see **)		
				24 hrs. ending at observation time		at	24 Hour Amounts ending at observation time		At Observation Time
				Max.	Min.	O b s e r v a t i o n	Rain, melted snow, etc. (Inches & hundredths)	Snow, ice pellets (Inches & tenths)	Snow, ice pellets, hail, ice on ground (Inches)
*	2010	02	1	39	20	999999	0	0	4
*	2010	02	2	41	27	999999	0.20	2.1	4
*	2010	02	3	42	30	999999	0.06	1.2	5

Figure 4: Record of Climatological Conditions at Ronald Reagan National Airport on February 1<sup>st</sup>, 2010. Data provided by NCDC.

Station: WASHINGTON DC DULLES AP									
			State: VA		County: LOUDOUN Standard Time: EASTERN				
Observation Time Temperature: Precipitation: 9900									
(LST)			Evaporation:		Soil:				
P r e l i m i n a r y	Y e a r	M o n t h	D a y	Temperature (?F)			Precipitation (see **)		
				24 hrs. ending at observation time		at	24 Hour Amounts ending at observation time		At Observation Time
				Max.	Min.	O b s e r v a t i o n	Rain, melted snow, etc. (Inches & hundredths)	Snow, ice pellets (Inches & tenths)	Snow, ice pellets, hail, ice on ground (Inches)
*	2010	02	1	38	6	999999	0	0	2
*	2010	02	2	40	13	999999	0.28	4.0	1
*	2010	02	3	40	27	999999	0.02	0	4

Figure 5: Record of Climatological Conditions at Washington Dulles International Airport on February 1<sup>st</sup>, 2010. Data provided by NCDC.