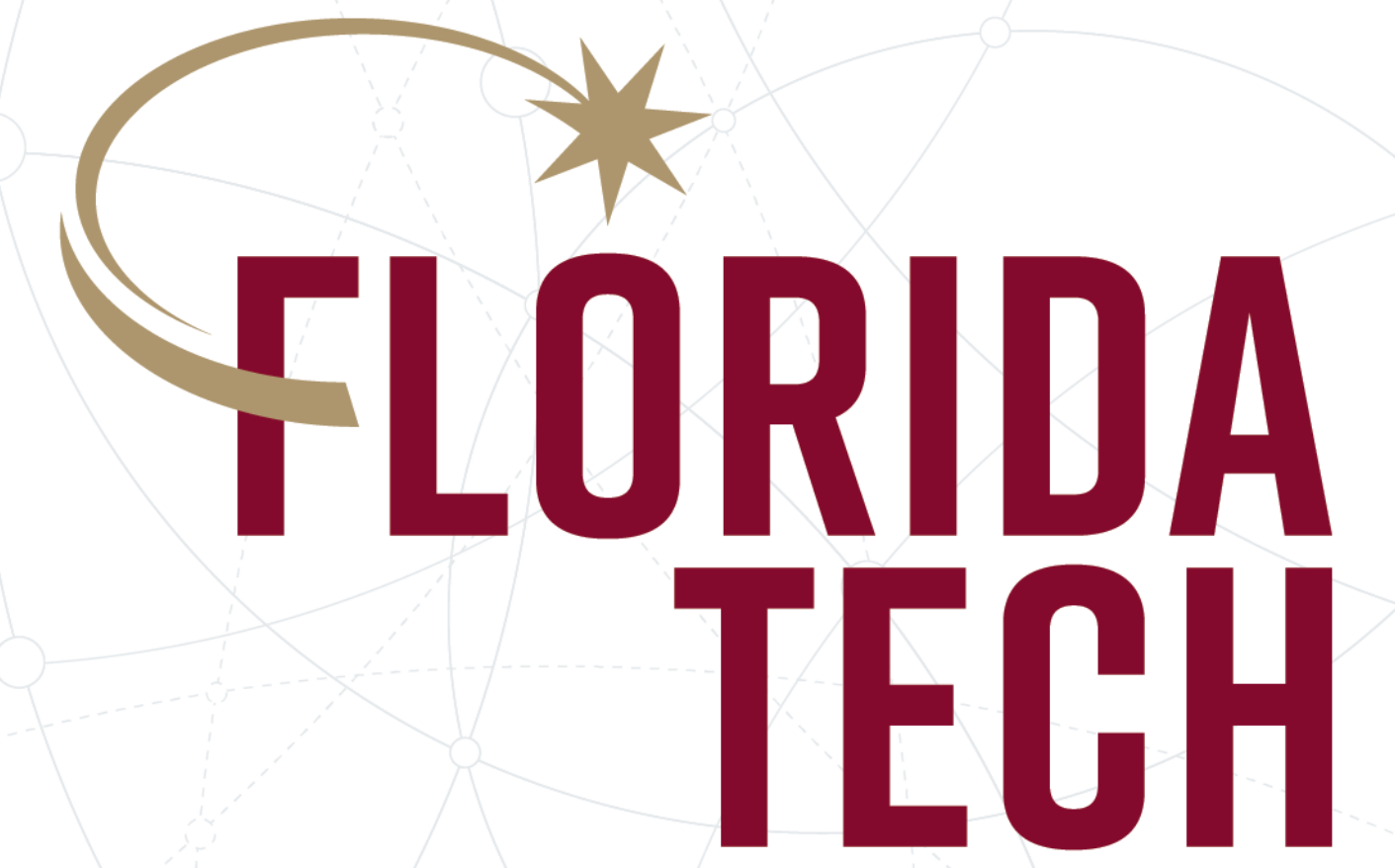


KBOS Aviation Weather



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Introduction

The Boston Logan International Airport (KBOS) is located in East Boston, Massachusetts with an elevation of 19.7 feet and resides on the eastern coast of the United States. KBOS is surrounded by Boston Harbor that flows into the Atlantic Ocean with an elevation of 19.69' as shown in Figure 1. The ASOS lies between Runway 4L/22R and Runway 4R/22L.

Massachusetts is a New England state and this region's weather is influenced by polar air, tropical air, and the Atlantic Ocean and lies near several storm tracks that favor low-pressure systems. The Atlantic Ocean to the east and south offers a significant source of moisture in the atmosphere. The data used and analyzed for this project includes one and five minute ASOS observations over a span of 10 years to give us enough data to capture trends and patterns.

Geographic Setting

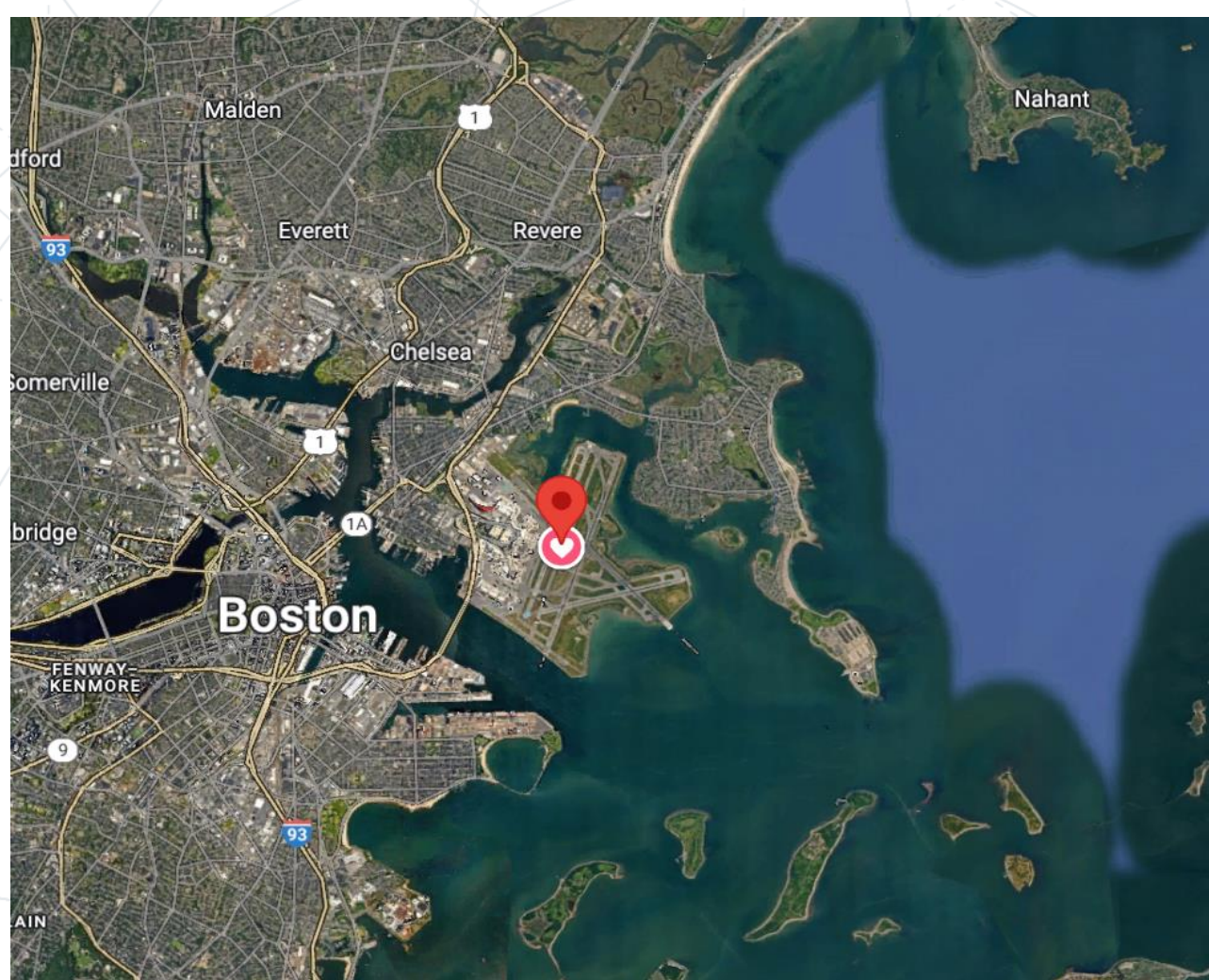


Figure 1. KBOS Setting.

Airport/ASOS Setting

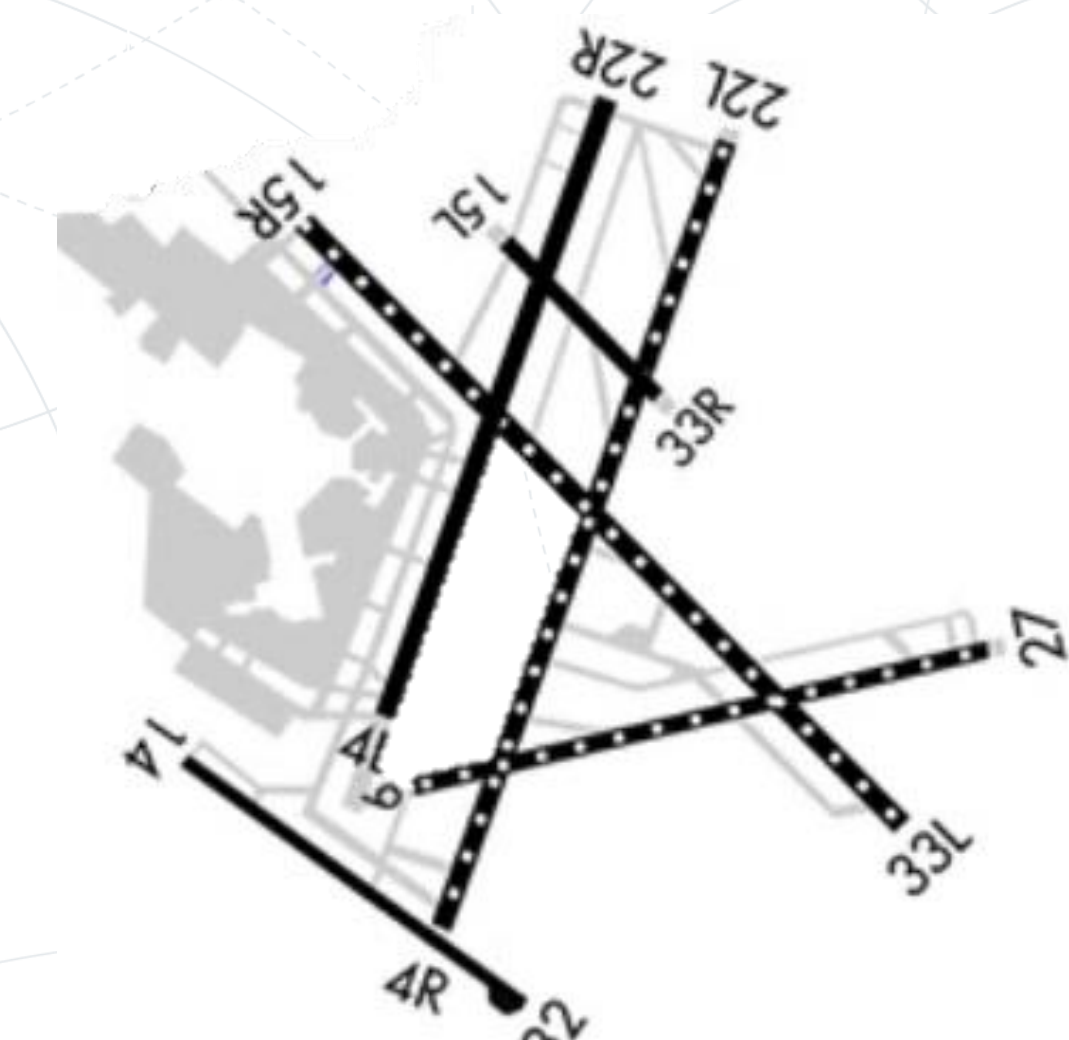


Figure 2. KBOS Asos location .

Climate / Wx. Hazards

KBOS lies in a humid continental climate zone which is categorized as a Dfa. This means that Boston can have moist and severe winters, precipitation all year and long, hot and moist summers (Figure 3). KBOS does not have a wet or dry season. The average temperature during the coldest months is -3°C. In contrast, the average temperatures during the warmest month is greater than 10°C. We see moist and cold winters because of the influence of Canada cold fronts and moisture from the Atlantic Coast bringing many snowstorms to KBOS. Snow in also poses a problem during the winter months, peaking at an average of 14 inches during January and February (Figure 3).

The most severe Hazards KBOS experiences are coastal storms, snow squalls and Nor'easter cyclones all year round along the northeast coast. The precipitation in the air, pressure and temperature both effect the density altitude. Peaking in July because the temperatures are warmer, and it always declines in the winter. February reports the lowest for KBOS (Figure 4).

Average Precipitation

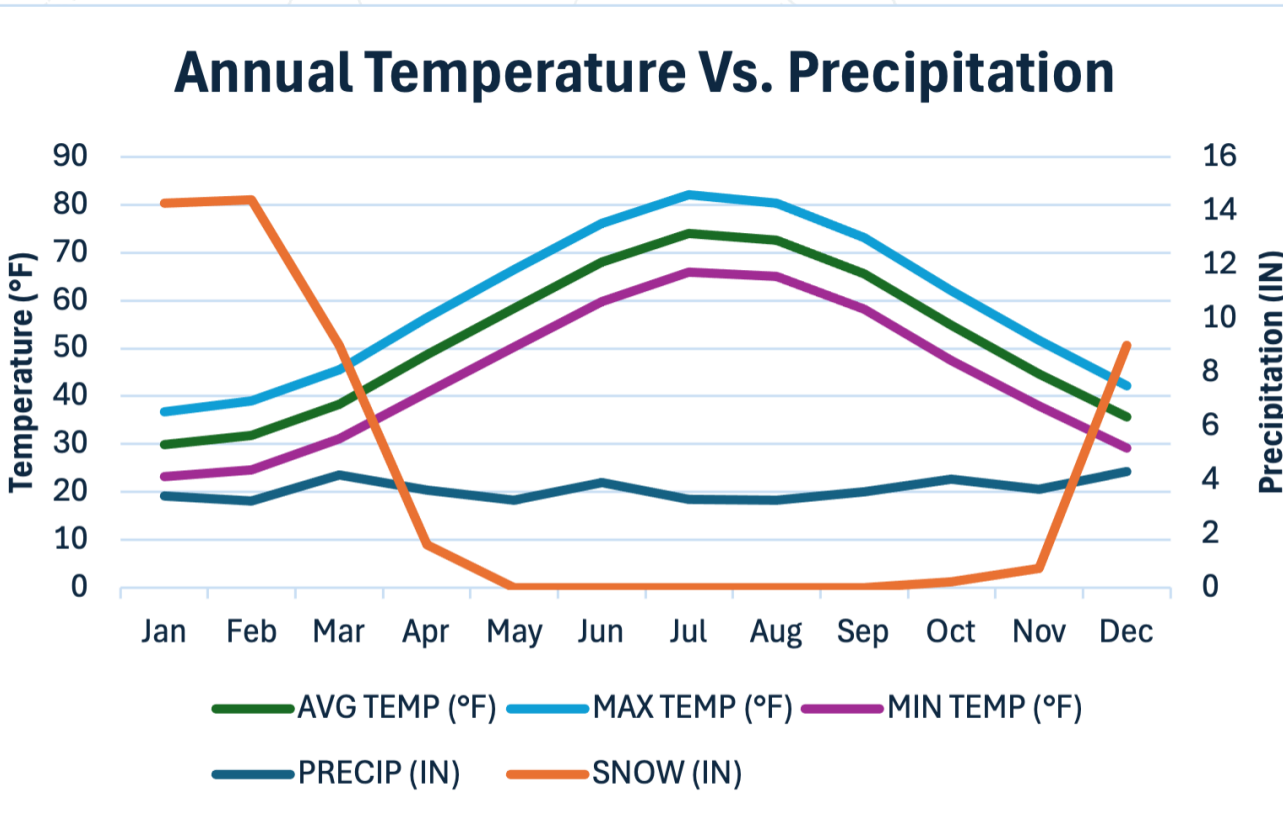


Figure 3. The average precipitation and temperatures at KBOS annually. NOAA Climate Data

Annual Density Altitude

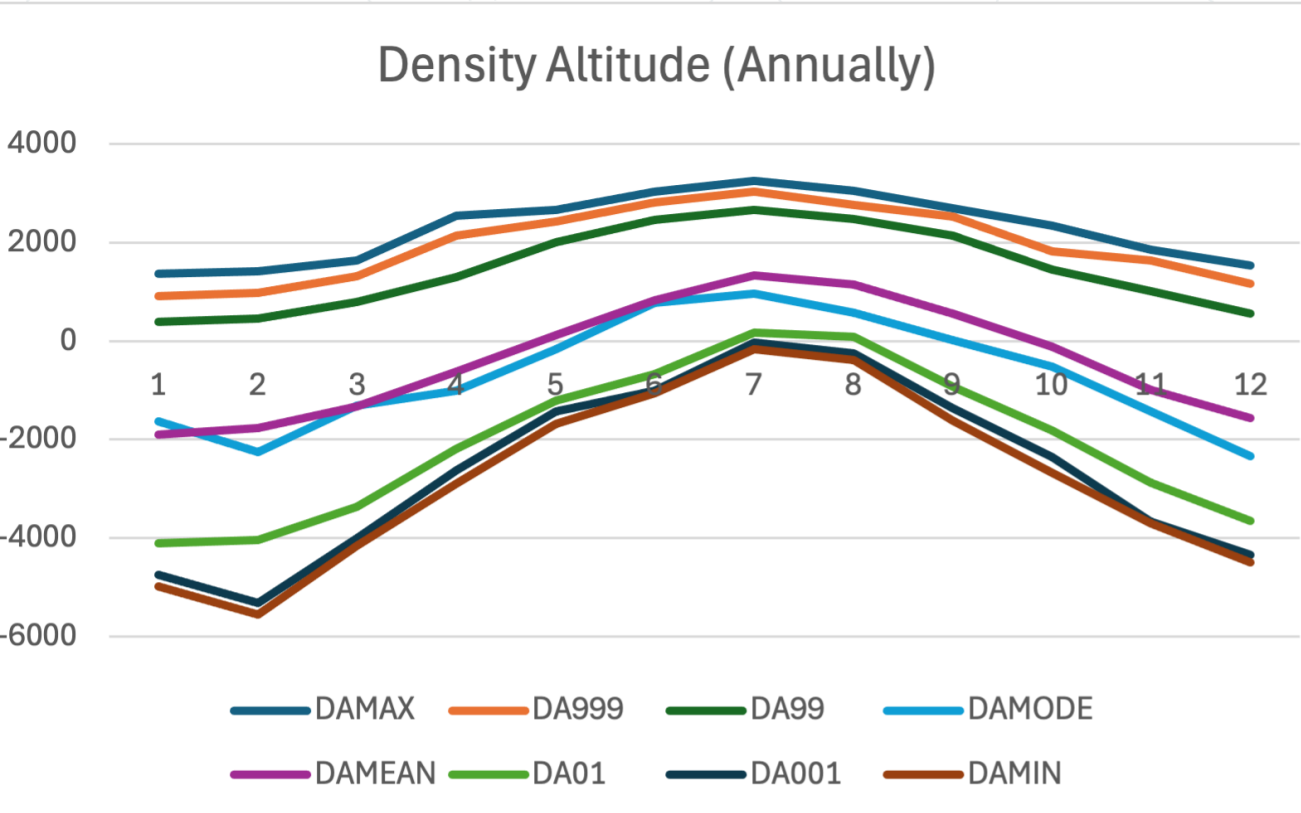


Figure 4. Annual Density Altitude measured in feet at KBOS.

Winds and Weather

Annual Wind Rose

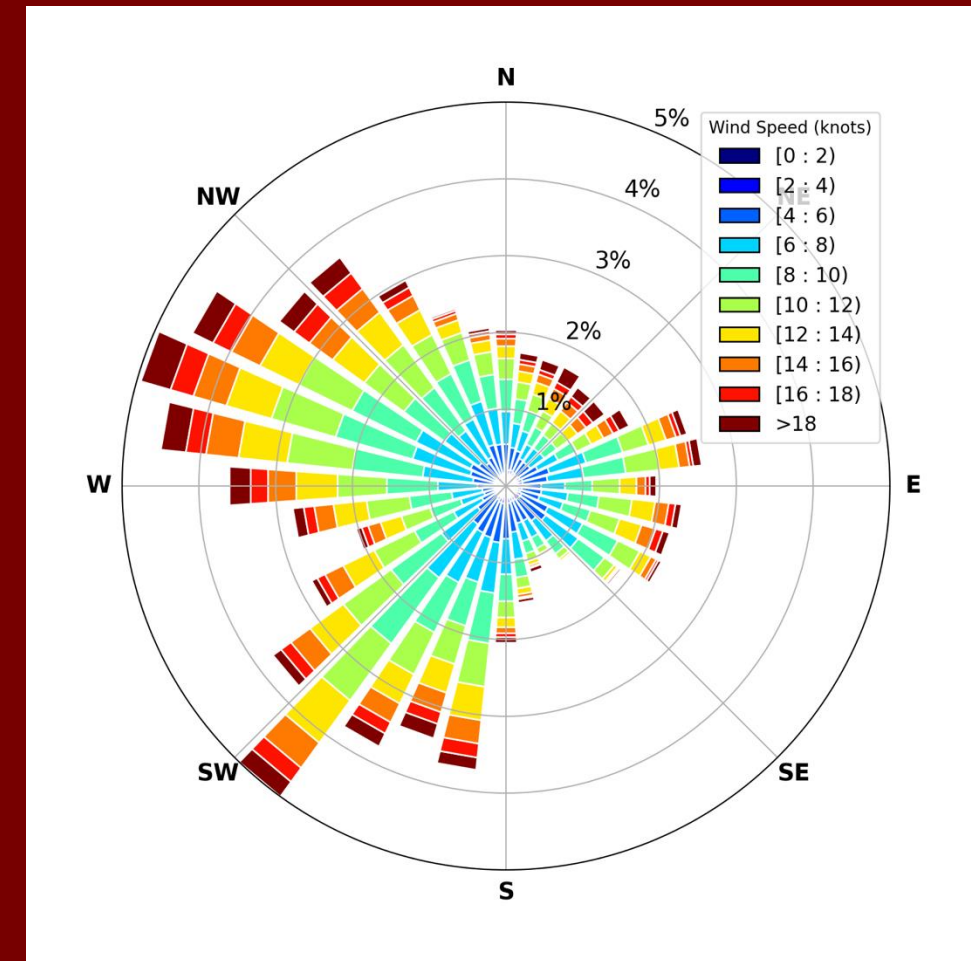


Figure 5. Annual wind rose with speed measured in knots.

Annual Ceiling Count

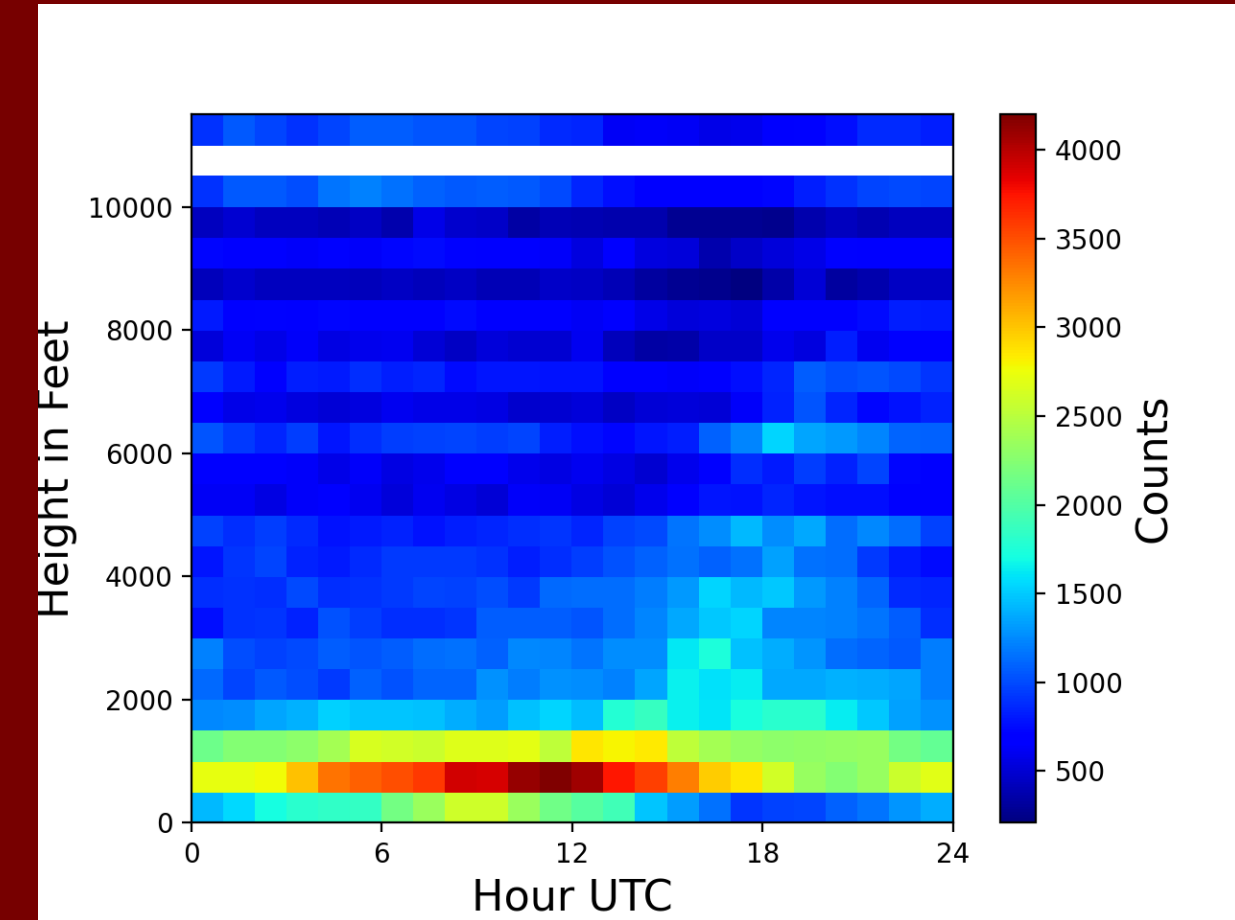


Figure 6. The Ceiling count by hour at KBOS.

Annual Fog Occurrence

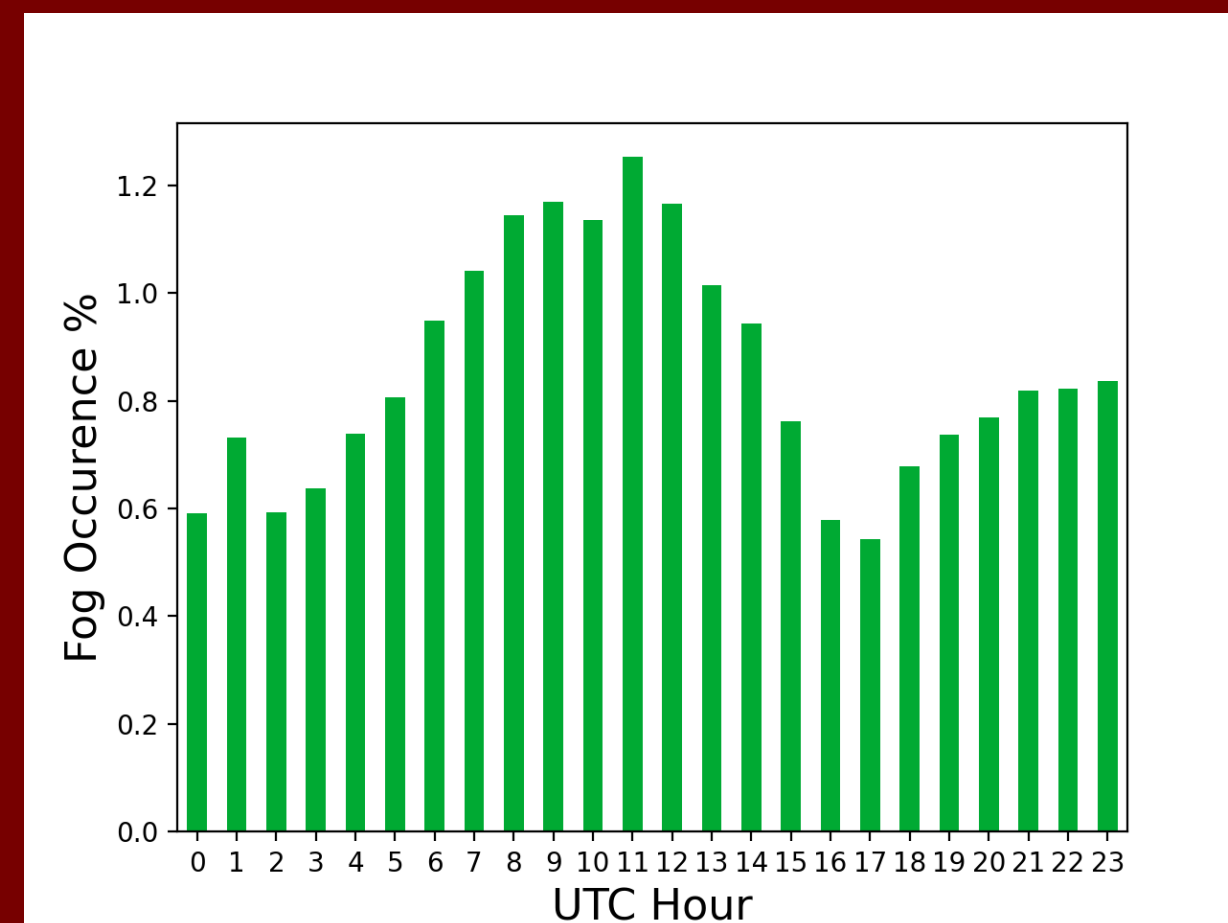


Figure 7. Percentage of fog occurring on an annual scale.

Fog Cases

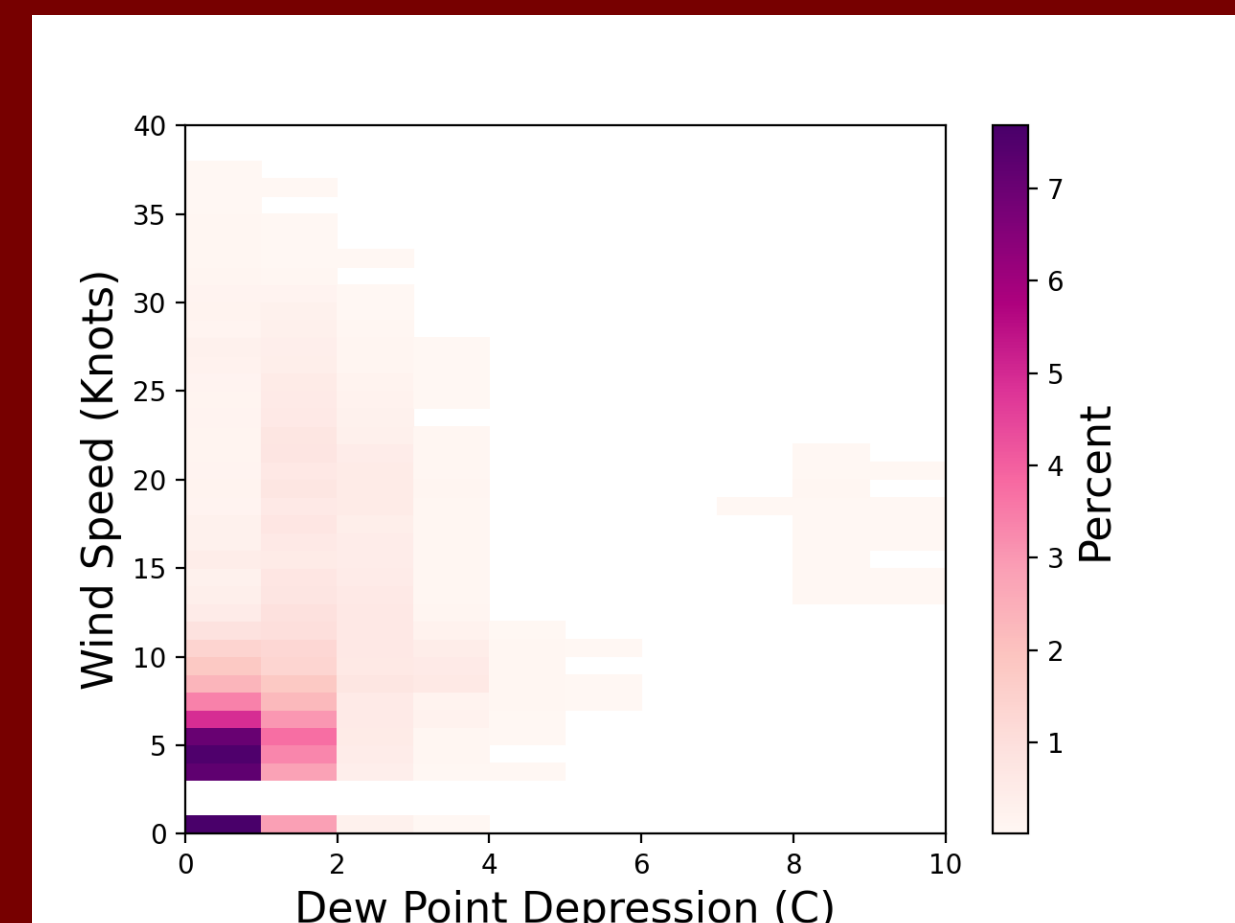


Figure 8. Cases of fog happening at low dew point depressions.

Wind Speeds in Winter

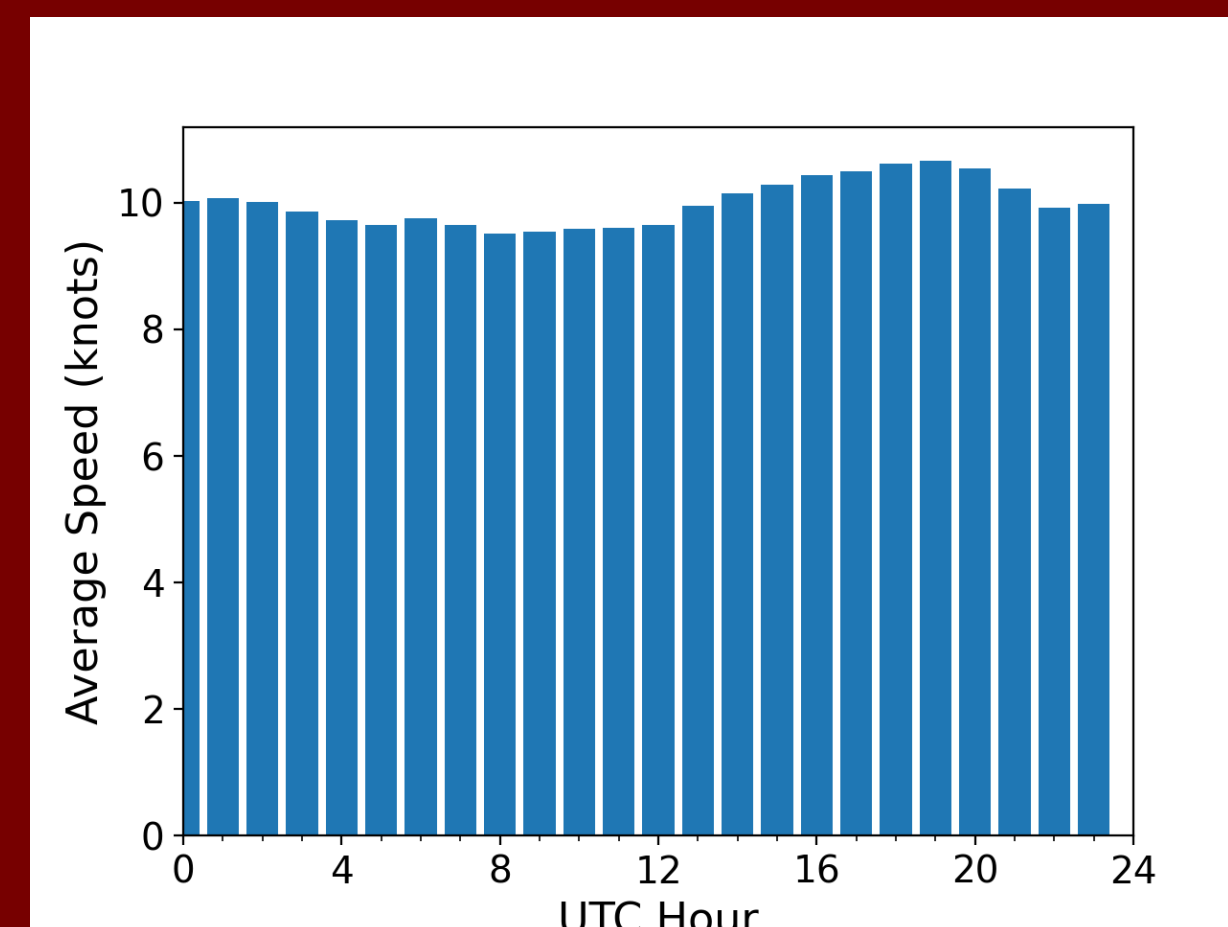


Figure 9. Average Wind speeds measured in knots during the winter.

Wind Speeds in Summer

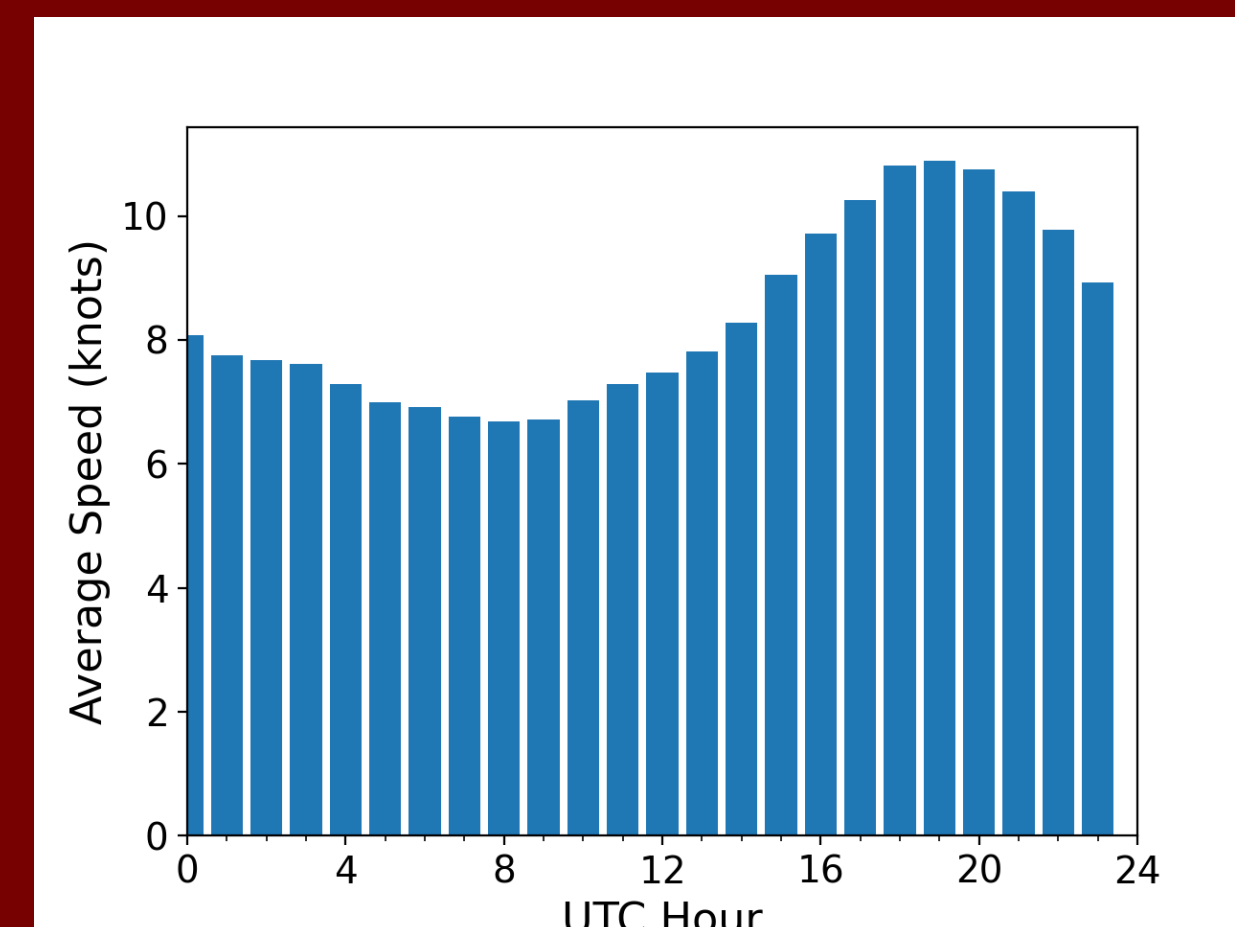


Figure 10. Average Wind speeds measured in knots during the summer.

TSRA Frequency

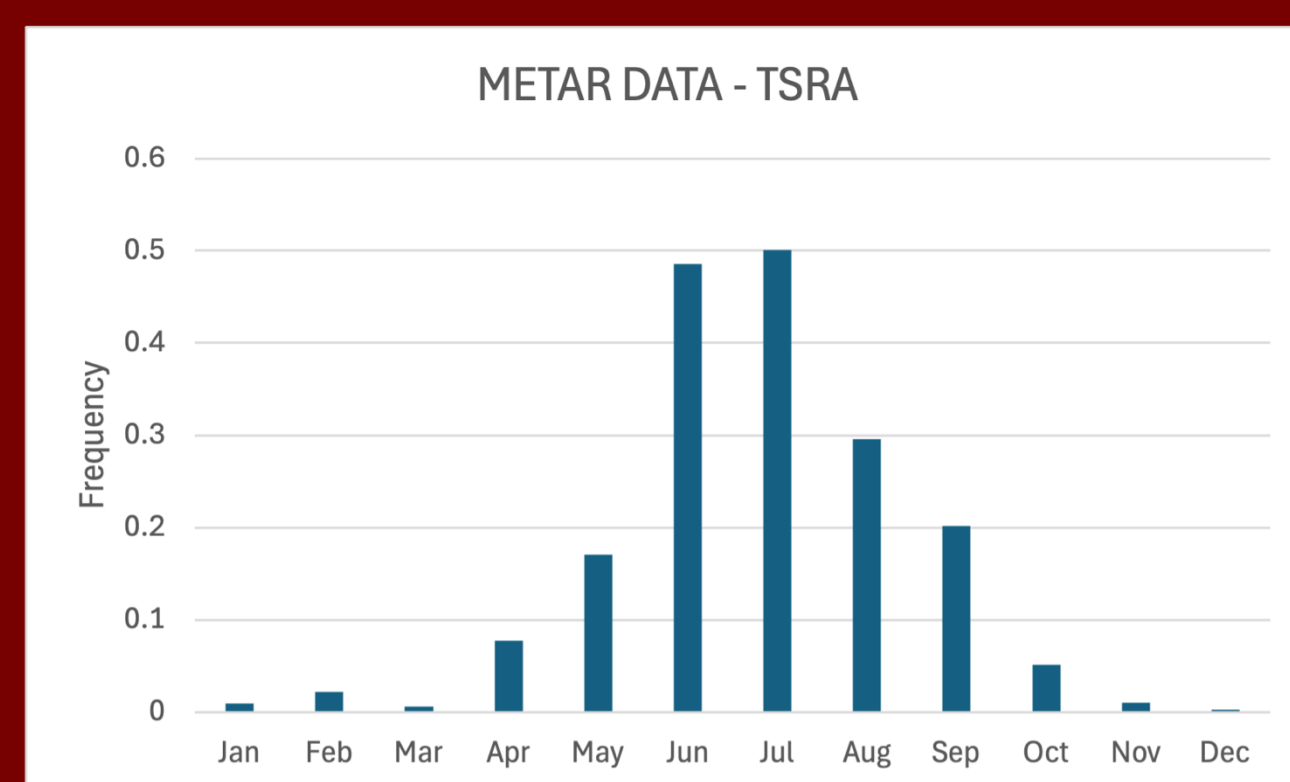


Figure 11. Annual frequency (percentage) of thunderstorms with rain on KBOS.

Annual Flight Categories

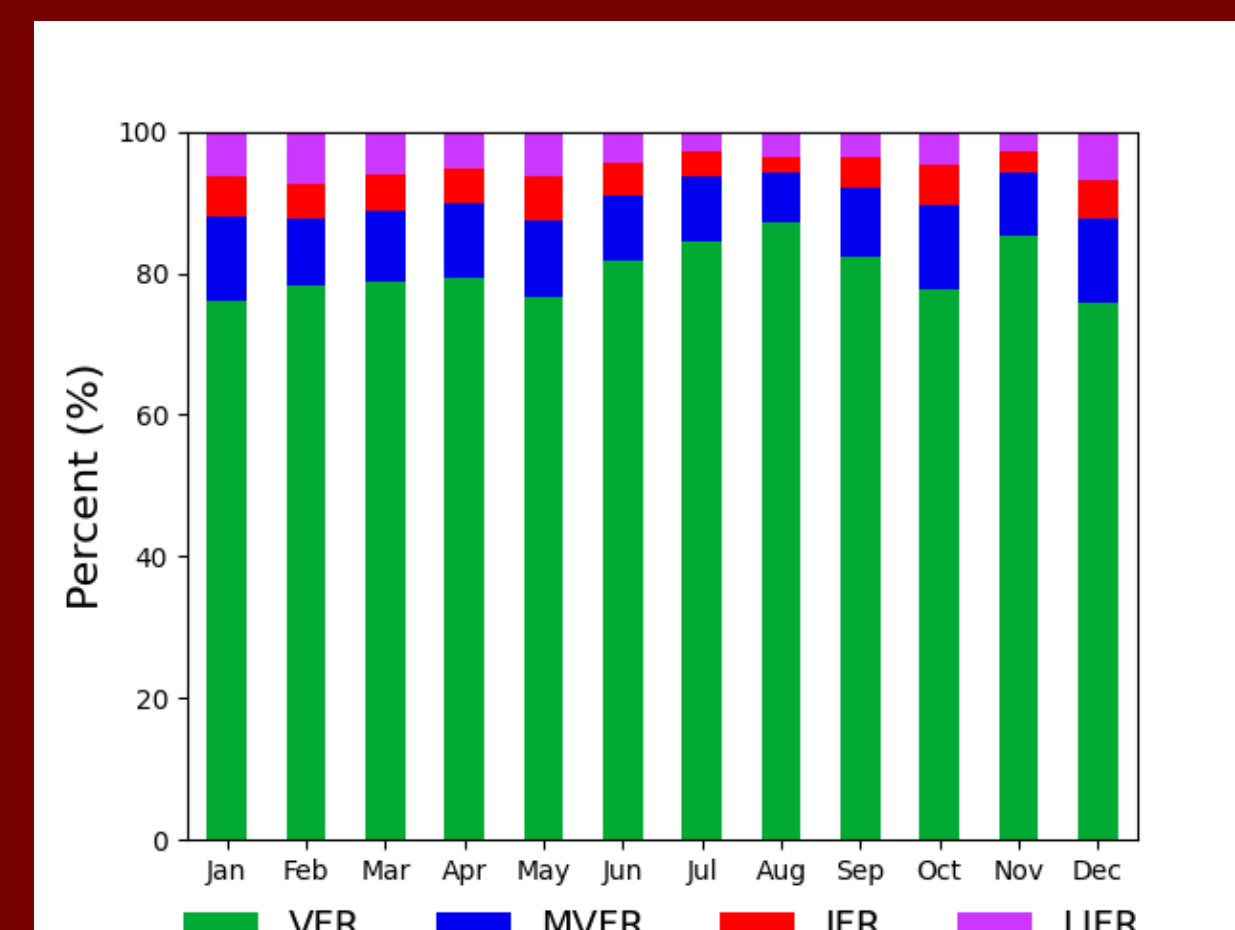


Figure 12. Annual percentage of flight category reports at KBOS.

Winds and Weather Assessment

Logan International Airport (KBOS), located in East Boston, Massachusetts, resides on a narrow peninsula extending into Boston Harbor. This coastal airport has exposure to marine influences, like sea breezes, fog, and coastal storms. This can also influence Boston's low ceilings (Figure 6). Boston is a New England state and often receives prevailing westerlies and polar winds from Canada (Figure 5).

In Boston, there is a high chance of fog to happen through out the day, peaking in the morning (Figure 7). However, one thing you do not see often is Fog occurring at high winds. In Figure 8, you can see reports of very low dewpoint depressions with windspeeds of 35+ knots. Fog is more common during calm winds and a humid atmosphere. However, due to Boston's coastal location, winds can transport warm, moist air over the colder surface of the harbor. As this air cools from below, it reaches saturation, creating advection fog. The high wind speeds associated with advection fog may be the result of a warm front and a tight pressure gradient, which can enhance low-level wind flow and support fog formation despite the stronger winds. During the winter Boston experiences choppy surface winds throughout the day around 10 knots (Figure 9), But during the summer the winds are gentle around 8 knots and peak at 10+ Knots around 17:00 UTC (noon EST.).

Boston experiences many coastal storms and thunderstorms (Figure 11) as well as Nor'easters which are mid-latitude cyclones that form along the east coast and are frequent between October and April. The cold surface temperatures and warm air from the ocean fuels nor'easters. Nor'easters are responsible for Boston's largest snowstorms to date. How does this effect KBOS? During the winter and spring months, KBOS airport receives more MVFR and LIFR reports (Figure 12) because of the frequent low ceilings and frequent fog that lowers visibility.

Snow Is The Ink, Wind Is The Voice

Winter Wind Under MVFR

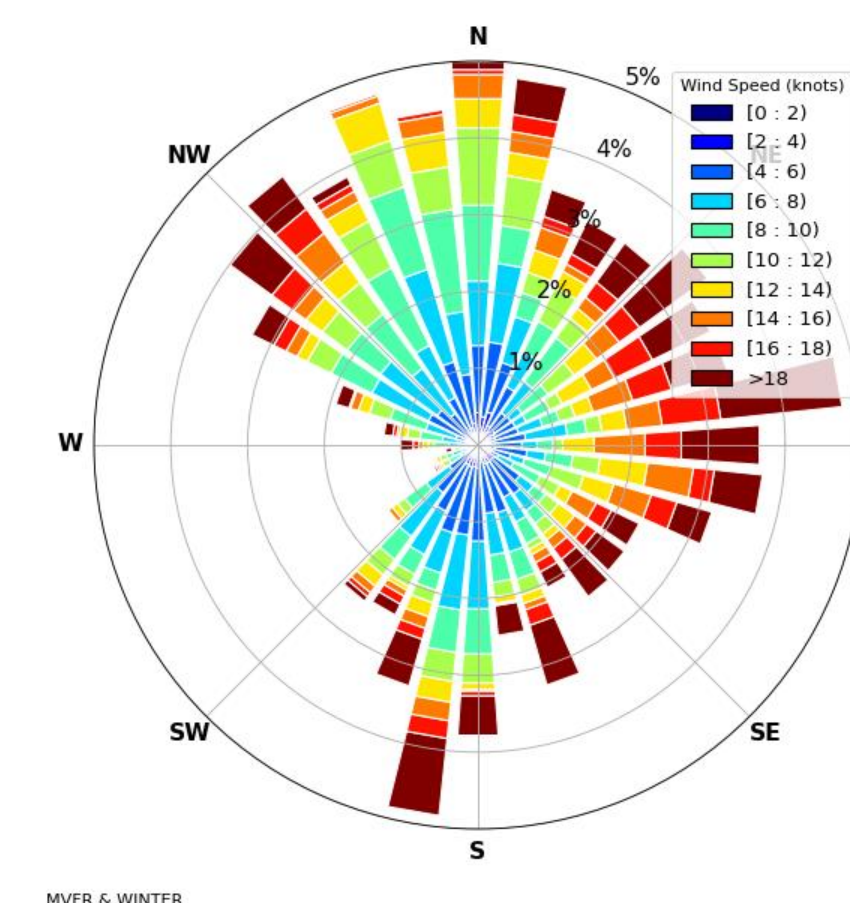


Figure 13. Winter wind rose with speed measured in knots under MVFR conditions.

+SN Frequency

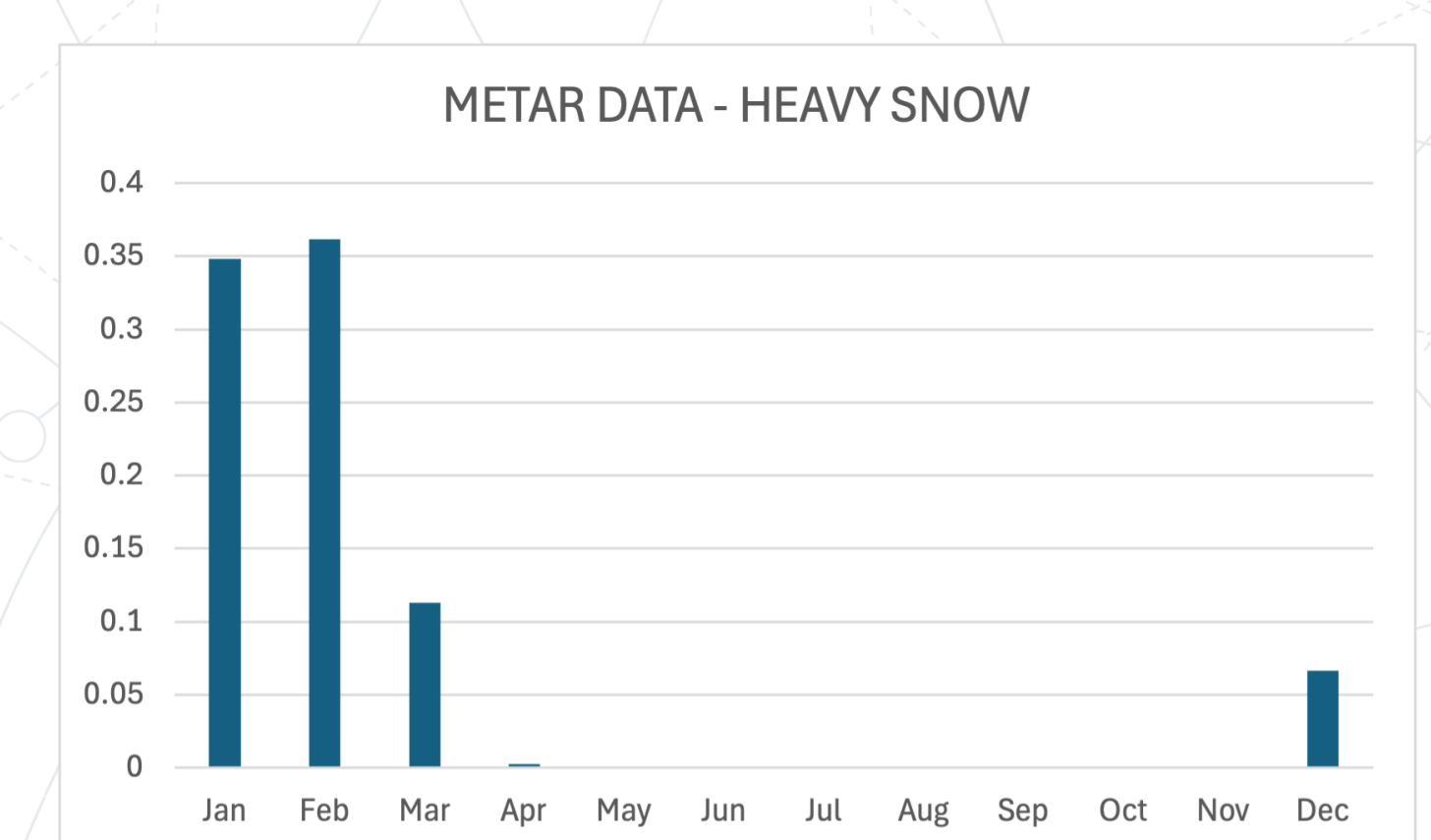


Figure 14. Annual frequency (percentage) of heavy snow reports at KBOS

Boston's "Snowmageddon" (2015)

Boston's "Snowmageddon" occurred in January to February 2015. Residents of the city were trapped under 24 inches of snow in for two months. Four severe storms lasted over a few weeks resulting in 110.6 inches of snow fall during this event. Transportation including the airport shut down and canceled all flights in and out of Boston. Heavy snow like this can lower visibility, damage aircraft or runways with ice, or cause accidents. One of the biggest blizzards took place January 27th, 2015.

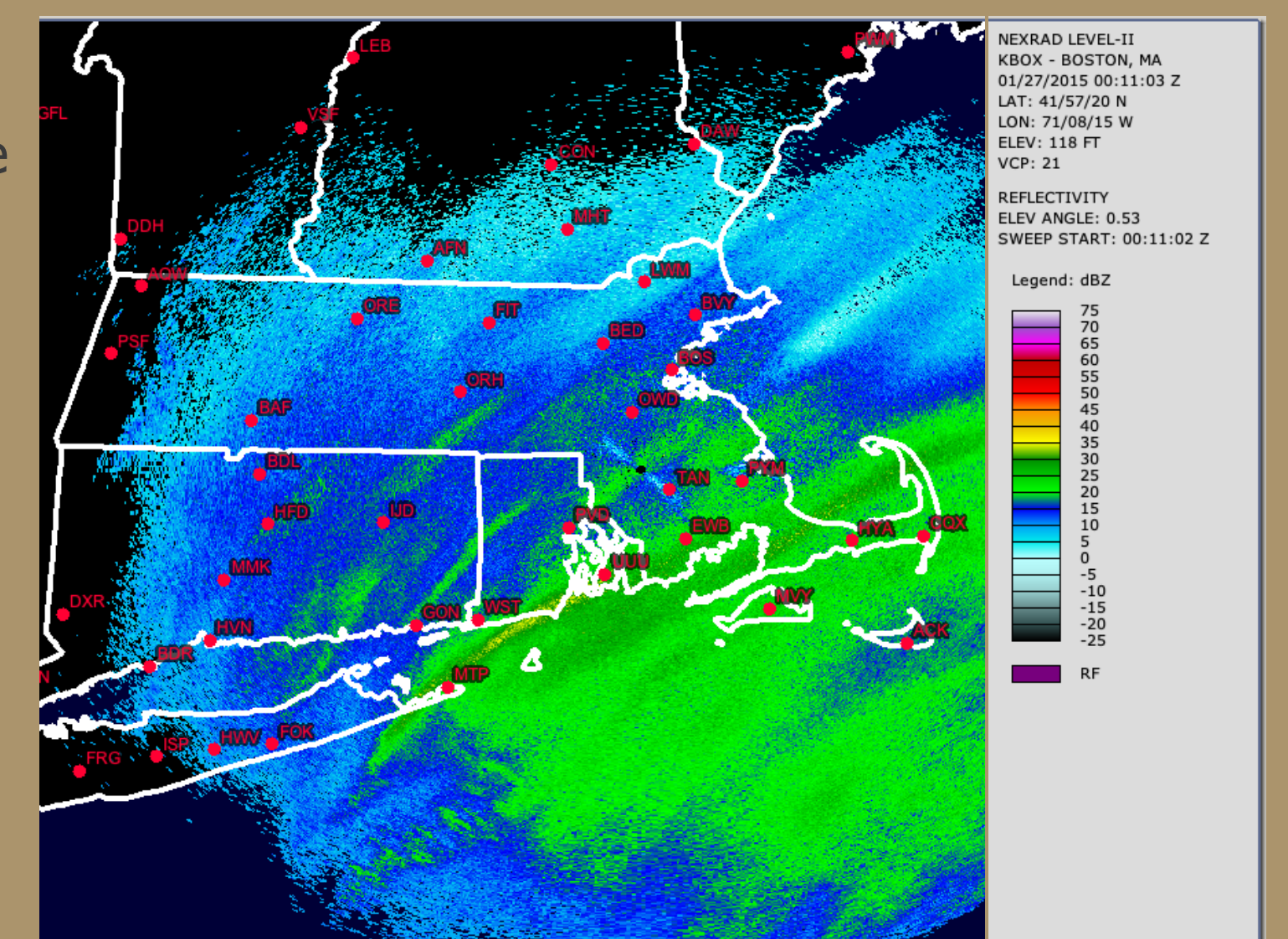


Figure 15. January 27, 2015 at 11:03Z. The Massachusetts Blizzard of 2015

Boston's winters do not whisper. They arrive loud, move fast and leave a mark.