



EWV



FLIGHTS DELAYS AND CANCELLATIONS AT NEWARK AIRPORT

Sandra Tobón Osorio

Problem Statement and approach

Problem statement

- Investigate the effect of weather on aeroplane departure delays at Newark Airport.
- Investigate any other factors that might have an effect, and understand how important weather is in comparison to them.
- Understand how Newark airport compares to other New York airports.

Approach

- Extracted data from weather stations at Newark, JFK and La Guardia
- Used information on flight departures provided by the client
- Explored data to understand general picture of flights at Newark
- Analysed relationship between different weather variables on flight delays and cancellations
- Analysed relationship between other factors and flight departures
- Compared effect of weather variables across different airports



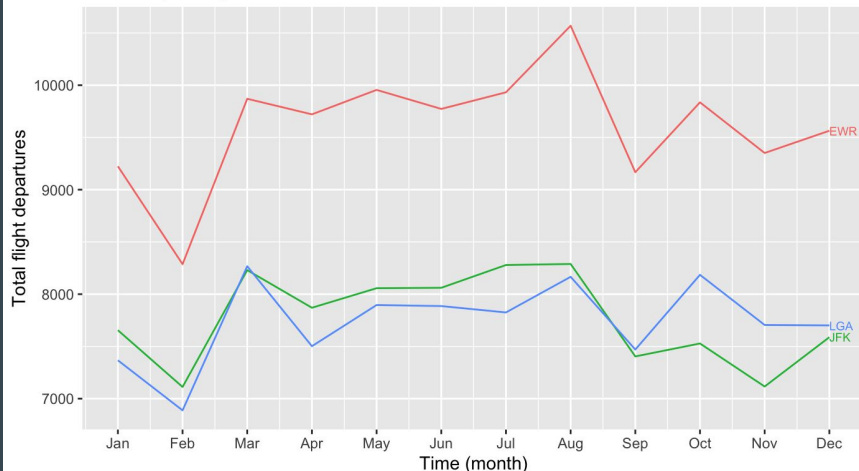
Assumptions

- Flights with less than 15 minutes delay are not counted as delays
- Scheduled flights without a departure time are assumed to be cancelled
- Electric planes incl. drones have been excluded
- Flights for which no airplane data was provided have been included
- Only flights that departed between 6:00 - 24:00 have been included

General understanding of departures at Newark and other NY airports

Comparing total number of scheduled departures

Across airports by month in 2017

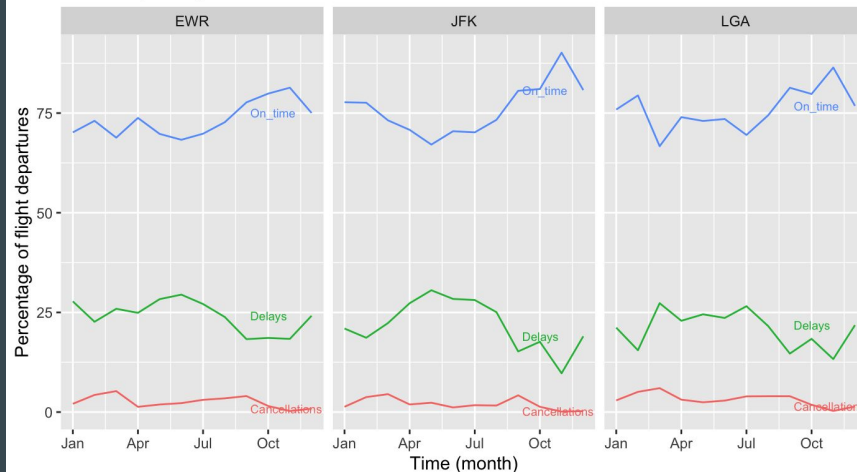


General comments

- In 2017, Newark Airport was the biggest airport by number of departures in the New York area
- Across all 3 airports, there are more flights in spring and summer time

Comparing on-time, delayed and cancelled departures

Across airports by month in 2017

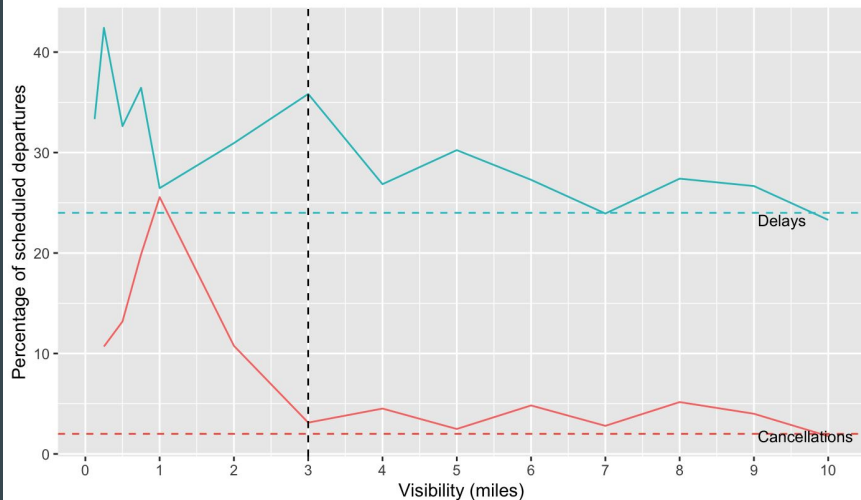


Delays and cancellations

- In spring and summer time, when demand is higher, the percentage of delayed flights is also higher - this is the case in all 3 airports
- Interestingly, across all airports, there is a minor spike in demand in Oct, but this is not accompanied by an increase in delays and cancellations
- At Newark, the average rate of delays and cancellations is, respectively, 24% and 2% - **IMPORTANT: these average are included in most graphs throughout this presentation as a visual reference point**

Impact of visibility and wind speed on departures

Relationship between visibility and departure delays & cancellations



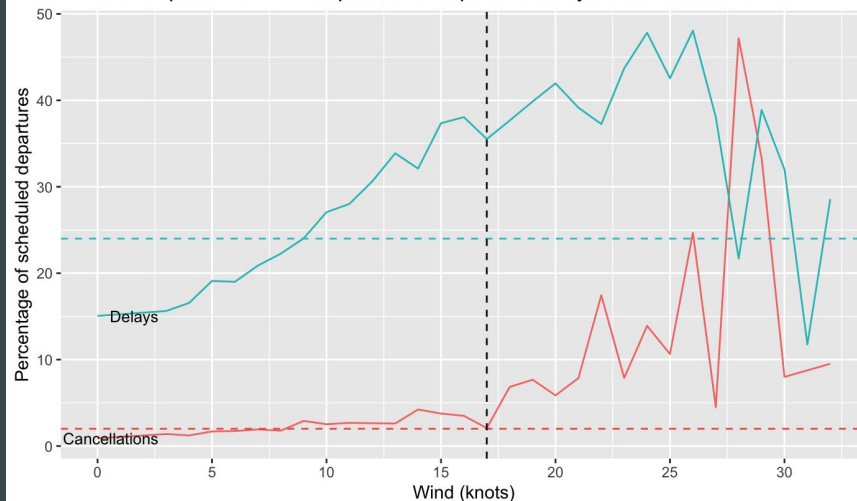
Visibility

- Above average rate of delays and cancellations when visibility is under 10 miles
- Considerable impact **when visibility falls below 3 miles** - this happens with 5.3% of all departures

Wind speed

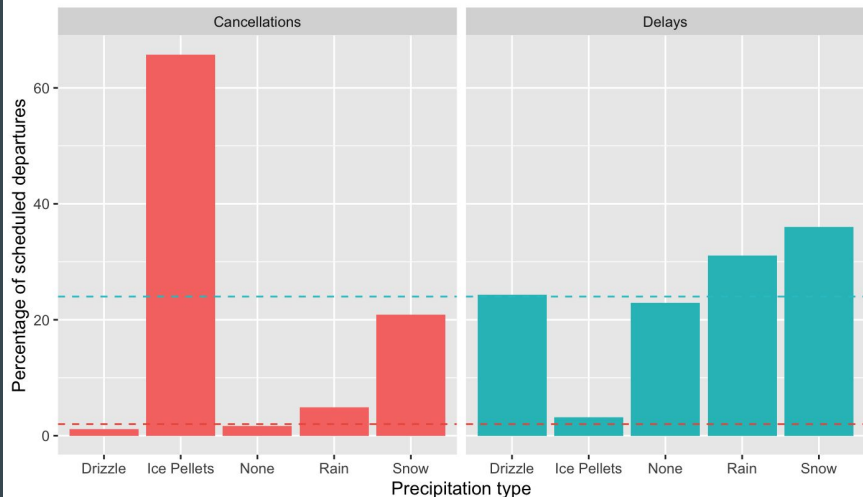
- **Above 17 knots of wind**, the rate of delays and cancellations increases significantly - this applies to 6.9% of all departures
- Above 27 knots of wind, it looks like flights tend to be cancelled rather than delayed

Relationship between wind speed and departure delays & cancellations



Impact of precipitation type and air pressure on departures

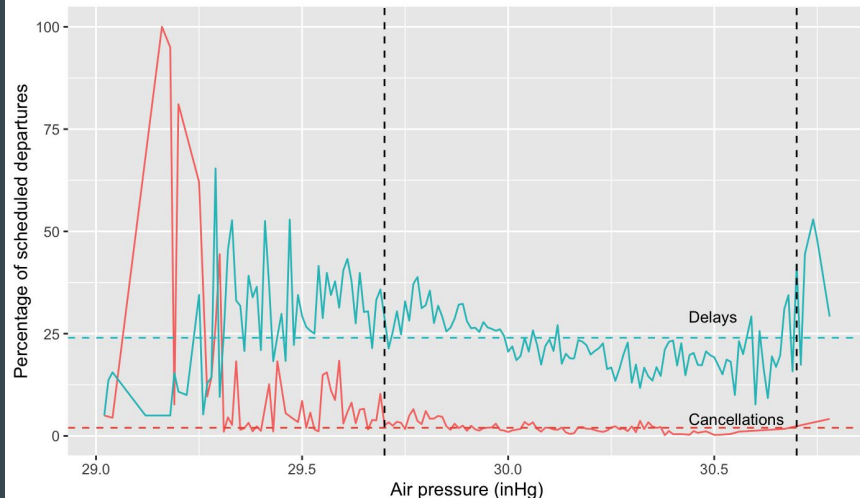
Relationship between type of precipitation and departure delays & cancellations



Precipitation type

- Both rainy and snowy conditions increase the rate of delays
- Cancellations are particularly high with **snow and ice**, but also with in **rain** (this happens in 1.9% and 13.2% of all departures respectively)

Relationship between air pressure and departure delays & cancellations



Air pressure

- Under **high pressure** (≥ 30.6 inHg) conditions the rate of delays tends to increase significantly
- Under **low pressure** (≤ 29.7 inHg) conditions both delays and cancellations tend to be significantly above the average rates
- These conditions occur during 9.4% of all departures

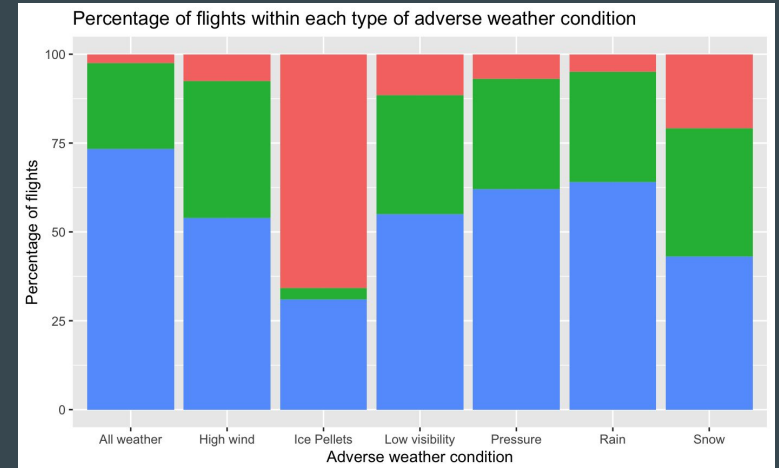
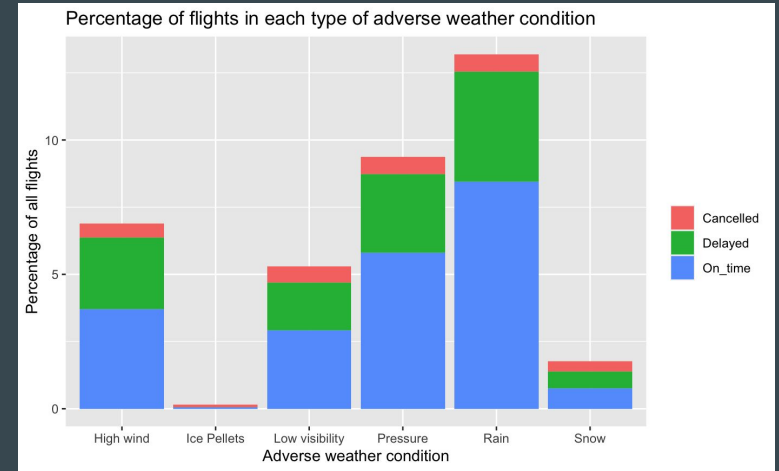
Definition of adverse weather conditions

Adverse weather

Given the high rate of delays and cancellations under certain weather conditions, the concept of adverse weather can be introduced to further understand the possible effect this can have on departures.

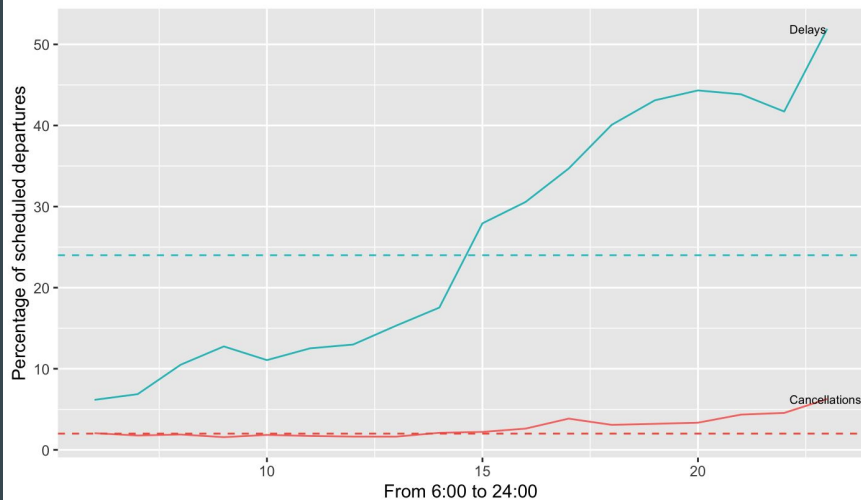
The main types of weather to be concerned about are:

- Visibility below 3 miles
- Wind speed above 17 knots
- High air pressure (below 29.7 inHg)
- Low air pressure (above 30.6 inHg)
- Snowy conditions
- Rainy conditions
- Ice Pellets



Other factors that could affect departures

Relationship between hour of the day and departure delays & cancellations



Hour of the day

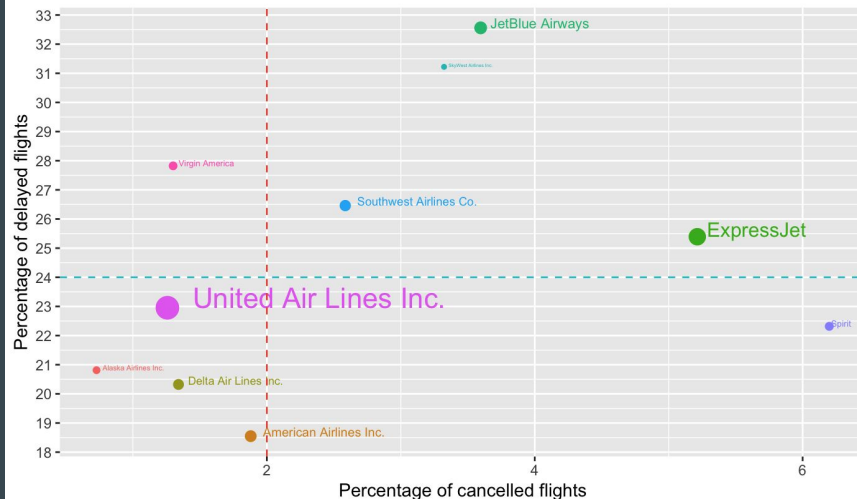
- The percentage of flights that are delayed is below average before 3pm
- After 3pm, the rate of delays increases significantly, which continues until late evening, when remaining flights become subject to cancellation

Carriers

The percentage of flights cancelled or delayed is considerably above the average dependent on the carrier:

- ExpressJet and JetBlue, who account for 28.5% of all departures, are particularly bad performers when it comes to punctuality
- United, with 47.4% of all departures, performs better than average

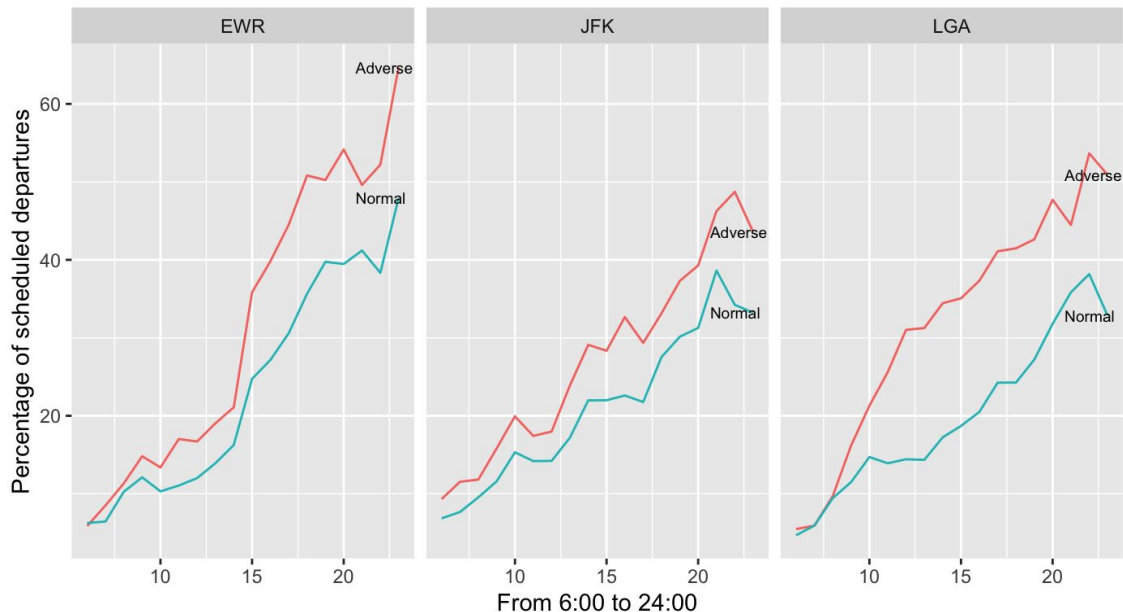
Comparison of delays and cancellations across carriers



Flight delays in different weather conditions across New York airports

Comparing departure delays across New York airports

In different weather conditions



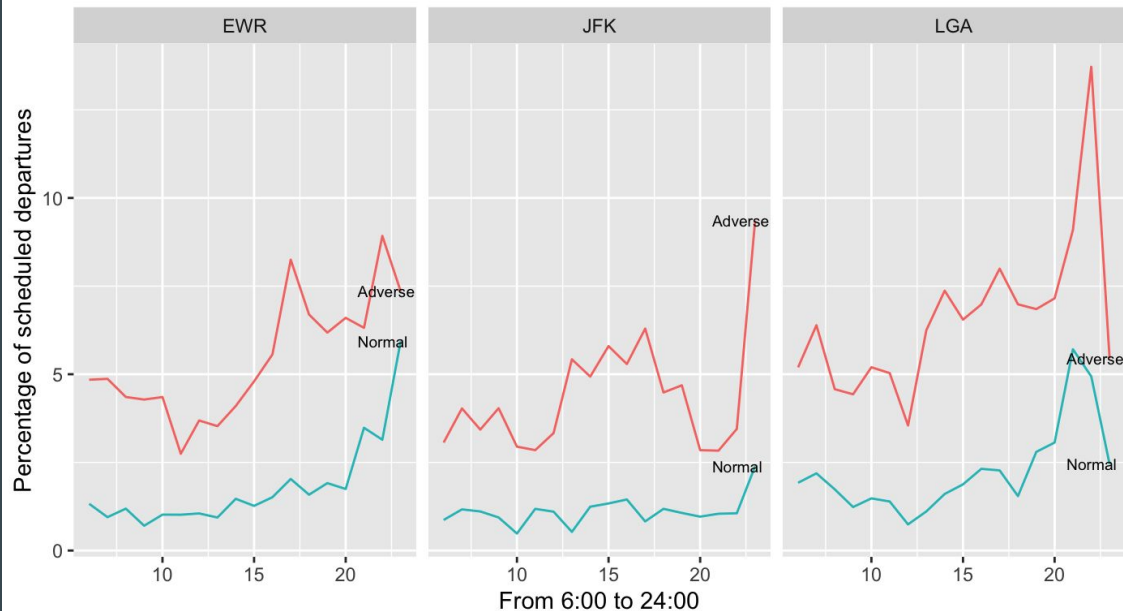
Delays at different airports:

- Regardless of the airport or the weather conditions, the percentage of delays increases throughout the day
- In adverse weather conditions, the percentage of delays is significantly higher than in normal weather conditions in all New York airports
- The increase in the number of delays during adverse weather conditions at Newark appears to be higher than at JFK, however La Guardia seems to be worst affected and also has increased delays starting earlier in the day on adverse weather days.

Flight cancellations in different weather conditions across NY airports

Comparing departure cancellations across New York airports

In different weather conditions



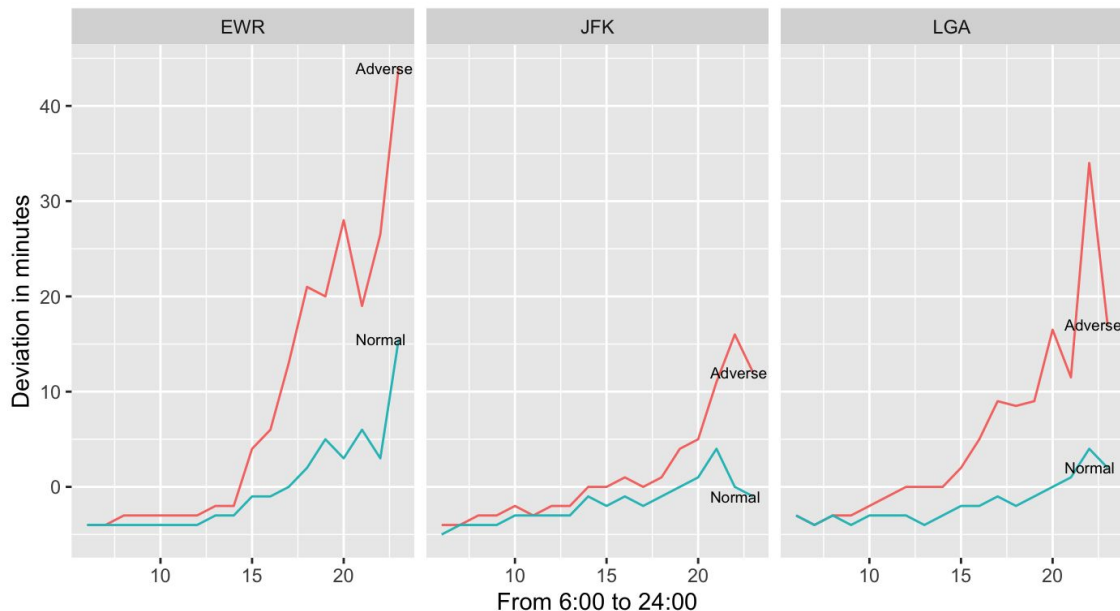
Cancellations at different airports:

- All three airports are showing a significant increase in cancellations in the last 2 hours of the day, regardless of the weather conditions.
- All three airports are seeing significant increases in cancellations in adverse weather conditions.
- La Guardia seems more likely to cancel flights in adverse conditions than both other airports

Average waiting times in different weather conditions across NY airports

Average deviation to scheduled departure time across New York airports

In different weather conditions



Waiting times at different airports

- On average, flights are departing ahead of schedule in all airports in the first half of the day.
- In the afternoon, flights are - on average - falling behind schedule, with the average waiting time increasing throughout the rest of the day.
- Even in normal weather conditions, flights at Newark tend to depart with a greater delay than flight departing from other airports.
- In adverse conditions, waiting times at Newark tend to be particularly affected when compared to the other airports.

Biography

- <https://en.wikipedia.org/wiki/METAR>
- <https://www.airportspotting.com/spot-york-ifk-airport/>
- <https://www.transtats.bts.gov/HomeDrillChart.asp>
- <https://www.ogimet.com/>