Does Barometric Pressure have a Correlation with Cloud Composition and Quantity?

Raechel Nelson
American Fork Junior High (American Fork Utah)

Abstract

Over the time span of 5 days, at 3:30 and 7:30 P.M., barometric pressure data from the National Weather Service was collected, and GOES 17 data from NOAA Star Nesdis ABI Bands 2, 4, and 6 were collected. This was in order to answer the following research question, "Does Barometric Pressure have a Correlation with the Composition and Quantity of Clouds?" ABI (Advanced Baseline Imagery) is one of the most important instruments on the GOES 17 satellite. It has 16 different spectral bands and as stated earlier, in the research process bands 2, 4, and 6 were used. ABI spectral band 2, nicknamed the 'Red Band' has a central wavelength of 0.64 µm. Its primary application is to detect and analyze weather systems and especially clouds during the day. Band 4, nicknamed 'Cirrus Band' has a central wavelength of 1.38 µm. Its primary application is to detect high and very thin clouds, particularly cirrus. And finally, band 6, the 'Cloud Particle Size Band' has a central wavelength of 2.24 µm. This band has a primary application of inputting products such as cloud phase. I found that there IS a correlation between barometric pressure and cloud composition and quantity.

Research Question

"Does Barometric Pressure have a Correlation with Cloud Composition and Quantity?"

Image 1 (Above): A picture of an aneroid barometer.

Image 2 (Below): An artists picture of clouds.

Research Methods

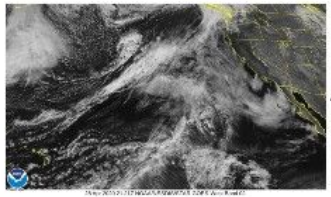
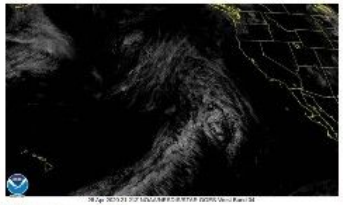
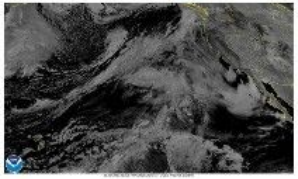


Figure 1, 2, and 3: NOAA Star Nesdis GOES 17 data from ABI bands 2, 4, and 6 was collected daily. I was observing Salt Lake Valley.

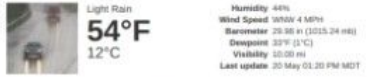
Data was then compiled onto a google doc daily to store the information.





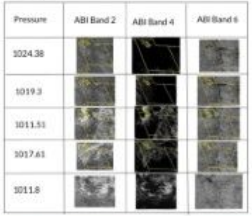
Information was then put into small daily data tables.

Figure 4: Barometric Pressure data was also collected daily from the National Weather Service.



Results and Conclusions

I decided to pick ABI bands 2, 4, and 6 because they showed both the composition and quantity of clouds, which was exactly what I was looking for. Through the experimental process, I found that there IS a correlation between cloud composition and quantity. When the barometric pressure goes up, the cloud quantity goes down. As far as composition goes, thin clouds and non storm clouds like cirrus are seen most often with higher pressures. Thicker and more storm like clouds like cumulonimbus and some stratus clouds are more often seen in lower pressures. This makes total sense because we tend to have storms when the pressure drops.



Pressure	ABI Band 2	ABI Band 4	ABI Band 6
1024.38			
1019.3			
1011.51			
1017.61			
1011.8			

Figure 5: This is one of the two final data tables. This is the data from 3:30 observations.

References

http://cimss.ssec.wisc.edu/education/goesr/vsf.html
http://cimss.ssec.wisc.edu/education/goesr/VSF_PPT_Template.pptx
http://cimss.ssec.wisc.edu/goes/GOESR_QuickGuides.html
http://cimss.ssec.wisc.edu/education/goesr/ScoreCard2020.pdf
http://cimss.ssec.wisc.edu/education/goesr/faq.html
https://www.star.nesdis.noaa.gov/GOES/conus.php?sat=G17
https://www.weather.gov/