

THE EFFECT OF FIREWORKS DURING NEW YEAR'S EVE ON AEROSOLS

Do the fireworks during New Year's Eve affect the amount of aerosols?

ABSTRACT

Aerosols are little pieces of dust or parcels, for example soot and water droplets. These particles float in the air. Aerosols are a global issue. If the amount of aerosols is high, the environment becomes worse. Aerosols can, if they are in the bottom layer of the atmosphere, cause breathing problems. In that context they are also known as particulate matter content.

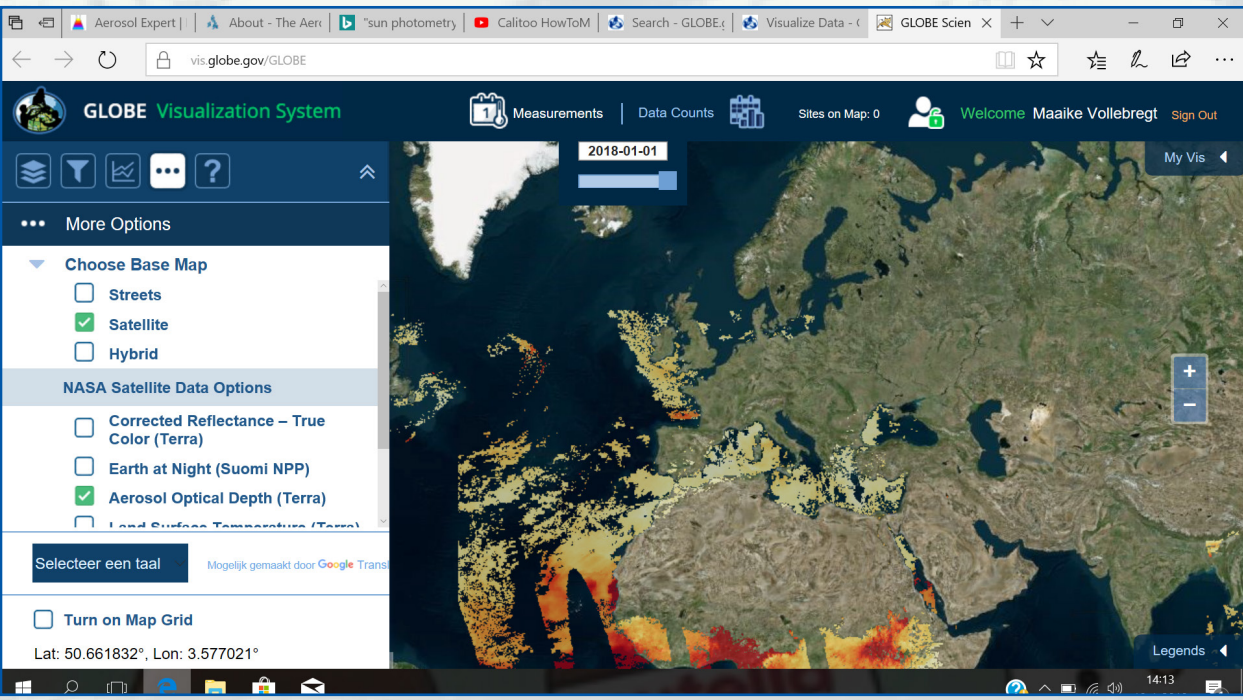
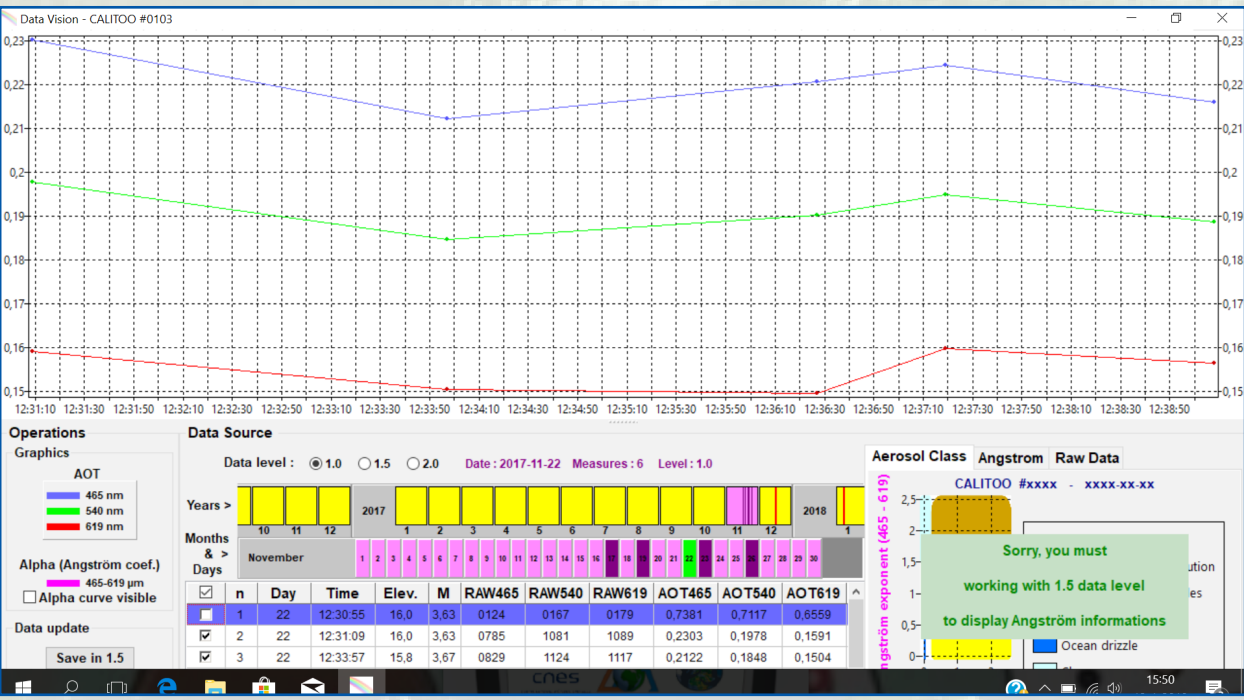
Aerosols scatter and absorb sunlight, this affects the weather. How it affects the weather depends on several factors, such as the concentration and the kind of aerosols. Aerosols are present at all the levels of the air up to the ozone layer. The number of aerosols is phrased in AOT.

AOT is the aerosol optical thickness. With the AOT, you can measure the amount of aerosols in the atmosphere. With the amount of aerosols in the atmosphere, you measure the optical thickness of the aerosols. "Optical" means: in relation to light (Optical means in respect to sunlight.) Solar radiation becomes weaker because of the aerosols in the air. You can measure this with the AOT.

There are a lot of ways to measure the AOT. We measured the AOT with a device called Calitoo, it is a sun photometer. We compared our measurements with data from satellites.

We researched if the fireworks during New Year's Eve affect the amount of aerosols. Particulate matter is a part of aerosols and it is known that the amount particulate matter increases during New Year's Eve. How big the air pollution of the fireworks particles in the air is, depends on the state of the weather. When there is no wind and a high humidity, the fireworks smog will linger longer. The high amount of particles in the air mostly does not last long.

The influence of the fireworks smog for the aerosol optical thickness is not investigated yet. This is why we researched this subject.



PROBLEM STATEMENT

Aerosols can, if they are in the bottom layer of the atmosphere, affect health. Besides that, black aerosols can affect the climate. The health effects of aerosols consist of short-term acute symptoms, such as asthma and bronchitis, and long-term chronic irritation and inflammation of the respiratory tract. The role of aerosols on the climate is still a bit unclear. What we do know for sure, is that white aerosols have a cooling effect on the climate.

METHODS

The objective of this research is to give some information about if the fireworks during New Year's Eve affect the amount of aerosols. We have done the measurements in a while before and a while after New Year's Eve in the Netherlands.

We measured the AOT with the Calitoo

This is a sun photometer. The results are only reliable when the sun shines and when there are no clouds, because they scatter a lot of solar radiation and will give a very high AOT.

We compared our data with Terra (satellite)

Satellites can, of course, be wrong sometimes. For that reason, scientists often compare data from the satellite with data from ground-based instruments.

We researched the direction of the wind

Because of the time difference, the exact moment when we shoot the fireworks into the air is in every country different. That is why we also researched the direction of the wind, that stipulates how fast and in which direction the particulate matter flows. This way we want to declare a prospective random high AOT.

CONCLUSION

Partial conclusions

- With our measurements, we can conclude that one week after New Year's Eve, the fireworks do not affect the amount of aerosols.
- When we looked at the satellite data from Terra, we could see that the number of aerosols do not change very much before New Year's Eve and after New Year's Eve.
- According to the measurements from Skola Za Medicinske Se-stre Vrapce the average AOT before New Year's Eve and after New Year's Eve is higher.

Conclusion

Our partial conclusions were very different. With our partial conclusions we can not conclude if the fireworks during New Year's Eve affect the amount of aerosols.

FUTURE DIRECTIONS

A future research which can be done, is measuring the AOT before and after New Year's Eve three years in a row. If you do this, you will have a more reliable conclusion. It is also better to measure the data in a country where it is always sunny, so we can measure for sure on New Year's Day. This gives a better conclusion.

Another possible future research is doing research about the effect of fireworks in the summer. You can light fireworks on a special place and then immediately take measurements. With this you can say something about the amount of aerosols immediately after lighting fireworks.

ACKNOWLEDGEMENTS

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REFERENCES

We have had contact with 4 people.

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| <i>Joost Wesseling</i> | He is an aerosol specialist for the RIVM. He helped us when we had a question about aerosols. He also read our report. |
| <i>Hester Volten</i> | She is also an aerosol specialist for the RIVM. She read our research report and gave tips. Besides that, she helped us with the Calitoo. On a certain moment we had a lot of questions about the device. |
| <i>Koen Michels</i> | He was a Calitoo expert, so he could help us when we had questions about the device. |
| <i>Marinela Labaš</i> | She was our contact person from a school in Croatia. They also did measurements for AOT. We exchanged our results with them. |

Our teachers are Joris ten Barge and Maaïke Vollebregt. They helped us with the process of making a research report. They also told us about the project and lead us to the Globe site.

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