Ari Asmi: Air pollution, another factor in global warming

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Tiny particles impact our air quality and cause health problems, but European researchers have been discovering how these particles can also influence climate change.

Ari Asmi talks to youris.com about the link between aerosols and global warming. His expertise stems from his previous role as coordinator in an EU funded project called EUCAARI. This project probed how aerosols affect the levels of energy reaching the earth as well as global temperatures. He is also a scientist at in the department of physics at the University of Helsinki, Finland.

How can small particles impact on global climate and health?
There are several kinds of small particles, or aerosols, in the atmosphere. It can be dust, or maybe sea salt. When you see black smoke, this is small aerosol particles absorbing light. These can have a climate effect by blocking sunlight. We were looking at particles below one micron in size, so that's one-thousandth of a millimeter. Most of them are even smaller, below the wavelength of visible light, so you can't really observe them without a special instrument by simply looking at them.

These small particles can have quite big effects. They make clouds whiter. And white clouds block more sunlight, reflecting light away from the surface and making the surface cooler. They also can have big effects on the health of populations by getting into people's lungs. You don't see them unless they are in huge numbers like fumes from a diesel exhaust.

What was the focus of your research project on aerosols?
In the EUCARRI project, we made one of the first attempts to comprehensively look at the connection between these aerosols and the climate system. There's also a connection between these small aerosols and air quality. Therefore, we finally started to gain an understanding of the mechanism of the effects of these small particles in both climate and air quality systems. Before this project, we would have observations and then theories to explain them. But when we get an idea of the actual mechanism, we can perform better estimates of what is going to happen in future when we have a different climate.

Could removing these small particles from our atmosphere increase global warming?
Small particles like sulphate particles are making clouds whiter and cooling the earth. This is happening at the same time that greenhouse gases are warming the atmosphere. We should remove the small particles for health reasons, but there is a timing problem. The small aerosols stay

in the atmosphere about a week and we lose the cooling effect quite quickly. But the greenhouse gases will stay in the atmosphere for hundreds of years. If we remove the small particles we could have a huge amount of warming, as the greenhouse gases remain. This is worrying. But the size of this effect is uncertain.

The effect of these particles is poorly known and clouds are extremely complex things to understand. Our research has helped reduce uncertainty about the effect of aerosols, but there is still a huge amount of uncertainty. It is still much bigger than, say, for greenhouse gases, which we understand much better. Since the completion of EUCAARI, another project called PEGASOS has been measuring small particles using a zeppelin airship to sample air masses in the lower atmosphere. Last year, it was over Germany, and this year it will move to Finland and northern Europe.

You describe your recent paper's results how air pollution control will lead to more global warming as worrying?
Recently, I have been working to set up a network for taking measures of the atmosphere across Europe. The atmosphere is very diverse and different environments have different aerosols present above them. Light levels and temperature can influence how small particles behave. You cannot just take a measure from one place and you need to standardise measurements.

It seems the aerosol cooling has been stronger than we thought, at least from the experiments we did. It is also more sensitive to the amount of sulphur in the atmosphere. This would also mean that by 2100 the atmosphere will be far more sensitive to the carbon dioxide increases than we had estimated, leading to more warming. But this is just one paper. There isn't consensus about this amongst scientists.

More information: www.cas.manchester.ac.uk/resprojects/eucaari/

pegasos.iceht.forth.gr/

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