

Climate change!

The word insinuates, of course, a change in the climate, but how does it change and why?

That is a very frequently discussed question around the world. And no one has yet found one reason or one solution to the problem. Simply because there is not just one reason or just one solution. There are several reasons for climate changes, both natural and man-made.

As examples of the natural causes we can mention volcanoes and sunspots.

Volcanoes.

At big volcano eruptions a large amount of dust particles and sulphur dioxide is sent up into the upper part of the atmosphere. Here, the dust cloud spreads, in some coincidences to most of the earth, and reflects the sunlight back into space. At very large volcano eruptions, the ash carpet can reflect a great deal of the sunlight and cause a drop in the global temperature at about one degree. The effect of such an eruption can still be registered up to three years later. Simultaneous with dust and sulphur dioxide the volcano also sends great amounts of carbon dioxide up into the atmosphere. Volcanoes have in that way a double effect on the climate. On one hand there can on short term be a cool down of the earth, if large amounts of dust and sulphur dioxide get up into the upper layers of the atmosphere – the stratosphere. On the other hand the carbon dioxide, which is one of the greenhouse gasses, contributes to a higher greenhouse effect – on long terms – a global temperature rise.

Sunspots.

The so-called sunwind consists of electrically loaded atomic particles, most of all protons and electrons. The swinging of the sunwind can be read by the number of sunspots. The sunwind and thereby also the sunspots, varies in intensity and number in periods of about 11 years. A theory about how the sunwind can affect the climate on the earth has been advanced by two Danish scientists. They believe that the sunwind can create variations in the amount of sunlight, which is thrown back into space.

The sunwind creates electric and magnetic areas around the earth. These areas shield the earth against the cosmic radiation, which comes from space. When the cosmic radiation gets into the earth's atmosphere, there will be an ionization of the air's molecules and this may advance the cloud formation. If the theory is correct- which is still unknown- a powerful

sunwind, many sunspots, will give a powerful area around the earth. This will make the intensity of the cosmic radiation in the atmosphere smaller, which means that there will be made less clouds, which will give a larger amount of sunlight to the earth and thereby a higher global temperature.

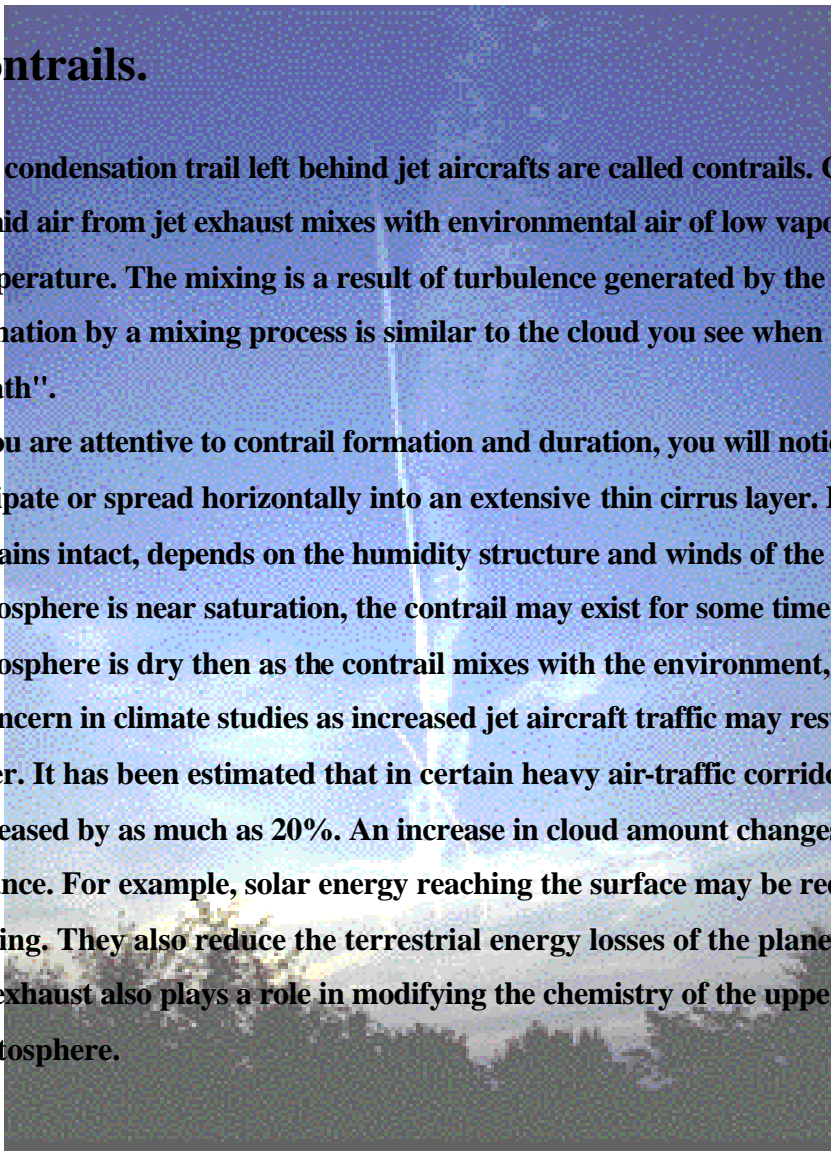
In addition to the natural causes there are, sadly enough, also many man made reasons, such as :

CO₂ release, oil spills, burning of fossil fuels and contrails.

Contrails.

The condensation trail left behind jet aircrafts are called contrails. Contrails form when hot humid air from jet exhaust mixes with environmental air of low vapour pressure and low temperature. The mixing is a result of turbulence generated by the engine exhaust. Cloud formation by a mixing process is similar to the cloud you see when you exhale and "see your breath".

If you are attentive to contrail formation and duration, you will notice that they can rapidly dissipate or spread horizontally into an extensive thin cirrus layer. How long a contrail remains intact, depends on the humidity structure and winds of the upper troposphere. If the atmosphere is near saturation, the contrail may exist for some time. On the other hand, if the atmosphere is dry then as the contrail mixes with the environment, it dissipates. Contrails are a concern in climate studies as increased jet aircraft traffic may result in an increase in cloud cover. It has been estimated that in certain heavy air-traffic corridors, cloud cover has increased by as much as 20%. An increase in cloud amount changes the region's radiation balance. For example, solar energy reaching the surface may be reduced, resulting in surface cooling. They also reduce the terrestrial energy losses of the planet, resulting in a warming. Jet exhaust also plays a role in modifying the chemistry of the upper troposphere and lower stratosphere.



Deforestation.

- Rondonia, Brazil.

Rondonia is an area of the Amazon rainforest in Brazil, which has been a victim of the intensive deforestation .

The reason for the systematic felling of Brazil's rainforest was not only because of rich money-makers who wanted to get even richer. It was also simply necessary to get space and work for the tremendous growing population.

In the years after the war things changed. Instead of using all of the money on weapons and war the government started to use money on healthcare. This made the infant mortality rate fall drastically and the death rate also fell. The birth rate did not fall until 10-20 years later. And in 1970 there was a huge "population explosion".

Because of this enormous growth there was no longer enough space so everyone could get a piece of land. Therefore they had to go into the rainforest, to get work, food and a place to live. They felled the forest systematically so they could make roads and build houses.

This systematic felling can be seen very clearly on satellite photos from the area.

Satellite pictures.

The satellites, which are used for the detailed observation of land areas, are the polar satellites. The satellite we will concentrate on is one of the three first satellites, which comes from the batch LANDSAT, which includes six satellites.

When you see a satellite picture it is not like an ordinary photo.

The satellite observes the ground's different surfaces by measuring their reflection of the light in several parts of the light's spectrum.

The satellite is equipped with multispectral scanners (MMS) with four channels in the visible and near infrared ranges.

Every channel, also called band, scans the ground's reflection of light among the bands part of the spectrum. Band three scans fx the area from 0,63 mm – 0,69 mm. The reflection it observes gets converted to codes of numbers, which are sent to the earth. When these

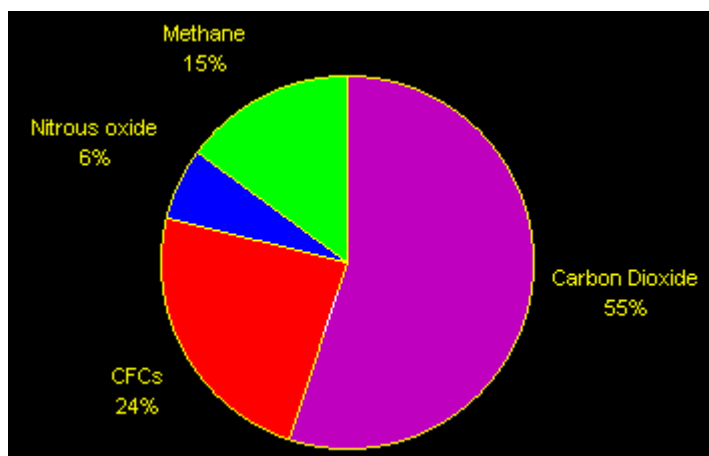
numbers are received, we know how every little part of the chosen area reflects the light in the specific bands of the spectrum. Every type of surface has its own percentage reflection of the light. It might, however, as an example be difficult to make a distinction between a large cloud and a small forest fire.

They can reflect the light identically in one or a couple of the bands, but not in all of them. When we get the information from each band about every part in an area, we know how the different surfaces reflect the light in every band. When we know the surface of every part in the scanned area, we colour it. To make it realistic, you often make the forest green, the water blue and so on, so it looks like a photo. But it is important to mention that it is *not* that way the satellites “watch” the earth, it is ourselves who colour the satellite’s information about the surface in the concerned area.

What will happen – what influence does the deforestation have on the climate?

There are some natural greenhouse gases: water vapour, nitrous oxide, carbon dioxide, methane and ozone. However, over the past fifty years, production of carbon dioxide, nitrous oxide and methane has risen sharply, and a new type of chemical - the chlorofluorocarbon, or CFC - has been introduced as a refrigerant, solvent and aerosol propellant, but it is also a very powerful greenhouse gas, because it can trap a lot of radiation - one molecule of CFC is 12,000 to 16,000 times as effective at absorbing infra-red radiation as a molecule of carbon dioxide.

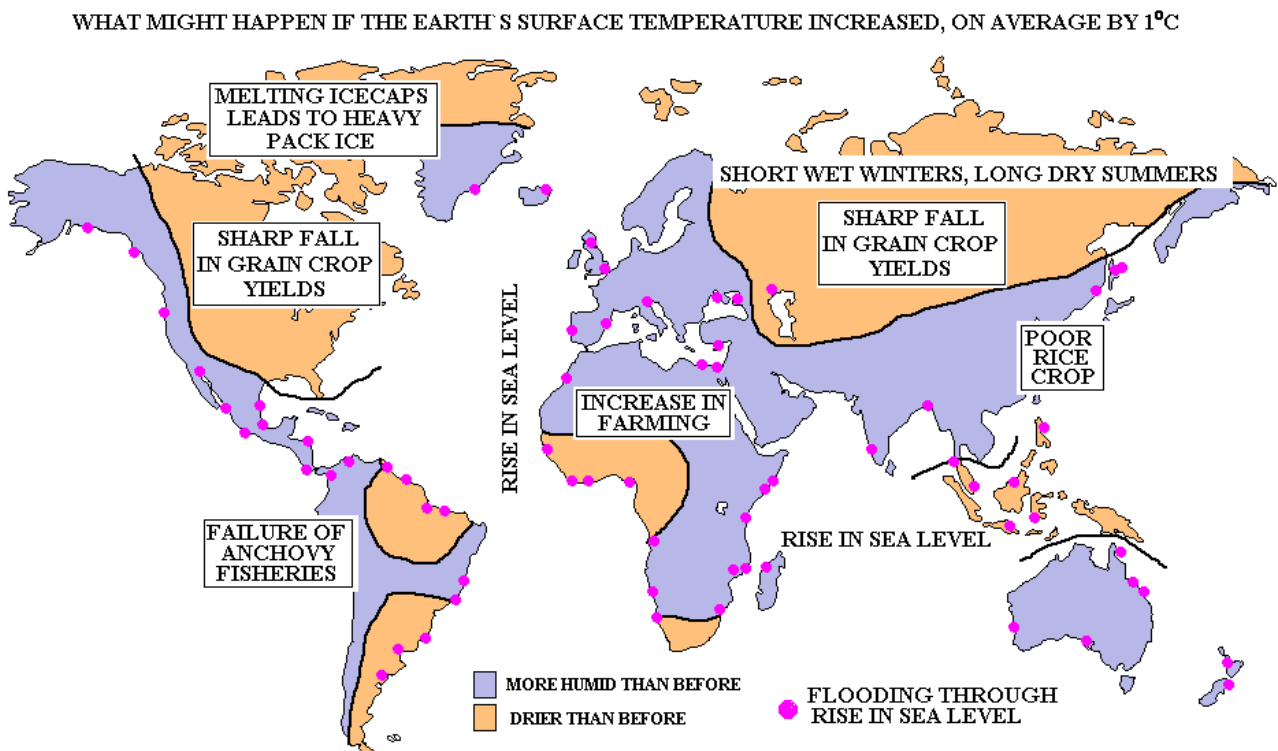
This graph shows how much each gas contributes to the greenhouse effect, taking into account how much of it there is and how much radiation it can absorb.



The carbon dioxide comes mainly from burning fossil fuels in power stations, which also causes acid rain. It is also created by living animals breathing, and is naturally converted by plants back to oxygen. However, deforestation is reducing the planet's carbon dioxide absorbing capability. Nitrous oxide is a by-product of nylon production, and is also released by fertiliser use in agriculture. The extra methane is produced in coal mining, natural gas production and distribution (natural gas is methane), and waste disposal. One fifth of all methane generated by human activity comes from microbial decay of organic material in flooded rice fields.

The greenhouse effect causes trouble by raising the temperature of the planet. The actual rise is not very much, but the Earth's ecosystem is very fragile, and small changes can have large effects: The Inter-Governmental Panel on Climate Change has predicted that the rise of one degree will happen by the year 2025. This could potentially cripple the North American corn belt, which produces much of the world's grain, leading to much higher food prices, and even less food for the Third World than they already have. However, it would also mean that some countries which are further north would be able to grow crops they had never been able to grow before, although there is less land as you move north from the corn belt.

The other serious worry is that rising sea levels from the melting of the polar ice caps could severely flood many countries.



Deforestation can cause the climate to become more extreme in nature; the occurrence and strength of floods and droughts could increase. Forests store large amounts of carbon that are released when trees are cut down or burned. It is projected that deforestation and the burning of biomass will be responsible for fifteen percent of the greenhouse effect between 1990 and 2025. The ranges of tree species could shift with respect to altitude and latitude as a result of global warming. Furthermore, the stress of such environmental change may make some species more susceptible to the effects of insects, pollution, disease and fire. In addition, genetic diversity may decrease and areas of trees may be lost. Rising sea levels brought on by global warming have the potential to threaten the locations of many major cities, much fertile agricultural land, the purity of freshwater supplies and the survival of some nations. The clearing of forestland results in increased erosion and landslides.

Will this ever stop?

Deforestation is a serious problem, yes! But the future does not look so sad and dark anymore.

It is no longer custom to have 4-5 children, now the average family only gets two, and later on it will be custom to have less than two children.

This will make the population pressure much smaller, and there will no longer be any need to get extra land.

The main problem in the future probably is the industry, which makes a lot of money on the rain forest. So if the felling is going to stop entirely, the industry must be stopped too.

