

Air Pollution

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Air pollution directly impacts on human health, agriculture and the biosphere. Pollutants are emitted into the air by industrial processes, energy production, from the use of fossil fuels for transportation and domestic heating and cooking.

Cities and large urban areas produce much pollution but surprisingly in rural areas, downwind of sources, chemical transformation forms aggressive secondary pollutants. Some pollutants are gases, such as nitrogen dioxide or ozone, others are small particles also called aerosols.

Once in the atmosphere, the substances emitted such as nitrogen oxides or carbon monoxide undergo chemical reactions forming other pollutants such as ozone and aerosols.

They are eventually removed from the atmosphere through rain or deposition at the ground.

During their transport and transformation, pollutants interact with constituents, released naturally such as dust from deserts or emissions from plants and trees forming e.g. formaldehyde.

Pollution levels have been decreasing in cities as emission controls were implemented and technology is improved but the remote background level of pollution is increasing.

In regions having rapidly developing economies, pollution continues to increase as the use of fossil fuels intensifies.

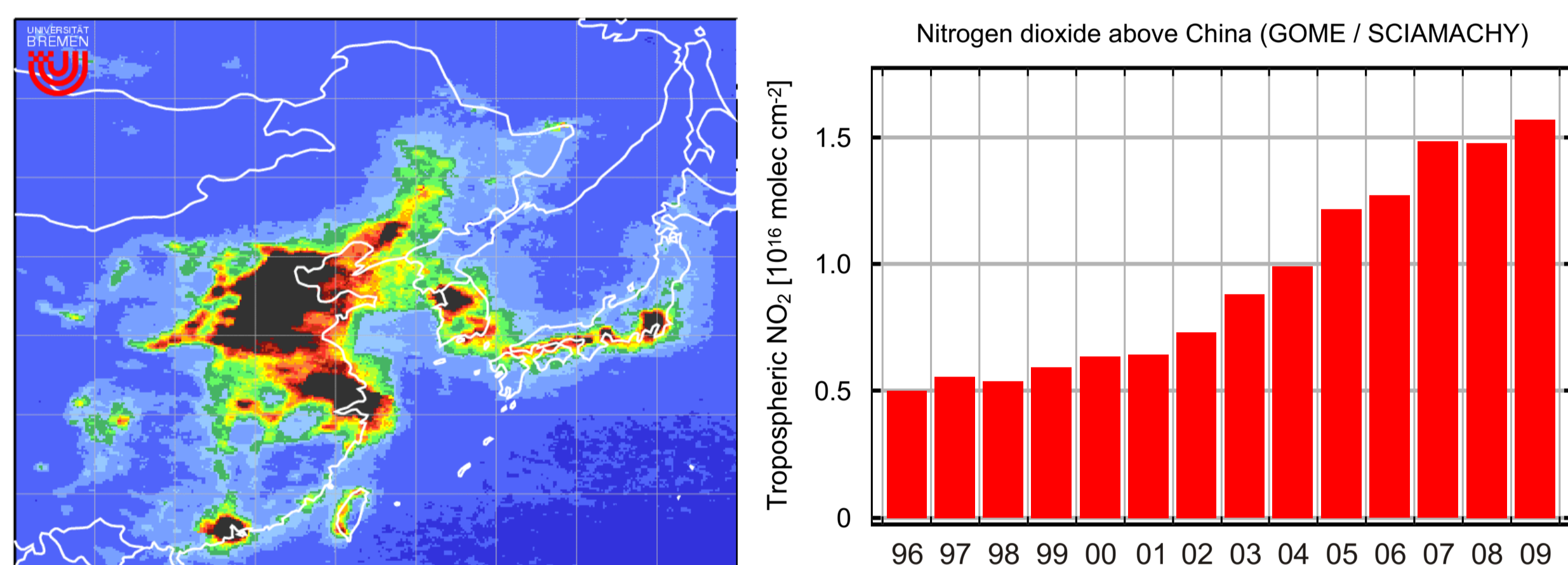
Satellite measurements are used to investigate emission hot-spots, the transport of pollution and changes in emissions.

Nitrogen Oxides

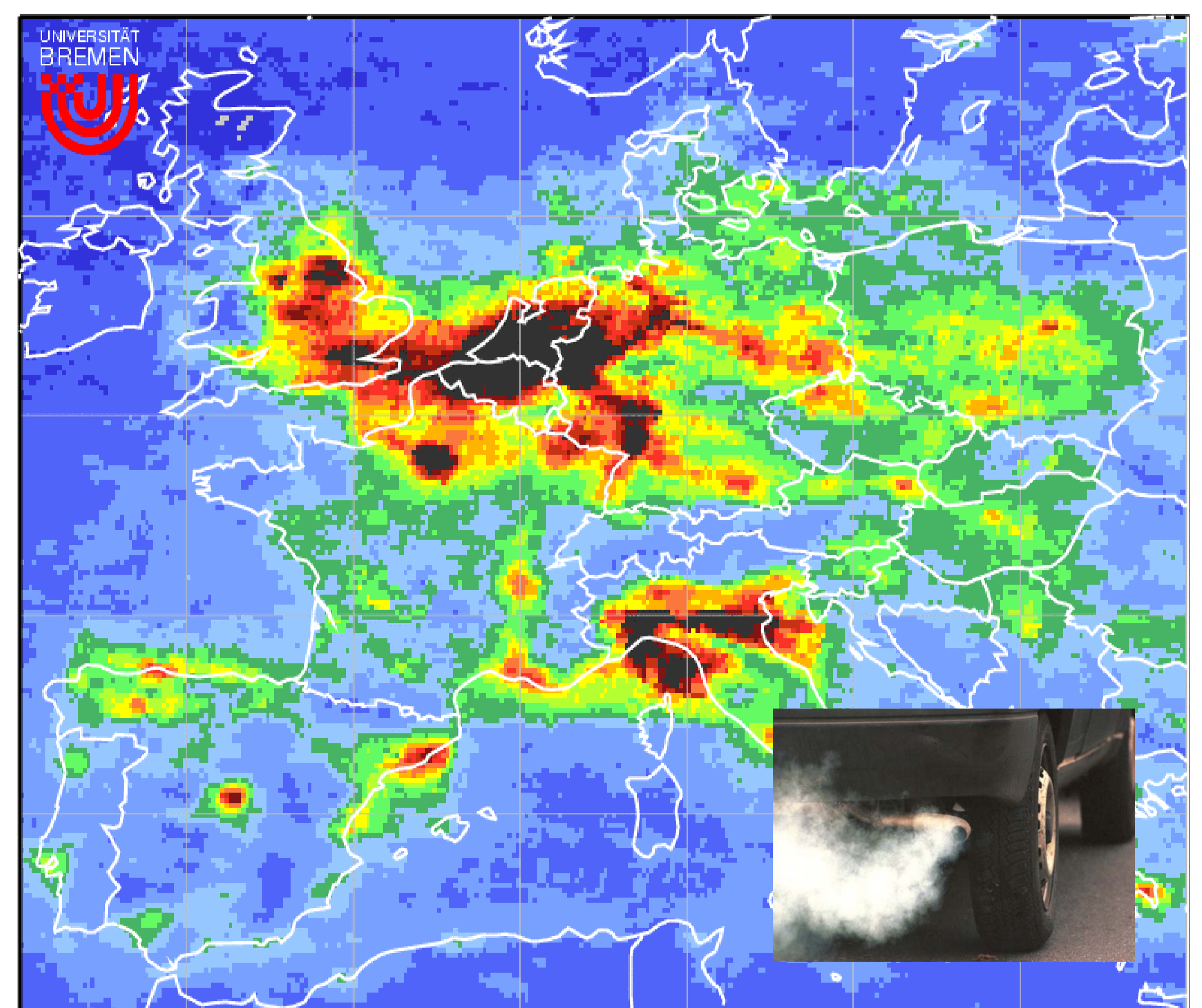
Nitrogen oxides are emitted from all combustion processes, e.g. in power plants, cars and during wildfires.

High concentrations are observed over industrialised countries, along the main shipping routes, and also over regions having large scale fires e.g. the African Savannah.

Dramatic changes in nitrogen dioxide levels have occurred over China in the last decade as result of intensified use of fossil fuels as is evident in the satellite data.

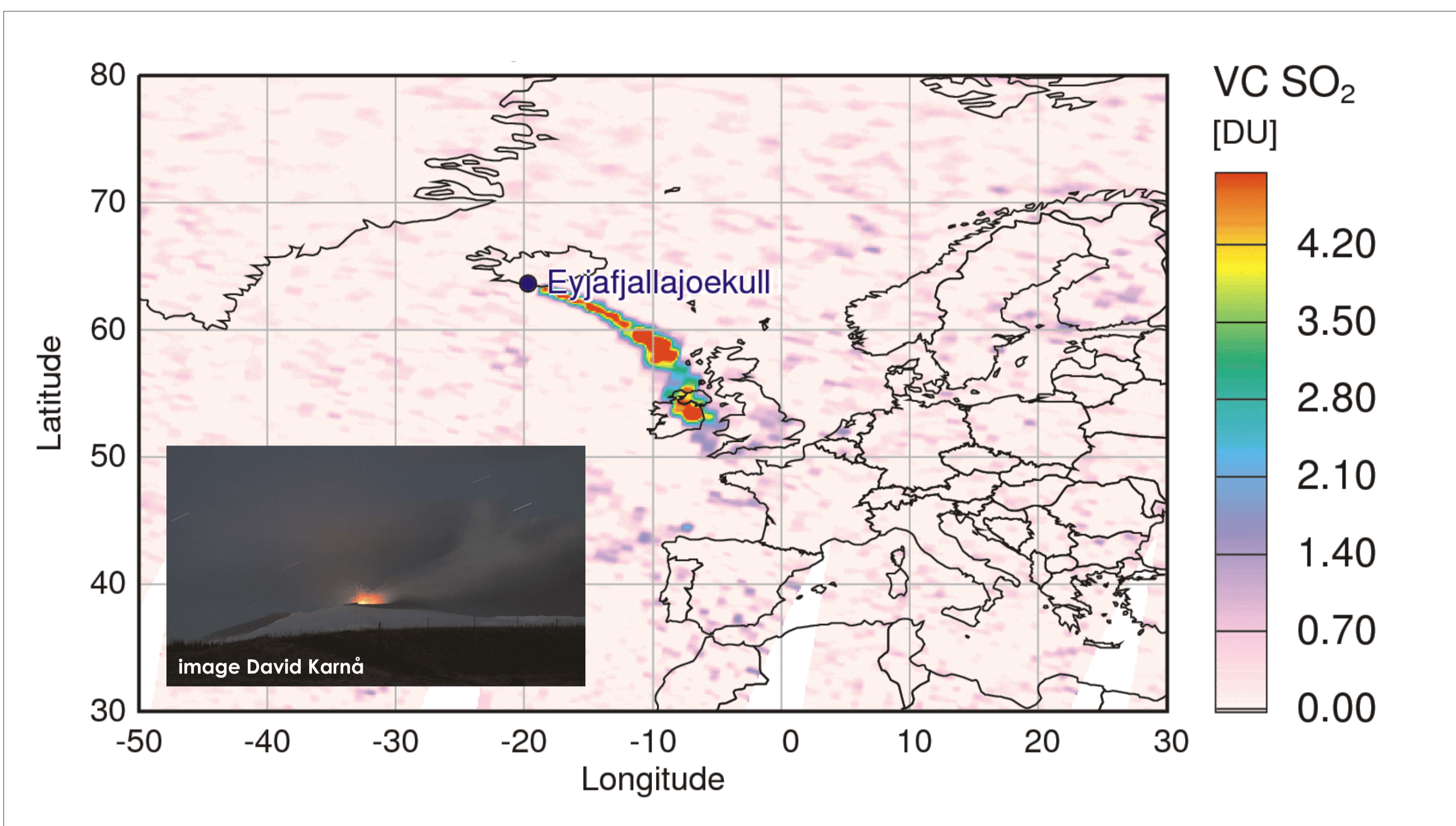


Nitrogen dioxide over China measured by SCIAMACHY (left) and change since 1996 (right).



Nitrogen dioxide over Europe measured by SCIAMACHY.

Sulphur Dioxide



Volcanic sulphur dioxide 2010/05/05 measured by GOME-2.

The largest sources of sulphur dioxide are anthropogenic, mainly from the use of sulphur rich fossil fuels.

In response to wide spread problems with acid rain and smog, emissions have been reduced very much in Europe and North America.

After a period of large increases in sulphur dioxide pollution in China, filters are now being implemented in power plants reducing the problem.

Although globally man-made emissions dominate, locally volcanic sulphur dioxide concentrations are large and readily detected from satellite.

Carbon Monoxide

Carbon monoxide (CO) is emitted by many burning processes including biomass burning and domestic heating. CO is also released in large quantities by traffic and industrial processes.

SCIAMACHY observes elevated CO concentrations over many regions including large biomass burning areas in Africa, highly populated regions in China and India, and even over localized sources such as cities.

Carbon monoxide 2004 measured by SCIAMACHY.

