

Press release

Biomass combustion gas may contribute to particulate pollution

Researchers from Leipzig find new woodsmoke tracer compounds that originate from wood stove flue gas

Leipzig. The biomass burning can contribute significantly to regional air pollution. This is a result of a study by Leibniz Institute for Tropospheric Research (IfT). The researchers had a closer look at aerosol samples collected over one winter in Seiffen, Ore Mountains (Erzgebirge) on behalf of the Saxon State Office for Environment, Agriculture and Geology (LfULG) and evaluated against laboratory data. They identified several nitro-aromatic compounds together with well known woodsmoke tracer levoglucosan in the aerosol collected in the Ore Mountains, where people traditionally use wood stoves heavily for heating. These tracer compounds indicate the strong influence of the biomass combustion on the air quality in the regions, the researchers report in the journal *Environmental Science & Technology*.

Particles from the biomass burning are suspected to be a health risk because they can be toxic, mutagenic and carcinogenic. In order to introduce legislation to limit woodsmoke emissions, detailed information about these chemical compounds are needed. In addition to harmful effects on human health they also pose a potential environmental risk: nitrated phenols are toxic to plants. The accumulation in the snow over the winter and the leaching into the soil during the spring could slow the development of plant growth. In recent years there is a steady increase in the number of small domestic fire places in Germany and thus a strong increase in the consumption of wood. Since 2004, more than 15 million stoves and fireplaces emit higher amounts of particulate matter than road transport. Therefore, a new regulation controlling small combustion facilities came into force from 2010, setting the emission limits and stimulate the modernization of the combustion facilities. This act also aims to reduce particulate emissions from older facilities by advocating the use of proper fuel, proper operation and retrofitting filters.

The biomass burning - whether caused by natural forest fires or human initiated - produces a large amount of gases and particles. Several hundreds of chemical compounds have been observed so far. As wood heaters are considered CO₂ neutral and can be an inexpensive alternative to other fuels, their popularity is expected increase steadily. To better understand the composition of the exhaust from wood heaters, the researchers collected aerosol samples daily from October 2007 to March 2008 in a residential area at Seiffen where the wood heaters are heavily used. The village is in a valley of the Ore Mountains near the Czech border, and known for its wood crafts. The influence of local wood smoke is prominent together with regional transport of pollutants from the industrial area of Litvinov in north-west Bohemia and traffic exhaust especially in the winter. "Wood combustion is known as a source of primary organic aerosol for a long time but little is known about the reaction of wood smoke emissions in the air, leading to the formation of secondary organic aerosol." Prof. Hartmut Herrmann from IfT explained. The so-called secondly organic aerosol (SOA) is formed during the oxidation of volatile organic compounds (VOCs) from the biomass combustion.

The investigations have shown that nitrated aromatic compounds (C₇H₇NO₄) play an important role in the formation of biomass burning SOA. "These various methyl nitrocatechol compounds are formed in the wood combustion smoke and can be used as SOA tracers in the future" said Dr. Yoshiteru Iinuma. The Japanese scientist has been

working for nine years in the Department of Chemistry at the Leibniz Institute for Tropospheric Research. "Wood smoke tracer compounds help scientists in determining the origin of the organic aerosol. So far Levoglucosan, that is produced during the combustion of cellulose, was used as an indicator for the presence of primary biomass burning aerosol. With the newly found tracer compounds, it will be possible to follow the chemical transformation of biomass burning aerosol even better.

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