

Field research station of the Leibniz-Institute for Tropospheric Research (IfT) in Melpitz (Germany)

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The Leibniz-Institute for Tropospheric Research (IfT) was founded in 1992 for the investigation of physical and chemical processes in the polluted troposphere.

The research profile focus on aerosols, i.e. small airborne particles, and clouds. Despite their minute absolute amount, aerosols and clouds are essential parts of the atmosphere because they control the budgets of energy, water and trace substances of the Earth System. The research interest in these highly disperse systems is stimulated foremost by their potential change through human activities. This system changes feed back into the troposphere not only through regional and global climate change but also directly through health effects of inhaled haze and fog particles.

Rapid advances in our understanding of tropospheric multiphase processes and an application of this process understanding to the prediction of the consequences of human impacts can only be expected from concerted approaches from several directions. Consequently, the IfT conducts development of analytical methods for aerosol and cloud research with parallel field studies in several polluted regions. Field experiments elucidate the atmospheric life cycle and related processes of aerosol and cloud particles. Particles sizes over more than four orders of magnitude occur in atmospheric aerosols and clouds, all of which play an important role in certain processes. All condensable substances of the Earth System can be found in the aerosol and a large number of them contribute to climate and biospheric effects. As a consequence of this multidimensional system essential aerosol and cloud properties are not well established on a global scale yet.

The medium-term scientific concept of the IfT defines three major research topics:

1. Evolution, transport and spatial-temporal distribution of the tropospheric aerosol
2. Influence of the tropospheric aerosol on clouds and on the radiation budget
3. Chemical processes in tropospheric multiphase systems.

Field experiments constitute a substantial part of the experimental studies. Aims are the physical and chemical characterization of the atmospheric aerosols, studies on microphysical cloud properties, investigations of chemical multi-phase processes in the troposphere and the characterization of atmospheric trace gases regarding its development and deposition.

For a continuous characterization of the atmosphere in the rural background the IfT operates a ground based research station (Field site). The research station of the IfT is situated near the village Melpitz in the vicinity of the city Torgau in the river Elbe valley (87m above sea level, 51°32' N and 12°54' E, Fig. 1). The station is located on a flat meadow surrounded by agricultural land (Fig. 2, 3 and 4). The grassland is semi-natural without pest control and was fertilized in spring only. There are no grazing animals on the meadow throughout the seasons. The grass was cut two or three times per year. The distance to Leipzig in the south west is 41 km. A federal main road (B 87) crosses the region in a minimum distance of 1.5 km in northern direction. Edges of forests, Dübener Heide and Dahleener Heide, both with nature conservation status, are located 2,5 km to the north and 1 km to the south, respectively. The houses in both villages in neighbourhood (Melpitz and Klitzschen) were heated by natural gas, commonly. Under the dominating wind direction from southwest humid air masses from the Atlantic crossing parts of western Europe and important parts of Germany before reaching Melpitz. The second important wind direction maximum is east. Hence, during high-pressure conditions dry air masses are transported over long distances to Melpitz, often with moderate

wind velocity and without precipitation. The main source regions for these air masses are Poland, Belarus, Ukraine and the north of the Czech Republic. In these areas coal heated power plants with little exhaust treatment, old industry and older cars still exist (Fig. 1).

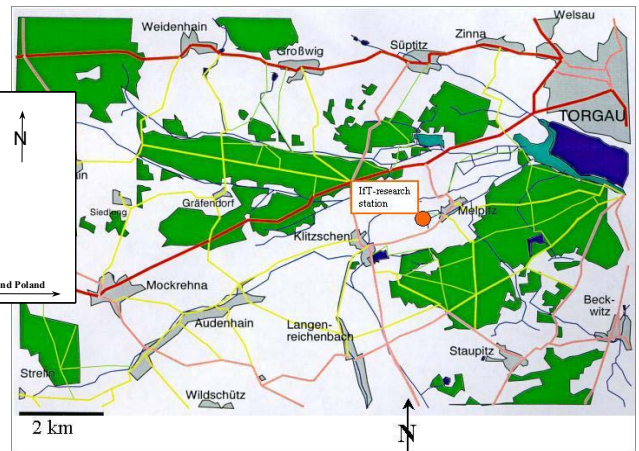
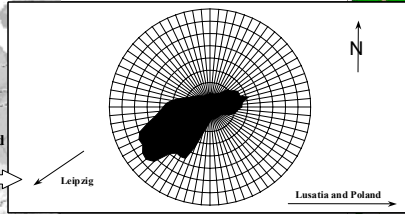


Fig.1: Location of the IfT-research station in Europe. The wind rose is a mean for the years 1992 up to 2001, base 5 minute means

Fig 2: Surroundings of the Melpitz site



Fig. 3: Melpitz site, view to east, with wet only Sampler, Partisol "2000" filter-sampler and containers for data acquisition and special sampling technique

Fig. 4: Melpitz site, view to north, in the foreground DIGITEL-filter-sampler for particles PM_1 , $PM_{2.5}$ and PM_{10}

The research station was founded 1992 during the national research project SANA. The today infrastructure, equipment and data base of this site are the result of different national and international projects and cooperation with national authorities. The well equipped infrastructure enables interdisciplinary field experiments in different aspects of atmospheric research (Fig. 3 and 4). In the context of EUROTRAC 2 (Aerosol) the field experiment INTERCOMP2000 took place in Melpitz. The IfT research station is one point in the measuring network of the Umweltbundesamt (UBA). In a joint two year project with the UBA will be carried out an size segregated physical and chemical characterization of the aerosol in the urban background with permanent measurements and intensive field campaigns in summer and winter. This complex scientific particle characterization started in July 2004, data are for the EMEP data-base (EMEP-level 3).

The available instruments and the continuous monitoring activities at the Melpitz site are listed in Table 1. Additional to these continuous parameters results of measurements from special campaigns are available, e.g. for wet annular denuder measurements of HNO₂, HNO₃, HCl, and size segregated sampling as well as analysis for particles with impactors (analysis also for organic and elemental carbon)

Table 1 Available Instruments and continuous monitoring activities

type	parameter	method	start / end	time resolution	
Aerosol	light scattering coefficient	nephelometer	2004	30 minutes	
	absorption	photometer	2005	30 minutes	
	number size	TDMPS	2004	30 minutes	
	mass total	filter (gravimetry)			
	water soluble ions	ionchromatography			
	PM10		1993	daily	
			1995	weekly	
	PM2.5		2002	daily	
			1995	weekly	
	PM1		1999	weekly	
		2003	daily (very 6 days)		
NH3	concentration	wet annular denuder (continuously)	1995	2000	30 minutes (campaigns)
			2001		30 minutes
Meteo- rology	wind velocity	cup anemometer	1992	10 minutes	
	wind direction	wind vane	1992	10 minutes	
	temperature	dry bulb temperature	1992	10 minutes	
	humidity	wet bulb temperature	1992	10 minutes	
	global radiation	pyranometer	1992	10 minutes	
preci- pitation	Volume ion content	wet only sampler	1992	daily	

The data are stored as ASCII, Lotus ore Excel-files for continuous measurements and for campaigns in a definite database for the projects in which these data were collected. Selected data will be integrated in the EMEP data base.

There is no stand alone website for the Melpitz site, information is given by the IfT website www.tropos.de. The Melpitz site can be used over the whole year. There is a cobble starting for cars (< 10 t) from Melpitz to the containers of the site. Additional electrical power consumption is possible up to 40 A (380 V/ 220V). Technical assistance can provided by the IfT staff. Nearby the site (4 km) several hotels exist in the city of Torgau (also next railway station).

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