Distribution of aerosol over coal strip mine

V. Docekalova[1], J. Hovorka[1], F. Kobrzek[2], P. Marecek[2]
[1]Institute for Environmental Studies, Faculty of Science, Charles University in Prague, Benatska 2, 128 01 Prague 2, Czech Republic
[2] AirshipClub.com, Nad Salkovnou 9, 147 00 Praha 4, Czech Republic

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Presenting author email: venikae@gmail.com.

Coal strip mine is supposed to be significant source of coarse atmospheric aerosol to surroundings of the mine. Contribution of the mine aerosol to the air pollution in the surroundings are usually modelled (Chakraborty et al., 2002; Guidebook, 2009) and rarely directly measured (Hovorka et al., 2011), since vertical transport of the mine aerosol directly from the source is difficult to measure.

Therefore, objective of this study was to measure vertical and horizontal distribution of PM_{10}, PM_1 and coarse aerosol in atmospheric boundary layer above the area of coal strip mine through unique experimental flight measurements.

Electrically powered airship was used with specially designed gondola carrying aerosol monitors DustTrak DRX Aerosol Monitor 8533, TSI, P-Trak Ultrafine Particle Counter 8525, TSI. Temperature and relative humidity data were also recorded. Detailed information is summarised in table 1.

Table 1. Parameters measured during flights.

Parameter	Instrument	Logging interval
PM_{10}, $PM_{2,5}$, PM_1	DRX	1 s
20 nm – 1000 nm particles number concentration	P-Trak	1 s
Temperature, RH	Commeter	10 s

Repeated flights were carried out in several heights according to mine edge level (- 50 m, 0 m, 50 m, 100 m, 150 m). Airship position data were recorded also every second. Airship velocity was in the range from 2 to 7 ms^{-1}.

Figure 1 shows how mass concentration of coarse mode of aerosol depends on distance from the mine surface: the closer distance, the higher concentration.

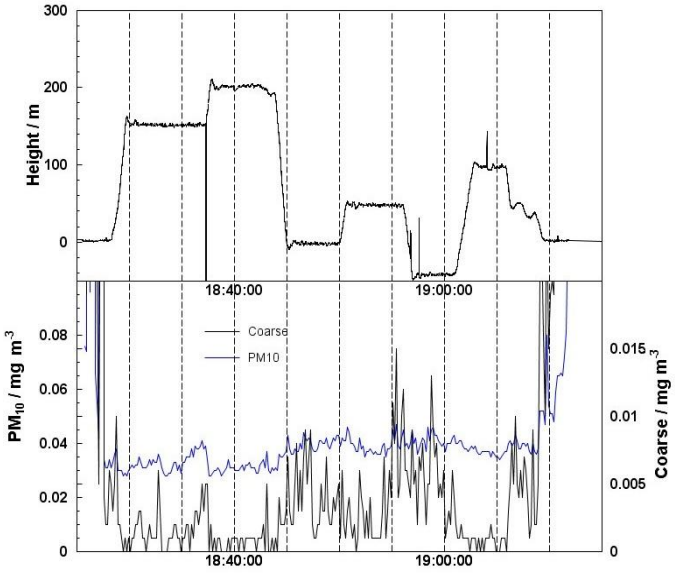

Figure 1. Vertical distribution of PM_{10} and coarse mode-particles over coal strip mine.

Flight measurements were also compared to ground-based measurements of PM_{10} and PM_1 and meteorological data.

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