Preliminary results of assessment of impact of the shale gas exploration and exploitation activities on the quality of ambient air - analysis of Wysin, Poland case study, 2015-2017

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SHEER
SHale gas Exploration and Exploitation induced Risks

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Abstract. One of objectives of the" Shale gas exploratio and exploitation induced risk - SHEER" project (Horizon 2020, call LCE 16-2014) is to assess the possible impact of activities related to the shale gas exploration and exploitation processes to the surrounding air quality. To achieve this goal, a mobile air pollution monitoring station has been deployed in Stary Wiec village, about 1 km from the drilling site at Wysin (54.08 N, 18.32 E).In addition to the standard parameters measured routinely at air quality monitoring stations like: Nitrogen oxides, Ozone, Carbon Monoxide and Particulate matter PM10, several parameters have been added to the measurement program, including Carbon dioxide, Methane, non-methane hydrocarbons and Radon 222. Impact on the air quality is analyzed in three dimensions: analysis of levels of "classical" pollutants (NO_x,CO, O_3, PM10), greenhouse gases (Co_2, CH_4) and gases specific to the shale gas exploitation activities (CH_4, ^{222}Rn). Continuous monitoring has been performed before, during and after axploration activities. Air quality can be considered as very good ("rural" conditions) before the exploration/exploitation processes have started. Results obtained so far show that the air quality in the vicinity of shale gas exploration area has not changed significantly during the analyzed time period. Tha only significant signal of the presence of the shale gas well were two short episodes of elevated concentrations of methane registered during the hydrofracturing phase of the exploration.

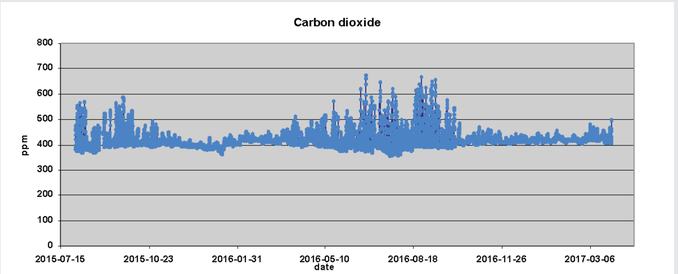


Figure 1. Carbon dioxide at Stary Wiec station, 08.2015-03.2017. Distinct natural (diurnal and seasonal) variability occurs. No detectable deviations have been detected even during hydrofracturing phase (06.2016-08.2016)

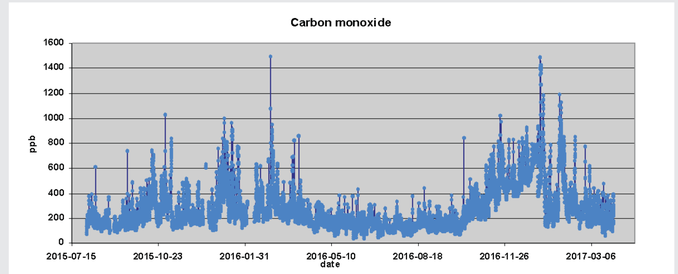


Figure 2. Carbon monoxide at Stary Wiec station, 08.2015-03.2017. Distinct natural (diurnal and seasonal) variability occurs. No detectable changes have been detected even during hydrofracturing phase (06.2016-08.2016). Relatively high values of CO concentrations occurred after closing the activity at Wysin site.

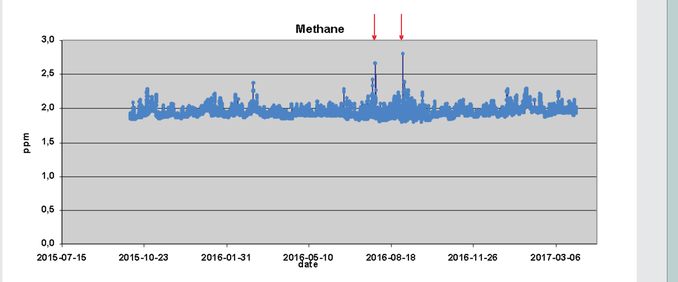


Figure 3. Methane at at Stary Wiec station, 08.2015-03.2017. Two spikes of short (1-hour) episodes of elevated levels of methane occurred at 30.07 and 01.09.2016 during hydrofracturing related activities at Wysin site. Hourly means of methane reached nearly 2.8 ppm (the bacground oscilates around 2 ppm).

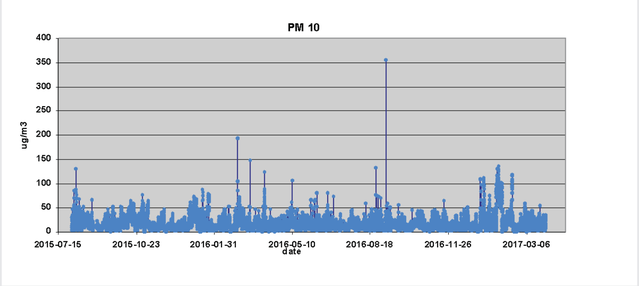


Figure 4. PM10 at Stary Wiec station, 08.2015-03.2017. High levels of PM10 occurred in January and February 2017, breaking air quality standards, hovewer they occurred after closing any activity at Wysin site. Single spike in August 2017 is not related to the Wysin site activities.

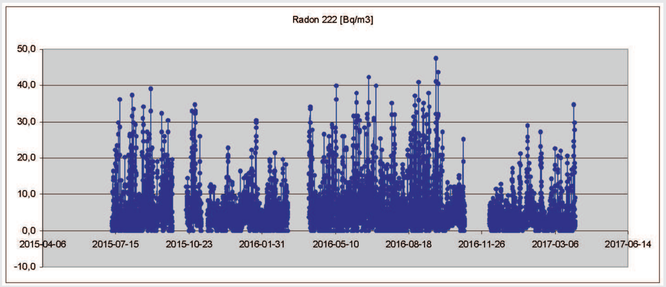
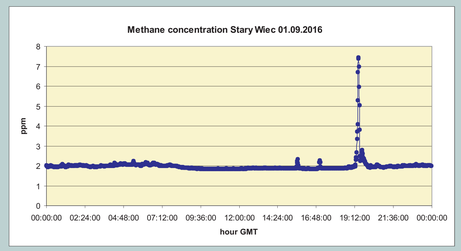


Figure 5. Radon at Stary Wiec station, 08.2015-03.2017. Enhanced levels of this gas could indicate directly enhanced emission of gases from the ground, but only natural levels ov this gas have been observed so far



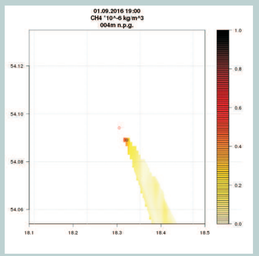


Figure 6 a and b. One of two episodes of enhanced methane levels observed during the hydrofracturing related activities at Wysin site. 1-min averages of metane reachen nearly 8 ppm compare to the bacground level (2 ppm) (fig 6a). Air pollution dispersion model (HYSPLIT) pointed to the well (red circle at fig 6b) as a possible source of this event.

Acknowledgments.

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