

NILU TR: 6/91

NILU TR : 6/91  
REFERENCE : O-91042  
DATE : JULY 1991  
ISBN : 82-425-0262-5

# Air Quality Measurements at Nordmedunit, Umm Quasr, Iraq

B. Sivertsen



**NILU**

NORSK INSTITUTT FOR LUFTFORSKNING  
Norwegian Institute for Air Research  
POSTBOKS 64 — N-2001 LILLESTRØM — NORWAY

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## AIR QUALITY MEASUREMENTS AT NORDMEDUNIT, UMM QUASR, IRAQ

### 1 INTRODUCTION

The Norwegian Institute for Air Research (NILU) was asked by the Norwegian army field hospital (UNIKOM/NORDMEDUNIT) in Umm Quasr to provide instruments for air quality measurements. The objectives of these measurements were to daily collect air samples to quantify the air pollution impact at the hospital. The health personnel consists of 50 Norwegians. Some of these persons will be located in the area for up to 12 months. A selection of persons will be followed up through medical tests. Information about air quality is thus needed for explanatory reasons. The concern about potential health effects was also mentioned in the request to NILU.

### 2 INSTRUMENTATION

The following instruments are being used at the Umm Quasr site:

- One automatic 24 h sampler (NILU-FK) for SO<sub>2</sub> and soot measurements (filter and absorption solution).
- One NILU PUF sampler for PAH sampling on filter and on polyurethane foam (filters can also be used for analyses of heavy metals).
- One analog wind recorder (Woelfle) mounted on a 2 m mast, located in an open field.

Temperatures are also measured at 01, 07, 13 and 19 hrs every day.

### 3 LOCATION

The monitoring site is located near Umm Quasr in the UN controlled zone at the border between Kuwait and Iraq (see map, Figure 1). The area is located 20-50 km north and north east of some of the burning oil fields in the north of Kuwait. The distance from the larger part of the burning oil field is about 100 km.

### 4 WIND DIRECTIONS

The predominant winds in May and June have been from around north and north-west (roughly 80% of the time). This means that smoke from the fires only rarely has been blown directly from the fire areas towards Umm Quasr. One such period was, however, observed between 26 and 27 May 1991. In the morning of 27 May weak winds (0.5 m/s) from south and west were observed in Umm Quasr.

### 5 THE FIRST RESULTS

The 24 h average SO<sub>2</sub> concentrations in May and June 1991 varied between 5 and 36 µg/m<sup>3</sup>. The average concentration was 11.5 ± 6.4 µg/m<sup>3</sup>. The highest concentration, 36 µg/m<sup>3</sup>, was measured on 26-27 May 1991.

The measured 24 h average soot concentrations were between 8 and 400 µg/m<sup>3</sup>. The average concentration was 43.3 ± 71.5 µg/m<sup>3</sup>.

The WHO air quality guideline value for black smoke (reflectance method), which is 125 µg/m<sup>3</sup> as a 24 h average, was exceeded on two occasions. On 26-27 May 1991 the measured concentration was more than 3 times the WHO guideline value. On 14-15 June 1991 the soot concentration was 156 µg/m<sup>3</sup>.

Four PAH samples have been analyzed so far. The total PAH con-

centrations varied between 207 and 412 ng/m<sup>3</sup>. Naphtalene alone accounted for between 45 and 60%. The naphtalene concentrations in air were probably considerably higher. At high temperatures the sampling efficiencies of naphtalene and other volatile PAH-components are usually poor.

The average total PAH concentration of (296 ± 87) ng/m<sup>3</sup> is rather low, and much lower than the concentrations measured in some of the industrialized areas in Norway or in streets with high traffic.

## 6 CONCLUSIONS

Strong conclusions cannot be drawn based on these rather limited data, collected during a period with favourable weather conditions with little air quality impact on the location in Umm Quasr. However, during winds from south and south west, the concentrations of black smoke (soot) at the border between Kuwait and Iraq exceeded the WHO air quality guideline value by a factor of 3. The SO<sub>2</sub> concentrations were surprisingly low and not higher than 36 µg/m<sup>3</sup>.

Also the total PAH concentrations were rather low. The most volatile compounds might, however, have been considerably higher than measured by the methods used.

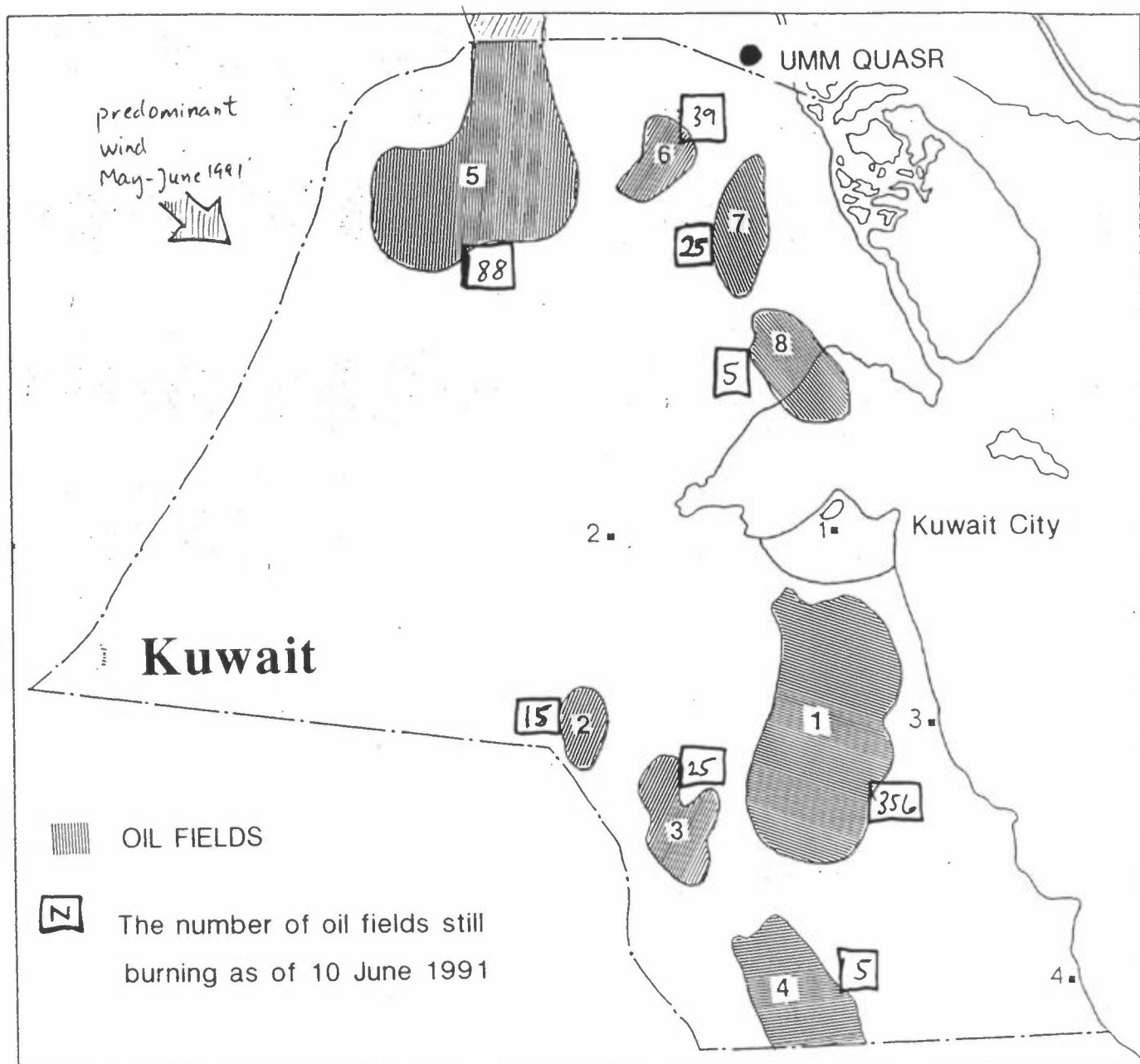


Figure 1: Burning oil fields and location of monitoring site in Umm Quasr.

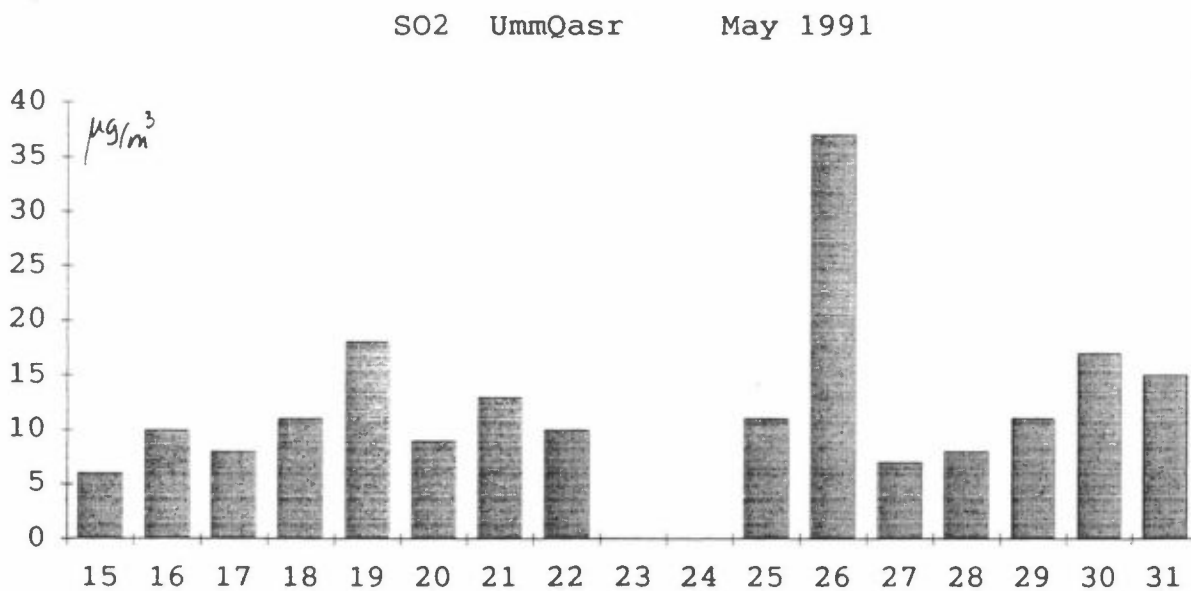
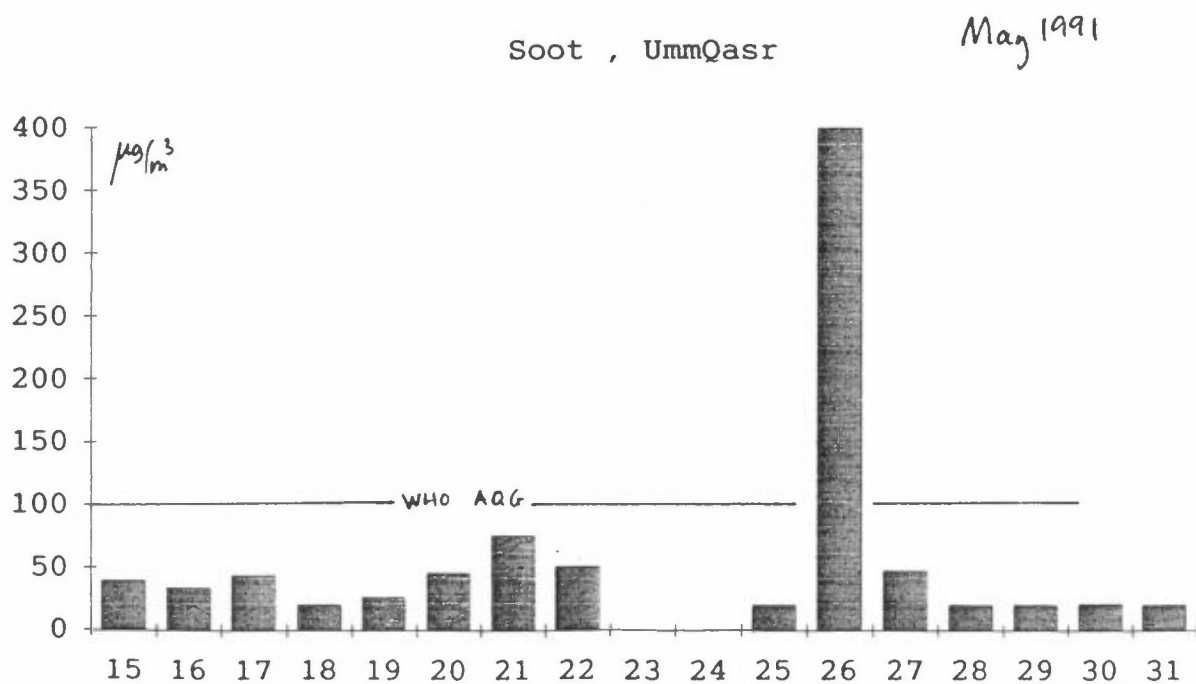


Figure 2: 24 h average concentrations of SO<sub>2</sub> and soot (black smoke) in Umm Qasr at the border between Kuwait and Iraq (May 1991).

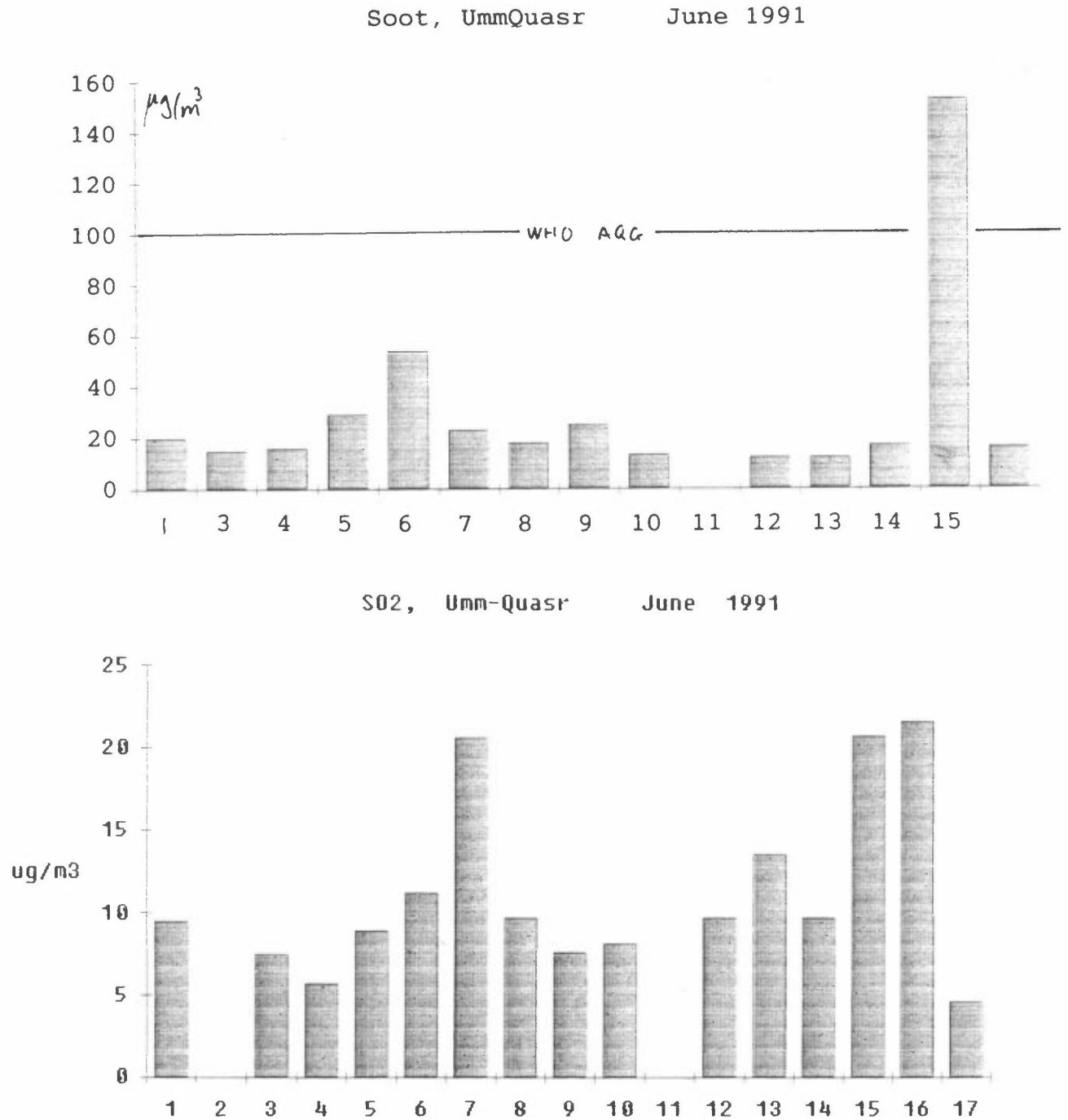


Figure 3: 24 h average concentrations of SO<sub>2</sub> and soot (black smoke) in Umm Quasr at the border between Kuwait and Iraq (June 1991).



Table 1: Concentration of PAH in air (ng/m<sup>3</sup>) Umm Quasr, Kuwait

PAH	21.5.1991 Total	27.5.1991 Total	14-15.6.1991 Total	15.6.1991 Total
Naphtalene	228	94.4	184	132
2-methylnaphtalene	8.8	4.5	7.2	9.3
1-methylnaphtalene	4.6	2.1	4.2	5.6
Biphenyl	5.0	2.1	7.4	17.4
Acenaphthylene		1.4		
Acenaphthene				
Dibenzofuran	5.7			
Fluorene	15.4	7.2	17.6	34.8
Dibenzothiophene	26.6	12.2	2.7	5.5
Phenanthrene	48.7	31.7	33.2	22.3
Anthracene	10.8	4.5	6.1	10.4
2-methylphenanthrene	11.4	3.4	2.5	3.0
2-metylanthracene				
1-methylphenanthrene				
Fluoranthene	17.3	11.5	15.3	6.6
Pyrene	16.1	11.3	9.6	6.1
Benzo(a)fluorene				
Retene				
Benzo(b)fluorene				
Benzo(g,h,i)fluoranthene		1.4	0.5	
Cyklopenta(cd)pyrene	(2.9)	(2.7)	(2.0)	(1.7)
Benz(a)anthracene	1.3	1.0	1.3	~0.4
Chrysene/Thriphenylene	4.6	2.4	1.9	1.1
Benzo(b,j,k)fluoranthenes	2.7	5.9	2.9	1.4
Benzo(e)pyrene	~0.8	1.3	1.2	0.6
Benzo(a)pyrene	~0.8	0.3	1.0	0.5
Perylene				
Inden-(1,2,3-c,d)pyrene		1.8	0.7	0.7
Dibenzo(ac/ah)anthraces				
Benzo(g,h,i)perylene		1.8	1.1	1.0
Anthanthrene				
Coronene		2.0	1.0	
1,2,4,5-dibenzopyrene				
<b>Total</b>	<b>412</b>	<b>207</b>	<b>303</b>	<b>260</b>

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 NORWEGIAN INSTITUTE FOR AIR RESEARCH  
 POSTBOKS 64, N-2001 LILLESTRØM

RAPPORTTYPE TEKNISK RAPPORT	RAPPORTNR. TR 6/91	ISBN-82-425-0262-5	
DATO JULY 1991	ANSV. SIGN. <i>P. Berg</i>	ANT. SIDER 8	PRIS NOK 15,-
TITTEL Air quality measurements at NORDMEDUNIT, Umm Quasr, Iraq		PROSJEKTLEDER B. Sivertsen	
		NILU PROSJEKT NR. O-91042	
FORFATTER(E)  B. Sivertsen		TILGJENGELIGHET * A	
		OPPDRAGSGIVERS REF.	
OPPDRAGSGIVER (NAVN OG ADRESSE)  Norsk institutt for luftforskning			
STIKKORD Partikler   Svoveldioksid   PAH			
REFERAT			

TITLE
ABSTRACT  The first results of air quality measurements performed by NILU in Umm Quasr, at the border of Kuwait and Iraq show high concentrations of black smoke, and rather low concentrations of SO <sub>2</sub> and PAH.

\* Kategorier: Åpen - kan bestilles fra NILU                    A  
                   Må bestilles gjennom oppdragsgiver                B  
                   Kan ikke utleveres    C