

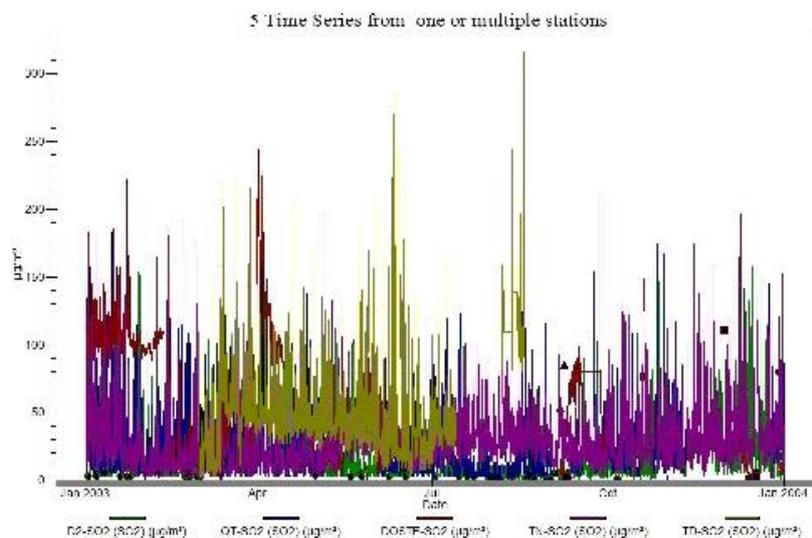


Department of Natural  
Resources and Environm  
(DONRE)  
Ho Chi Minh City



# Ho Chi Minh City Air Quality Monitoring Programme Data evaluation report, 2007

*Vo Thanh Dam and Bjarne Sivertsen*





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Data evaluation report, 2007**

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# Contents

	Page
<b>1. Introduction .....</b>	<b>3</b>
<b>2. Data quality control, QA/QC procedures .....</b>	<b>3</b>
<b>3. Data availability.....</b>	<b>4</b>
<b>4. Monthly average values by station .....</b>	<b>6</b>
Doste.....	6
Hong Bang.....	6
Thu Duc.....	6
Tan son hoa .....	6
ThongNhat.....	7
BinhChanh.....	7
Zoo 8	
District 2 .....	8
QuangTrung .....	8
<b>5. Station Operation Status .....</b>	<b>8</b>
Zoo 9	
District2.....	11
ThongNhat.....	12
QuangTrung .....	13
Doste.....	14
TanSonHoa.....	15
HongBang.....	15
ThuDuc.....	16
The meteorological station .....	17
<b>6. Concentration levels .....</b>	<b>17</b>
Monthly average PM <sub>10</sub> concentrations .....	17
Monthly average NO <sub>2</sub> concentrations .....	18
Monthly average ozone concentrations .....	19
<b>7. Summary station status and actions .....</b>	<b>20</b>
<b>8. References .....</b>	<b>21</b>
<b>Appendix A Hourly concentrations Presented quarterly for each station.....</b>	<b>23</b>



# Ho Chi Minh City

## Air Quality Monitoring Programme

### Data evaluation report, 2007

## 1. Introduction

A total of 9 measurement sites using automatic monitors have been established in Ho Chi Minh City (HCMC). Four of the sites were supported by Danida and installed in 2000, while the remaining five sites have been supported by NORAD and were installed with the support from Norwegian Institute for Air Research (NILU) in 2002. The stations, site characteristics and locations are given in the Table 1 below.

*Table 1: Air pollution measurement sites in HCMC, site characteristics and positions.*

Stations				Indicators					UTM 84 N	
ID	Code	Name	Charact.	PM10	NO2	SO2	O3	CO	X coordin (m)	Y coordin (m)
1	DO	DOSTE	Traffic		X	X	X	X	684,430	1,192,220
2	HB	Hong Bang	Traffic		X		X	X	681,620	1,189,460
3	TD	Thu duc	Res/Ind		X	X			693,640	1,199,790
4	TS	Tan Son Hoa	Urb Bkg		X	X	X	X	682,830	1,193,930
5	TN	Thong Nhat	Traffic	X	X	X		X	680,690	1,193,530
6	BC	Binh Chanh	Traffic	X	X			X	674,500	1,183,000
7	ZO	Zoo	Urb Bkg	X	X		X		686,420	1,193,370
8	D2	District 2	Res/ind	X	X	X	X		691,160	1,193,510
9	QT	Quang Trung	Urb Bkg	X	X	X	X		677,940	1,200,080

Hourly air quality data have been processed and transformed to 24-hour average concentrations for all stations and parameters during the period 2002 to 2007. This report presents analyses of data and data quality for 2007.'

## 2. Data quality control, QA/QC procedures

Quality assurance and quality control procedures implemented in HCMC follows international standards. Standard Operating Procedures (SOPs) have been prepared for DONRE/HEPA including station manuals for instrument installations, maintenance, calibrations and controls. All sites are visited and checked every week.

The daily control of the data is manually undertaken as soon as data have been retrieved at the Division of Environmental Quality, Monitoring and Assessment (EQMA) at HEPA: Data checks and data quality is being registered in a daily data

validation manual. Whenever errors or strange data are identified from the database, the field operators will have to be notified, so that errors in calibrations or in instrument performance can be checked and corrected as soon as possible.

The analyses performed on the data after five years of data collections still indicate that QA/QC in practical applications still need to be intensified and improved.

The operations are generally well taken care of but many of the instruments have reached a operational time that normally require maintenance, repair and in some cases total renewal.

We have noted that:

- A few errors on some of the instruments will have to be corrected.
- Some stations experienced power failures, which may damage some of the components
- The station history logbooks are well filled in
- The instrument logbooks are not adequately used as prescribed
- Some intake structures will have to be cleaned
- At two shelters water leakages were reported, which need repair
- The weekly (or bi-weekly) calibrations have been followed up

### 3. Data availability

The data availability is presented in Figure 1 for all stations and all parameters measured automatically in HCMC for 2007.

The colours in the figure indicate:

- Red = > 70 % of the data are available,
- Orange = > 30% and < 70 %,
- Green = < 30% data availability,
- Blue = missing or no data and
- Grey = not updated yet.

The general picture shows that most of the instrumentation at the oldest Danida installed stations such as Hong Bang, Thu Duc, Tan Son Hoa, and Doste does not work properly any more. Some of the instruments have reached their life expectancy, but some of them may be repaired and set in operation again as indicated in the next chapters.

Problems at the Quang Trung station have been prevailing throughout the last years. Both monitors and infrastructures at this station will have to be upgraded.

The new meteorological station that was installed at Doste in 2004 is operating well.

ID	Component	Station	% data availability											
			1	2	3	4	5	6	7	8	9	10	11	12
1	1h DOST E-NOx	DOSTE	88	71	67	47	16	2	-	-	-	-	-	-
2	1h DOST E-NO	DOSTE	2	4	59	74	15	2	-	-	-	-	-	-
3	1h DOST E-NO2	DOSTE	-	-	62	47	15	1	-	-	-	-	-	-
4	1h DOST E-SO2	DOSTE	1	-	8	-	-	0	-	-	-	-	-	0
5	1h DOST E-O3	DOSTE	100	72	85	74	16	57	34	29	26	76	0	0
6	1h DOST E-CO	DOSTE	85	60	82	38	1	57	34	18	15	-	-	-
7	1h DOST E-PM10	DOSTE	-	-	-	-	-	-	-	-	-	-	-	-
8	1h DOST E-Temp Upper	DOSTE	100	100	99	86	99	99	99	99	99	100	100	100
9	1h DOST E-WD	DOSTE	99	100	99	87	100	100	100	100	100	99	100	100
10	1h DOST E-WS	DOSTE	99	99	100	86	100	100	100	99	100	100	100	100
11	1h DOST E-RH	DOSTE	99	100	100	87	100	100	100	100	100	100	100	100
12	1h DOST E-Pressure	DOSTE	100	100	100	87	99	100	100	99	100	100	100	100
13	1h DOST E-Radiation	DOSTE	0	0	0	-	-	-	-	-	-	-	-	-
63	1h DOST E- Lower Temp	DOSTE	100	100	100	87	-	-	-	-	-	-	-	52
14	1h TN-NOx (NOx)	THONG NHAT	24	100	61	100	99	100	16	68	-	59	90	90
15	1h TN-NO (NO)	THONG NHAT	24	100	60	100	97	98	16	68	89	59	89	89
16	1h TN-NO2 (NO2)	THONG NHAT	28	100	62	100	99	100	16	69	89	60	90	90
17	1h TN-SO2 (SO2)	THONG NHAT	28	100	60	100	64	12	8	69	89	34	89	89
18	1h TN-CO (CO)	THONG NHAT	28	100	76	100	87	100	15	67	89	59	24	24
19	1h TN-PM10 (PM10)	THONG NHAT	-	-	12	82	87	-	-	-	-	-	-	-
20	1h BC-NOx (NOx)	BINH CHANH	69	100	89	73	88	57	70	94	98	98	73	73
21	1h BC-NO (NO)	BINH CHANH	69	100	89	73	88	57	69	94	97	98	72	72
22	1h BC-NO2 (NO2)	BINH CHANH	70	100	89	74	88	58	71	95	98	99	74	74
23	1h BC-CO (CO)	BINH CHANH	82	100	89	73	81	58	72	95	98	98	74	74
24	1h BC-PM10 (PM10)	BINH CHANH	81	99	89	73	81	58	71	95	73	98	35	35
25	1h D2-NOx (NOx)	DISTRICT 2	28	99	73	58	81	85	98	89	69	89	62	62
26	1h D2-NO (NO)	DISTRICT 2	28	99	73	58	80	84	86	87	65	86	62	62
27	1h D2-NO2 (NO2)	DISTRICT 2	29	99	83	58	81	85	99	90	70	89	63	63
28	1h D2-SO2 (SO2)	DISTRICT 2	95	99	72	55	81	84	98	71	52	-	80	80
29	1h D2-O3 (O3)	DISTRICT 2	75	99	83	58	81	85	99	89	70	89	74	74
30	1h D2-PM10 (PM10)	DISTRICT 2	97	98	35	17	100	81	92	89	-	-	-	-
44	1h TS-NOx (NOx)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
45	1h TS-NO (NO)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
46	1h TS-NO2 (NO2)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
47	1h TS-SO2 (SO2)	TAN SON HOA	-	0	80	63	-	-	43	-	-	-	-	-
48	1h TS-O3 (O3)	TAN SON HOA	100	98	99	95	81	59	90	99	98	90	46	46
49	1h TS-CO (CO)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
50	1h TS-PM10 (PM10)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
58	1h ZO-NOx (NOx)	ZOO	53	100	79	93	100	100	27	-	-	-	79	79
59	1h ZO-NO (NO)	ZOO	53	100	78	93	98	100	19	-	-	-	75	75
60	1h ZO-NO2 (NO2)	ZOO	53	100	94	93	100	100	33	-	-	-	80	80
61	1h ZO-O3 (O3)	ZOO	100	100	89	93	100	100	65	76	82	97	94	94
62	1h ZO-PM10 (PM10)	ZOO	10	11	0	-	-	-	-	-	-	-	-	-
31	1h HB-NOx (NOx)	HONGBANG	-	-	-	-	-	-	-	-	-	-	-	-
32	1h HB-NO (NO)	HONGBANG	-	-	-	-	-	-	-	-	-	-	-	-
33	1h HB-NO2 (NO2)	HONGBANG	-	-	-	-	-	-	-	-	-	-	-	-
35	1h HB-O3 (O3)	HONGBANG	-	-	-	-	-	-	-	-	-	-	-	-
36	1h HB-CO (CO)	HONGBANG	-	-	-	-	-	-	-	-	-	-	-	-
37	1h HB-PM10 (PM10)	HONGBANG	-	-	-	-	-	-	-	-	-	-	-	-
38	1h QT-NOx (NOx)	QUANG TRUNG	-	-	-	-	-	-	-	-	-	-	-	-
39	1h QT-NO (NO)	QUANG TRUNG	-	-	-	-	-	-	-	-	-	-	-	-
40	1h QT-NO2 (NO2)	QUANG TRUNG	-	-	-	-	-	-	-	-	-	-	-	-
41	1h QT-SO2 (SO2)	QUANG TRUNG	-	-	-	-	-	-	-	-	-	-	-	-
42	1h QT-O3 (O3)	QUANG TRUNG	-	-	-	-	-	-	-	-	-	-	-	-
43	1h QT-PM10 (PM10)	QUANG TRUNG	-	-	-	-	-	-	-	-	-	-	-	-
51	1h TD-NOx (NOx)	THU DUC	-	-	-	-	-	-	-	-	-	-	-	-
52	1h TD-NO (NO)	THU DUC	-	-	-	-	-	-	-	-	-	-	-	-
53	1h TD-NO2 (NO2)	THU DUC	-	-	-	-	-	-	-	-	-	-	-	-
54	1h TD-SO2 (SO2)	THU DUC	-	-	-	-	-	-	-	-	-	-	-	-
57	1h TD-PM10 (PM10)	THU DUC	-	-	-	-	-	-	-	-	-	-	-	-
	% Average		68	88	76	76	76	81	63	82	81	81	76	76

Figure 1: Data availability for one hour average concentrations available in the AirQUIS raw database.

The colours do not indicate anything of the quality of the data. To arrive at a statement indicating data quality has been the background for this report.

#### 4. Monthly average values by station

The monthly average values of all available parameters measured by the automatic network in HCMC during 2007 are presented below. A discussion of the different concentrations relative to expected long term averages and what should be expected in HCMC will also indicate the quality of calibrations and instrument performances.

##### Doste

The Doste station measures both air quality and meteorology.

Component	Station	Average										
		1	2	3	4	5	6	7	8	9	10	11
1h_DOSTE-NOx	DOSTE	157.1	129.5	94.6	96.4	107.3	-	-	-	-	-	-
1h_DOSTE-NO	DOSTE	-	-	7.5	10.1	7.3	-	-	-	-	-	-
1h_DOSTE-NO2	DOSTE	-	-	82.9	85.1	87.9	-	-	-	-	-	-
1h_DOSTE-SO2	DOSTE	-	-	29.6	-	-	-	-	-	-	-	-
1h_DOSTE-O3	DOSTE	28.8	26.9	19.1	32.6	17.0	13.6	14.6	10.9	8.4	16.4	-
1h_DOSTE-CO	DOSTE	6.8	9.8	15.4	16.2	-	7.6	5.6	3.2	4.4	-	-
1h_DOSTE-PM10	DOSTE	-	-	-	-	-	-	-	-	-	-	-
1h_DOSTE-Temp Upper	DOSTE	26.5	26.1	27.5	28.9	28.0	28.2	27.2	26.9	26.9	26.7	26.2
1h_DOSTE-WD	DOSTE	162.7	127.8	121.8	122.0	164.0	184.3	210.2	211.8	215.2	205.5	233.2
1h_DOSTE-WS	DOSTE	2.1	2.5	2.7	2.6	2.2	2.1	2.5	3.0	2.3	2.2	2.5
1h_DOSTE-RH	DOSTE	60.2	62.0	64.6	61.4	71.6	70.7	72.4	73.6	74.0	73.0	67.6
1h_DOSTE-Pressure	DOSTE	1 008.7	1 008.3	1 006.6	1 006.5	1 005.1	1 003.5	1 004.5	1 003.8	1 004.3	1 005.4	1 006.1
1h_DOSTE-Radiation	DOSTE	-	-	-	-	-	-	-	-	-	-	-
1h_DOSTE- Lower Temp	DOSTE	27.9	28.0	27.2	30.5	-	-	-	-	-	-	27.3

We see from the data that the NO concentrations are low compared to NO<sub>2</sub>. This feature can also be seen also at Binh Chanh, Thong Nhat and Zoo stations. The NOx levels at Doste and Binh Chanh (road side) seem to be consistently higher than at Zoo and D2. Ozone, on the other hand, is lower at Doste than at Zoo and D2, which should be expected. The CO concentrations at Doste are relatively high, and within ranges that should be expected.

##### Hong Bang

The Hong Bang station did not produce any data in 2007.

##### Thu Duc

The Thu Duc stations did not produce any valuable data in 2007.

##### Tan son hoa

Tan son hoa is an urban background station, and the ozone concentrations are higher than at road stations. The monthly average concentrations ranging from 22 µg/m<sup>3</sup> in the rainy season to 50 µg/m<sup>3</sup> in the dry season is within expected ranges.

Component	Station	Average											
		1	2	3	4	5	6	7	8	9	10	11	12
1h_TS-NOx (NOx)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
1h_TS-NO (NO)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
1h_TS-NO2 (NO2)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
1h_TS-SO2 (SO2)	TAN SON HOA	-	-	17.5	11.5	-	-	13.4	-	-	-	-	-
1h_TS-O3 (O3)	TAN SON HOA	50.3	41.3	36.1	45.7	30.0	28.3	26.7	22.8	22.4	24.2	25.7	-
1h_TS-CO (CO)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-
1h_TS-PM10 (PM10)	TAN SON HOA	-	-	-	-	-	-	-	-	-	-	-	-

The measured monthly average SO<sub>2</sub> concentrations seem to be ranging between 20 and 50 µg/m<sup>3</sup> at all stations reporting SO<sub>2</sub> concentrations in HCMC.

### ThongNhat

The air quality monitoring station at Thong Nhat hospital is located close to a main road, but is somewhat sheltered by large trees and some branched growing too close to the intake of air.

Component	Station	Average											
		1	2	3	4	5	6	7	8	9	10	11	12
1h_TN-NOx (NOx)	THONG NHAT	36.6	16.3	15.0	19.1	21.7	29.0	27.6	27.1	-	36.5	36.6	-
1h_TN-NO (NO)	THONG NHAT	10.4	5.8	4.2	4.3	5.7	9.2	9.6	9.7	11.9	14.6	12.2	-
1h_TN-NO2 (NO2)	THONG NHAT	22.5	12.1	10.9	11.4	13.4	15.2	12.9	13.7	14.6	15.5	18.9	-
1h_TN-SO2 (SO2)	THONG NHAT	22.2	20.8	18.2	19.7	21.8	23.7	11.6	19.0	24.7	13.6	18.2	-
1h_TN-CO (CO)	THONG NHAT	3.2	4.0	3.2	3.6	3.6	4.6	3.7	3.2	4.5	4.8	5.4	-
1h_TN-PM10 (PM10)	THONG NHAT	-	-	76.0	55.6	45.9	-	-	-	-	-	-	-

This may be reflected by the relatively low concentrations of NO<sub>x</sub> and PM<sub>10</sub> measured at this site. The seasonal variation with higher concentrations in the dry season than during the rainy season is well reflected in the data.

### BinhChanh

The Binh Chanh station is located close to a main traffic artery leading out of HCMC to the south. This road has a high ratio of heavy vehicles, which is reflected in the relatively high monthly average concentrations of NO<sub>x</sub> and PM<sub>10</sub>.

Component	Station	Average											
		1	2	3	4	5	6	7	8	9	10	11	12
1h_BC-NOx (NOx)	BINH CHANH	107.1	75.3	63.4	60.1	70.1	73.7	59.3	47.5	40.2	49.0	45.6	-
1h_BC-NO (NO)	BINH CHANH	28.6	23.3	20.0	18.5	25.7	29.4	24.2	19.2	18.0	20.7	18.2	-
1h_BC-NO2 (NO2)	BINH CHANH	63.3	39.6	32.4	31.8	31.1	29.0	22.5	18.3	14.4	21.2	20.1	-
1h_BC-CO (CO)	BINH CHANH	7.1	6.4	6.6	7.0	8.1	9.2	9.1	8.9	9.2	9.4	9.5	-
1h_BC-PM10 (PM10)	BINH CHANH	113.9	74.6	64.1	74.4	75.3	89.6	76.7	69.1	63.0	77.7	105.2	-

Monthly average PM<sub>10</sub> concentrations exceeded 100 µg/m<sup>3</sup> in the dry season months of January and November 2007. These are the highest average PM<sub>10</sub> concentrations measured in HCMC.

The average CO concentrations measured during some of the months indicated that there might have been exceedance of air quality standards at this station.

## Zoo

The Zoo station is located in a park. A main road is running about 20 m from the station. The NO<sub>2</sub> concentrations are still very low, which may be due to a filtering effect from the trees surrounding the station.

Component	Station	Average											
		1	2	3	4	5	6	7	8	9	10	11	12
1h_ZO-NOx (NOx)	ZOO	33.4	26.6	27.3	25.8	31.7	40.1	34.4	-	-	-	38.6	
1h_ZO-NO (NO)	ZOO	8.5	7.9	8.3	8.7	14.0	17.3	12.2	-	-	-	6.7	
1h_ZO-NO2 (NO2)	ZOO	18.9	12.9	11.8	10.9	13.5	16.7	24.9	-	-	-	29.0	
1h_ZO-O3 (O3)	ZOO	53.6	41.6	37.2	47.6	30.4	30.0	26.1	30.2	21.8	26.1	33.6	
1h_ZO-PM10 (PM10)	ZOO	50.7	47.9	-	-	-	-	-	-	-	-	-	

The average NO<sub>2</sub> and ozone concentration levels are similar to the levels measured at the urban and regional background stations.

## District 2

The station is located at a roof top about 6 km east of the HCMC city centre.

Component	Station	Average											
		1	2	3	4	5	6	7	8	9	10	11	12
1h_D2-NOx (NOx)	DISTRICT 2	33.0	23.5	21.2	20.3	25.1	31.3	26.9	20.3	30.1	37.9	26.4	
1h_D2-NO (NO)	DISTRICT 2	4.3	4.5	3.8	3.1	8.7	8.2	7.5	4.7	8.8	13.4	5.6	
1h_D2-NO2 (NO2)	DISTRICT 2	26.5	17.2	15.6	17.1	12.6	19.2	17.5	14.3	19.2	20.7	19.0	
1h_D2-SO2 (SO2)	DISTRICT 2	29.3	14.0	16.6	12.2	7.2	13.2	16.8	14.2	18.4	-	16.4	
1h_D2-O3 (O3)	DISTRICT 2	48.3	44.8	39.7	54.7	31.2	33.2	32.3	40.9	34.0	34.7	47.3	
1h_D2-PM10 (PM10)	DISTRICT 2	89.0	63.4	58.1	76.7	57.5	71.9	68.1	50.2	-	-	-	

The concentration level seems to be representative for the regional impact of air pollution in the area. However, the station may be occasionally impacted from plumes emitted at industries and a power plant located north of the station.

The seasonal variation of all compounds seems to follow the expected pattern due to dry season and rainy season characteristics.

## QuangTrung

The Quang Trung station is located in a technology park 12 km north of the city centre. Problems with instruments, data loggers, power failures and infra structures has lead to that there is no data available from this site in 2007.

## 5. Station Operation Status

An audit to the air quality monitoring system in HCMC was performed in December 2007. The whole monitoring system was audited and evaluated. Status of the instruments was presented including the spare parts suggestion and some indicated method indicated in order to fix some problems.

The situation at each of the stations is presented in the following based on technical status reporting and evaluations.

## Zoo

The urban background station was located inside the city park of HCMC Zoo in the northeastern part of District 1. It is surrounded by park areas and located about 20m from a large main road leading out the city toward northeast. The station was funded by NORAD and the station started measuring in November 2002. It is measuring three main air pollution components NO<sub>x</sub> (NO + NO<sub>2</sub>), O<sub>3</sub> and PM<sub>10</sub> which is representative for this area.

The operations of equipments in this station are performed satisfactorily and follow the QA/QC procedures.

The only problem at this station as is the case also at other stations is the operation of the PM<sub>10</sub> monitors. The HEPA staff is lacking the knowledge of how to fix the problem and will need the support from NILU in order to repair and operate these instruments. The PM<sub>10</sub> monitor in this station stopped working from March 2007. The error message is OFFSET=100.

Due to the failures of PM<sub>10</sub> which prevailed almost for the whole year 2007 as well as for problems with the NO<sub>x</sub> monitor from July to October 2007, the data availability of this station is rather low; average about 53% for the year 2007.

### STATION NAME: ZOO (ZO)

LOCATION: THE ZOO IN HCMC, 02 NGUYEN BINH KHIEM ST., DISTRICT 1  
 COORDINATE: 686420 1193370  
 ELECTRICITY LINE NO. 18A398330  
 TELEPHONE: 9104691  
 STARTING DATE: 18/11/2002  
 AUDITING TIME: Dec-07

### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	2233	GOOD			
SO2					
CO					
O3	807	GOOD			
PM10	237	OFF	OFFSET=100	Dirty Rcell or low source	clean the reaction cell
ZERO AIR	1137	GOOD			

### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX	BN22981F	1120	1120	100	
SO2					
CO					

### DATALOGGER

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER	E206	GOOD			
MODEM	D-link	GOOD			
TELEPHONE, LINE	Panasonic	GOOD			
DATA COMMUNICATION		GOOD			

### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		GOOD			
GENERAL PUMP		GOOD			
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		Water leaking and worm-eaten			repair the roof and remove termites
MANIFOLD, AIR INTAKE		GOOD			

## BinhChanh

The BinhChanh station is a Roadside – traffic station. It is located about 15km southwest of the city centre. The station shelter is located right at the fence next to the main road leading out the city to Mekong Delta area. This is one of the busiest roads in the city.

After 5 years operation continuously, the station proved to be the most stable station due the very good performances of instruments in the station. The monitors at this site include parameters such as NO<sub>x</sub> (NO and NO<sub>2</sub>), CO, and PM<sub>10</sub>. Most of the monitors are still working well. The PM<sub>10</sub> monitor has the same problem as already mentioned above for the other stations. At BinhChanh it has just stopped working in the middle of November 2007.

The highest data availability among the nine HEPA operated automatic air quality monitoring stations in HCMC has been recorded at BinhChanh and it is on the average 82% for the year 2007.

### STATION NAME: BINH CHANH (BC)

LOCATION: EDUCATION OFFICE OF DISTRICT BINH TAN, 462 KINH DUONG VUONG ST., DISTRICT BINH TAN

COORDINATE: 674500 1183000

ELECTRICITY LINE NO. 18L722250

TELEPHONE: 7523160

STARTING DATE: 21/11/2002

AUDITING TIME: Dec-07

### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	2231	GOOD			
SO2					
CO	1777	GOOD			
O3					
PM10	231	FAIL	OFFSET -75%	Dirty in Rcell , low source	Clean the reaction cell
ZERO AIR	1138	GOOD			

### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX	BN22984F	1050	895.9	110	
SO2					
CO	129989	50	46.4	140	

### DATALOGGER

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER	E206	GOOD			
MODEM	D-link	FAIL			Change new modem
TELEPHONE, LINE	Panasonic	GOOD			
DATA COMMUNICATION		FAIL			

### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		GOOD			
GENERAL PUMP		GOOD			
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		The shelter is worm-eaten			Use chemical to remove the termites
MANIFOLD, AIR INTAKE		GOOD			

## District2

The regional background station is on the roof of the People Committee building of District 2. The site is located about 6 km east of the City Centre of HCMC. The area is under development. Open areas is surrounding the site. The main road to Hanoi passes less than 2 km north of the site and small industries are located about 3km to the south and to the northeast. This area is planned to be a new city of HCMC.

This station is measuring NO<sub>x</sub> (NO and NO<sub>2</sub>), SO<sub>2</sub>, O<sub>3</sub> and PM<sub>10</sub>. This is the station where power breaks have been occurring most often. The power supply company in this area has strictly rules to the customers who are late in paying the electricity bill in time. The problem has been that on the way to HEPA the bill has to go through many people. The procedures take time and the time limit has been missing many times. To recover the power supply, it takes more than a week to complete the paper procedures. The PM<sub>10</sub> at this station stopped working from September 2007. Those two reasons make the data availability of this station is only average 73% for the year 2007.

### STATION NAME: DISTRICT 2 (D2)

**LOCATION:** PEOPLE COMMEETE OF DISTRICT 2, 249 LUONG DINH CUA ST., DISTRICT2, HCMC  
**COORDINATE:** 691160 1193510  
**ELECTRICITY LINE NO.** 04X921712  
**TELEPHONE:** 7470181  
**STARTING DATE:** 27/11/2002  
**AUTDITING TIME:** Dec-07

### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES
NOX	2232	GOOD		
SO2	1635	GOOD		
CO				
O3	806	GOOD		
PM10	236	<b>FAIL</b>		Temperature sensor error, the data can't transfer to DL
ZERO AIR	690	GOOD		

### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE
NOX	121906		971	110
SO2	133657		958.02	100
CO				

### DATALOGER

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES
DATALOGER	E206	GOOD		
MODEM		GOOD		
TELEPHONE, LINE		GOOD		
DATA COMMUNICATION		GOOD		

### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES
AUTOVOLT. STABL.		GOOD		
UPS	YS0208210833	GOOD		
GENERAL PUMP		GOOD		
AIR CONDITIONER		GOOD		
TABLE, DESK		GOOD		
CON TAINER - SHELTER		<b>The shelter is worm-eaten</b>		
MANIFOLD, AIR INTAKE		GOOD		

### ThongNhat

This is the roadside station standing inside the hospital in Tan Binh District. The area is located in the northwest part of the city centre of HCMC, about 2 km south of the airport. The shelter is located in side the fence, 5 m from the roadside.

This station is measuring NO<sub>x</sub> (NO and NO<sub>2</sub>), SO<sub>2</sub>, CO and PM<sub>10</sub>. At the auditing time, the NO<sub>x</sub> has a problem with the PMT temperature sensor. The spare part needed to repair this failure was not available at HEPA, so the instrument had to be stopped and wait for at least 4 months.

The PM<sub>10</sub> monitor was working only for 2 months (April and May) of the year 2007. It stopped working due to the same error with other PM<sub>10</sub>. Thus, the average data availability of this station is only 59% for the year 2007.

#### STATION NAME: THONG NHAT (TN)

LOCATION: THONG NHAT HOSPITAL, 01 LY THUONG KIET, DISTRICT TAN BINH  
 COORDINATE: 680690 1193530  
 ELECTRICITY LINE NO. 15P985040  
 TELEPHONE: 9713218  
 STARTING DATE: 20/11/2002  
 AUDITING TIME: Dec-07

#### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	2234	<b>FAIL</b>	PMT temp warning	PMT temperature sensor error	change new HVPS
SO2	1634	GOOD			
CO	1776	GOOD			
O3					
PM10	233	<b>OFF</b>	OFFSET=100	Dirty Rcell or low source	clean the reaction cell
ZERO AIR	1135	GOOD			

#### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX	BN22983F			0	BUY NEW CYLINDER
SO2	XF004050B	900	815	100	
CO	BD58537F	50.9	34.1	140	

#### DATALOgger

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOgger	E207	GOOD			
MODEM	D-link	GOOD			
TELEPHONE, LINE	Panasonic	GOOD			
DATA COMMUNICATION		GOOD			

#### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.	YZ020821101	GOOD			
UPS		GOOD			
GENERAL PUMP		GOOD			
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		<b>Water leaking and worm-eaten</b>			repair the roof and remove termites
MANIFOLD, AIR INTAKE		GOOD			

## QuangTrung

This is the residential/urban background station. The site is inside a large technology park with open areas. It is located in District 12. The area is located about 12 km north-northwest of the city centre of HCMC, about 5 km north of the international airport. The site is located about 100 m from Highway no.1.

This station measures NO<sub>x</sub> (NO and NO<sub>2</sub>), SO<sub>2</sub>, O<sub>3</sub> and PM<sub>10</sub>.

Problems at the Quang Trung station have been prevailing throughout the last years. Both monitors and infrastructures at this station will have to be upgraded. The O<sub>3</sub> monitor has a problem with the internal pump and it also has to wait for the spare parts. PM<sub>10</sub> showed the message error is Offset=100 and stopped working. The data logger and data communication system within the station also have problems.

During 2007, the station totally does not work at all, so there is no data at Quang Trung in 2007.

### STATION NAME: QUANGTRUNG (QT)

LOCATION: QUANGTRUNG SOFTWARE CITY, DISTRICT 12, HCMC  
 COORDINATE: 677940 1200080  
 ELECTRICITY LINE NO. Use the electricity of the software city  
 TELEPHONE: 7156679  
 STARTING DATE: 12/04/2002  
 AUDITING TIME: Dec-07

### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	1407	GOOD			
SO2	1633	GOOD			
CO					
O3	337	GOOD	Samp flow warning	Internal pump fail	change the new pump
PM10	237	OFF	OFFSET=100	Dirty Rcell or low source	clean the reaction cell
ZERO AIR	1139	GOOD			

### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX	BN22973F	1050	860	115	The valve is failed, change new
SO2	BN22979F	910	806	110	
CO					

### DATALOGGER

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER		GOOD??			
MODEM	internal	GOOD??			
TELEPHONE, LINE	Panasonic	GOOD			
DATA COMMUNICATION		FAIL			

### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		GOOD			
GENERAL PUMP		FAIL		Too old	change the new one
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		Water leaking and worm-eaten			repair the roof and remove termites
DUST INTAKE		FAIL			Check temp. Sensors

## Doste

The Doste station is characterised as a roadside station. The station is inside a government office area (Department of Science and Technology) close to the fence and about 4m from the main road of the city. It is located about 2 km west of the city centre of HCMC, about 5 km east-southeast of the international airport.

The station was intended to measure NO<sub>x</sub> (NO and NO<sub>2</sub>), SO<sub>2</sub>, CO, O<sub>3</sub> and PM<sub>10</sub>.

The PM<sub>10</sub> sampler that was installed with the Danida part of the programme in 2000 has not been operating since the end of 2003 after 3 years of unstable operations. At the moment, there are NO<sub>x</sub> and O<sub>3</sub> monitors that stopped working at this station due to lack of spare parts.

A brand new instrument with modern technology should replace the PM10.

The data availability of this station is low, average 20% for the year 2007.

### STATION NAME: DOSTE (DO)

LOCATION: DEPARTMENT OF SCIENCE AND TECHNOLOGY, 244 DIEN BIEN PHU ST., DISTRICT 3  
 COORDINATE: 684430 1192220  
 ELECTRICITY LINE NO. 11A308530  
 TELEPHONE: 9320962  
 STARTING DATE: 22/06/2000  
 AUDITING TIME: Dec-07

### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	1404	FAIL	PMT 5000	PMT ERROR	Change new PMT
SO2	1127	GOOD			
CO	1268	GOOD			
O3	336	FAIL	Display screen fail		No suggestion
PM10	264	OFF			Change new
ZERO AIR	1136	GOOD			

### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX					Buy new
SO2					Buy new
CO					Buy new

### DATALOGGER

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER		GOOD			
MODEM	D-link	GOOD			
TELEPHONE, LINE	Trend Tek	GOOD			
DATA COMMUNICATION		GOOD			

### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		FAIL		Mainboard burned	Change new
GENERAL PUMP		GOOD			
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		GOOD			Paint outside of station
MANIFOLD, DUST INTAKE		FAIL			New dust intake

## TanSonHoa

This station is located in a residential area in Phu Nhuan District, 2 km east from the international airport. The Air Quality Monitoring station was set up here from 2000 that measure O3, NOx, SO2 and PM10. But only O3 monitor still in good operation condition.

As other DANIDA sponsor stations, a modern technology instrument should replace PM10.

While CO, NOx, SO2, they are all waiting for spare parts.

The data availability is low, average 26% for the year 2007.

### STATION NAME: TANSONHOA (TSH)

LOCATION: TROPICAL TECHNOLOGY INSTITUTE, 57 TRUONG QUOC DUNG, PHU NHUAN DISTRICT, HCMC

COORDINATE: 682830 1193930

ELECTRICITY LINE NO. Use the electricity line of the Institute

TELEPHONE: 8475851

STARTING DATE: 20/06/2000

AUDITING TIME: Dec-07

### MONITORS

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	1403	FAIL (HEPA)	PMT 5000	PMT FAIL	Change PMT
SO2	1126	GOOD			
CO	1267	GOOD	Too high conc. >25		Calibration
O3	338	GOOD			
PM10	254	OFF			Buy new
ZERO AIR	693	GOOD			

### CYLINDERS

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX					Buy new
SO2					Buy new
CO					

### DATALOGGER

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER	E099	GOOD			
MODEM	Pro link	GOOD			
TELEPHONE, LINE	Trend Tek	GOOD			Buy new
DATA COMMUNICATION		GOOD			

### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		GOOD			
GENERAL PUMP		GOOD			
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		GOOD			
MANIFOLD, DUST INTAKE		FAIL			Change new

## HongBang

This site is belonging to the Hong Bang Junior High School in District 5, about 5 km southwest from the city centre. This position is used by Hochiminh City Protection Agency (HEPA) as an air quality monitoring site to measure the effect of urban transportation to the air quality. This is the roadside station that measure O3, NOx, CO, PM10.

The only working monitor is CO. The other are waiting for spare part, some need be replaced by new instrument. The Datalogger has problem from September 2006, so there is no data at all at this station for the year 2007.

**STATION NAME: HONG BANG (HB)**

**LOCATION:** HONGBANG JUNIOR SCHOOL, 123 HUNG VUONG ST., DISTRICT 5, HCMC  
**COORDINATE:** 681620 1189460  
**ELECTRICITY LINE NO.** 17E285400  
**TELEPHONE:** 8475851  
**STARTING DATE:** 20/06/2000  
**AUDITING TIME:** Dec-07

**MONITORS**

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	1402	FAIL	PMT 5000	PMT fail	Change PMT
SO2					
CO	1266	GOOD			
O3	806	FAIL	O3 meas, ref low	Detector Optical fail	Change detector Block Quartz Window
PM10		OFF			Buy new PM10
ZERO AIR	691	FAIL	Press <10	Pump fail	Change the pump

**CYLINDERS**

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX					Buy new
SO2					
CO					Buy new

**DATALOGGER**

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER	E099	GOOD			
MODEM	D-link	GOOD			Buy new
TELEPHONE, LINE	Trend Tek	GOOD			Buy new
DATA COMMUNICATION		GOOD			

**POWER SUPPLY AND OTHERS**

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		GOOD			
GENERAL PUMP		GOOD			
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		GOOD			
MANIFOLD, DUST INTAKE		FAIL			Change new

**ThuDuc**

This is industrial area station. It is located in a government office area, and in the industrial area. There are many big industry plans like Steel, Power, Cement, Food Processing within 2 km surrounding. This station measures NOx, SO2, PM10. But the whole station is dead from 2004. There is no data from 2004 to now

**STATION NAME: THUDUC (TD)**

**LOCATION:** URBAN MANAGEMENT OFFICE OF THUDUC DISTRICT, HCMC  
**COORDINATE:** 693640 1199790  
**ELECTRICITY LINE NO.** 18T840500  
**TELEPHONE:** 8978387  
**STARTING DATE:** 20/06/2000  
**AUDITING TIME:** Dec-07

**MONITORS**

COMPONENT	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
NOX	1407	FAIL (HEPA)	PMT 5000	PMT FAIL	Change PMT
SO2	1125	FAIL (HEPA)		Kicker FAIL	Change kicker
CO					
O3					
PM10		OFF			Buy new
ZERO AIR		GOOD			

**CYLINDERS**

COMPONENT	NO.	BEGINING CONC.	STANDARD CONC.	REMAIN PRESSURE	SUGGESTION
NOX					Buy new
SO2					Buy new
CO					

**DATALOGGER**

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
DATALOGGER		FAIL	Comm. Card missing	use for other DL	Buy new
MODEM		N/A			Buy new
TELEPHONE, LINE		GOOD			Buy new
DATA COMMUNICATION		FAIL			

**POWER SUPPLY AND OTHERS**

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
AUTOVOLT. STABL.		GOOD			
UPS		GOOD			
GENERAL PUMP		FAIL			Change new
AIR CONDITIONER		GOOD			
TABLE, DESK		GOOD			
CON TAINER - SHELTER		GOOD			
MANIFOLD, DUST INTAKE		FAIL			Change new

### The meteorological station

The meteorological tower is 25 meters high and was established as part of the DANIDA project from 2000. It is located at the Doste station. A new set of sensors was installed by NILU in 2005 based on the new Vaisala weather station. All the sensors are working very well.

#### STATION NAME: METEOROLOGY

LOCATION: DEPARTMENT OF SCIENCE AND TECHNOLOGY, 244 DIEN BIEN PHU ST., DISTRICT 3  
 COORDINATE: 684430 1192220  
 ELECTRICITY LINE NO. 11A308530  
 TELEPHONE: 9320962  
 STARTING DATE: 22/06/2000  
 AUDITING TIME: Dec-07

#### SENSORS

SENSORS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
UPER TEMP		GOOD			
WIND DIRECTION		GOOD			
WIND SPEED		GOOD			
RADIATION SENSOR		GOOD			
LOWER TEMP		GOOD			

#### POWER SUPPLY AND OTHERS

EQUIPMENTS	S/N	CURRENT STATUS	ERRORS WARNING	CAUSES	SUGGESTION
POWER SUPPLY		GOOD			
DATA COMMUNICATION		GOOD			
THE TOWER		OLD			Need painting and maintenance

## 6. Concentration levels

When evaluating the monthly average concentration levels as well as the spatial and seasonal variations the data accepted from the automatic monitoring stations during 2007 seem to be of reasonable quality.

The most important pollutants in HCMC are PM<sub>10</sub>, O<sub>3</sub>, and NO<sub>2</sub>. We have in the following figures presented the monthly average concentration levels for these parameters for all stations that reported data in 2007.

### Monthly average PM<sub>10</sub> concentrations

The monthly average PM<sub>10</sub> concentrations varied from 50 to 110 µg/m<sup>3</sup> at the 4 stations where data were available.

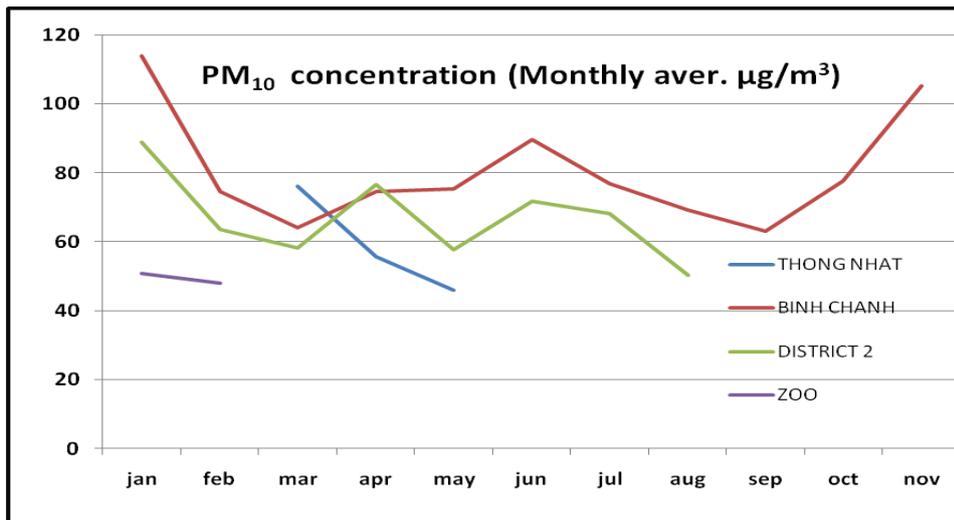


Figure 2: Monthly average PM<sub>10</sub> concentrations from four stations in HCMC 2007.

The highest concentrations were recorded at the traffic site at Binh Chanh. Concentrations during the dry season were recorded at more than  $100\mu\text{g}/\text{m}^3$ . The new updated World Health Organisation guideline (WHO, 2005) value for annual average concentrations of PM<sub>10</sub> is  $20\mu\text{g}/\text{m}^3$ . At all sites in HCMC the concentrations seem to be between 2 and 4 times that value. The annual limit value for Vietnam is set at  $50\mu\text{g}/\text{m}^3$  (TCVN, 2005).

### Monthly average NO<sub>2</sub> concentrations

The monthly average NO<sub>2</sub> concentrations measured at urban background and regional background stations was between  $10$  and  $25\mu\text{g}/\text{m}^3$ . The concentrations were slightly higher during the dry season than during the wet season.

The NO<sub>2</sub> concentrations measured at the road side stations were higher than at the background stations. The NO<sub>2</sub> concentrations as measured at the Binh Chanh station from January till June were 2 to 3 times higher than at the urban background stations. From August 2007 the concentration levels seem to have equalised.

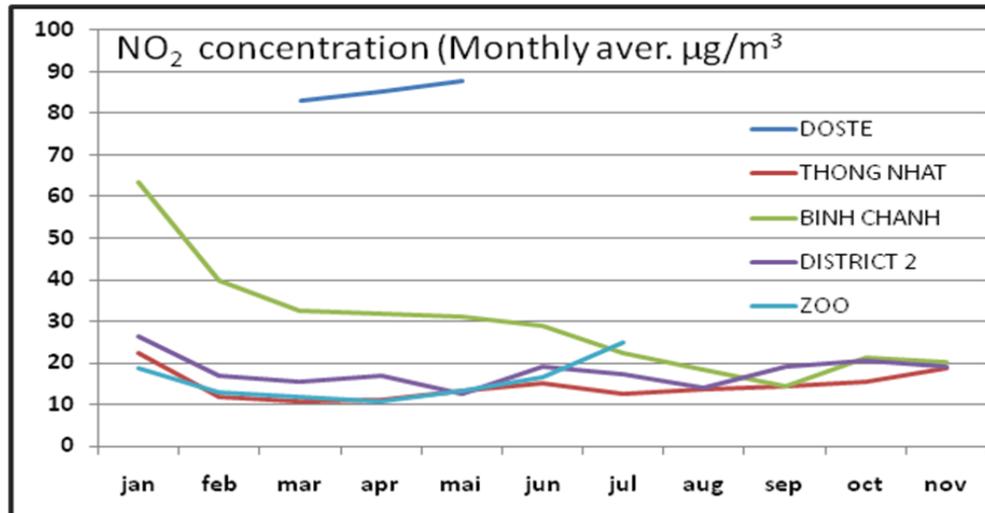


Figure 3: Monthly average NO<sub>2</sub> concentrations from five stations in HCMC 2007.

The proposed Vietnamese air quality standard for NO<sub>2</sub> is 40 µg/m<sup>3</sup> as an annual average and 200 µg/m<sup>3</sup> as hourly average. None of these standards seem to have been violated during 2007.

#### Monthly average ozone concentrations

The measured ozone concentrations show considerable diurnal and seasonal variations. The monthly average concentrations also indicated that concentrations may be 2 to 3 times higher in the dry season than during the wet season.

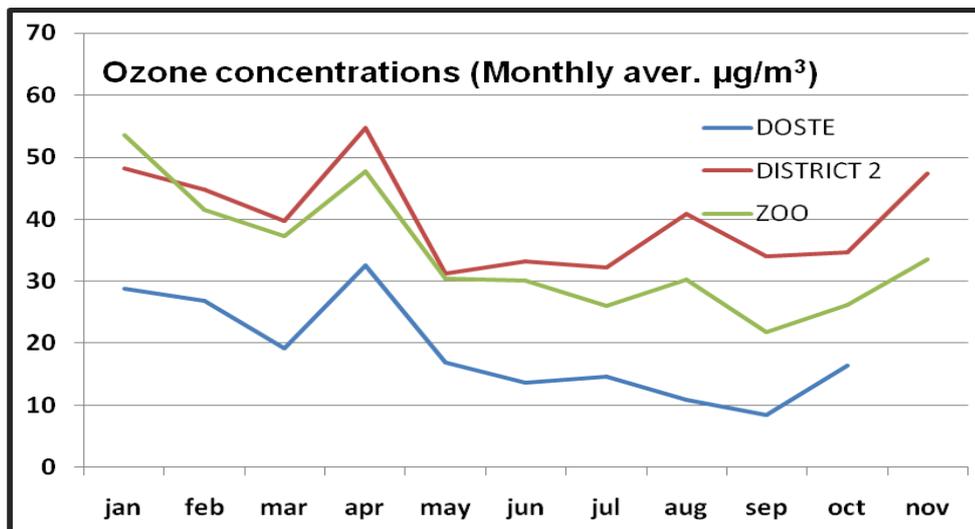


Figure 4: Monthly average ozone concentrations from three stations in HCMC 2007.

Another clear feature is that the concentrations at the road side station Doste is much lower than at the urban background station Zoo and the regional

background station District 2. Ozone concentrations were highest in April 2007. The hourly max concentrations during this month at D2 ranged between 100 and 225  $\mu\text{g}/\text{m}^3$  (see Appendix A). The Vietnamese standard for hourly ozone concentration is 120  $\mu\text{g}/\text{m}^3$ .

## 7. Summary station status and actions

Based on the analyses of air quality monitoring data and instrument performances as presented in this report the status, errors and suggested actions are presented in Table 2 below.

Table 2: Status, errors and suggested actions presented for each station and for instruments that need repair or replacements.

STATION	EQUIPMENT	CURRENT STATUS	ERRORS WARNING	SUGGESTION
DISTRICT2	PM10	Fail	Temperature sensor error, the data can't transfer to DL	
THONGNHAT	NOX	Need spare part	PMT temperature sensor error	Change new HVPS
	PM10	Need repair	Dirty Rcell or low source	Clean the reaction cell
ZOO	PM10	Need repair	Dirty Rcell or low source	Clean the reaction cell
BINHCHANH	PM10	Need repair	Dirty in Rcell , low source	Clean the reaction cell
	MODEM	Fail		Change new modem
QUANGTRUNG	O3	Need spare part	Internal pump Fail	change the new pump
	PM10	Need repair	Dirty Rcell or low source	clean the reaction cell
	Dust intake	Fail		Buy new
DOSTE	NOX	Need spare part	PMT Error	Change new PMT
	O3	Need spare part	Screen display Fail	Change new display board
	PM10	Off		Change new
	UPS	Fail	Mainboard burned	Change new
	Dust intake	Fail		New Dust intake
HONGBANG	NOX	Need spare part	PMT Fail	Change PMT
	O3	Need spare part	Detector Optical Fail	Change detector Block Quartz Window
	PM10	Off		Buy new PM10
	ZERO AIR	Need spare part	Pump Fail	Change the pump
	Dust intake	Fail		Change new
TANSONHOA	NOX	Need spare part	PMT Fail	Change PMT
	PM10	Off		Buy new
	Dust intake	Fail		Buy new
THUDUC	NOX	Need spare part	PMT Fail	Change PMT
	SO2	Need spare part	Kicker Fail	Change kicker
	PM10	Off		Buy new
	Data logger	Fail	Mainboard, HDD, IM module Fail	Buy new
	MODEM	N/A		Buy new
	Data communication	Need change		Setup new channel
	General Pump	Fail		Buy new
	Dust intake	Fail		Buy new
METEOROLOGY	The tower	Old		Need painting and maintenance
SHELTER	NILU style stations	Shelters worm-eaten		Use chemical to remove the termites

A draft proposal for an upgrading of the monitoring programme was prepared by NILU in 2007 (Sivertsen, 2007). In this proposal it was stated that the air quality monitoring programme has been operated for a total of more than 7 years, and some of the instruments have already met their life expectancy. Some of the monitors are out of order and cannot be repaired, and the measurements of particulate matter (PM) installed as part of the Danida project broke down already after 2 years.

Some of the NORAD installed PM<sub>10</sub> monitors can still be repaired but there is a great need for improvement of the PM monitoring system. PM is also the main air pollution problem in HCMC.

As indicated in Table 2 there is a need for spare parts, which again will lead to repair and improved maintenance. Some of the instruments will have to be replaced by new instruments, and for PM it will be adequate to also install PM<sub>2,5</sub> monitors at some stations.

There may also be a need for general upgrading of the infrastructure such as shelters, data loggers and data transfer systems. All these aspects should be specifically identified and described in a final audit report prepared for DONRE in HCMC.

## 8. References

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URL: [http://www.euro.who.int/air/activities/20050222\\_2](http://www.euro.who.int/air/activities/20050222_2)



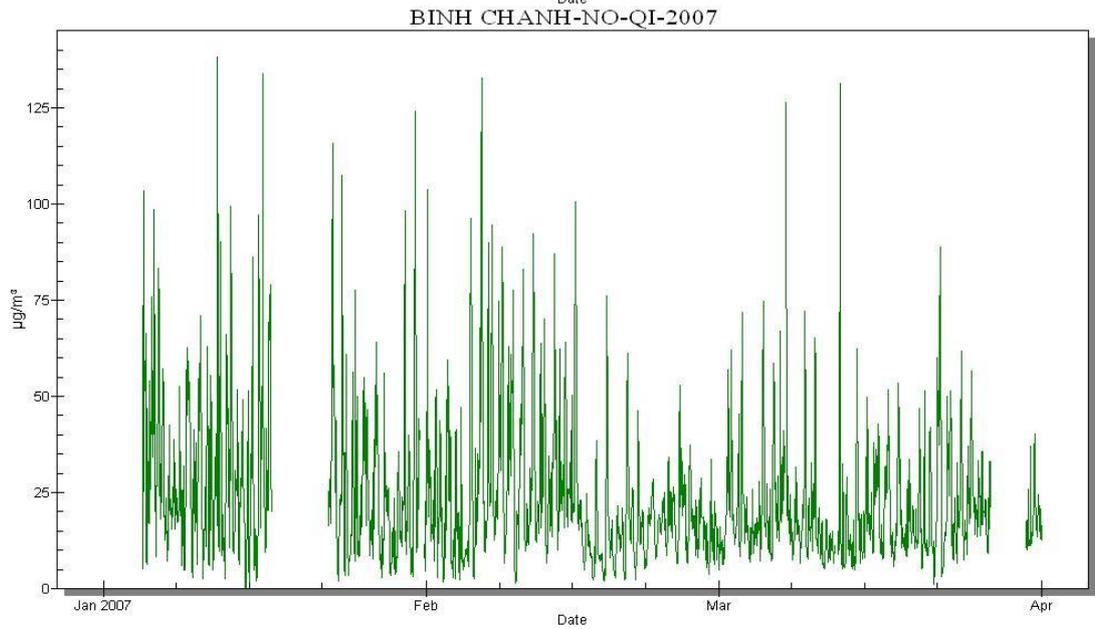
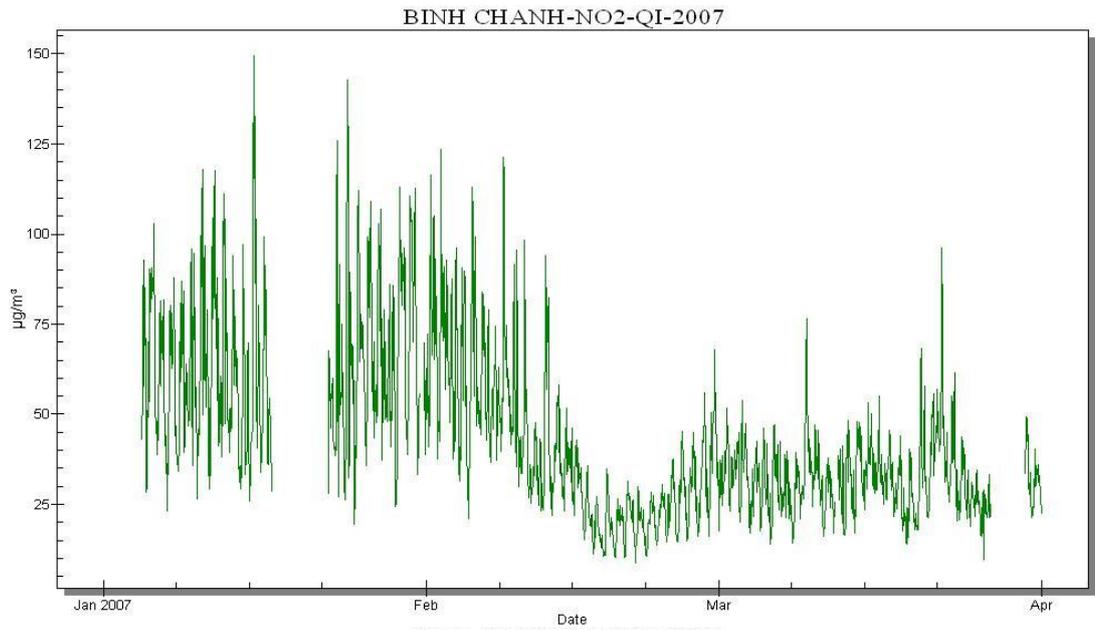
## **Appendix A**

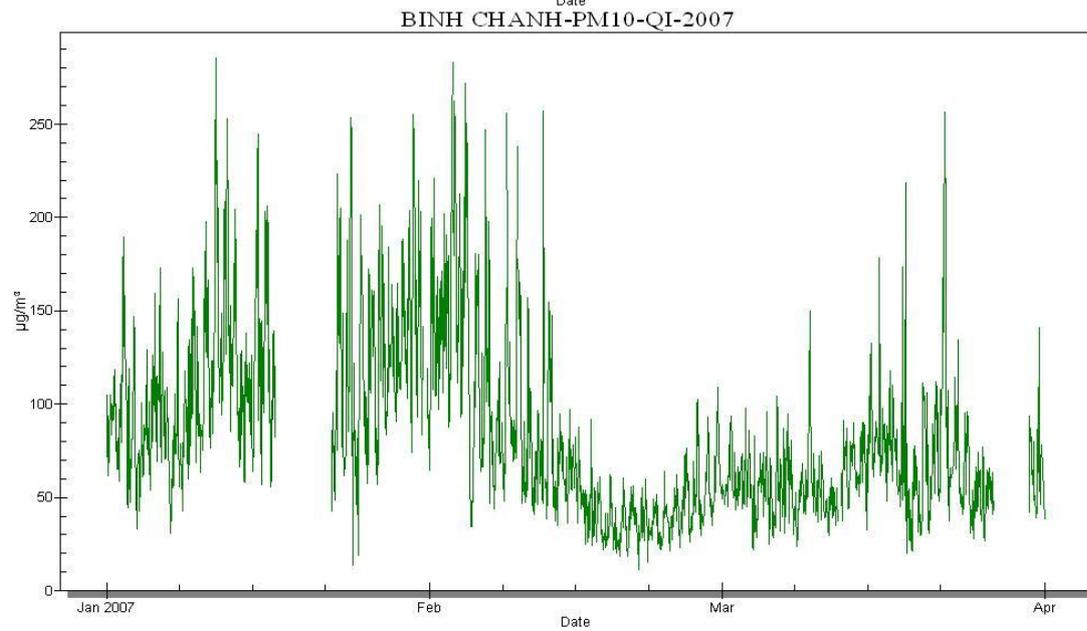
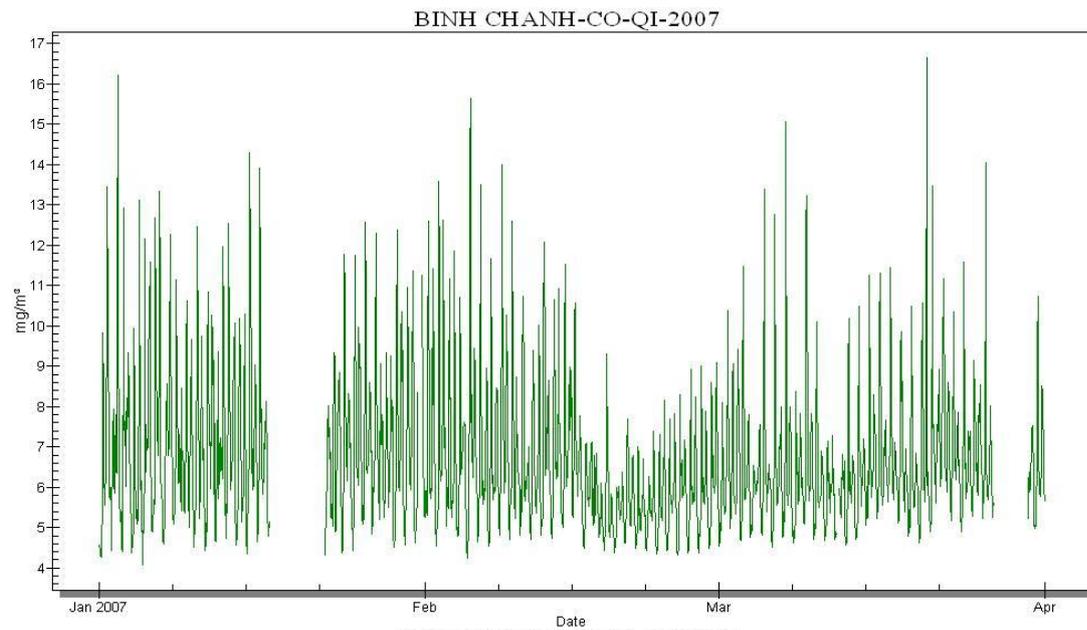
### **Hourly concentrations Presented quarterly for each station**

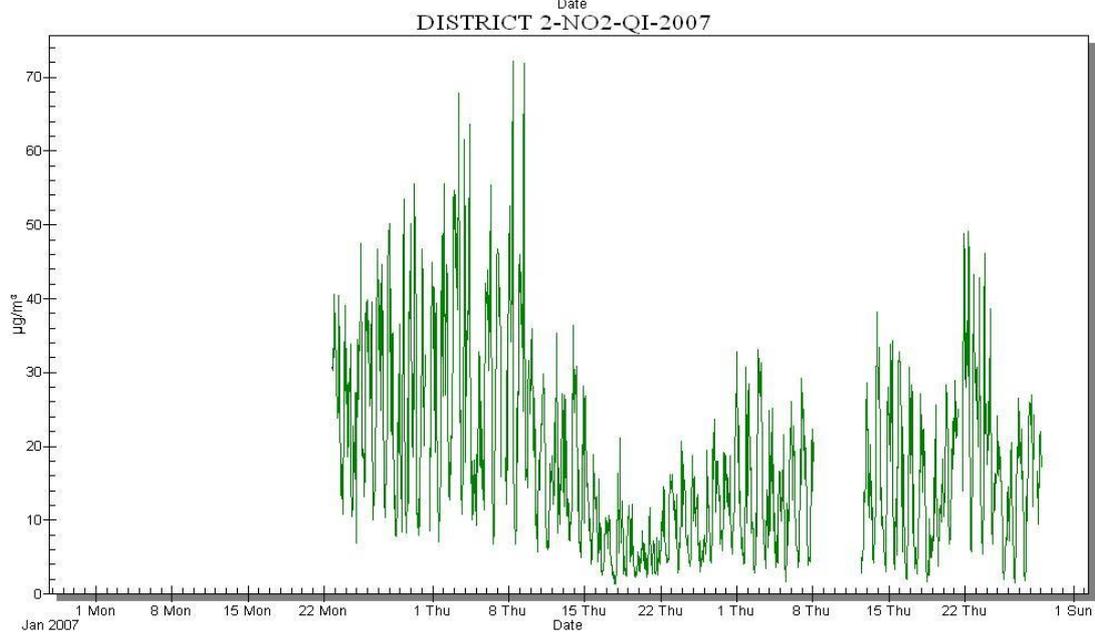
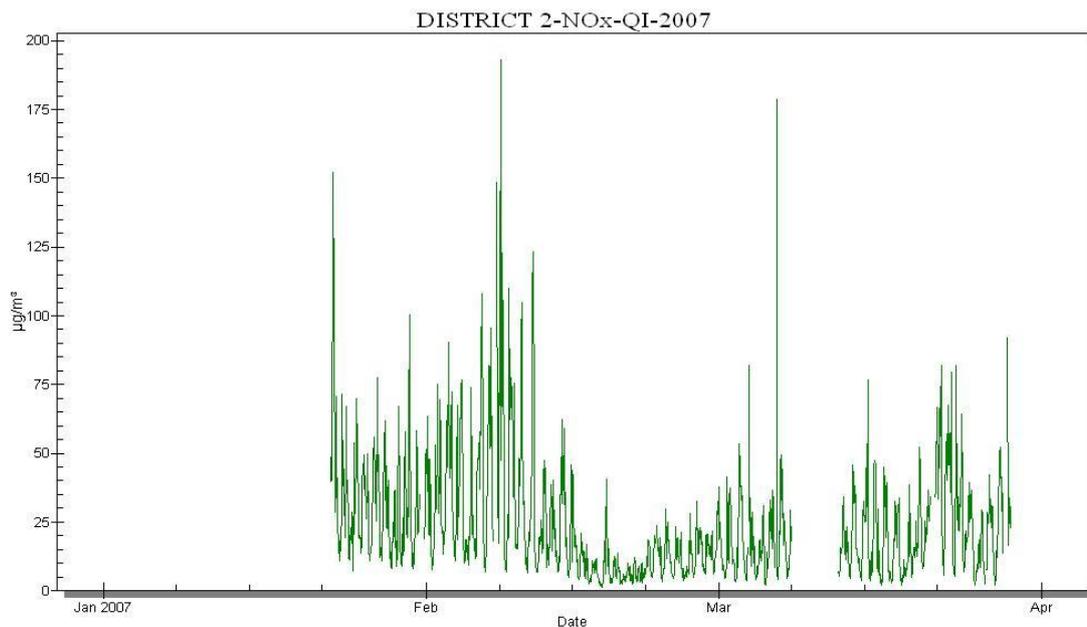


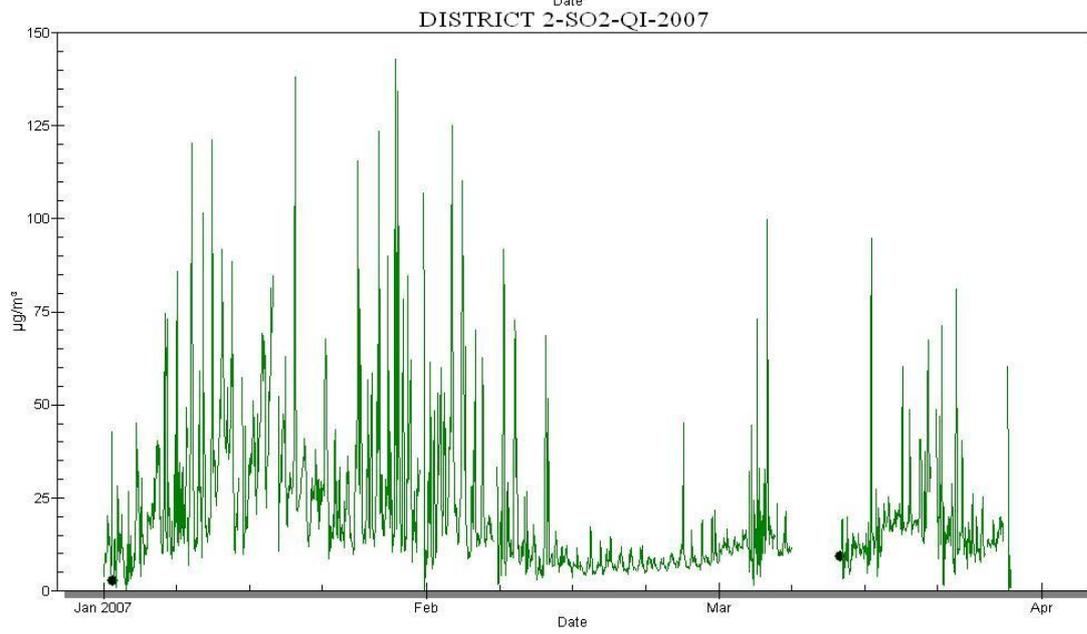
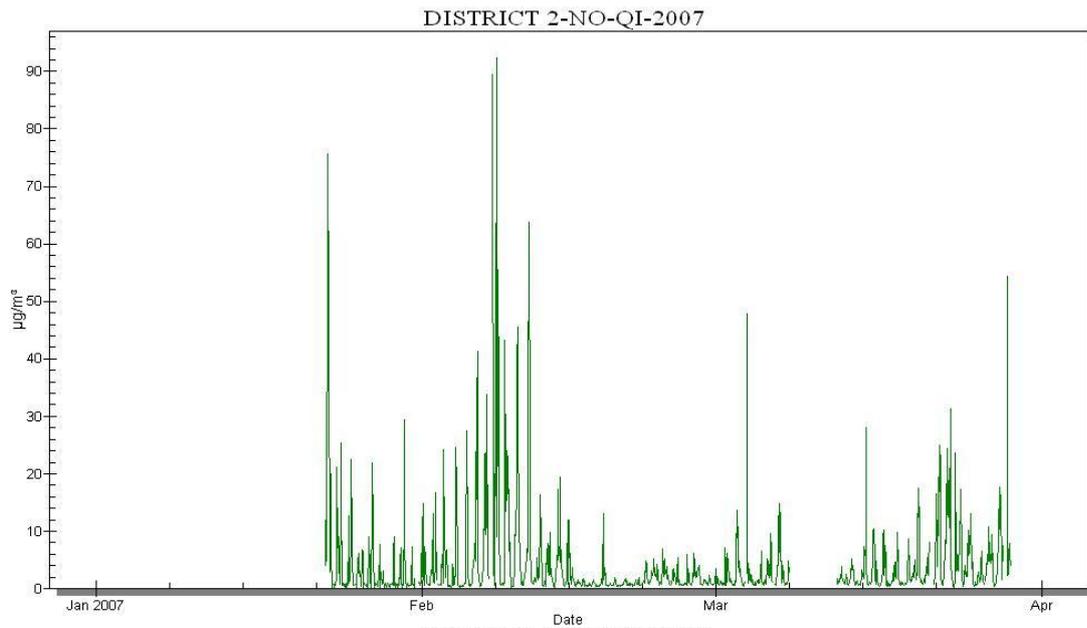
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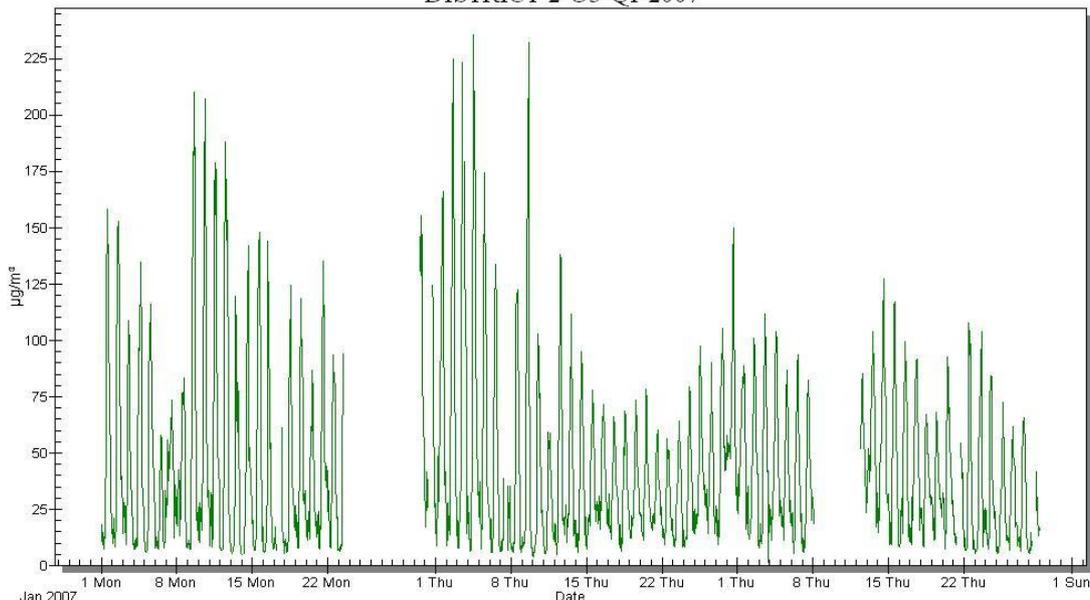




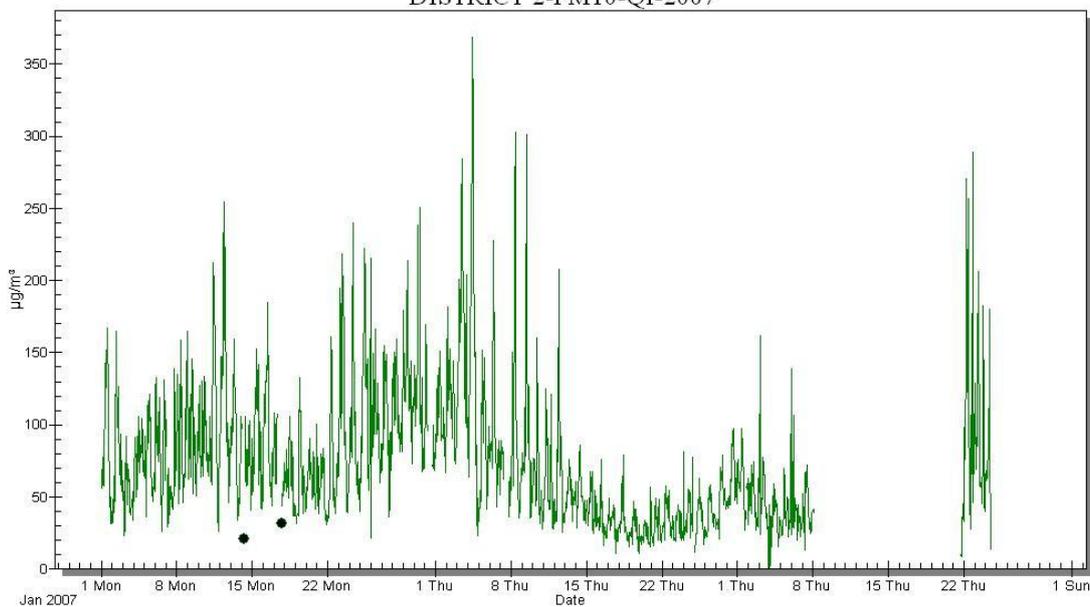


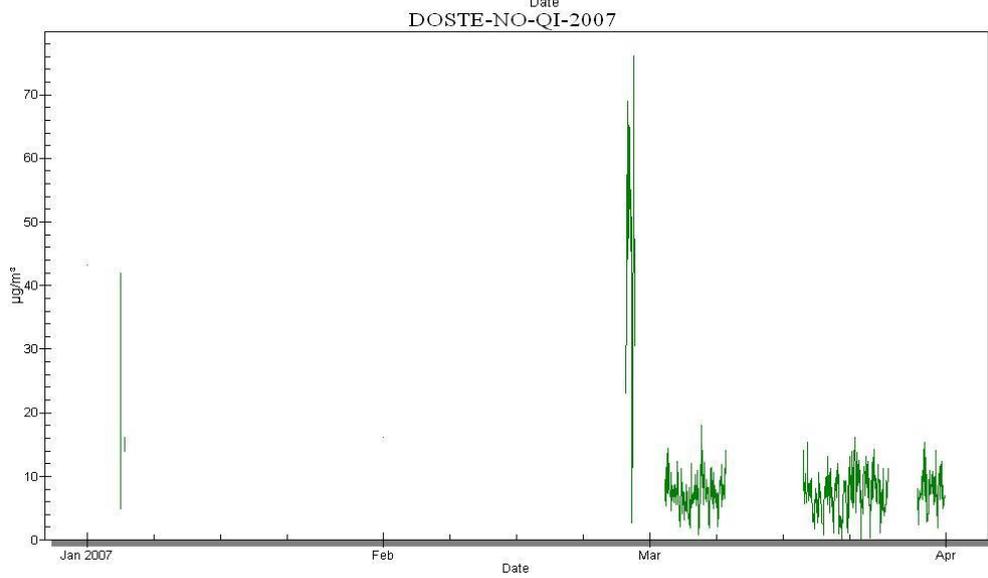
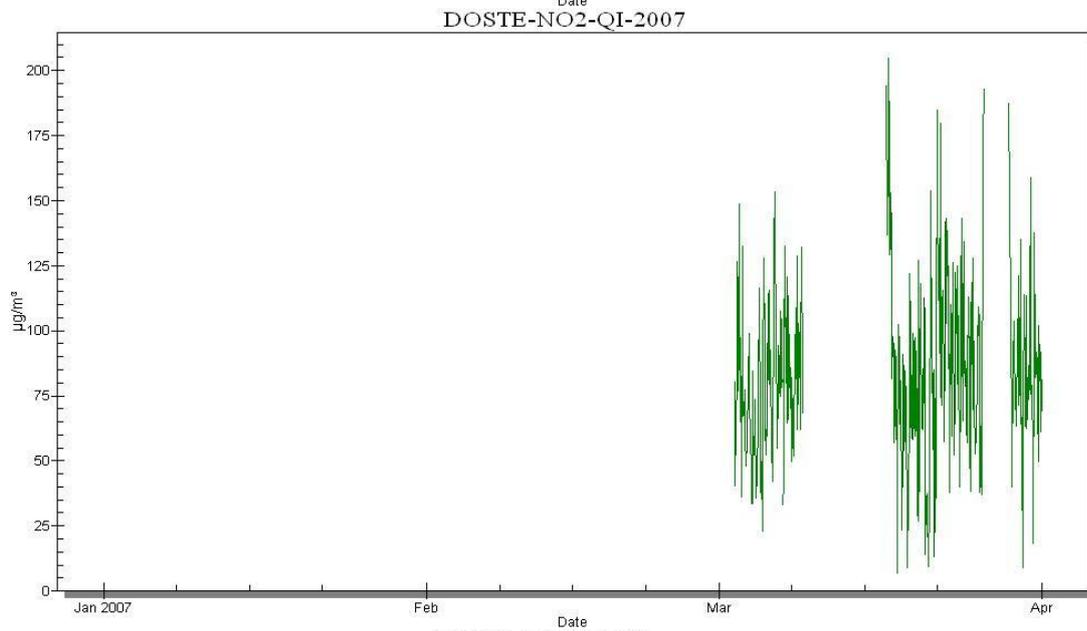
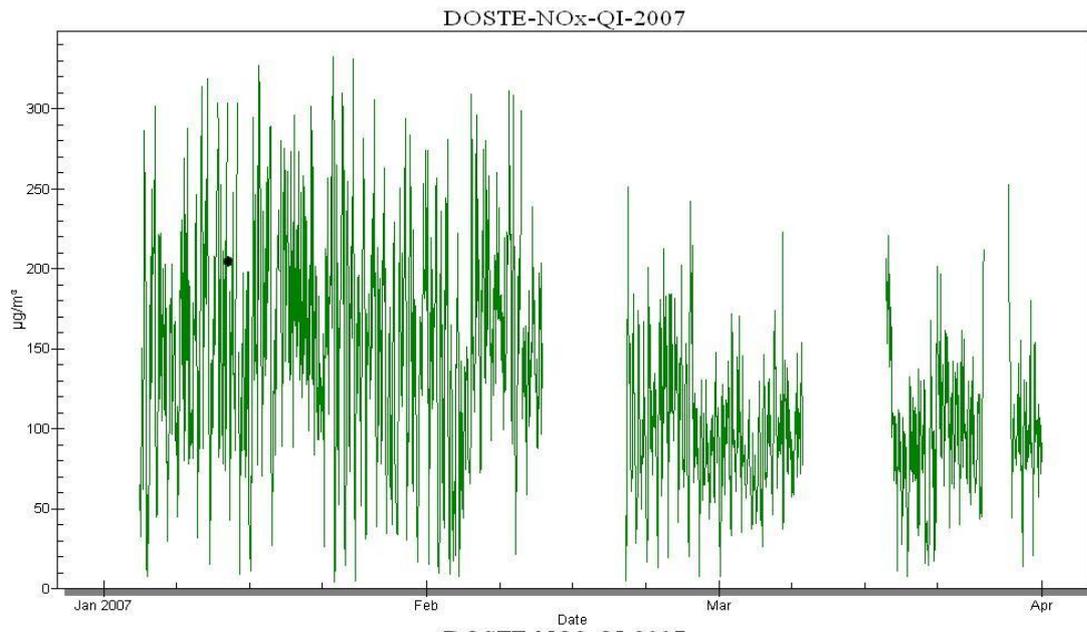


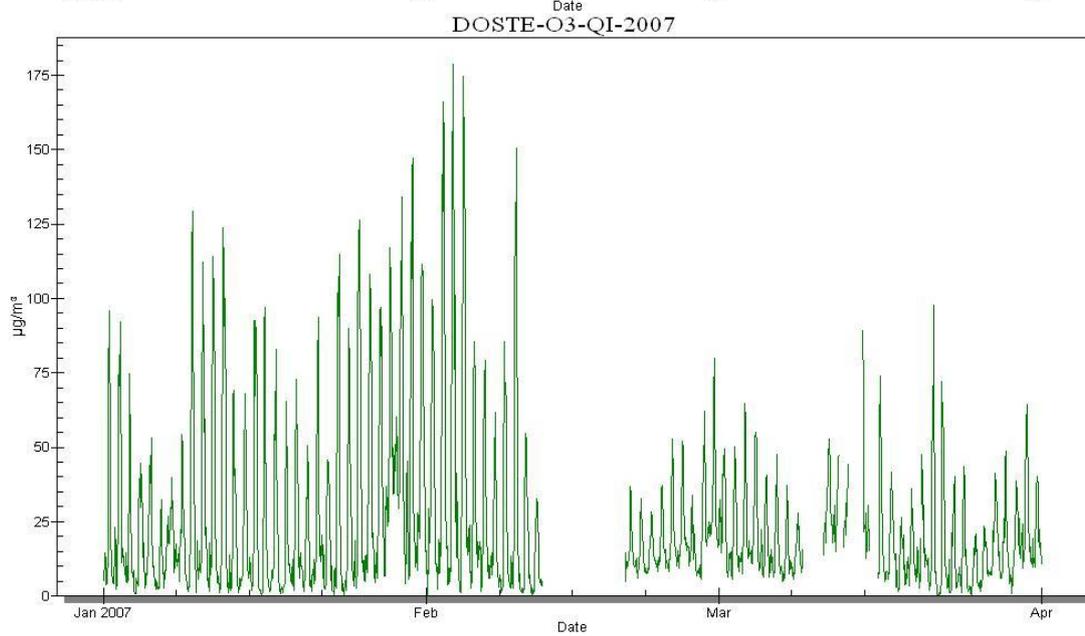
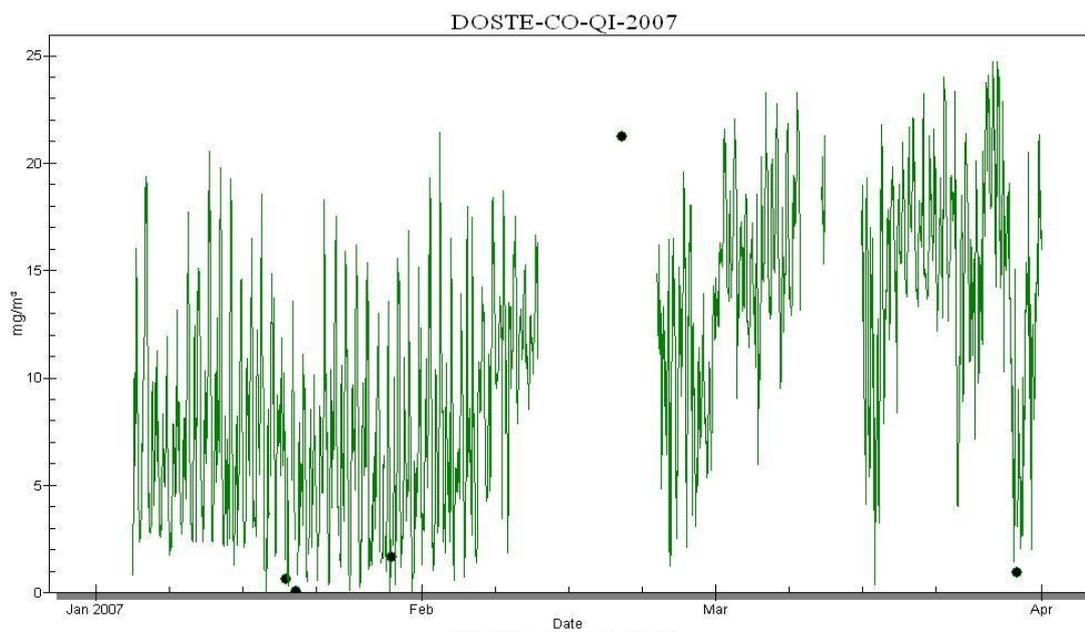
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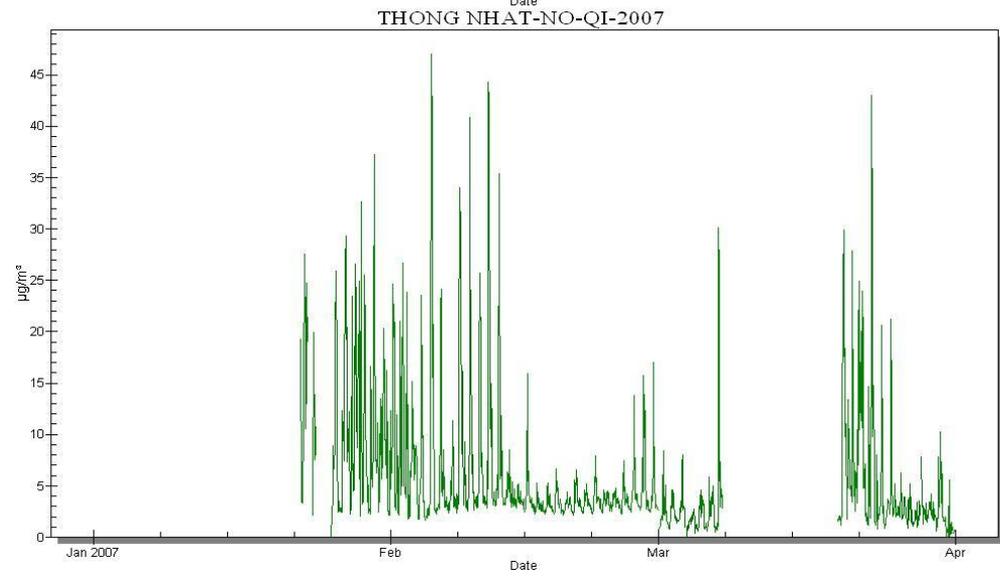
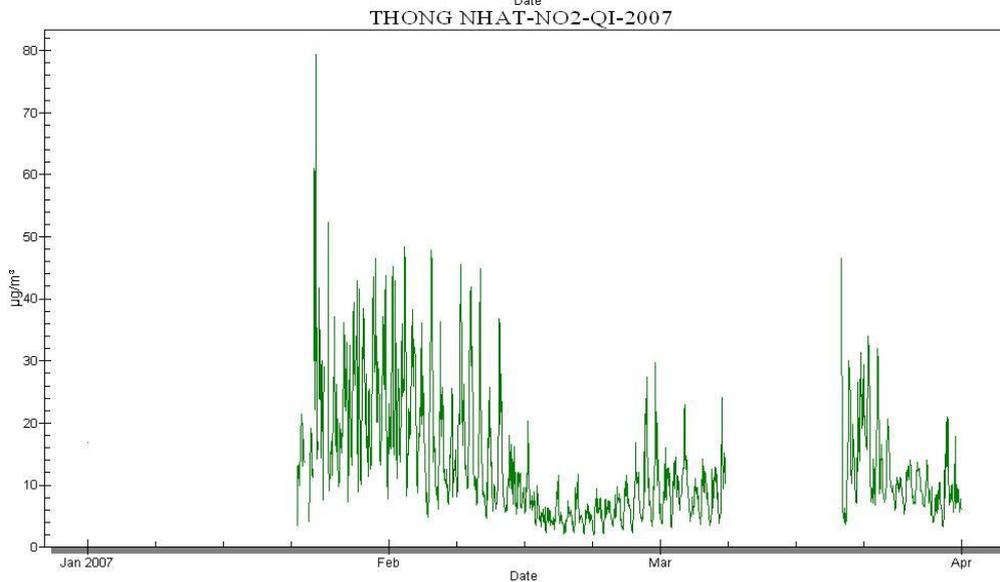
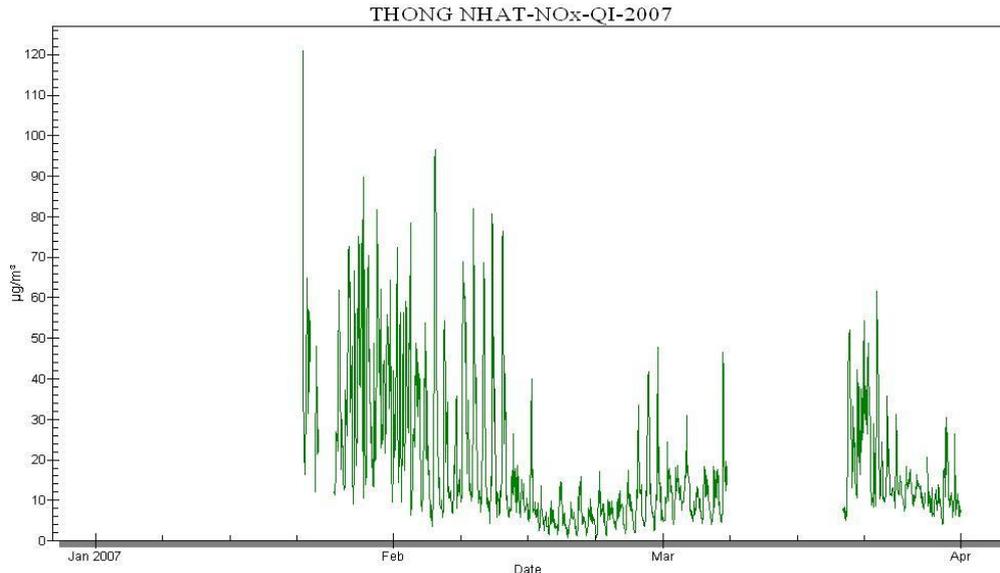


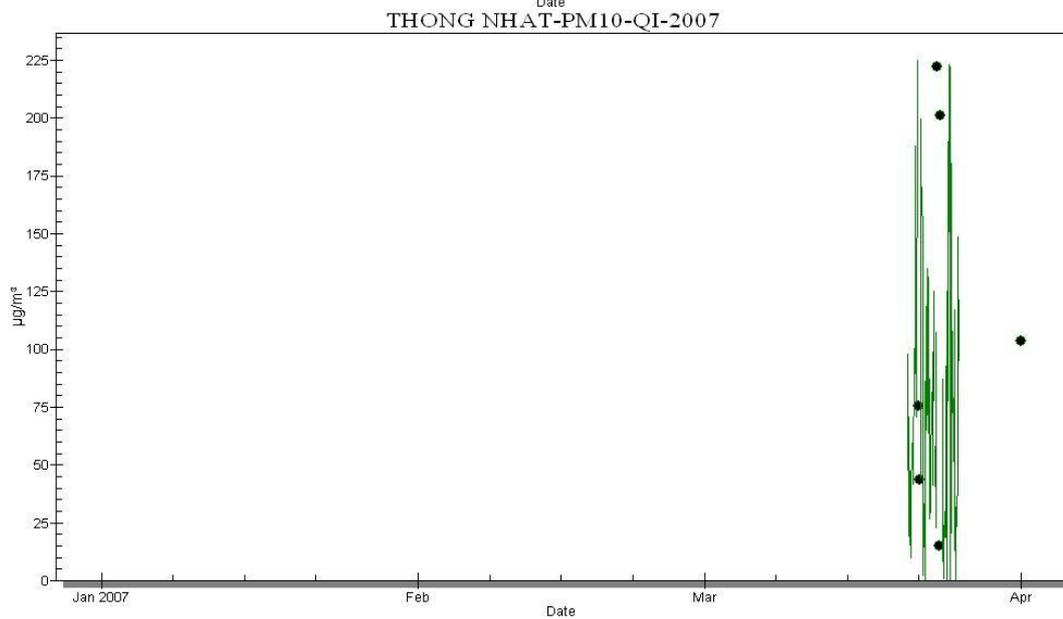
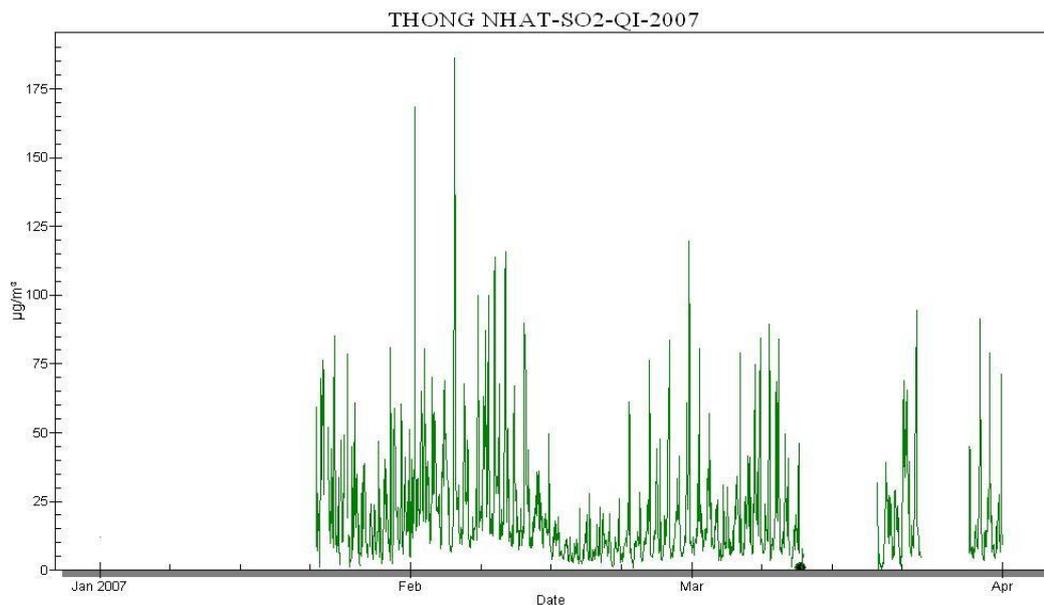
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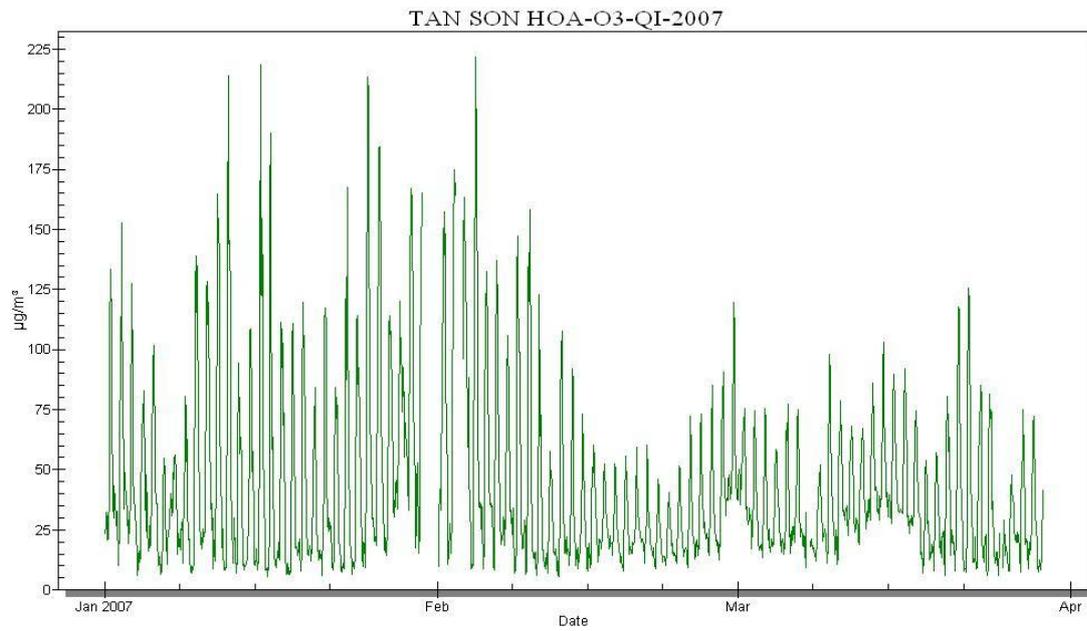
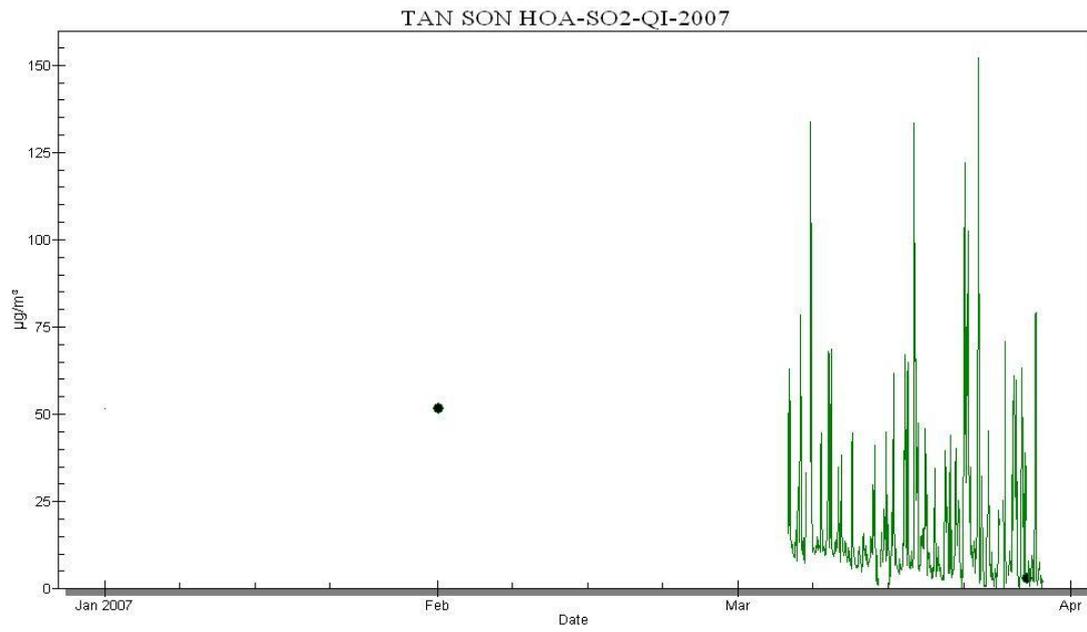


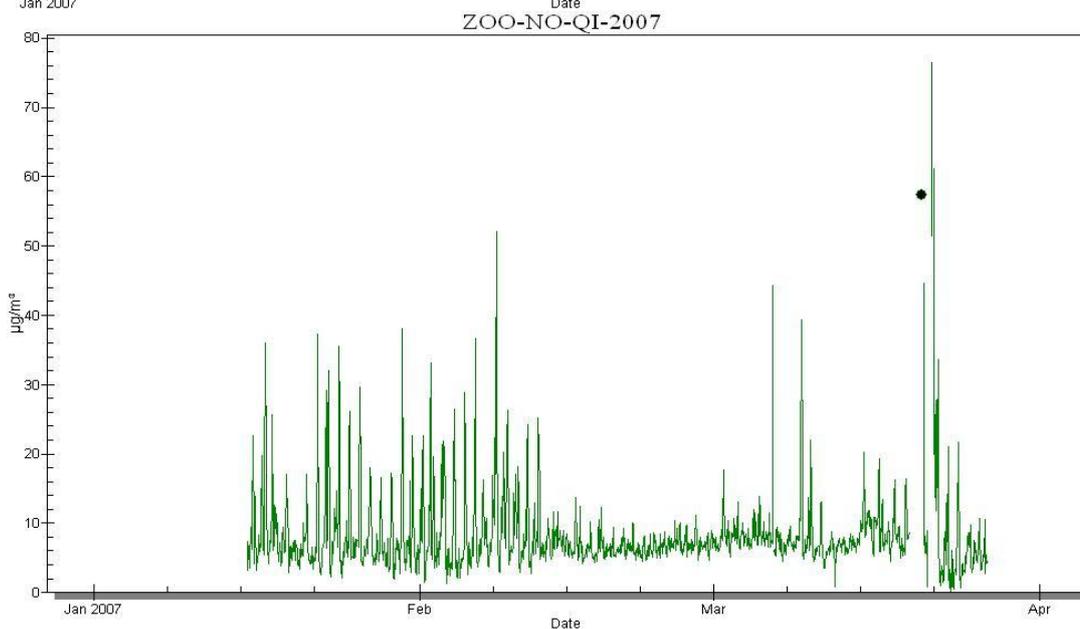
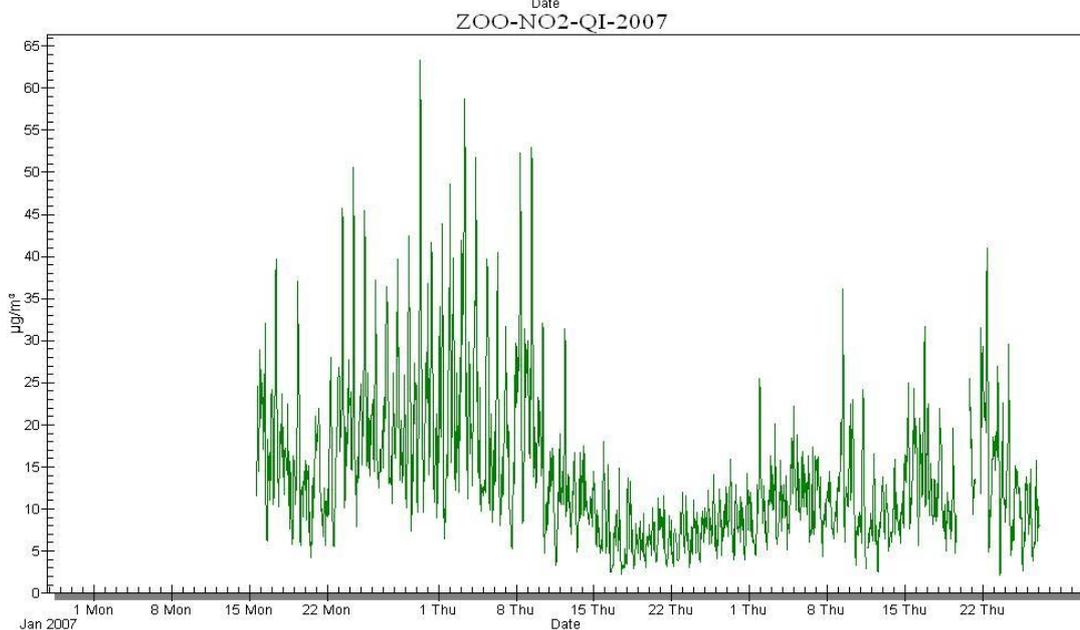
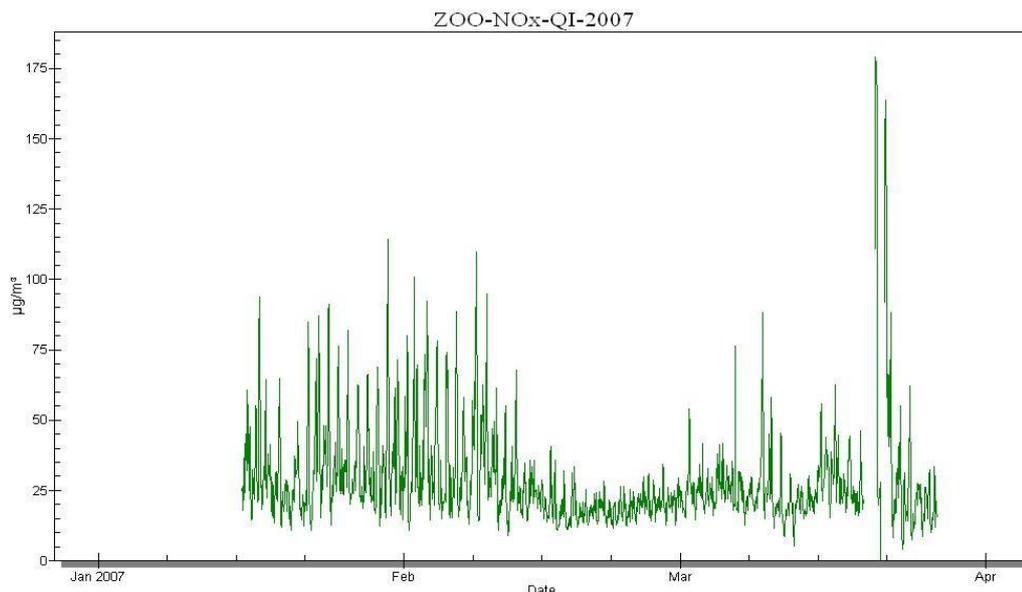


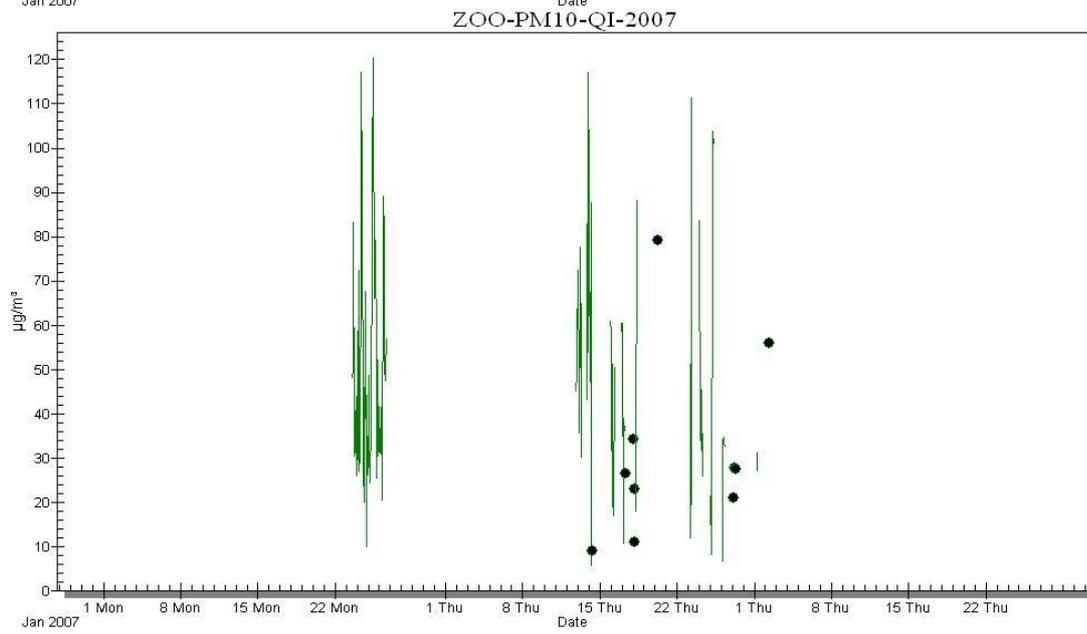
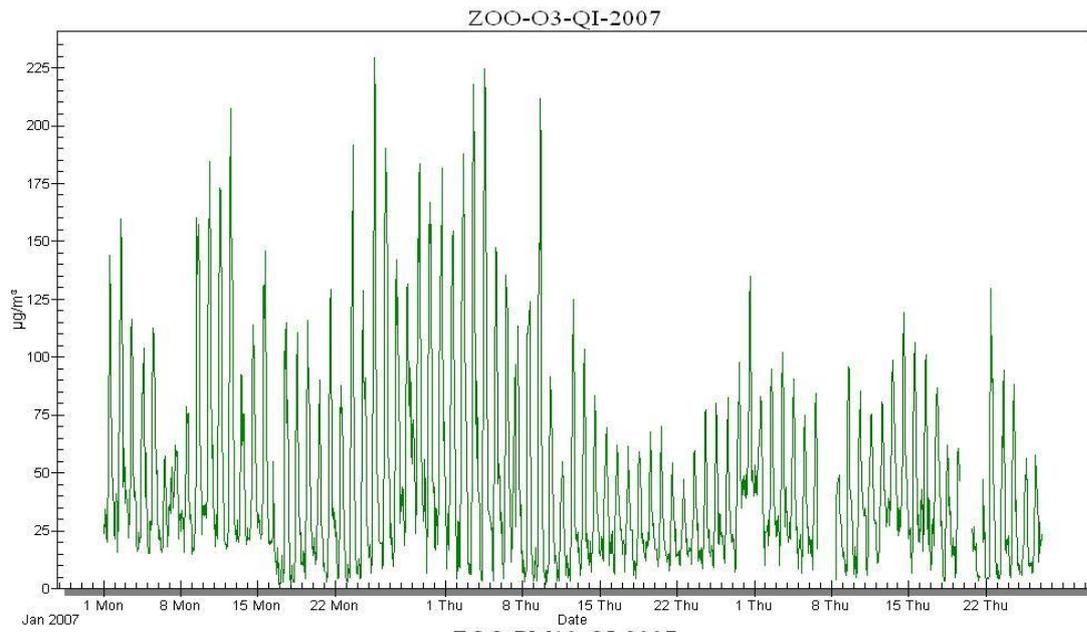






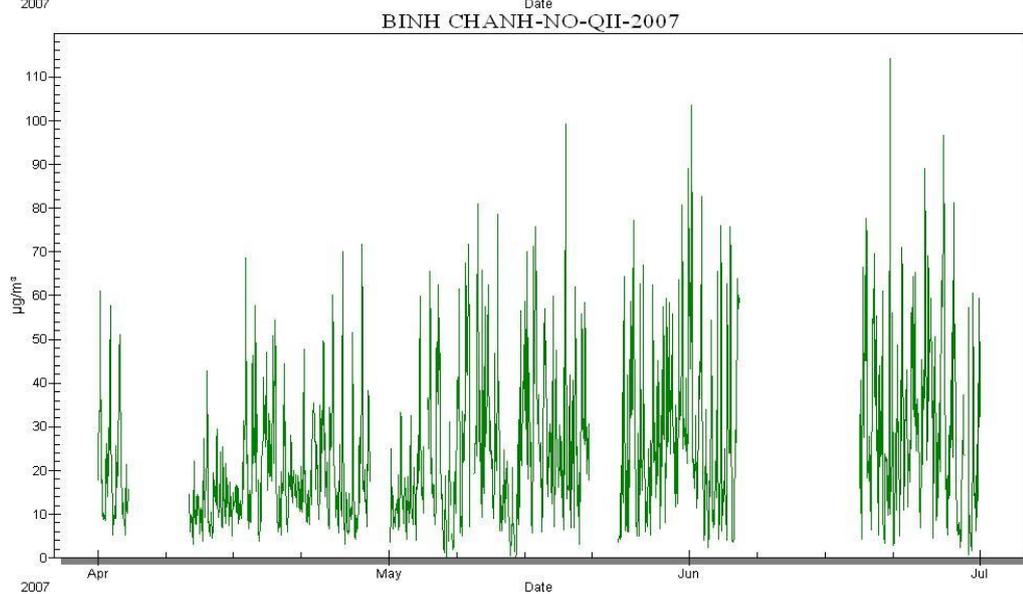
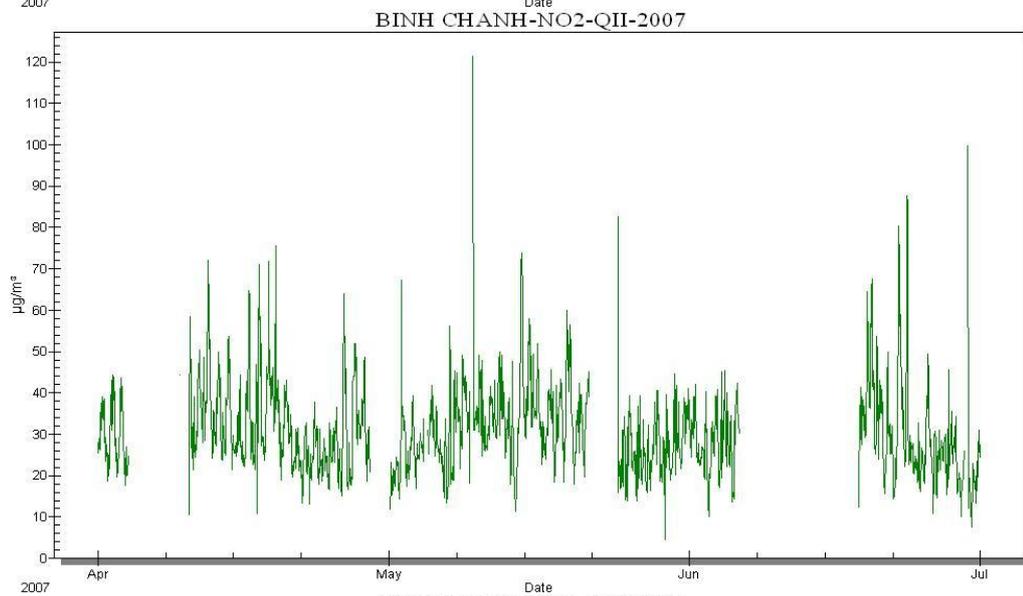
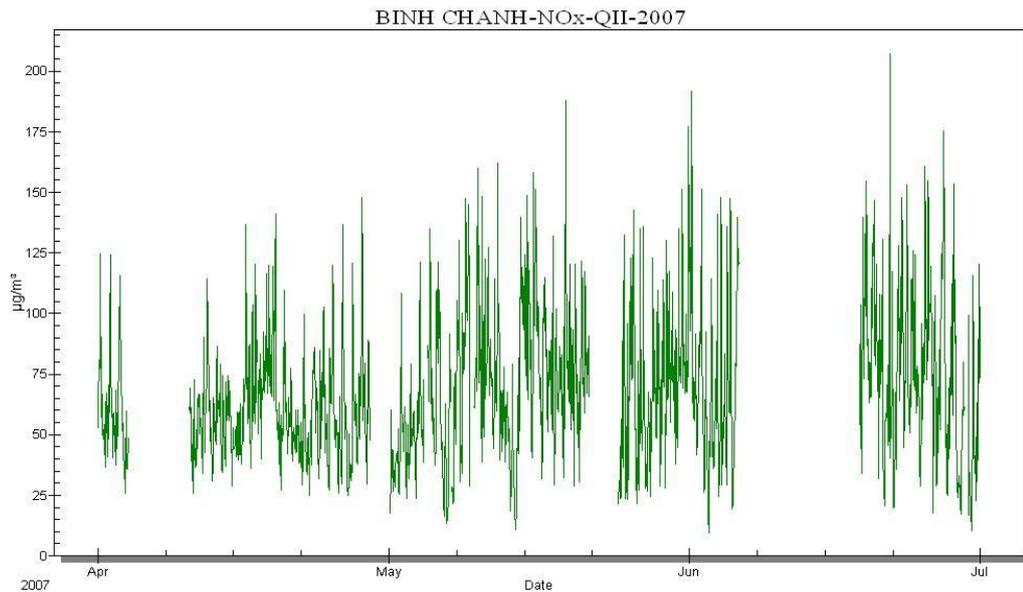


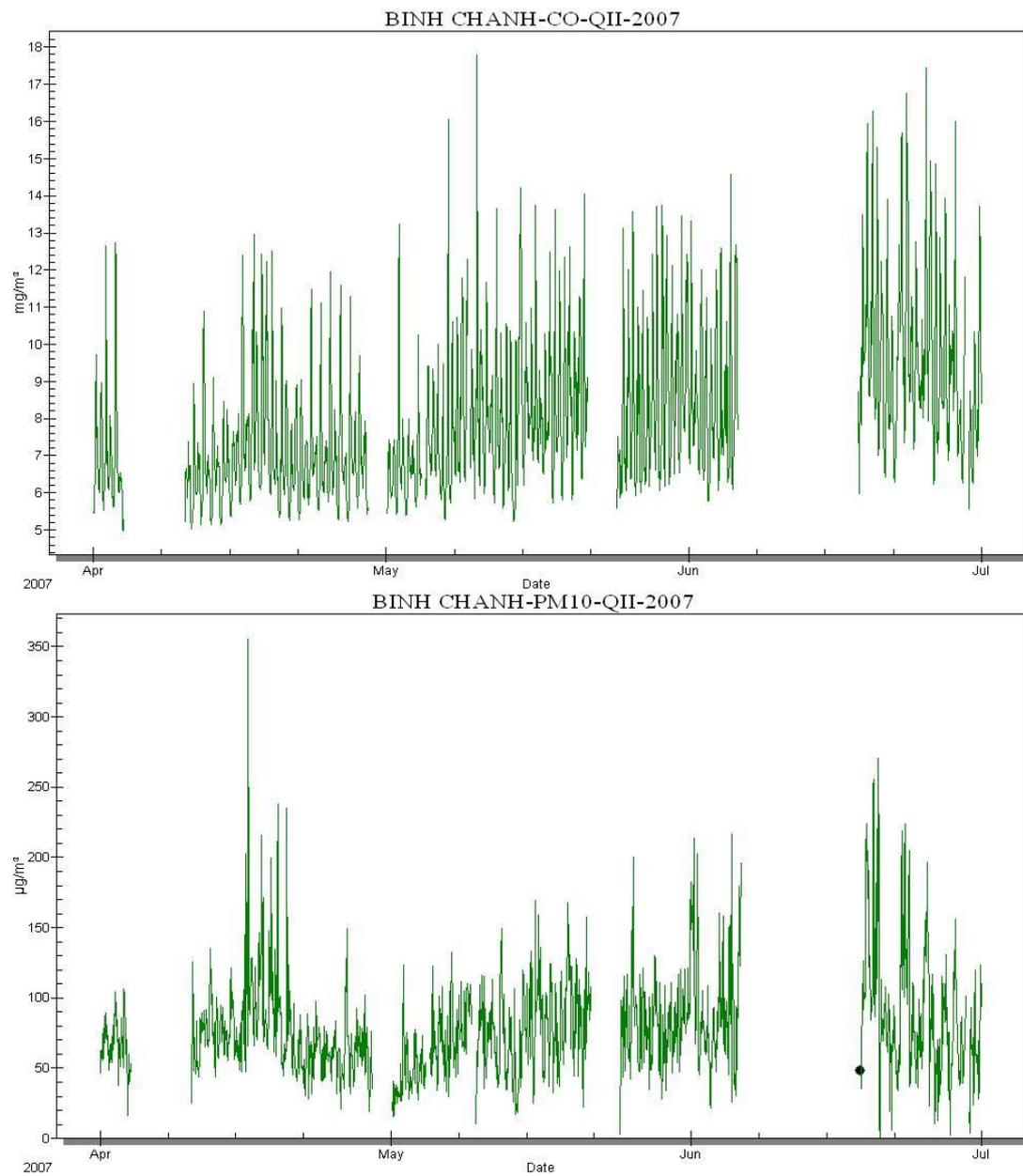


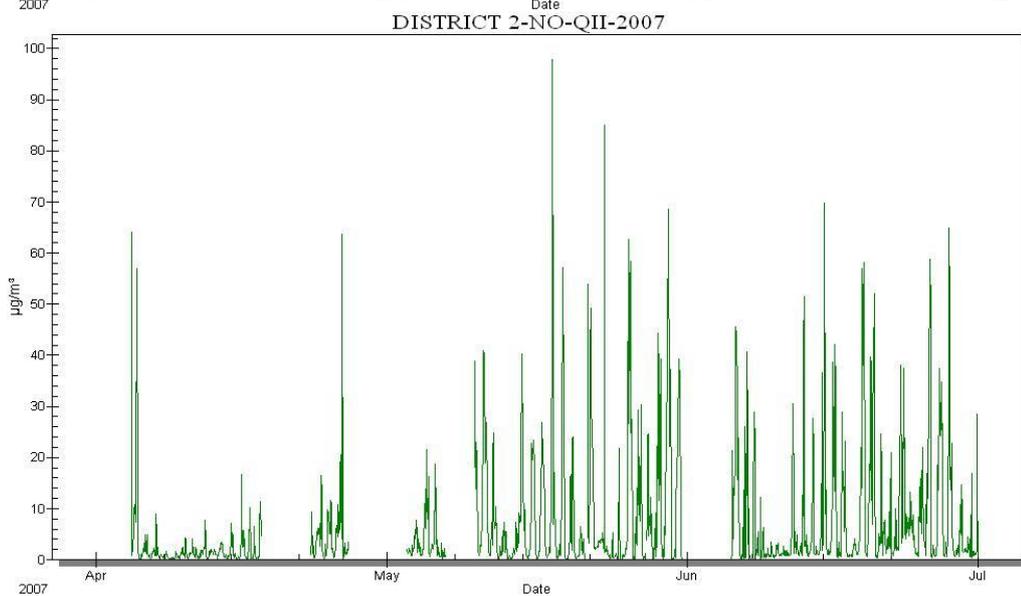
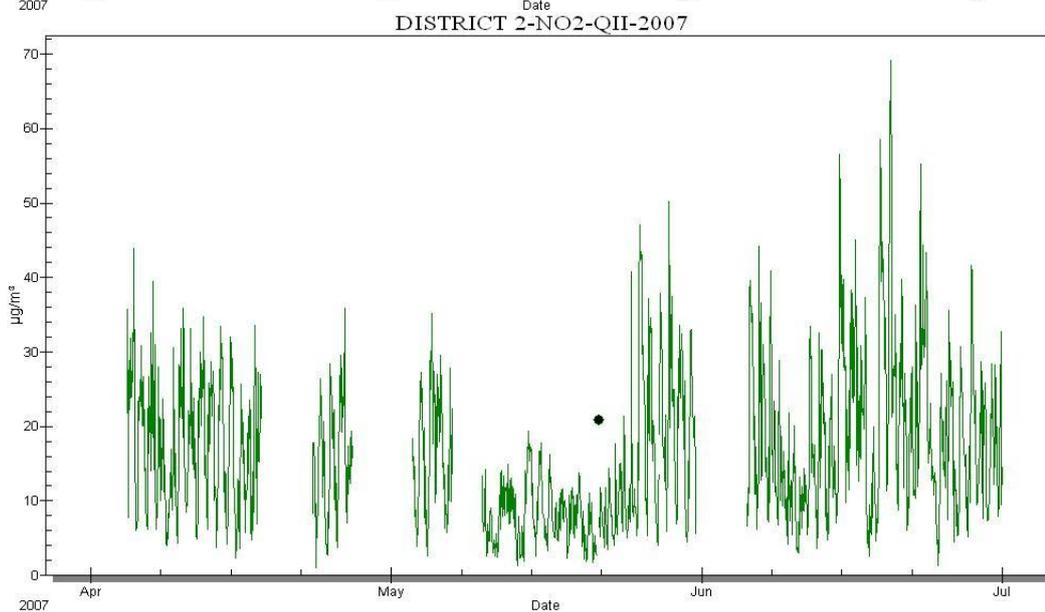
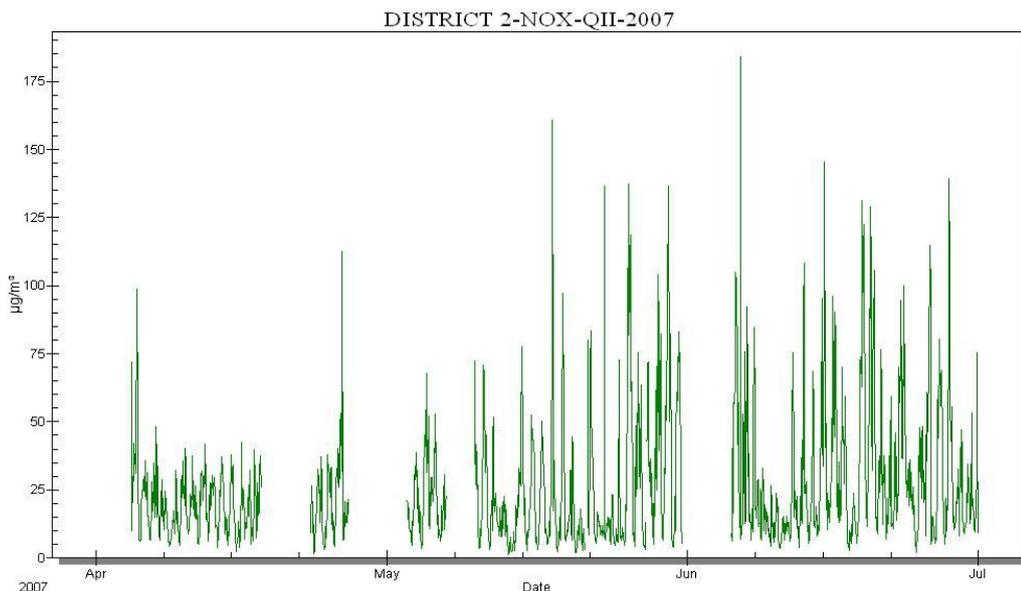


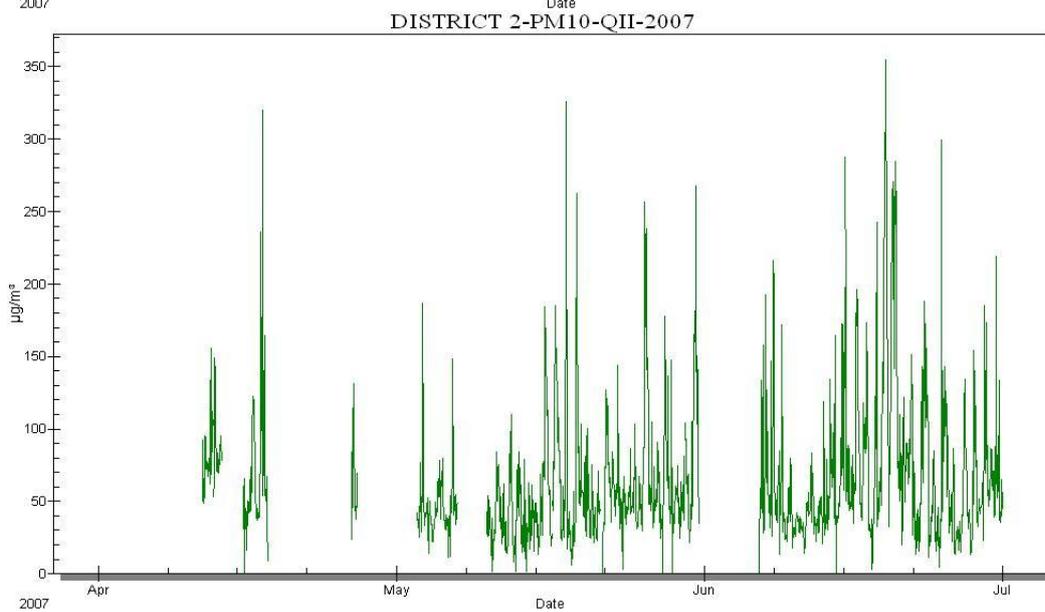
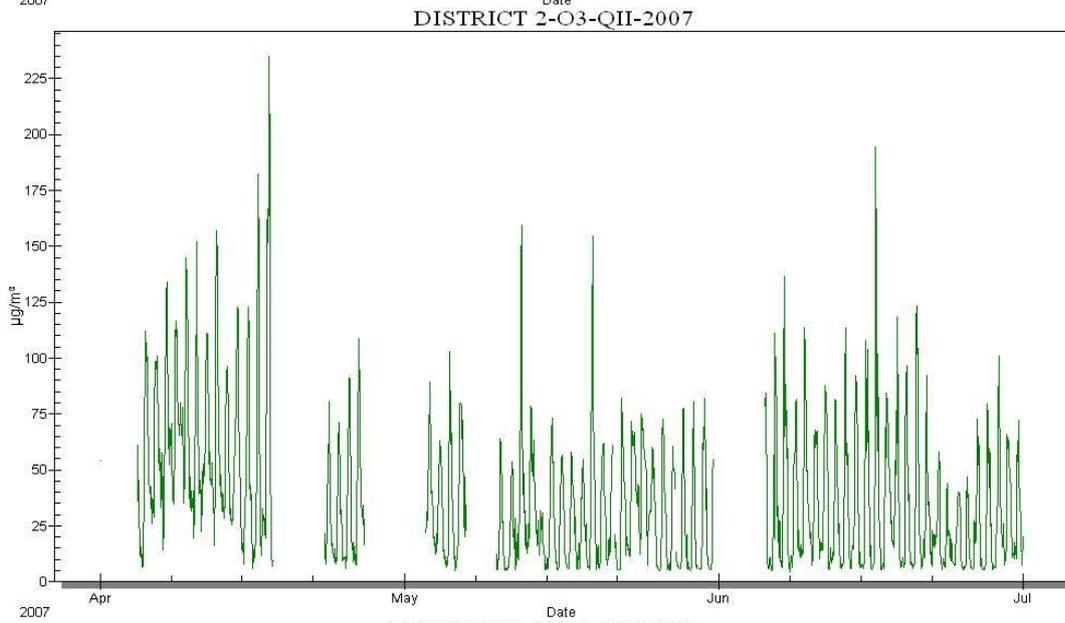
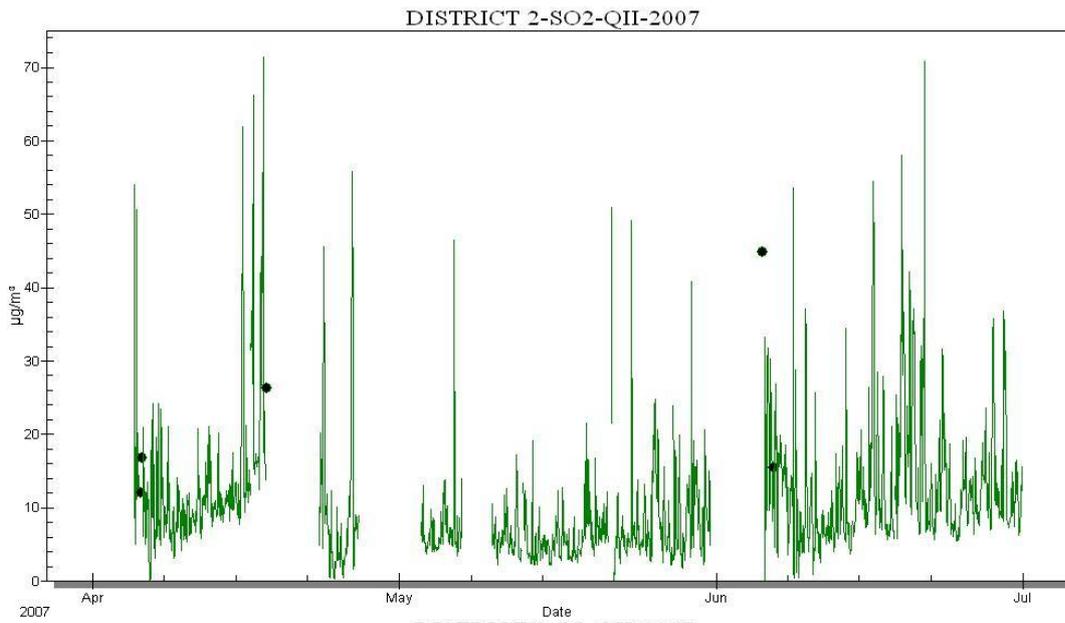
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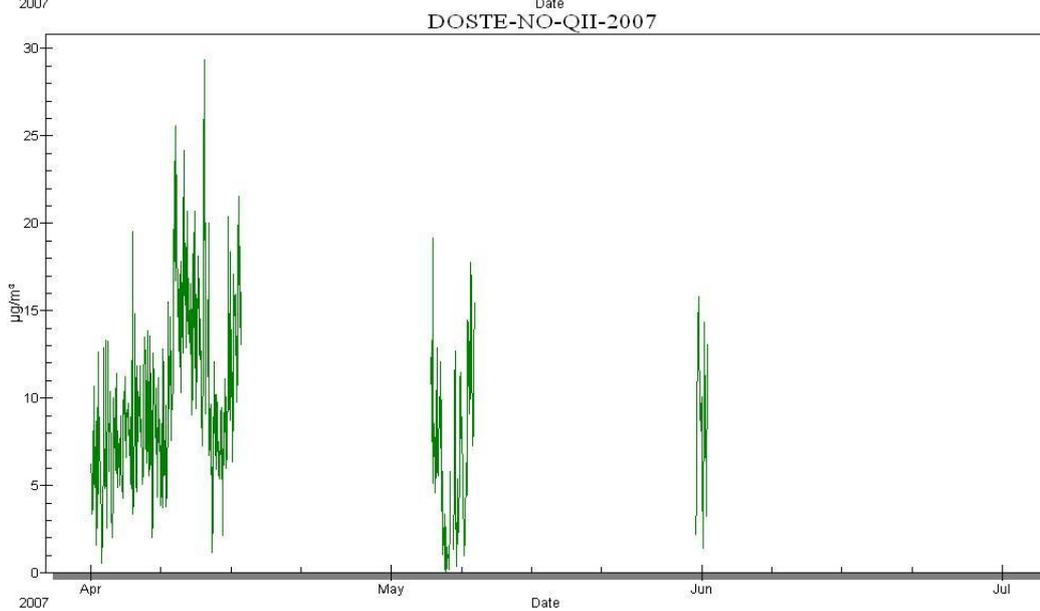
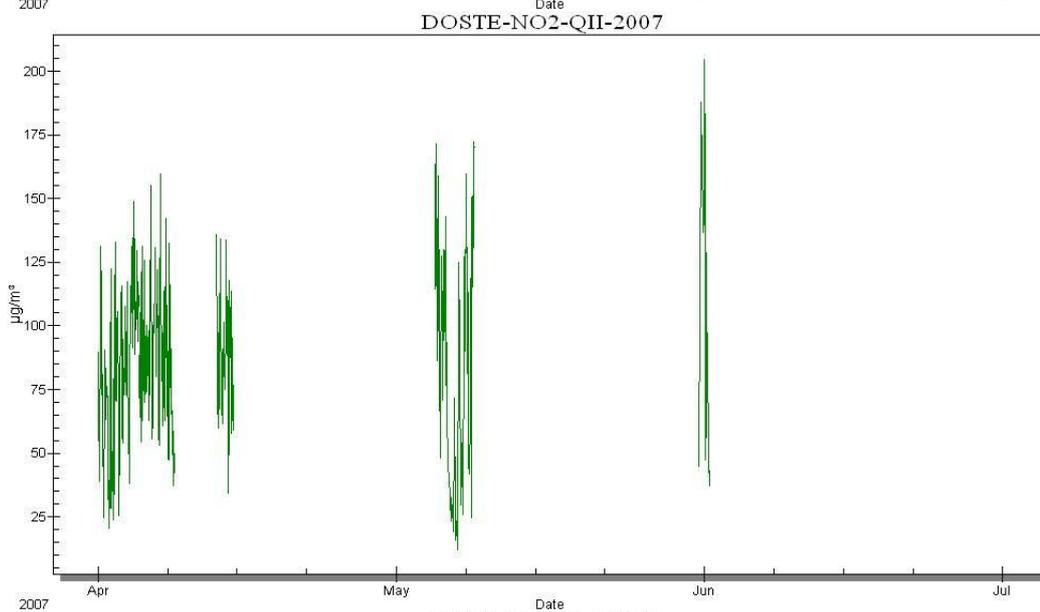
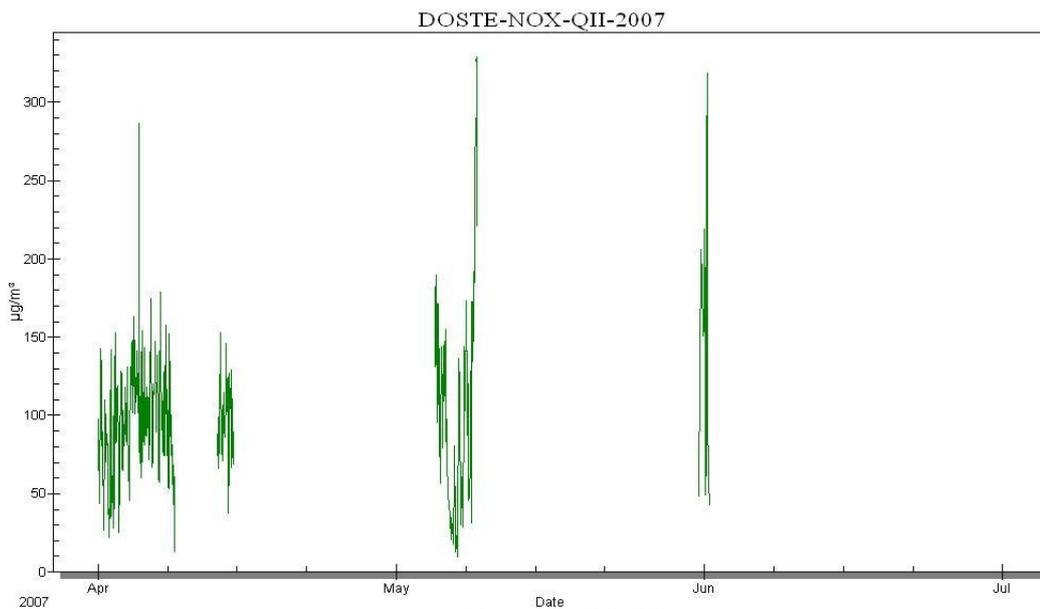


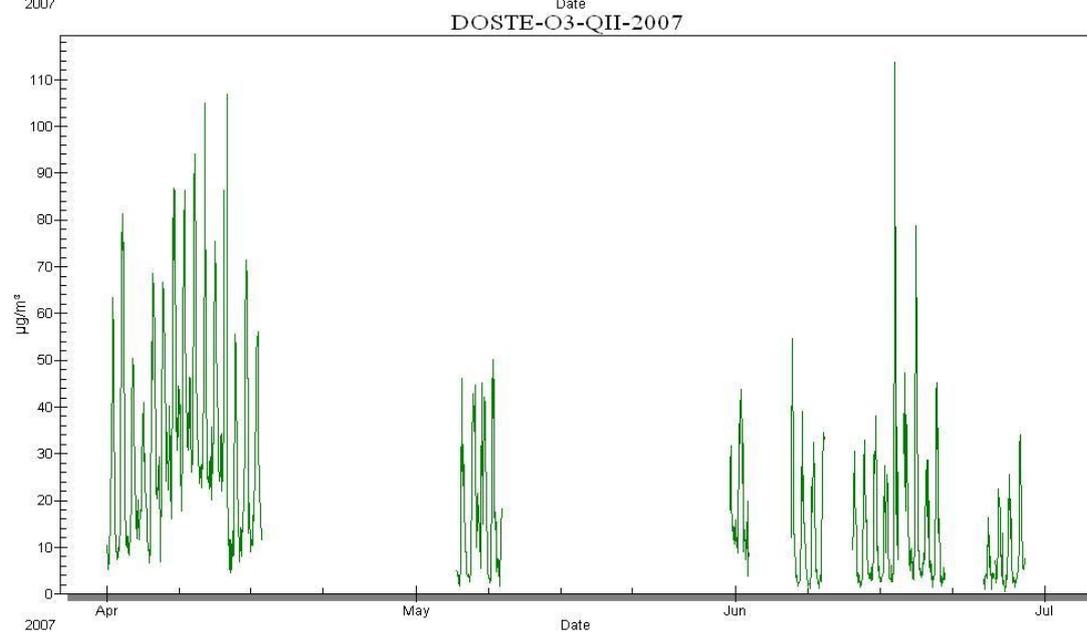
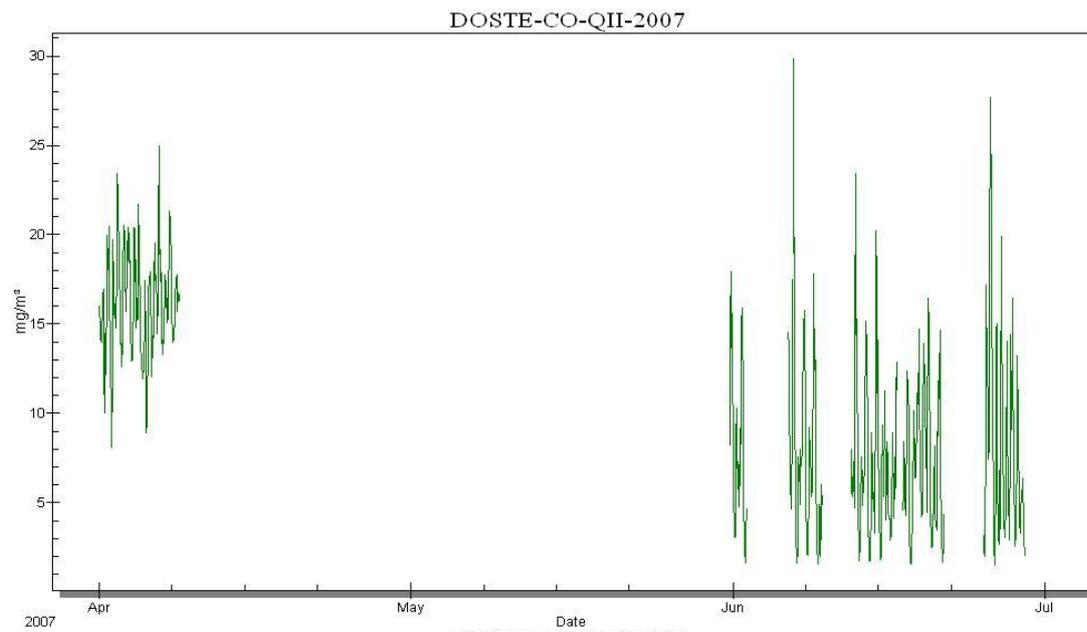


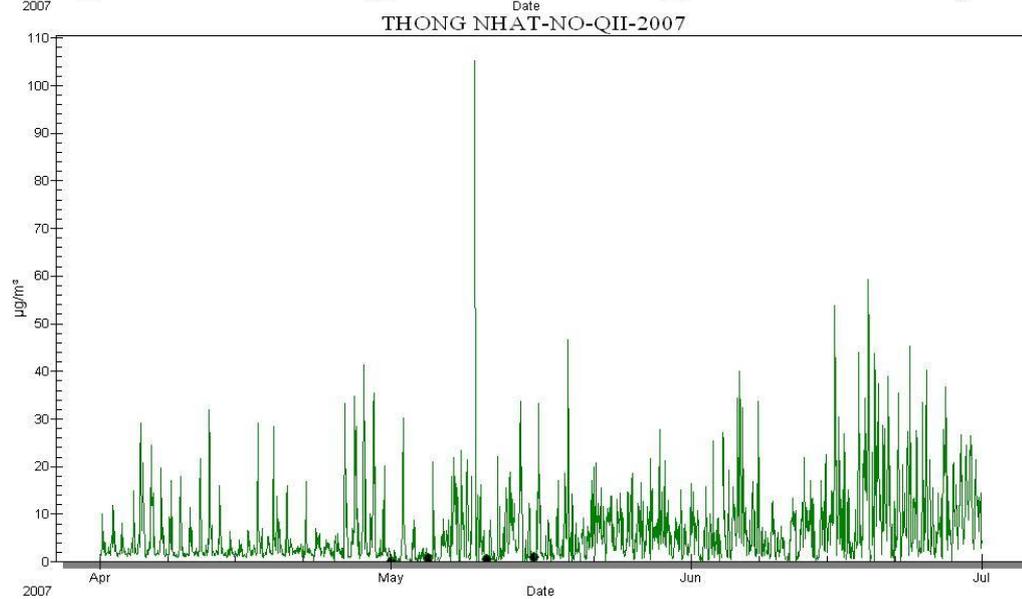
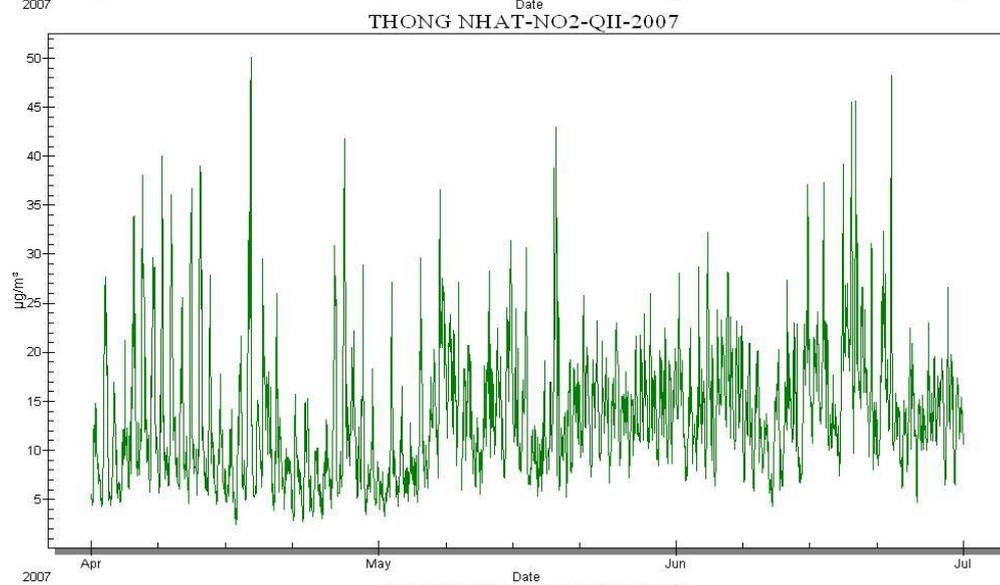
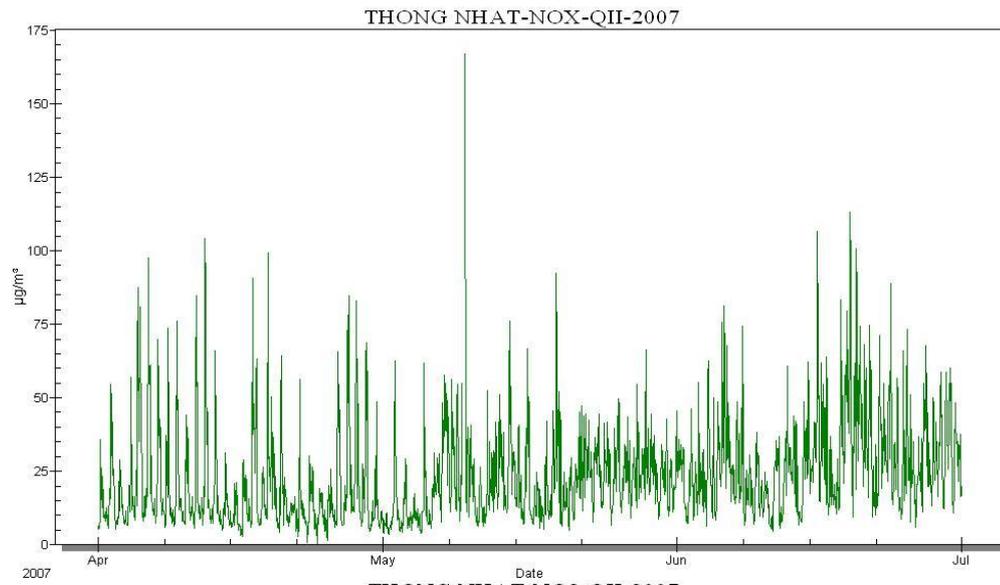


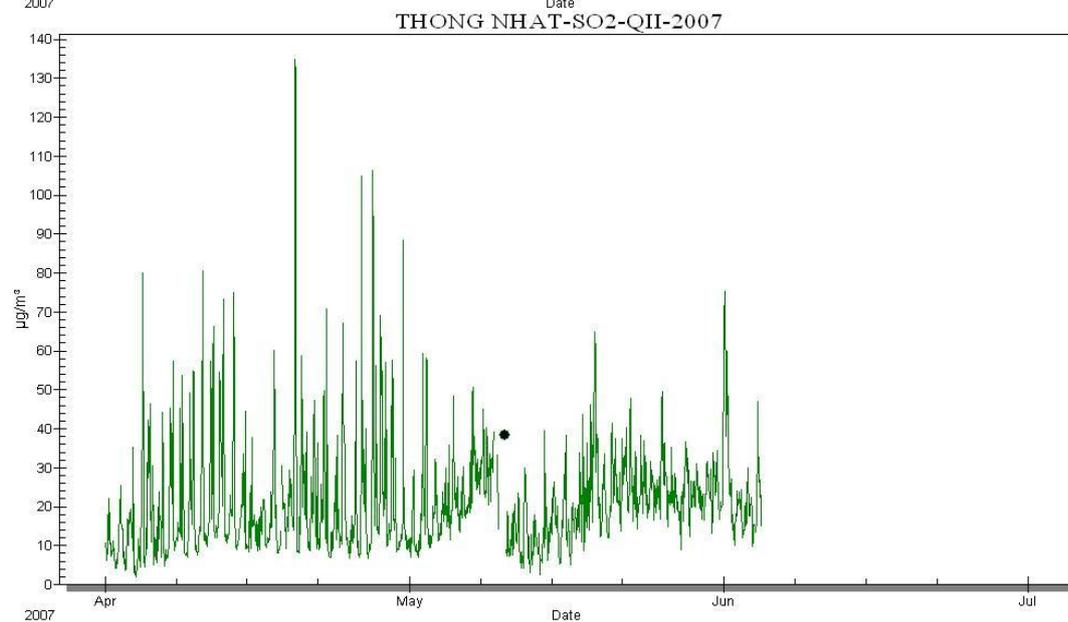
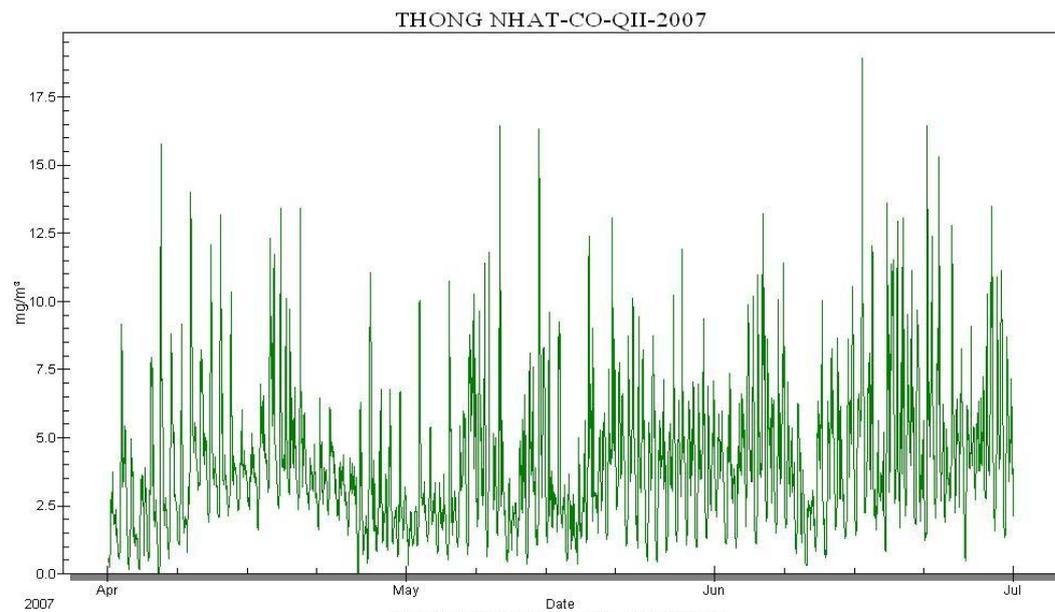




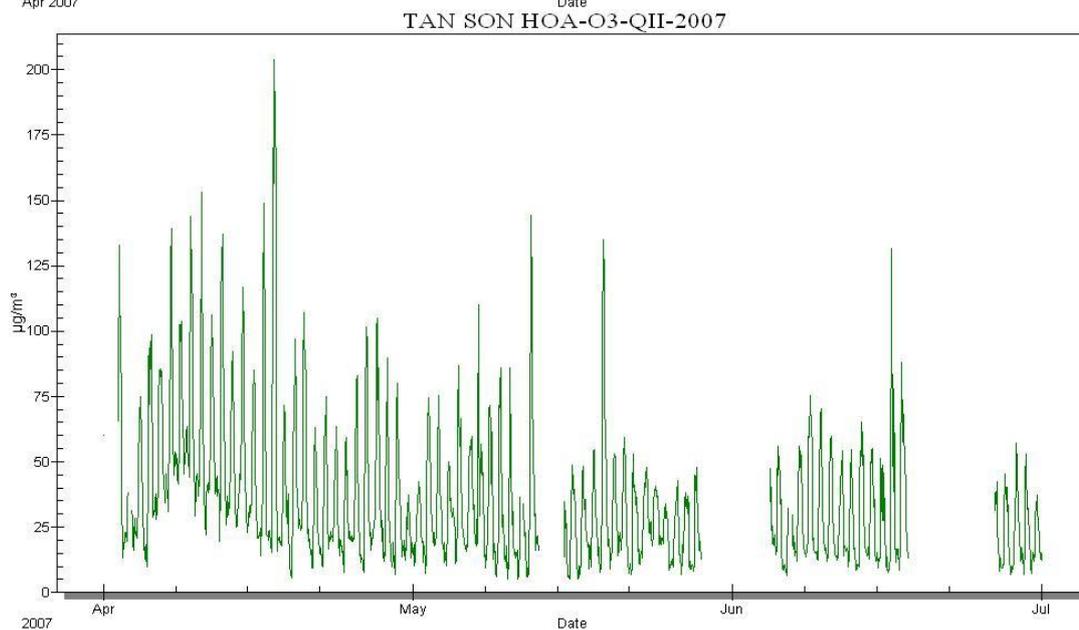
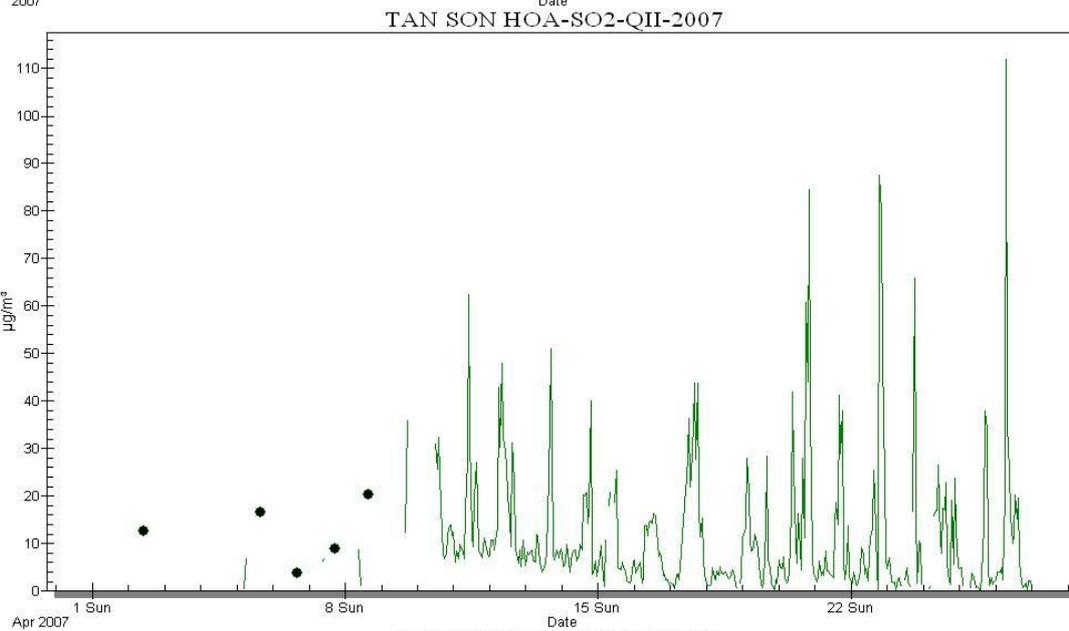
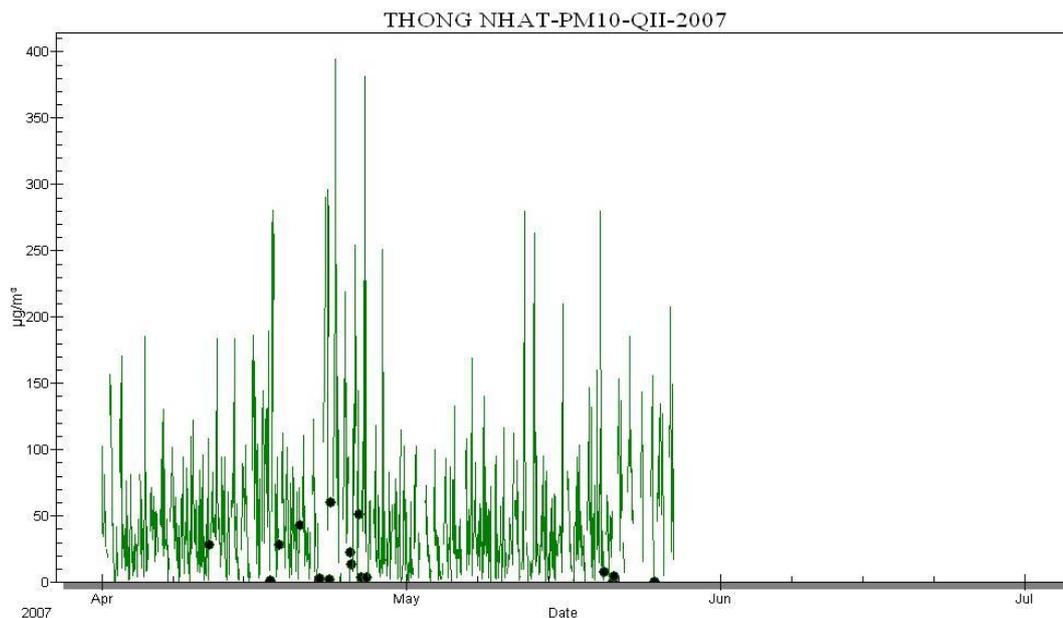


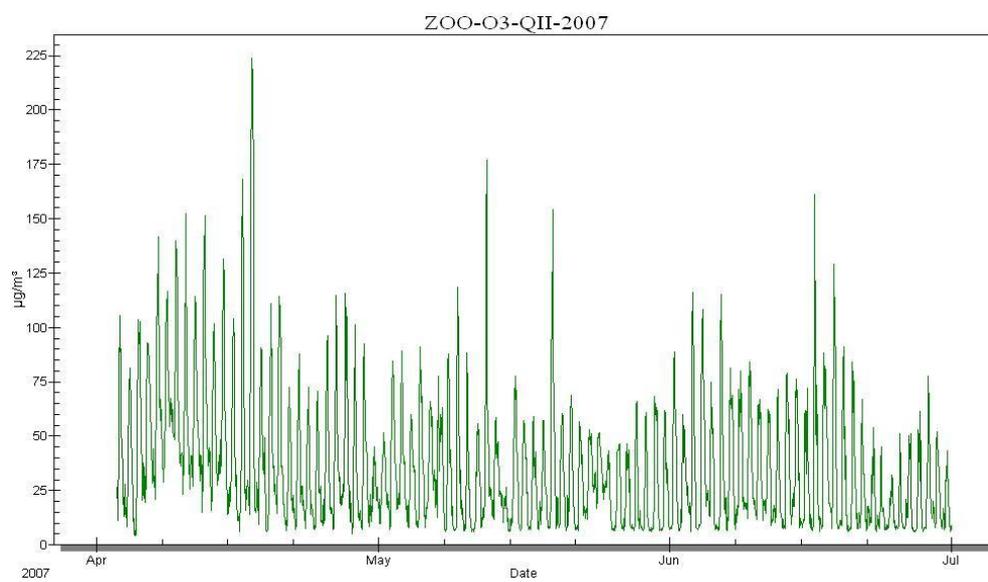
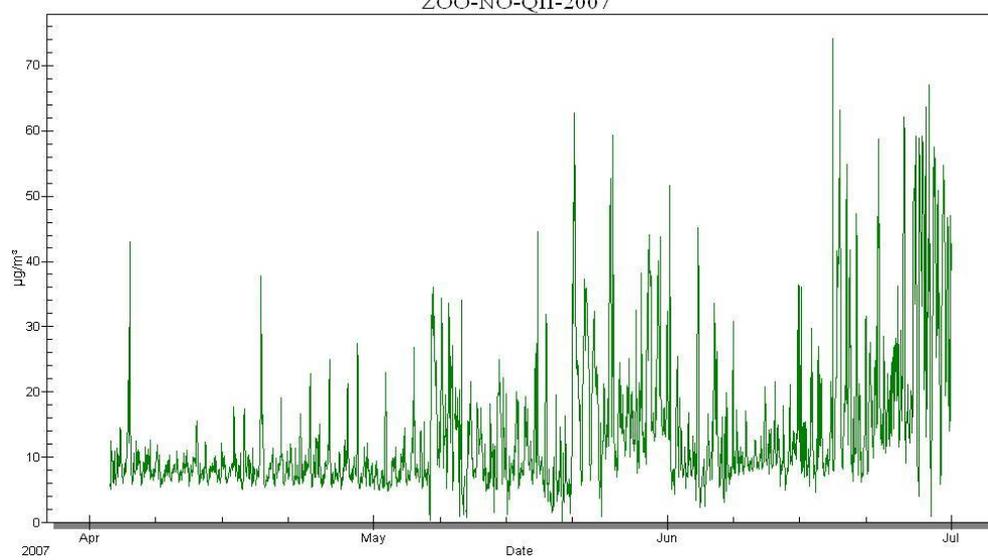
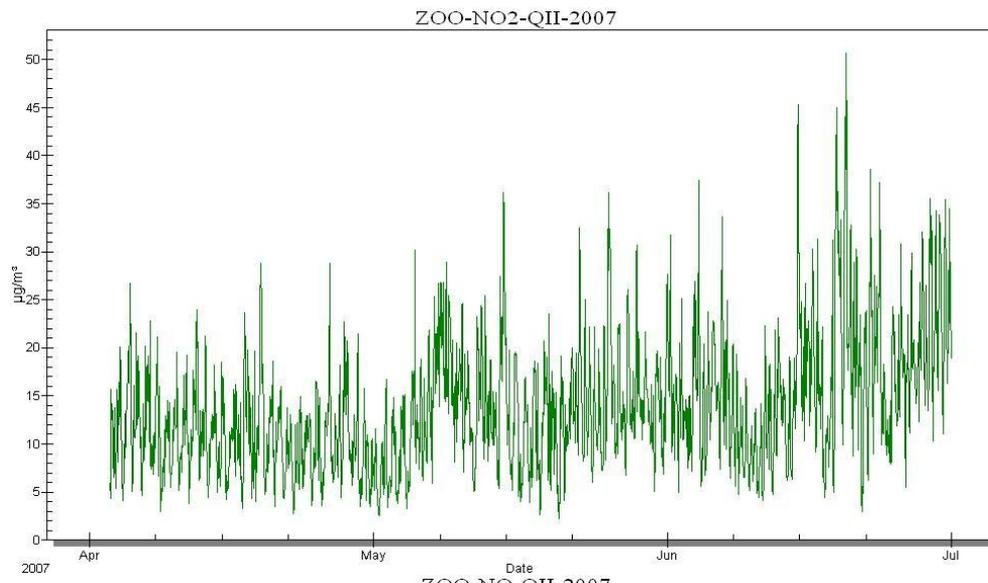






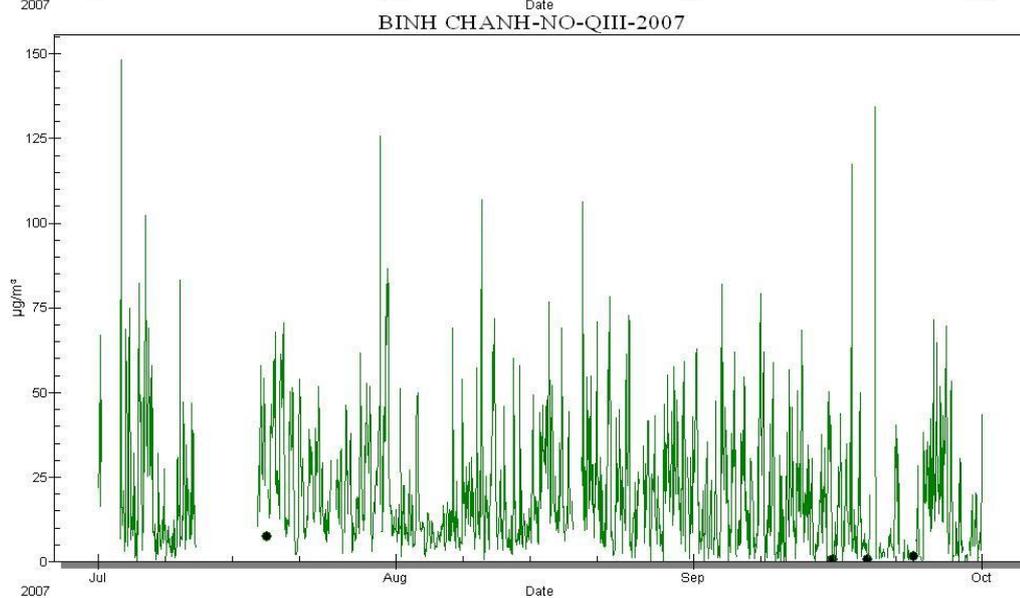
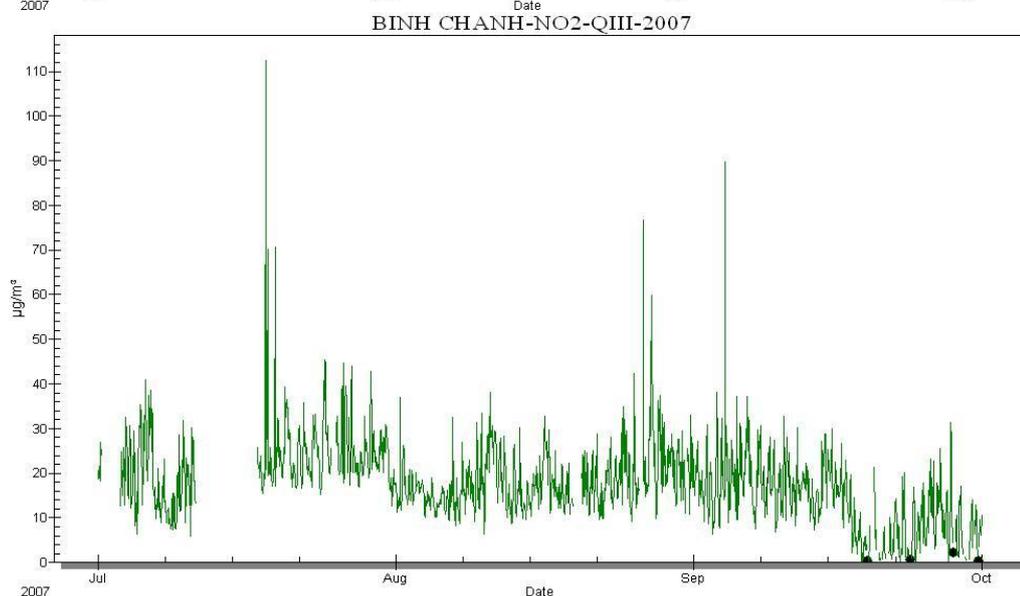
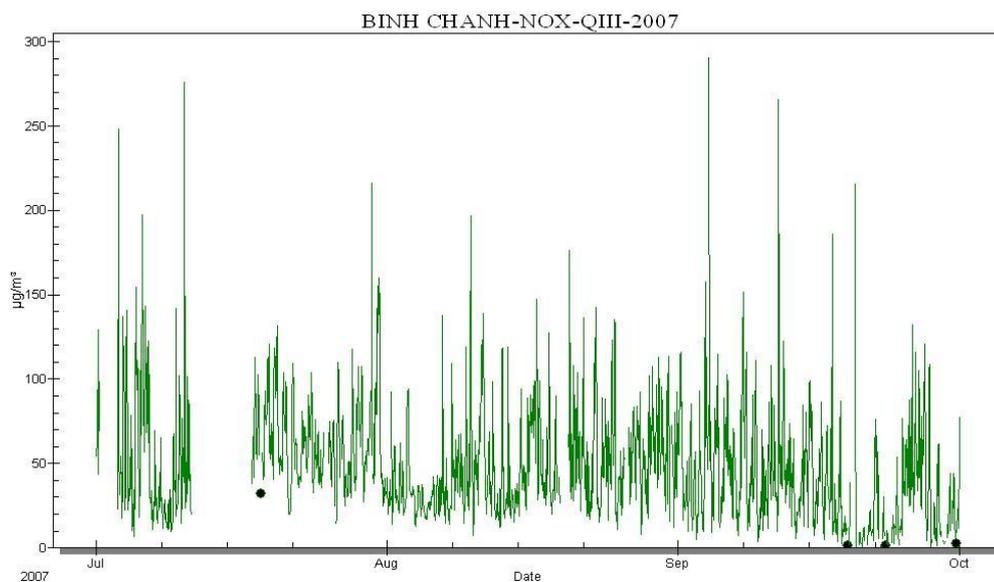
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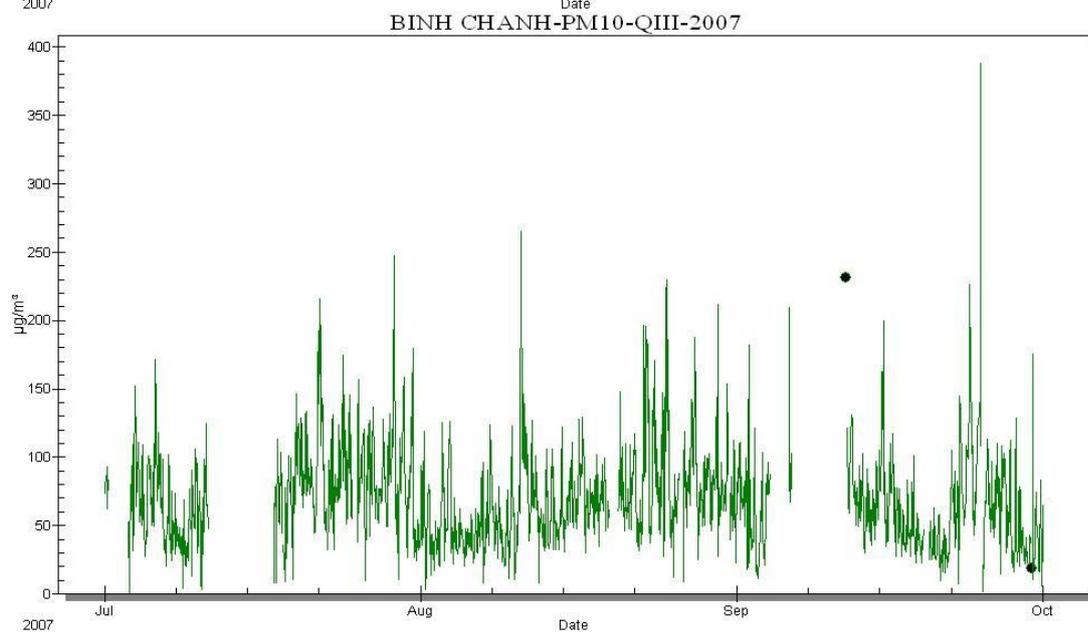
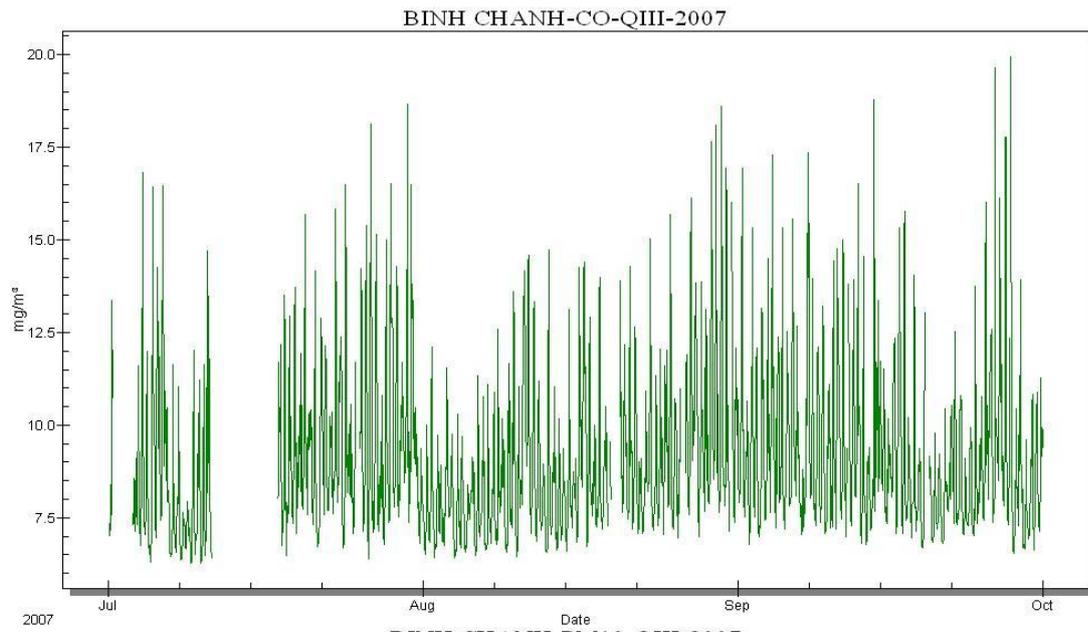


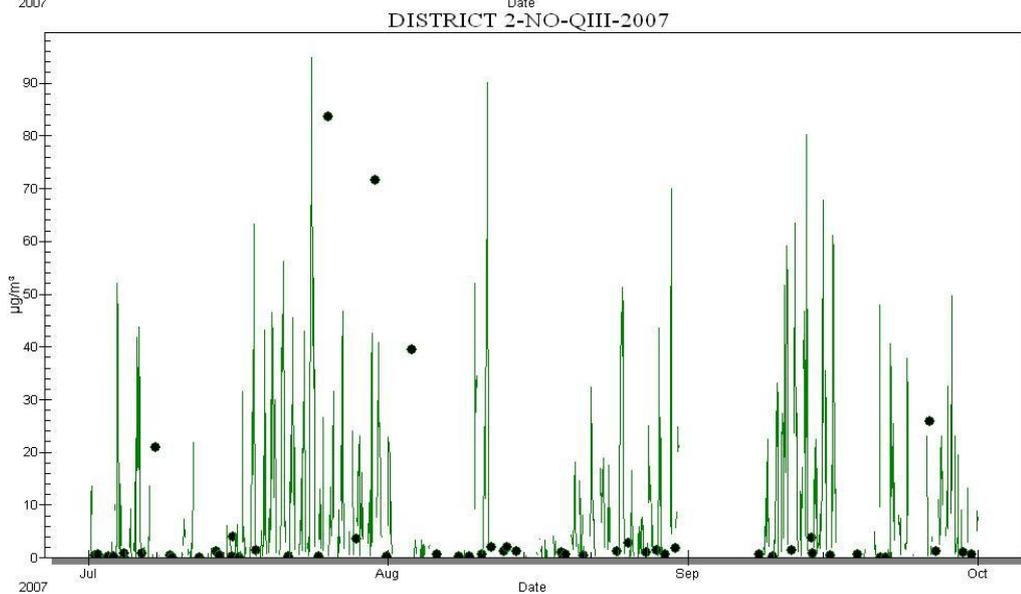
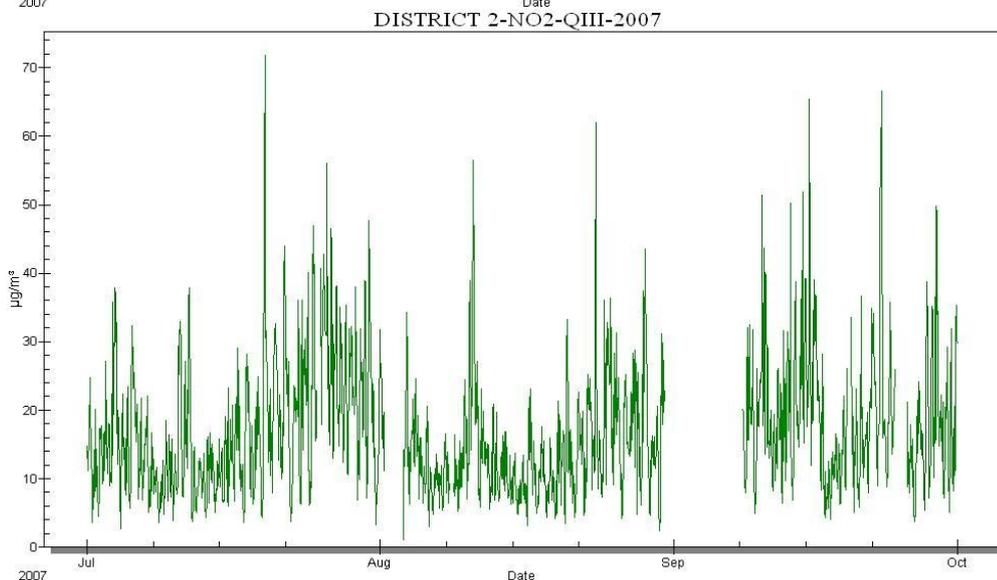
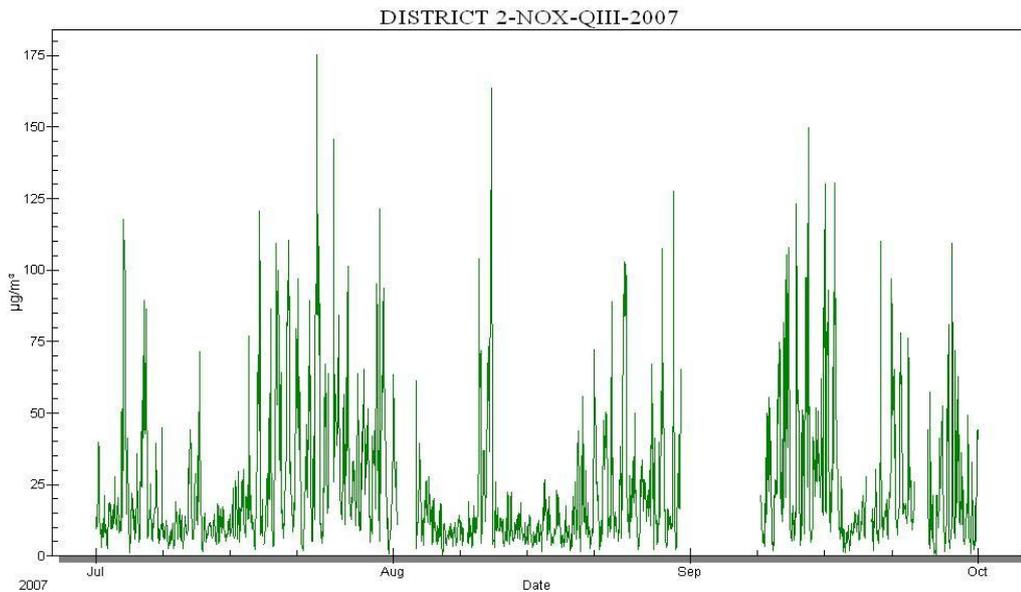


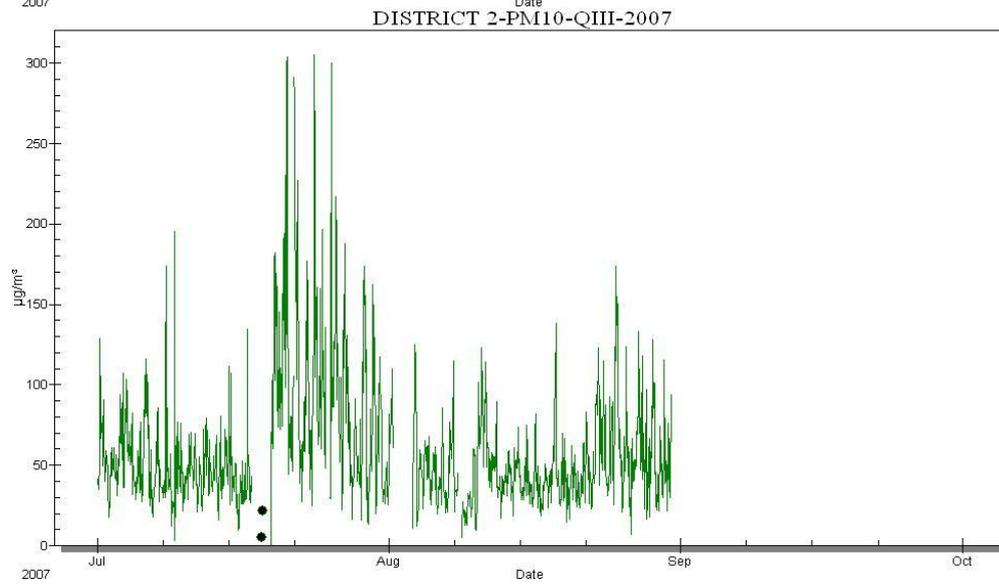
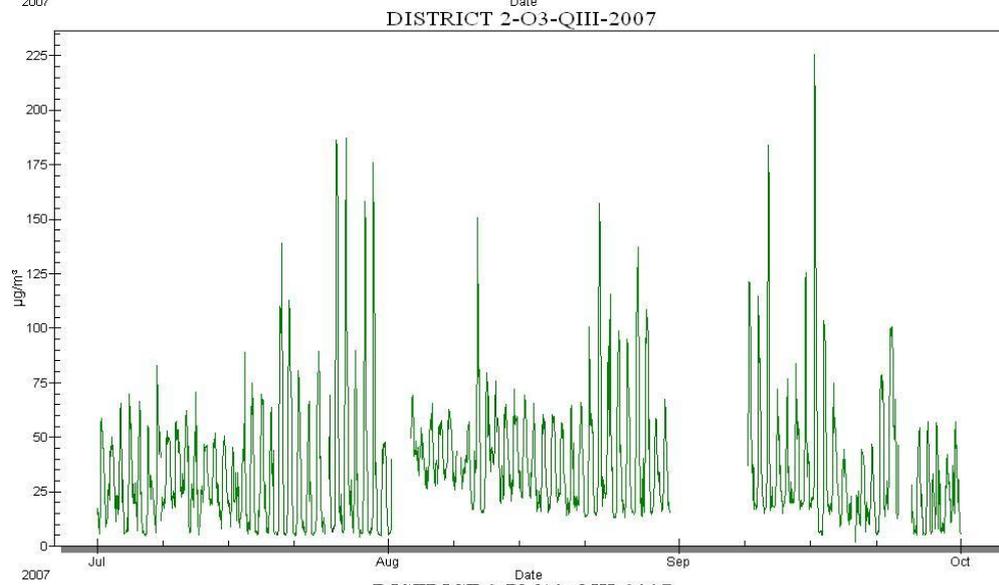
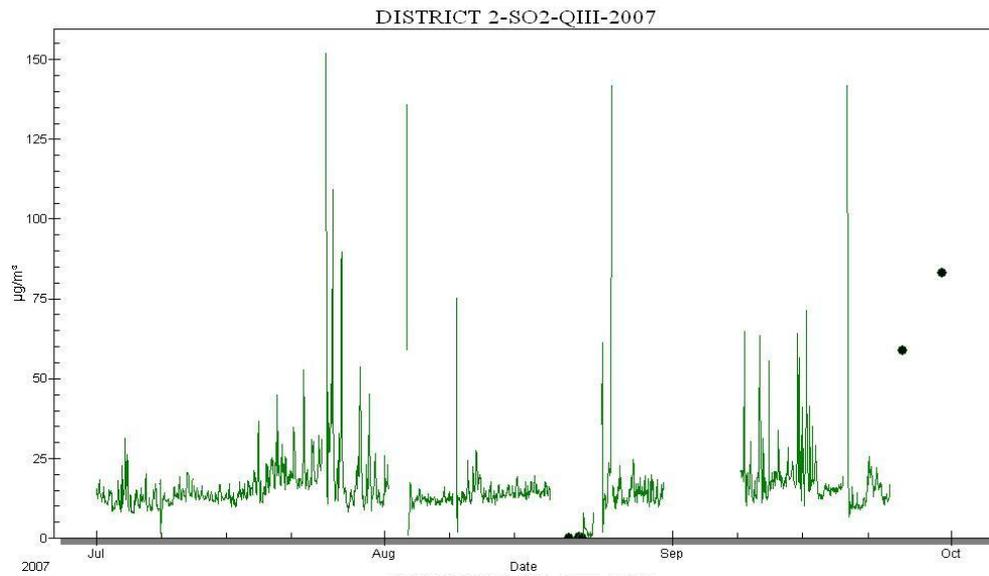
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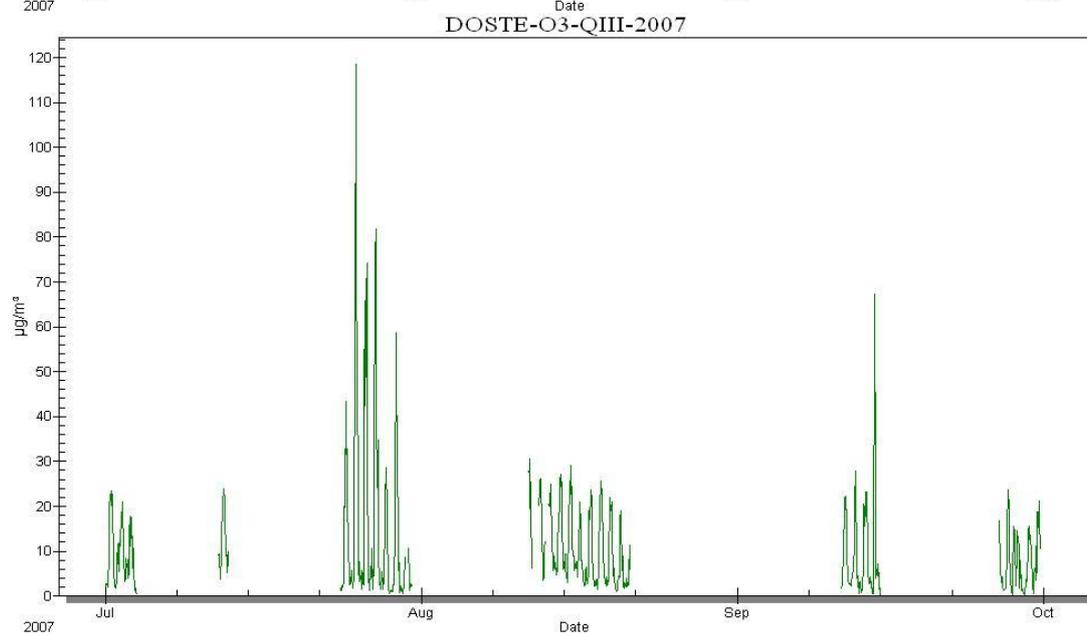
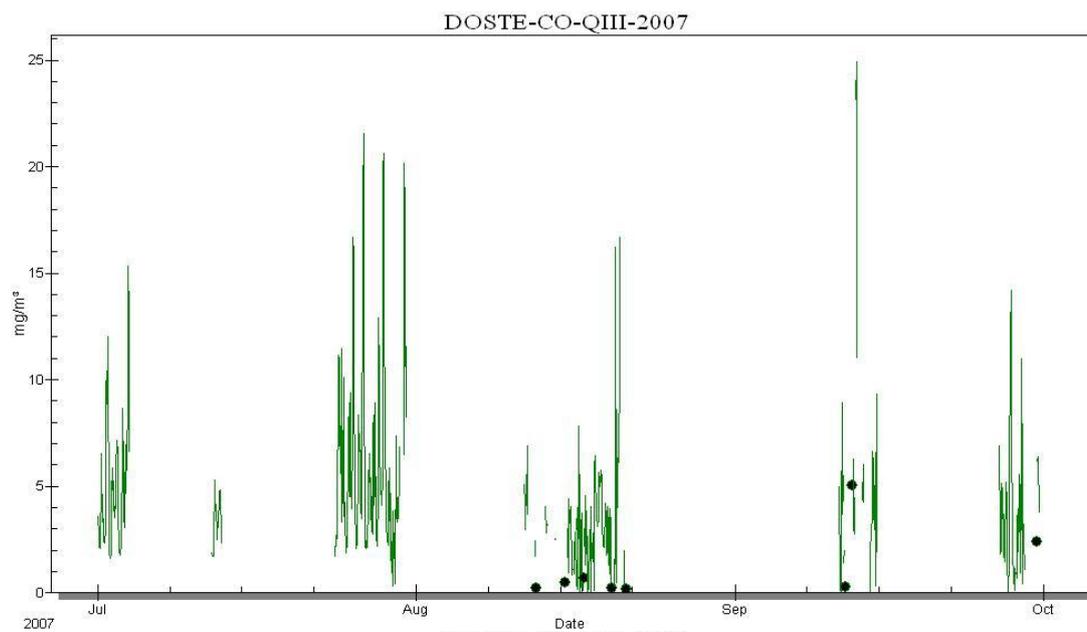


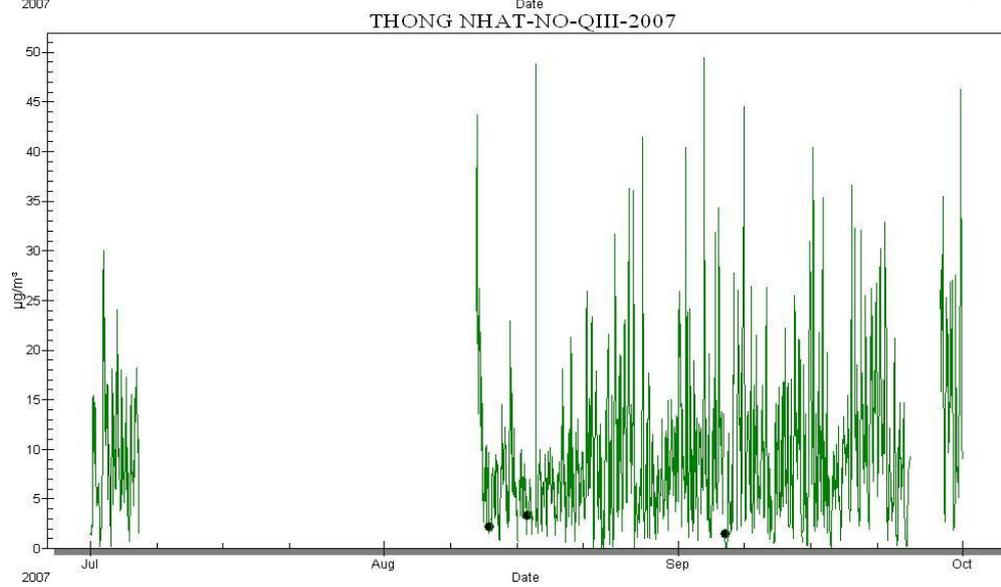
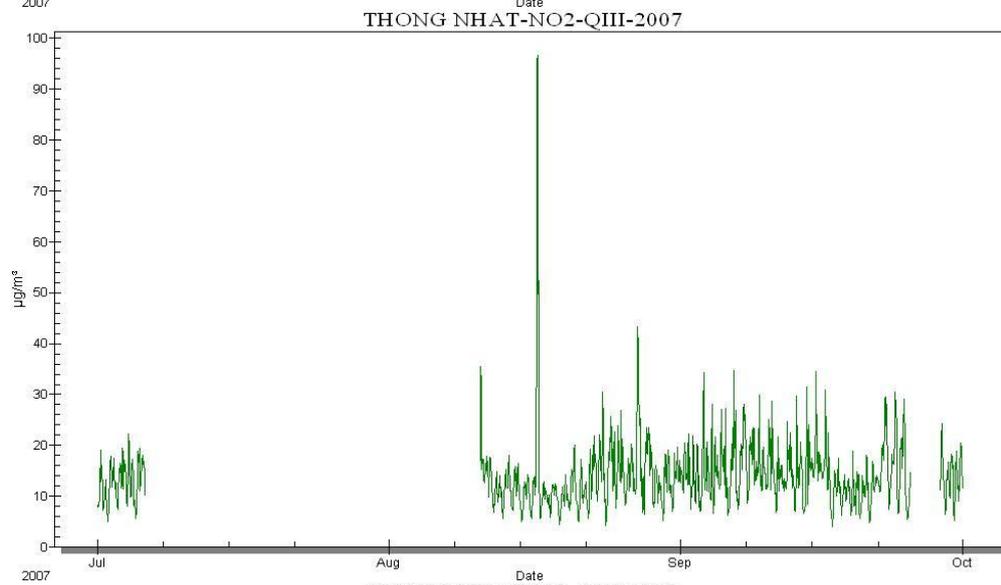
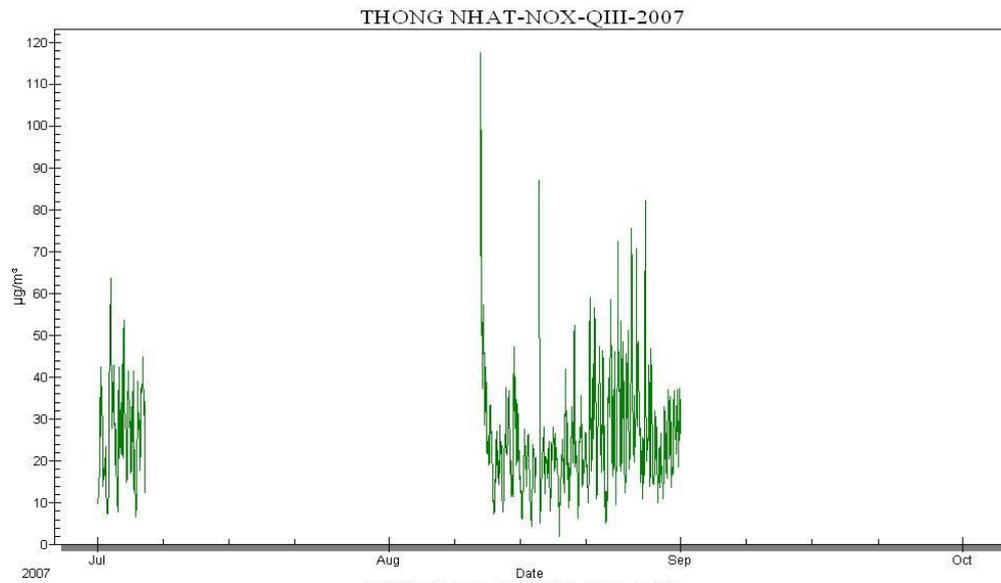


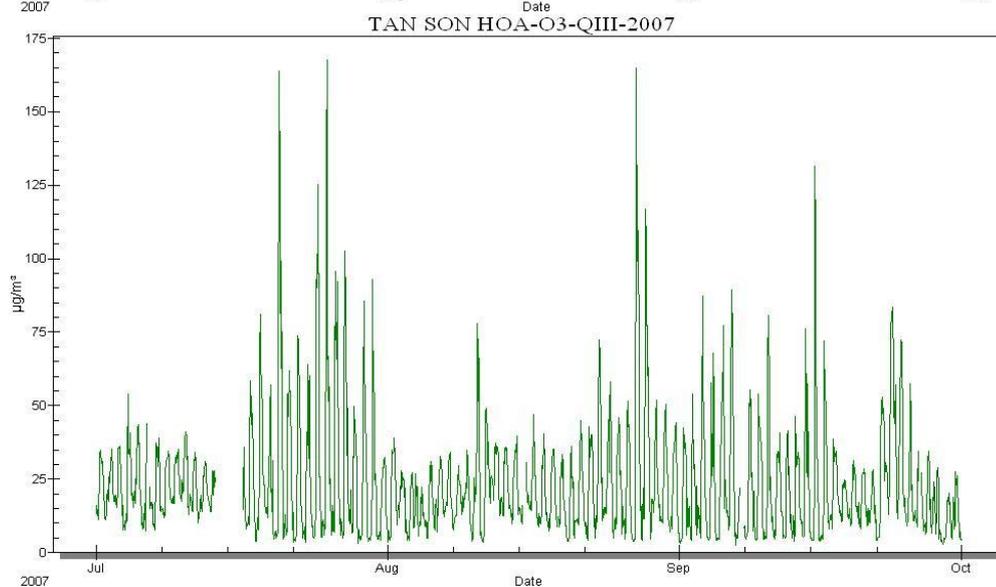
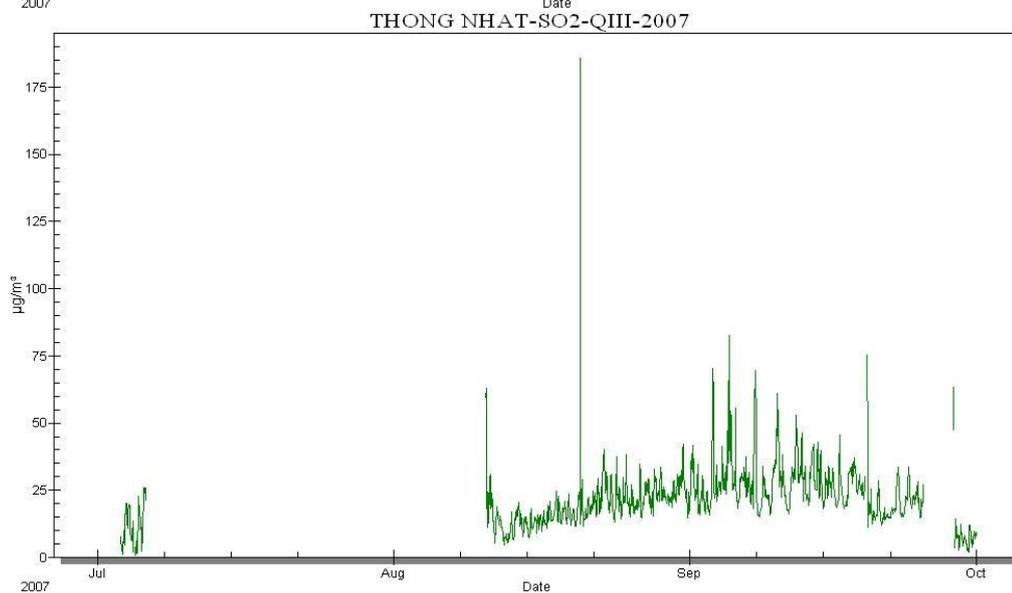
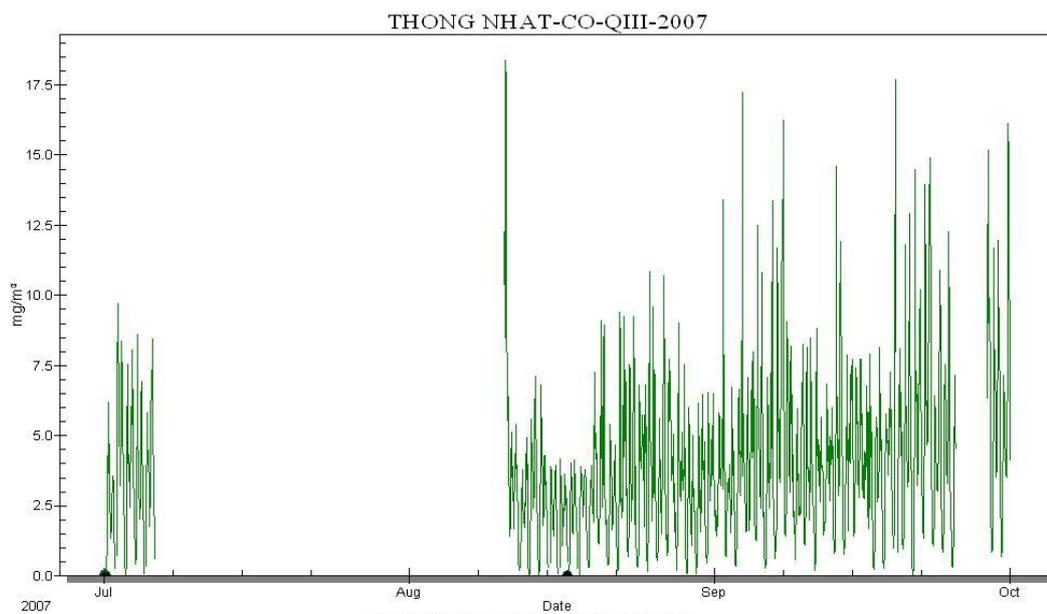


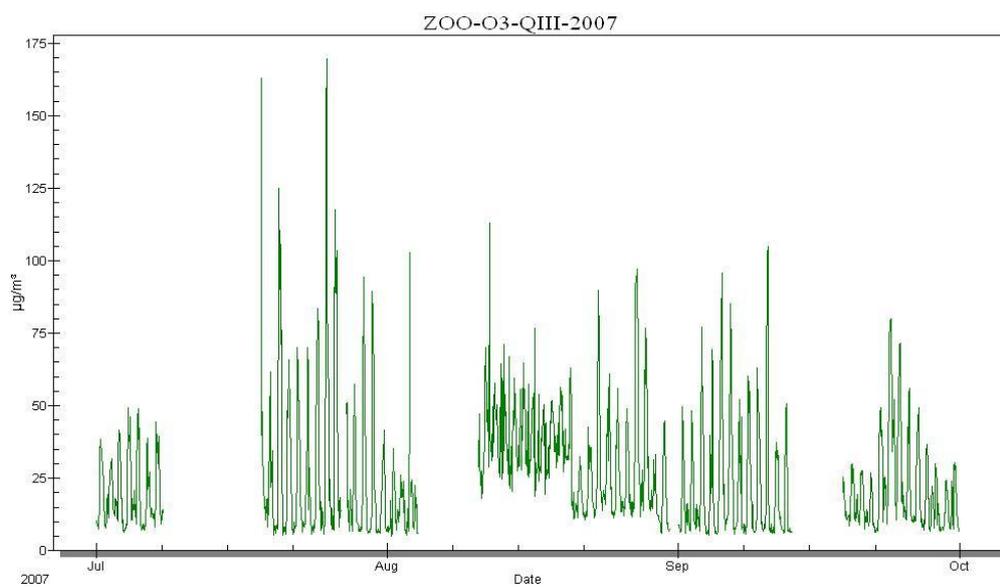
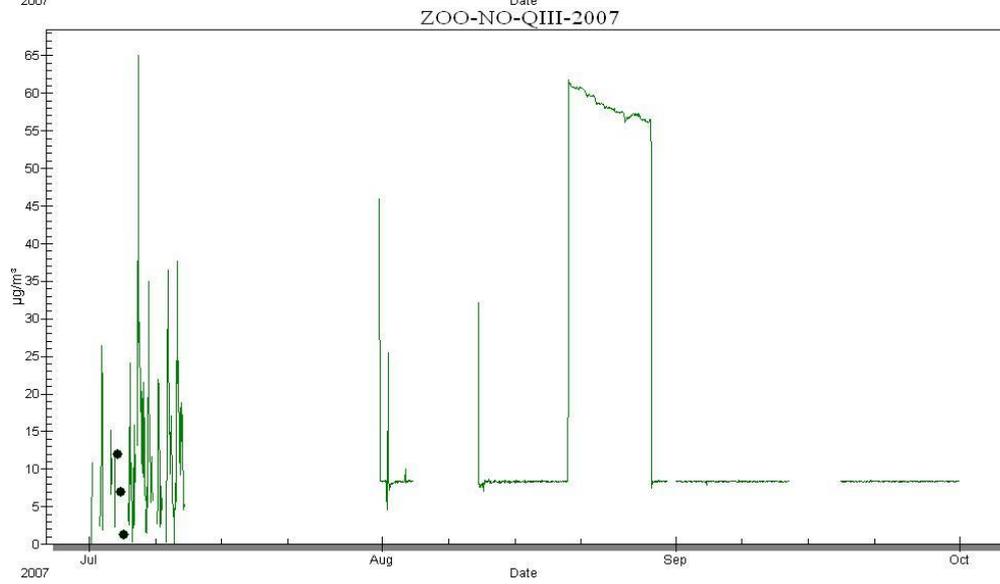
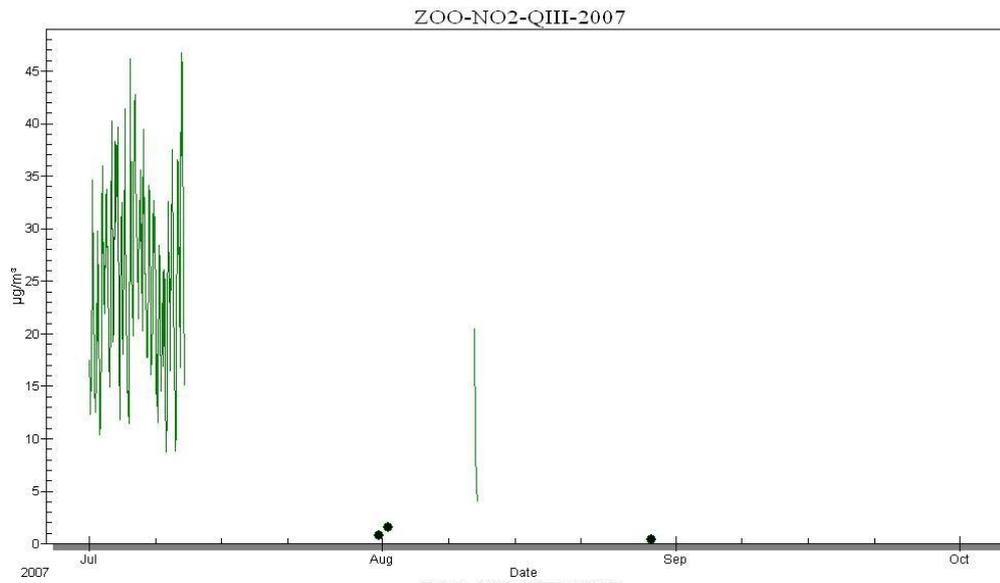


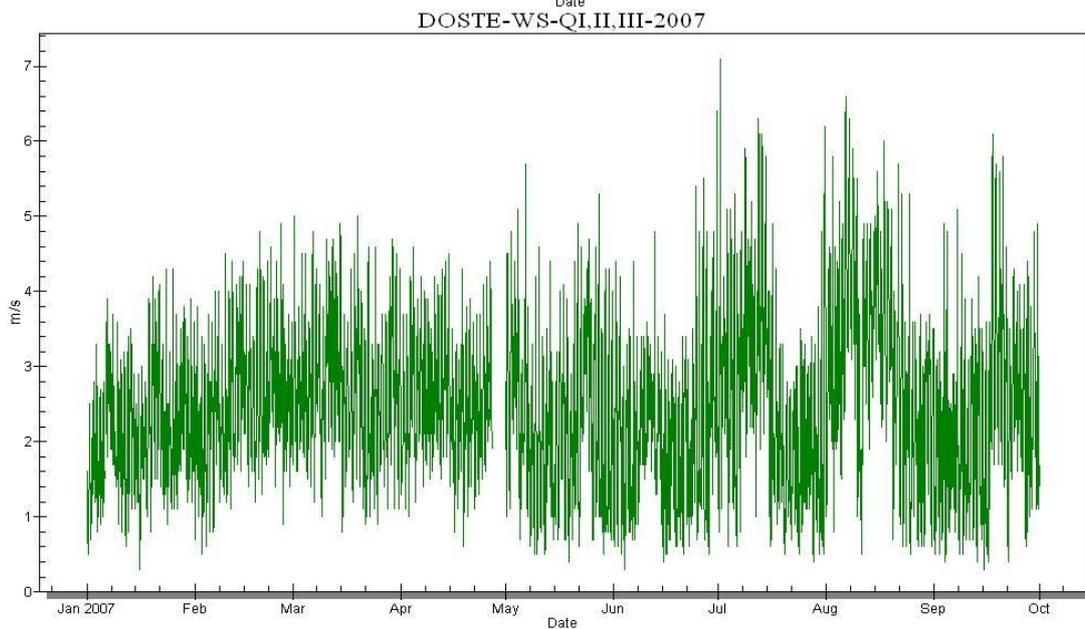
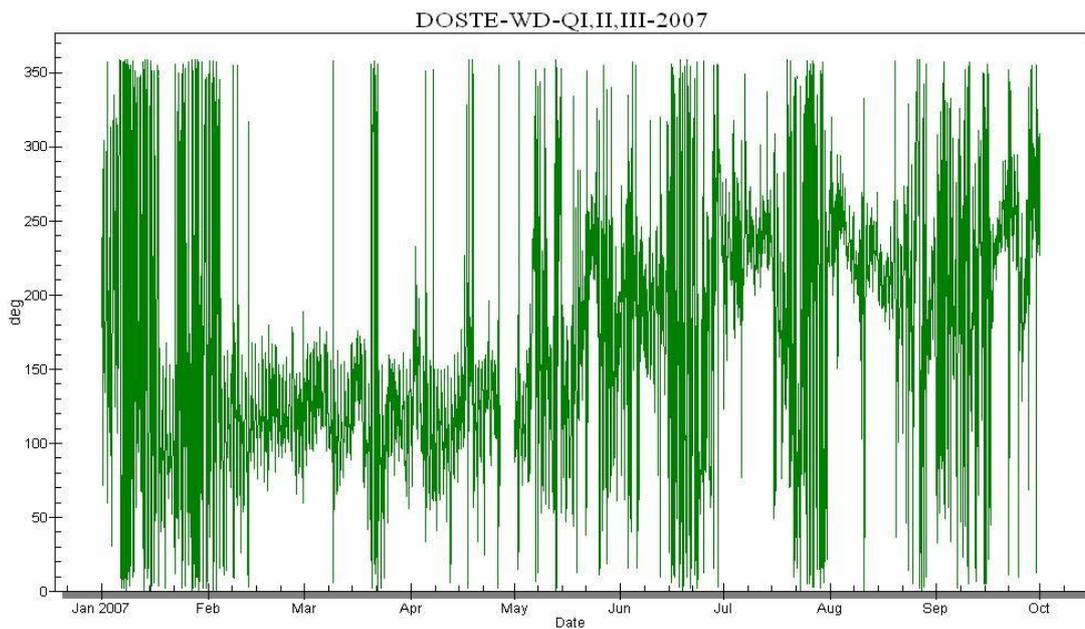


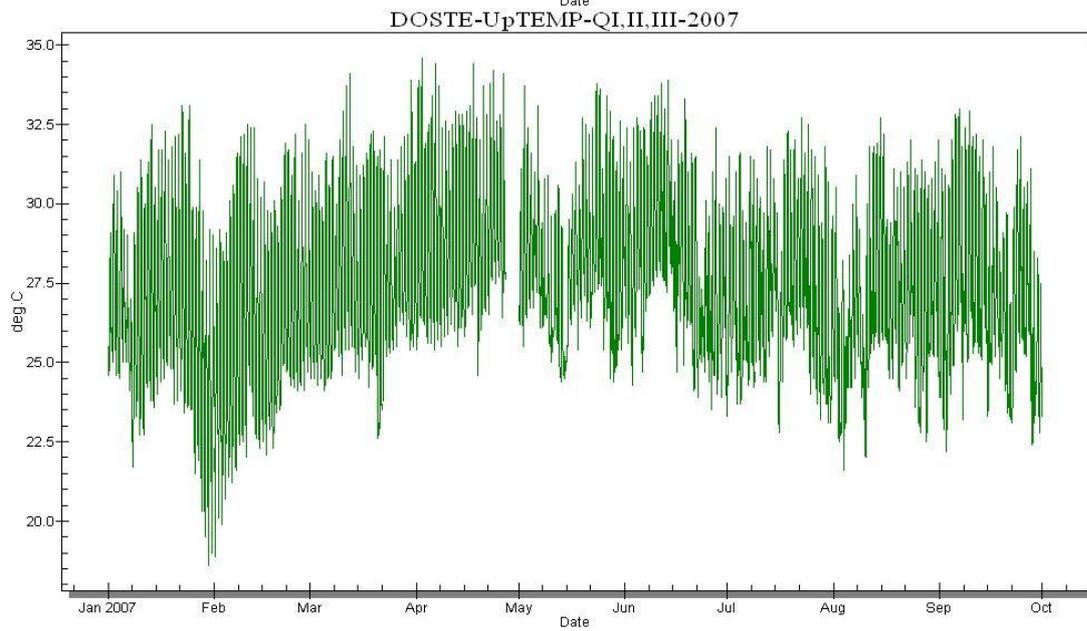
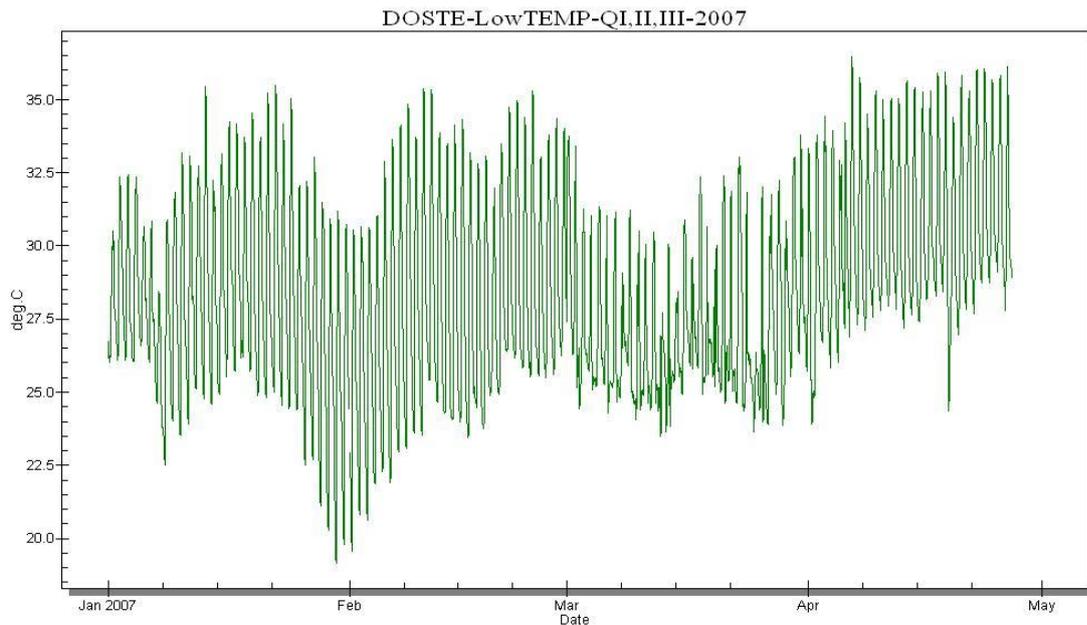














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REPORT SERIES Technical report	REPORT NO. TR 1/2008	ISBN 978-82-425-1933-7 (printed) 978-82-425-1934-4 (electronic) ISSN 0807-7185	
DATE	SIGN.	NO. OF PAGES 62	PRICE NOK 150,-
TITLE Ho Chi Minh City Air Quality Monitoring Programme Data evaluation report, 2007		PROJECT LEADER Bjarne Sivertsen	
		NILU PROJECT NO. E-107016	
AUTHOR(S) Vo Thanh Dam and Bjarne Sivertsen		CLASSIFICATION * A	
		CONTRACT REF.	
REPORT PREPARED FOR NILU/HEPA			
ABSTRACT The report presents the data availability and average concentrations for all air quality data measured in HCMC, Vietnam during 2007. The quality assessment indicated that there is a need for spare parts, which again will lead to repair and improved maintenance. Some of the instruments will have to be replaced by new instruments, and for PM it will be adequate to also install PM <sub>2,5</sub> monitors at some stations.			
NORWEGIAN TITLE Ho Chi Minh City. Overvåkingsprogram for luftkvalitet. Dataevalueringsrapport, 2007.			
KEYWORDS HCMC	A Q Monitoring	Data evaluation	
ABSTRACT (in Norwegian) Rapporten presenterer datatilgjengelighet og gjennomsnittskonsentrasjoner for alle luftkvalitetsdata målt i HCMC, Vietnam i løpet av 2007. En kvalitetsvurdering indikerer at det er behov for reservedeler for å reparere en del an instrumentene som er gått ut på dato. Noen av instrumentene må erstattes med nye, og for PM er det nødvendig også å installere PM <sub>2,5</sub> -monitører på noen stasjoner.			

\* Classification A Unclassified (can be ordered from NILU)

B Restricted distribution

C Classified (not to be distributed)