

4. MEASUREMENTS CARRIED OUT AT THE KOŠETICE OBSERVATORY

The programme of the monitoring of a multitude of parameters at the Košetice Observatory covers a broad range of measurements operated on various sites of the basin, at different intervals and using different methods.

The measurements are tabulated, for greater clarity, codes are allocated to the sites, intervals, monitoring networks and methodologies.

4.1 SITE CODING

4.1.1 Meteorology, air and precipitation quality

- 01 Kramolín climate station (observation from 1980 to 1987)
- 02 Former gauging site in a valley (observations ended in August 1988)
- 03 Košetice Observatory monitoring site
- 04 Forest monitoring site

4.1.2 Vegetation

The codes: 11–47

4.1.3 Surface water

- 71. Old pond
- 72. Under the springs
- 73. Under the road
- 74. Forest spring
- 75. Above the confluence
- 76. Martinický Brook (outside the monitored basin)
- 77. New pond

4.1.4 Soil and biotic components

- 81. Soil probe No. 1
- 82. Soil probe No. 2
- 83. Soil probe No. 3
- 84. Tree needles sampling site
- 85. Meadow, Anenský Brook spring
- 86. Slope, Anenský Brook spring
- 87. Meadow under trees, water gauging site 75
- 88. Meadow, water gauging site 75
- 89. Slope over water gauging site 75
- 90. Alluvium over water gauging site 74
- 91. Meadow under the trees above the road that passed water gauging site 74

4.1.5 Basin as a whole

- 99. The figure characterises the entire basin

4.2 FREQUENCY OF MEASUREMENTS

- 01. half-hour
- 02. one-hour
- 03. three-hour
- 04. climatology (at 7, 14 and 21 CET)
- 05. one-day
- 06. one-week
- 07. ten-day
- 08. one-month
- 09. three-month
- 10. one-year
- 11. once in several years
- 12. episodic and irregular
- 13. every other day
- 14. twice a week
- 15. thrice a week

4.3 CODING OF MONITORING NETWORKS

4.3.1 International programmes

- 01 GAW/WMO
- 02 EMEP/ECE
- 03 ICP/IM
- 04 GEMS/CMEA

4.3.2 National networks

- 11 CHMI – network of professional meteorological stations
- 12 CHMI – network of climate stations
- 13 CHMI – network of radiation stations
- 14 CHMI – manually operated network of air quality
- 15 CHMI – Automatic Imission Monitoring network (AIM)
- 16 GEOMON (Czech Geological Survey)
- 17 TOCOEN - Toxic Organic COmpounds in the ENvironment
- 18 Radiation monitoring network of the Czech Republic

4.4 METODOLOGICAL INSTRUCTIONS

See chapter 6.3. Overview of Methodological Guidelines

4.5 OVERVIEW OF MEASUREMENTS AT THE KOŠETICE OBSERVATORY

1. Name
2. Beginning (and end, when applicable) of measurement
3. Sampling site (coded, if relocated the relevant period of time is specified)
4. Frequency (coded)
5. Inclusion in monitoring networks (coded)
6. Methodology (coded, if more than one, the codes are listed chronologically to reflect the time in which the respective regulation and guidelines were in force, which in turn are specified in the overview of methodologies)

4.5.1 Meteorological and climate measurements.

Name	Start	Site	Frequency	Network	Methodology
Climate ¹⁾	1980	01 (1/1980–11/1987) 03 (since 9/1988)	04	01, 03, 12, 16	VIII, IX
SYNOP ²⁾	1988–2001	03 (1988–12/2001)	03	11	XVII
SYNOP ²⁾	2002	03 (since 1/2002)	02	11	XVII
Ionising radiation	1995	03	02	18	XIII

1) air temperature, soil temperature (depth 5, 10, 20, 50 and 100 cm), air pressure, air humidity, wind speed, wind direction, sunshine duration, precipitation amount, depth of snow cover, evaporation,

2) air temperature, air pressure, air humidity, wind speed, wind direction, sunshine duration, precipitation amount, depth of snow cover, visibility, height of cloud base, type of cloudiness,

4.5.2 Solar radiation.

Name	Start	Site	Frequency	Network	Methodology
Total radiation	1983	02 (9/1983–8/1988) 03 (since 9/1988)	02	01, 13	X
UV ³⁾	1986–1991	02 (8/1986–9/1988) 03 (10/1988–6/1991)	02	03, 13	X
UV-B	1995	03	10 min.	01, 13	X
Diffuse radiation	1995	03	02	01, 13	X

3) This measurement was discontinued as it did not meet the requirements of GAW programme which only calls for UV-B radiation

4.5.3 Air quality

4.5.3.1 Sulphur and nitrogen compounds.

Name	Start	Site	Frequency	Network	Methodology
SO ₂ (manual)	1981	02 (4/1981–10/1988) 03 (since 8/1988)	05	01, 02, 03 04, 14	XII, XV, XX
SO ₂ (auto)	1992	03	02	15	XII, XV
SO ₄ (manual)	1981	02 (4/1981–10/1988) 03 (since 8/1988)	05	01, 02, 03 04, 14	XII, XV, XX
NO (auto)	1992	03	02	15	XII, XV
NO ₂ (manual) ⁴⁾	1990	03	05	01, 02, 03 04, 14	XII, XV, XX
NO ₂ (auto)	1992	03	02	15	XII, XV
NO _x ⁵⁾ (manual)	1981–1990	02 (4/1981–10/1988) 03 (8/1988–4/1990)	05	01, 02, 03 04, 14	XX
Sum NH ₄ (manual)	1990	03	05	01, 02, 03 04, 14	XII, XV
Sum NO ₃ (manual)	1990	03	05	01, 02, 03 04, 14	XII, XV
H ₂ S ⁶⁾ (manual)	1981–1987	02	05	04	XX

4) Change of the sampling method : collection on filters (1990–1997), absorbing solution (since 1998)

5) Replaced by NO₂ measurements in the manually operated air quality monitoring network

6) Measurements discontinued because of the frequent occurrence of values below the detection limit

4.5.3.2 Heavy metals in suspended particulates.

Name	Start	Site	Frequency	Network	Methodology
Cd, Pb, Ni (manual)	1982	02 (6/1982–7/1988) 03 (since 8/1988)	08 13 (2003)	01, 03, 04, 14	XII, XV
Ca, Cu, Fe, Mn (manual)	1985	02 (1/1985–7/1988) 03 (since 8/1988)	08 13 (2003)	01, 03, 04, 14	XII, XV
Zn (manual)	1987	02 (1/1987–7/1988) 03 (since 8/1988)	08 13 (2003)	01, 03, 04, 14	XII, XV
TSP (manual)	1986–2002	02 (4/1986–7/1988) 03 (8/1988–3/2002)	08	01, 03, 04, 14	XII, XV
TSP (auto)	1993–1995	03	03	15	XII, XV
PM ₁₀ (auto)	1996	03	02	15	XII, XV
PM ₁₀ (manual)	2002	03	13	02, 14	XII, XV
PM _{2.5} (manual)	2004	03	13	02, 14	XII, XV
Hg (manual in air)	2006	03	06	02, 14	XII, XV
Hg (manual in aerosol)	2006	03	06	02, 14	XII, XV

4.5.3.3 Greenhouse gases and their precursors

Name	Start	Site	Frequency	Network	Methodology
Surface ozone (auto)	1989	03	02	01, 02, 03, 04, 15	XII, XV
Carbon monoxide (auto)	1995	03	02	01, 15	XII, XV
Methane (manual)	1994	03	14	01	XXI
VOCs (manual)	1992	03	14	01, 02	II, XIX
C-14/CO ₂ (manual)	2004	03	08	14	

Volatile organic compounds (VOCs) monitored : ethane, ethene, propane, propene, i-butane, acetylene, n-butane, total butanes, i-pentane, n-pentane, total pentenes, i-hexane, n-hexane, isoprene, i-heptane, n-heptane, benzene, toluene, ethylbenzene, m,p-xylene, o-xylene.

4.5.3.4 Aldehydes and ketones

Name	Start	Site	Frequency	Network	Methodology
Aldehydes and ketones	1993	03	14	01, 02	II, XIV

Monitored compounds : methanal, propanon, butanal, hexanal, methylglyoxal, benzaldehyde, ethanal, propanal, butanon, glyoxal, propenal, pentanal.

4.5.4 Precipitation quality

4.5.4.1 All-round analysis of daily precipitation – bulk deposition

Name	Start	Site	Frequency	Network	Methodology
pH, conductivity, SO ₄	1983–2004	02 (1/1983–8/1988) 03 (9/1988–12/2004)	05	02, 04, 14	XII, XV
NO ₃ , Na, K, Ca, Mg	1986–2004	02 (6/1986–8/1988) 03 (9/1988–12/2004)	05	02, 04, 14	XII, XV
NH ₄ , Cl, F, Pb, Cd, Ni Mn, Zn, Fe	1989–2004	03	05	02, 04, 14	XII, XV

4.5.4.2 All-round analysis of weekly precipitation – bulk deposition

Name	Start	Site	Frequency	Network	Methodology
Mn, Zn, Fe, Pb, Cd, Ni	1996	03	06	01, 02, 14	XII, XV
Hg	2006	03	06	01, 02, 14	XII, XV

4.5.4.3 All-round analysis of weekly precipitation – wet-only deposition

Name	Start	Site	Frequency	Network	Methodology
	1996–06/2004	03	06		XII, XV

Scope of analysis : pH, conductivity, SO₄²⁻, NO₃⁻, NH₄⁺, Ca, Na, K, Mg, Cl⁻, F⁻, Fe, Mn, Al, Zn, H³, O¹⁸.

4.5.4.4 All-round analysis of monthly precipitation – bulk deposition

Name	Start	Site	Frequency	Network	Methodology
	1985	02 (11/1985–8/1988) 03 (since 9/1988)	08	03, 04, 16	V, VI, VII

Scope of analysis: pH, conductivity, SO₄²⁻, NO₃⁻, NH₄⁺, Ca, Na, K, Mg, Cl⁻, F⁻, Fe, Mn, Al, Zn, Pb, Cd, Ni, H³, O¹⁸.

4.5.4.5 All-round analysis of monthly precipitation – wet-only deposition

Name	Start	Site	Frequency	Network	Methodology
	1984-2000	02 (11/1985–8/1988) 03 (9/1988–12/2000)	08	03, 04, 16	V, VI, VII

Scope of analysis the same as in 4.5.4.3.

4.5.4.6 All-round analysis of monthly precipitation – throughfall deposition

Name	Start	Site	Frequency	Network	Methodology
	1989	04	08	03, 16	V, VI, VII

Scope of analysis the same as in 4.5.4.4.

4.5.4.7 All-round analysis of daily precipitation – wet-only deposition

Name	Start	Site	Frequency	Network	Methodology
pH, conductivity, SO ₄	7/2004	03	05	02, 14	XII, XV
NO ₃ , Na, K, Ca, Mg	7/2004	03	05	02, 14	XII, XV
NH ₄ , Cl, F, Pb, Cd, Ni Mn, Zn, Fe	7/2004	03	05	02, 14	XII, XV

4.5.5 Surface water

4.5.5.1 Hydrological characteristics

Name	Start	Site	Frequency	Network	Methodology
Discharge	1984	74	15, 02	03, 04, 16	V, VI, VII
	1984–1999	75	05, 02	03, 04, 16	V, VI, VII
	1991–1999	73	06, 02	04	V, VI, VII
	1984–1987	72	06	04	
Water temperature	1991	74	15	03, 04	V, VI, VII
	1991–1999	75	05, 02	03, 04	V, VI, VII
	1991–1999	73	06, 02		V, VI, VII
pH, conductivity, NO ₃ ⁻	1983–1997	74, 75	05	04	XX

4.5.5.2 All-round analysis of surface water

Start	Site	Frequency	Network	Methodology
1985	74	08, 12	03, 04, 16	V, VI, VII
1985–1999	75	08, 12	03, 04	V, VI, VII
1991–1999	73	08, 12		V, VI, VII

Scope of analysis : pH, conductivity, SO₄²⁻, NO₃⁻, NH₄⁺, NO₂⁻, Ca²⁺, Na⁺, K⁺, Mg²⁺, Fe^{2+,3+}, Mn²⁺, Al³⁺, Pb²⁺, Cd²⁺, Cl⁻, SiO₂, PO₄³⁻, C_{org} (total and soluble), acidity, alkalinity, hardness (total, transient and permanent)

4.5.6 Biological monitoring

Name	Start	Site	Frequency	Network	Methodology
Spruce needles	1990–1993	84	10	03,04	V, VI, VII
Analysis: S _{tot} , N _{tot} , Ca, Na, K, Mg, C _{org} , P _{tot} , Al, Mn, Zn					
Moss	1991–1993	99	10	03,04	V, VI, VII
Analysis: Cd, Cu, Pb, Zn, As, Cr, Se, V, Fe					
Vegetation inventory	1992	11-47	11	03,04	V, VI, VII

4.5.7 Soil

Name	Start	Site	Frequency	Network	Methodology
Soil analysis	1979	04,81,82,83	11	03,04	V, VI, VII
Analysis: pH (H ₂ O), pH (KCl), acidity, Na, K, Ca, Mg, C _{org} , N _{tot} , Mn, Zn, P _{tot} , Al					
Soil water	2007	81,82	08	03,04	V, VI, VII
Analysis: pH, conductivity, SO ₄ ²⁻ , NO ₃ ⁻ , NH ₄ ⁺ , NO ₂ ⁻ , Ca ²⁺ , Na ⁺ , K ⁺ , Mg ²⁺ , Fe ²⁺ , ³⁺ , Mn ²⁺ , Al ³⁺ , Pb ²⁺ , Cd ²⁺ , Cl ⁻ , SiO ₂ , PO ₄ ³⁻ , C _{org} (total and soluble), alkalinity.					

4.5.8 Persistent organic compounds

Name	Start	Site	TOCOEN Site No.	Frequency	Network	Methodology
Ambient air	1988	03	01	05	02, 17	XXII
Wet deposition	1988	03	01	12	17	XXII
Surface waters	1988	71, 72, 74, 75, 76, 77	04, 02, 10, 12a, 12b, 14	10	17	XXII
Sediments	1988	71, 72, 74, 75, 76, 77	04, 02, 10, 12a, 12b, 14	10	17	XXII
Soils	1988	03, 85, 86, 87, 88, 89, 90, 91	01, 03, 05, 07, 08, 09, 11, 13, 15	10	17	XXII
Litter	1997	89	09	10	17	XXII
Spruce and pine needles	1988	86, 87, 88, 89, 91	05, 07, 08, 09, 13, (15), (16)	10	17	XXII
Mosses	1988	86, 87, 88, 89, 91	05, 07, 08, 09, 13, (15), (16)	10	17	XXII
Analysis: polycyclic aromatic hydrocarbons (PAHs) – 16 US EPA; organochlorinated pesticides (OCPs) – Σ DDTs (DDT+DDE+DDD), Σ HCHs (hexachlorocyclohexanes = $\alpha + \beta + \gamma + \delta + \epsilon$), hexachlorobenzene (HCB), polychlorinated biphenyls (PCBs) – congener IUPAC nos. 28, 52, 101, 118, 138, 153, 180), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/Fs) – 2,3,7,8-substituted congeners and homologues groups						

4.5.9 CAMPAIGNS (manual)

Name	Start	Site	Frequency	Network	Methodology
NILU comparison (N,S)	08/1998–07/1999	03	06	02,14	II, XII, XV
EMEP EC/OC	09/2002–06/2003	03	06	02,14	II, XII, XV
1. GAW VOCs	03/2004	03	14	01,14	IV, XII, XV
POPs/Tocoen – passive samp.	03/2003– till now	03	08	14,17	XVI
POPs/Canada – passive samp.	2005– till now	03	09,10	01,14	IV
POPs/EMEP – passive samp.	07, 08, 09/2006	03	09	02,14	II
EMEP intensive PM,EC/OC	06/2006, 01/2007	03	05	02,14	II, XII, XV
EUSAAR PM ₁₀ denuder	01/2007	03	15	14	II