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European Regional Development Fund - Instrument for Pre-Accession II Fund

HarmoNIA

Harmonization and Networking for contaminant assessment in the Ionian and Adriatic Seas

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&

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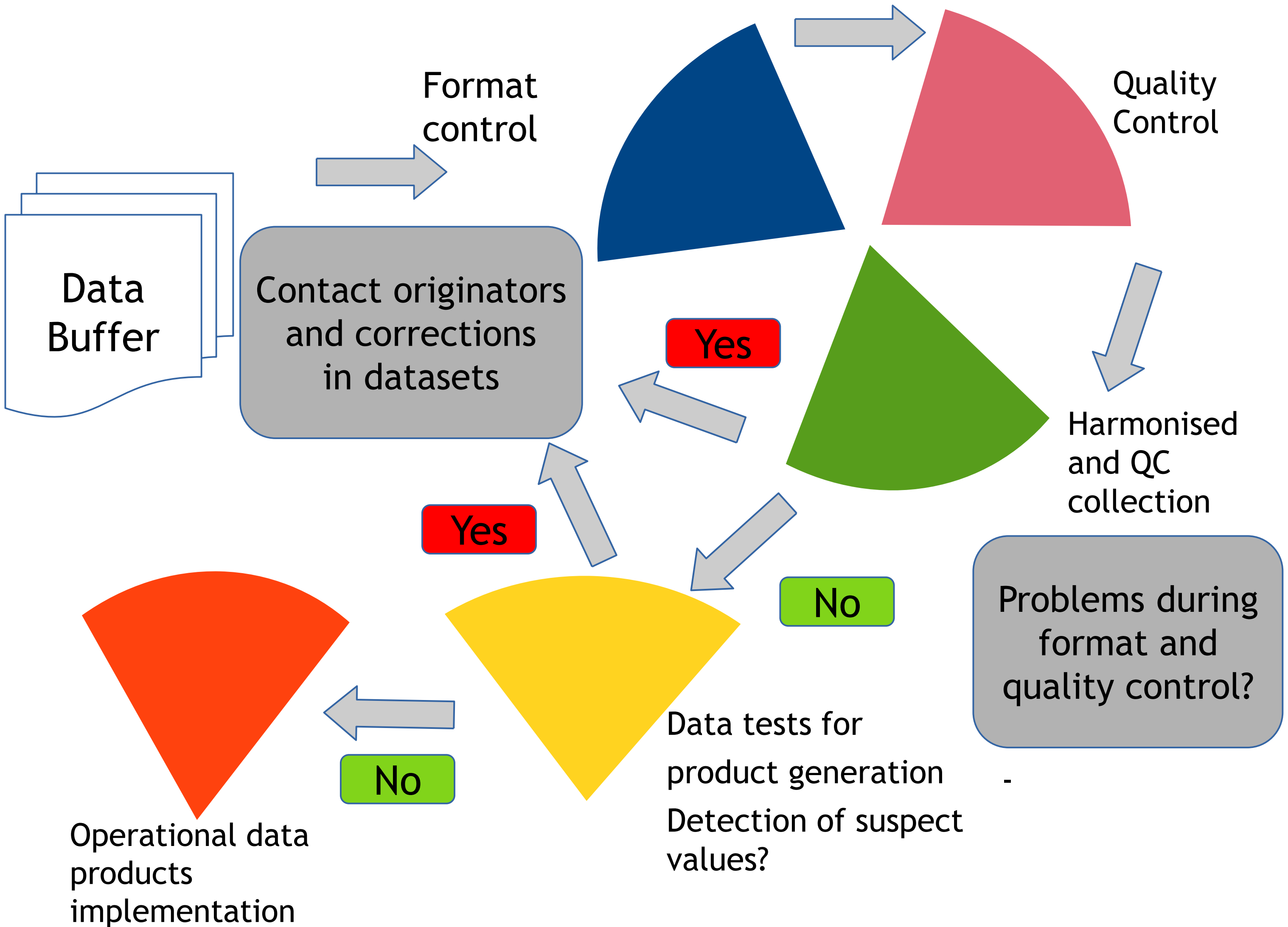
Harmonized quality controlled dataset focused on contaminants:

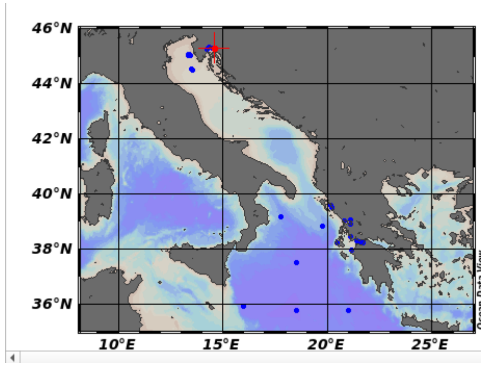
- Data used: all data harvested in HarmoNIA plus unrestricted data from EMODnet Chemistry for the Adriatic & Ionian Region
- Deliverable T.1.1.3 “Methodological Proposal for data QC procedures” contains an annex with a detailed description of the format checks
- Based on deliverable T.1.1.3, quality control has been performed on the collections related to sediment (time series and profiles)
- Additionally, in agreement with ISPRA, some general guidelines for the quality control in water and biota datasets were developed.

Data Work flow

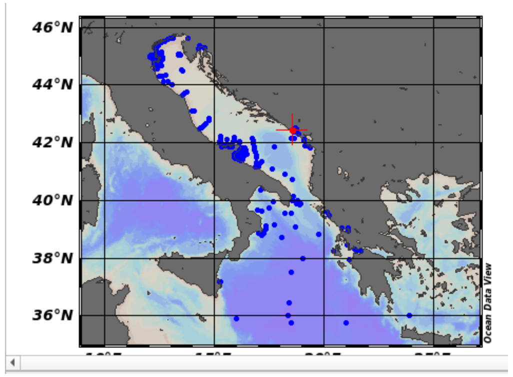


QC scheme:

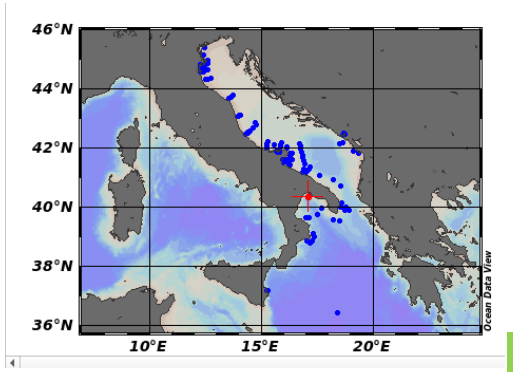
- Harmonized ODV collection
- Transposed matrix (enables to filter per substance, matrix characteristics, analytical method,…)
- Relevant metadata availability check: eg. Time, depth,…
- Selection of substances (for which we have ranges) to be QC
- Unit check: after harmonization STILL not uniform units
- If possible: manually harmonize units (eg. from mg/kg to µg/kg)
- Check values of quality flags:
  - Contaminants: value=0 → QF=6 --> *Below detection limit*
  - All parameters: empty value → QF=9 -->*Missing value*
- Range check for selected contaminant classes (e.g.: Metals and PAHs)
- If they are out of range re-check data with originators before the validation in order to assign appropriate Quality Flag (QF) according SeaDataNet standards
- Produce plots of data from single data originator and from harmonized collection allows to identify other potentially doubtful data



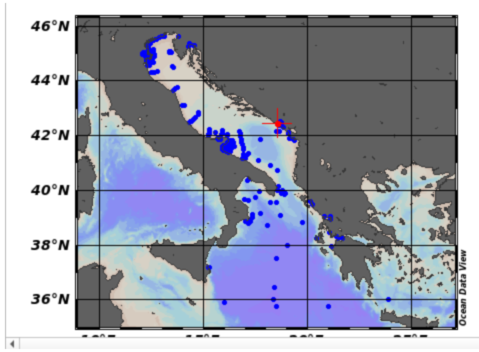
Sediment profiles:
43 stations
63 parameters



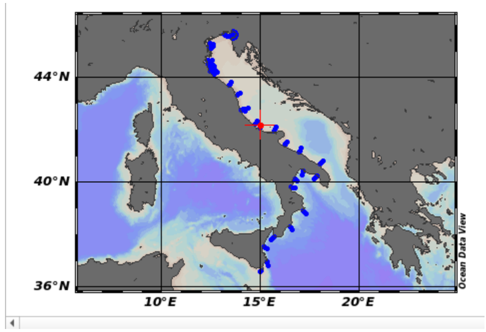
Sediment profiles:
489 stations
391 parameters



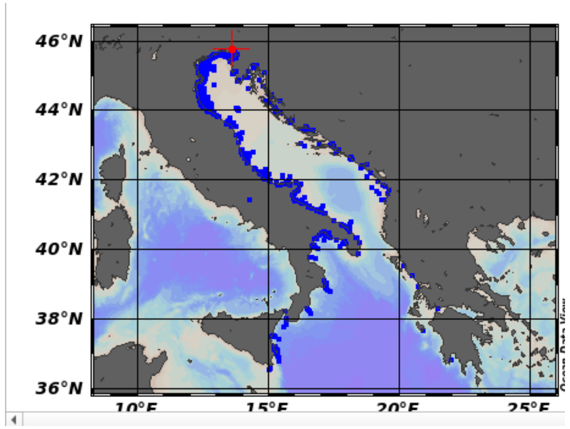
Sediment profiles:
214 stations
61 parameters



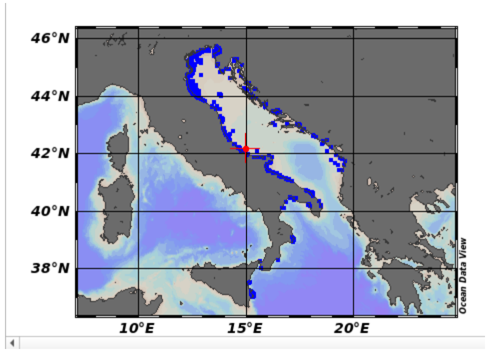
1 final collection:
458 stations
266 parameters
depth below seabed range: 0-0.1 m



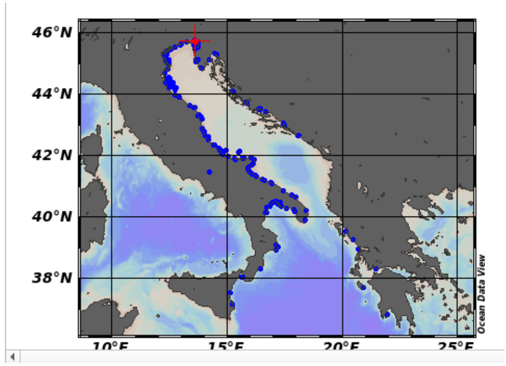
Water time series:
861 stations
142 parameters



1 initial collection for time series data:
4769 stations
804 parameters



Sediment time series:
3269 stations
246 parameters



Biota time series:
640 stations
249 parameters

Sediment Quality Control: ranges selection

Regional Background Concentration (RBC): Background concentration of the contaminant in the sediments for the Mediterranean, with a specific focus on the **eastern basin** (**Adriatic Sea, Ionian Sea, Sicily Channel, Aegean Sea, Cretan Sea**). The RBC were derived from the data available in the scientific literature. A range of variability was reported as RBCmin-RBCmax for the investigated area due to the different geochemical provinces.

Regional Maximum Concentration (RMaxC): Maximum concentration reported in scientific literature for contaminated coastal sediments in the Eastern Mediterranean (Adriatic Sea, Ionian Sea, Sicily Channel, Aegean Sea, Cretan Sea).

Regional Minimum Concentration (RMinC): Minimum concentration reported in scientific literature for contaminated coastal sediments in the Eastern Mediterranean (Adriatic Sea, Ionian Sea, Aegean Sea, Cretan Sea).

Regional Maximum Concentration for Offshore sediments (RMaxCO): Maximum concentration reported in scientific literature for offshore sediments in the Eastern Mediterranean (Adriatic Sea, Ionian Sea, Sicily Channel, Aegean Sea, Cretan Sea)

Regional Minimum Concentration for Offshore sediments (RMinCO): Minimum concentration reported in scientific literature for offshore sediments in the Eastern Mediterranean (Adriatic Sea, Ionian Sea, Sicily Channel, Aegean Sea, Cretan Sea)

Table 2: **Regional Background Concentrations (RBC)** for Mediterranean sediments

Element	**Units**	**RBC**		**Med** [1]	**MAd, SAd**[2]*		**NAd, Mad, SAd** [3]		**MAd, SAd** [4]		**NAd** [5]	**NAd** [7]	**WMed** [8]		**EMed** [9]
		Min	Max		Min	Max	Min	Max	Min	Max			Min	Max	
Cd	mg kg^{-1} dw	**0.07**	**0.57**	0.085	0.20	0.57	-	-	-	-	-	-	0.07	0.08	0.124
Hg	mg kg^{-1} dw	**0.02**	**0.08**	0.053	0.02	0.03	-	-	-	-	0.07	-	0.04	0.08	
Pb	mg kg^{-1} dw	**10.0**	**116**	16.95	15.4	18.4	10	23	16	34	18.9	116	15	18.1	13.8
As	mg kg^{-1} dw	**4.3**	**19.1**	-	4.3	19.1	-	-	5	10	-	-	-	-	
Cr	mg kg^{-1} dw	**57**	**178**	-	123	150	57	152	84	178	141	80	62	63.9	
Cu	mg kg^{-1} dw	**11.3**	**49**	-	20.2	37.3	12	30	29	37	-	16	11.3	25.8	49.3
Ni	mg kg^{-1} dw	**16.9**	**181**	-	126	181	23	103	67	173	-	148	16.9	46.9	
Zn	mg kg^{-1} dw	**41.5**	**103**	-	69	84	54	95	90	103	-	72	57	84.1	41.5
Co	mg kg^{-1} dw	**12**	**28**	-	19.7	28.2	-	-	12	22	-	-			-
V	mg kg^{-1} dw	**82**	**109**	-	-	-	-	-	84	109	-	-	82	108.3	-
Sedimentation rate	mm yr^{-1}				1.8	3.1	0.67	5.2	-		1-2 [6]	1-2.5	0.4-0.6		0.17
Core section	cm				14	28	older than 1910		200	Holocene	40-80	49-51 (ISO45)	2.5	8.5	3-12
Silt+clay	%				87	100	41	100			95-98	67	50	69.61	-
Corg	%				-	-	0.3	1.5	-	-	-	0.38	0.24	0.44	-

*ranges derived from the data provided by the authors

[1]UNEP-MAP 2016; [2]Ilijanic et al., 2014; [3]Lopes-Rocha et al., 2017; [4]Lucchini et al,. 2003; [5] Giani et al., 1994;

[6] derived from Frignani et al., 2005; [7]Covelli &Fontolan, 1995; [8]Berto et al., 2006; [9] median calculated from Angelidis et al, 2011

Med: Mediterranean; WMed: Western Mediterranean;Emed: Eastern Mediterranean; NAd: Northern Adriatic; MAd: Mid Adriatic; SAd: Southern Adriatic

ONLY DATA BASED ON METHODS CAPABLE TO QUANTIFY TOTAL METALS WERE CONSIDERED

RBC were derived from cores

Table 3. Ranges of trace metals concentrations in **offshore sediments** of the eastern Mediterranean Sea.

Element	Units	Offshore sediments		EMed[1] (Thermaikos gulf)		EMed[2]		Ionian sea[3]		MAd & SAd[4]		MAd & SAd[5]	
		RMinCO	RMaxCO	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Cd	mg kg^{-1} dw	**0.06**	**0.26**			0.12	0.26			0.06	0.14		
Hg	mg kg^{-1} dw	**0.013**	**0.419**					0.07	0.13	0.013	0.106	0.02	0.419
Pb	mg kg^{-1} dw	**5**	**71.4**	17	41	14.8	38.4	55.2	71.4	14.9	24.5	5	18
As	mg kg^{-1} dw	**1**	**32**									1	32
Cr	mg kg^{-1} dw	**53**	**276**					75.2	102.8	112	276	53	246
Cu	mg kg^{-1} dw	**2**	**60**	2	27	36.1	60	46.1	52.3	19.3	44.5	9.8	44.9
Ni	mg kg^{-1} dw	**49**	**323**	76	162			53.7	97.1	109	323	49	264
Zn	mg kg^{-1} dw	**34**	**124**	34	105	41.3	82.6	97.1	124	61	112	38	101
Co	mg kg^{-1} dw	**10**	**25**									10	25
V	mg kg^{-1} dw	**4**	**142**	4	106							50	142
Sediment section	cm			0	19	0	2	0	5	0	2	0	5
Stations selected				IP-30				9, 15, 16, 18, 19		SAPit1-2,Jabuka,Palagruza		Mad & Sad stations	
Bottom depth	m			~70-80		2800		400	2200	169.8	1041.4		~1000
Silt+clay	%			relict sand		pelitic muds				84.1	100		
Sedimentation rate	mm yr^{-1}			1.8						1.8	3.1		

EMed: eastern Mediterranean; MAd:MiddleAdriatic; SAd:Southern Adriatic

[1]Karageorgis et al, 2005 ;[2]Angelidis et al. 2011; [3]Buccolieri et al., 2006; [4]Ilijanic et al., 2017; [5]Dolenc et al., 1998

Sediments collected at depths ranging from 70 m to 2200 m, >10 nautical miles from coast

Table 4. Ranges of metal concentrations in **coastal sediments** (harbors and rivers prodeltas) of the Eastern Mediterranean Sea.

Element	**Unit**	**Coastal sediments**		**Trieste Harbor and Isonzo R. mouth**[1]		**Adriatic-Ionian harbors**[2]		**Mytilene harbor**[3]		**Rhodes harbor**[4]		**Thermaikos Gulf**[5]		**WNAd**[6]	
		RMinC	RMaxC	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Cd	mg kg^{-1} dw	0.03	18.2	0.16	18.2	0.13	0.25	0.17	0.495	0.03	0.17	-	-	-	-
Hg	mg kg^{-1} dw	0.11	6.18	0.54	6.18	0.11	0.40	-	-	-	-	-	-	-	-
Pb	mg kg^{-1} dw	19	230	24	170	19	68	32.7	93	77.1	230	26	128	9	30
As	mg kg^{-1} dw	6.6	18.2	6.6	18.2	-	-	-	-	-	-	-	-	-	-
Cr	mg kg^{-1} dw	19.4	180	73	171	-	-	83	154	19.4	118	-	-	26	180
Cu	mg kg^{-1} dw	14	101	23	70	-	-	21	86.2	31.5	101	38	61	14	47
Ni	mg kg^{-1} dw	23	231	62	231	-	-	-	-	-	-	124	255	23	87
Zn	mg kg^{-1} dw	59	339	100	339	-	-	74.1	230	59	242	84	229	65	137
Co	mg kg^{-1} dw	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	mg kg^{-1} dw	72	175	72	124	-	-	-	-	-	-	112	175	-	-
Stations selected				A0-4, TS1-3, IS1-2		Ta, Br, Ba, Man, Ter*		1-12		all except SD		IP1, IP17, IP38		Nad	
Corg	%	0.67	4.8	0.91	1.48	0.9	1.34	1.31	4.8	0.67	2.74	-	-	0.5	1.7
Silt+clay	%	3.2	99.8	97.8	87.8	-	-	3.2	96.66	3.5	23	95.8	99.8	42	99

*Ta:Taranto, Br:brindisi, Ba: Bari, Man: Manfredonia; Ter: Termoli

[1] Acquavita et al., 2018; [2]Giordano et al., 1992; [3]Aloupi&Angelidis, 2001;[4]Angelidis et al., 1995; [5]Karageorgis et al., 2005; [6]Lopes-Rocha et al., 2017b

ONLY DATA FROM SURFACE SEDIMENTS OF POTENTIALLY POLLUTED COASTAL AREAS

Table 5. Ranges used for the quality check of the trace metals in sediments in the EMed and comparison with ranges in WMed coastal sediments.

Element	Units		EMed			WMed[2]	
			Min	Max		Min	Max
Cd	mg kg^{-1} dw	RMinCO	0.06	18.2	RMaxC	<0.1	3.6
Hg	mg kg^{-1} dw	RMinCO	0.013	6.18	RMaxC	0.01	4.9
Pb	mg kg^{-1} dw	RMinCO	5	230	RMaxC	9.5	321
As	mg kg^{-1} dw	RMinCO	1	18.2	RMaxC	na	na
Cr	mg kg^{-1} dw	RMinC	19.4	276	RMaxCO	na	na
Cu	mg kg^{-1} dw	RMinCO	2	101	RMaxC	2.5	208
Ni	mg kg^{-1} dw	RBC_{min}	16.9	323	RMaxCO	na	na
Zn	mg kg^{-1} dw	RMinCO	34	339	RMaxC	21	741
Co	mg kg^{-1} dw	RMinCO	10	28.2	RMaxCO[1]	na	na
V	mg kg^{-1} dw	RMinCO	4	175	RMaxC	na	na

na: data not available [1]no data available for coastal sediments [2]RNO, 1998

The **minimum value** of all RBC_{min} (Tab. 2), RMinCO (Tab. 3) and RMinC (Tab. 4) was taken as the **lower limit** for the QC of the data and reported in Tab. 5.
The **maximum value** of all the RBC_{max} (Tab. 2), RMAxCO (Tab. 3) and RMaxC (Tab. 4) was taken as the **upper limit** for the QC of the data and reported in Tab. 5.
For the QC an overall error of **10%** can be assumed and applied to the range.

DATA FROM DEEP CORES
SINCE 1993

Table 6. Regional background concentrations of PAH compounds in sediments of the Mediterranean Sea.

Compound	Unit	RBC		Mediterranean[1]	OSPAR-BC[2,3]	Ustica Island [4]	Elefsis bay [5]		WNAd [6]		Trieste Gulf [7]
		Min	Max								
Naphthalene	µg kg^{-1} dw	4.00	13.25	4	5	-	-	-	-	-	13.25
Acenaphthene	µg kg^{-1} dw	0.20	0.80	0.38	-	bdl	0.2	0.8			0.48
Acenaphtylene	µg kg^{-1} dw	0.50	1.23	0.5	-	-	-	-	-	-	1.23
Fluorene	µg kg^{-1} dw	bdl-0.60	1.67	0.75	-	1.67	0.6	1	bdl	bdl	1.59
Phenanthrene	µg kg^{-1} dw	3.30	15.20	4.55	4.0	3.67	7.3	3.3	9.9	15.2	3.49
Anthracene	µg kg^{-1} dw	0.20	1.50	0.8	1.0	-	1.3	0.3	1.1	1.5	0.2
Fluoranthene	µg kg^{-1} dw	0.83	15.50	5.6	7.5	1.33	9.3	1.9	15.5	14.5	0.83
Pyrene	µg kg^{-1} dw	1.54	11.60	10.28	6	1.67	7.4	2.5	9.6	11.6	1.54
Benzo[a]anthracene	µg kg^{-1} dw	bdl-1.7	8.90	3.45	3.5	bdl	1.7	8.9	-	-	3.55
Chrysene	µg kg^{-1} dw	bdl-1.07	9.50	1.3	4	bdl	9	1.7	9.5	3.9	1.07
Benzo[a]pyrene	µg kg^{-1} dw	bdl-1.6	9.70	2.55	4	bdl	3.5	1.6	9.0	9.7	2.28
Benzo[ghi]perylene	µg kg^{-1} dw	bdl-1.09	18.90	3.5	3.5	bdl	-	-	17.3	18.9	1.09
Indeno[1,2,3-cd]pyrene	µg kg^{-1} dw	bdl-0.2	12.70	1.7	-	bdl	0.2	6.1	bdl	12.7	1.35
Dibenzo[ah]anthracene	µg kg^{-1} dw	bdl-0.18	2.40	0.18	-	bdl	0.2	0.7	2.3	2.4	bdl**
Perylene	µg kg^{-1} dw	0.60	2.40	-	-	-	2.4	0.6	-	-	-
Benzo[b]fluoranthene	µg kg^{-1} dw	bdl	-	-	-	bdl	-	-	-	-	-
Dibenzothiophene	µg kg^{-1} dw	-	-	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	µg kg^{-1} dw	-	-	-	-	-	-	-	-	-	-
Stations selected							K	I	53	62	GT2
Core section	cm					>=8.5 cm	30-32	33-35	30-35	30-35	315
Sedimentation rate	mm yr^{-1}					0.4-0.6	2		~2 *	~2 *	1.2-1.8
Organic carbon	%					0.28	1.41	0.64	-	-	1.2

*derived fom Frignani et al., 2005 bdl: below detection limit; NAd: Northern Adriatic **the 0.00 value was assumed to be bdl

[1]UNEP-MAP, 2011; [2]UNEP-MAP, 2016; [3]OSPAR, 2009 ;[4]Berto et al., 2009; [5]Hatzianestis et al., 2004; [6]Caricchia et al., 1993; [7]Notar et al., 2001

Table 7. Range of concentrations of PAH compounds in offshore sediments of the Mediterranean

Compound	Unit	Offshore sediments RMinCO	Offshore sediments RMaxCO	Mediterranean[1] deep sediments	Cretan Sea[2] min	Cretan Sea[2] max	MAd[3] min	MAd[3] max
Naphthalene	µg kg^{-1} dw	0.22	2.13	-	-	-	0.22	2.13
Acenaphthene	µg kg^{-1} dw	bdl, 0.20	1.05	1.05	-	-	bdl	0.2
Acenaphtylene	µg kg^{-1} dw	bdl, 0.15	0.33	0.33	-	-	bdl	0.15
Fluorene	µg kg^{-1} dw	0.18	0.45	0.45	-	-	0.18	0.43
Phenanthrene	µg kg^{-1} dw	0.74	7.21	3.95	0.74	4.18	1.13	7.21
Anthracene	µg kg^{-1} dw	0.04	1.56	1.56	0.04	0.32	0.17	0.27
Fluoranthene	µg kg^{-1} dw	0.73	11.1	6.7	1.13	11.1	0.73	3.27
Pyrene	µg kg^{-1} dw	0.5	6.35	2.1	0.5	6.35	0.77	3.13
Benzo[a]anthracene	µg kg^{-1} dw	0.2	47.39	1.28	0.36	4.82	0.2	47.39
Chrysene	µg kg^{-1} dw	0.25	7.3	6.64	0.97	7.3	0.25	5.15
Benzo[a]pyrene	µg kg^{-1} dw	0.25	6.65	3.71	0.54	6.65	0.25	2.04
Benzo[ghi]perylene	µg kg^{-1} dw	0.51	8.91	3.25	1.11	8.91	0.51	4.03
Indeno[1,2,3-cd]pyrene	µg kg^{-1} dw	1.07	9.85	4.49	1.39	9.85	1.07	7.18
Dibenzo[ah]anthracene	µg kg^{-1} dw	0.17	2.46	1.37	0.37	2.46	0.17	1.07
Perylene	µg kg^{-1} dw	0.28	18.35	-	0.43	18.35	0.28	3.1
Benzo[b]fluoranthene	µg kg^{-1} dw	8.32	-	8.32	-	-	-	-
Dibenzothiophene	µg kg^{-1} dw	0.15	0.71	-	-	-	0.15	0.71
Benzo[k]fluoranthene	µg kg^{-1} dw	6.03	-	6.03	-	-	-	-
Stations selected					all		S4-S7	
Sampled section	cm				0	1	not specified (top)	
Organic carbon	%				0.3	0.82		
Bottom depth	m				100	1570	78	175

[1]UNEP/MAP 2011; [2]Gogou et al., 2000; [3]Mandic&Vrancic, 2017

bdl: below detection limit; MAd: Middle Adriatic

Table 8. Range of concentrations of PAH compounds in coastal sediments (harbors and rivers prodeltas) of the Eastern Mediterranean Sea.

		Coastal sediments		WNAd[1]		WNAd[2]		NAd[3]		ENAd[4]		Ionian Sea[5]		EMed[6]		EMed[7]	
Compound	Unit			Po prodelta		Po delta, Ancona		Gulf of Trieste		Rovinj harbor		Taranto harbor		Greece coast		Greece coast	
		RMinC	RMaxC	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Naphthalene	µg kg^{-1} dw	bdl-3.11	76.3	-	-	bdl	47.9	3.11	76.3	bdl	bdl	15	56	-	-	-	-
Acenaphthene	µg kg^{-1} dw	bdl-0.1	256	-	-	bdl	31.3	-	-	bdl	bdl	26	83	0.1	256	-	-
Acenaphtylene	µg kg^{-1} dw	bdl-0.1	69.6	-	-	bdl	7.9	1.12	10.2	bdl	bdl			0.1	69.6	-	-
Fluorene	µg kg^{-1} dw	<0.1	172	3	6.9	bdl	6.4	0.76	4.64	bdl	bdl	4	69	0.8	172	<0.1	5
Phenanthrene	µg kg^{-1} dw	0.2	1571	18.7	41.8	-	-	6.43	50.31	4.28	1412	27	673	6.4	1571	0.2	13.1
Anthracene	µg kg^{-1} dw	bdl-<0.1	765	3.2	7.6	-	-	0.83	11.35	bdl	765	7	109	0.7	93.4	<0.1	4.6
Fluoranthene	µg kg^{-1} dw	bdl-0.1	3089	34.7	55.8	bdl	76.2	1.64	69.53	bdl	2758	39	1351	6.6	3089	0.1	21
Pyrene	µg kg^{-1} dw	bdl-0.1	2427	25.8	48.1	bdl	73.7	2.04	64.38	bdl	1149	37	1163	7	2427	0.1	19.7
Benzo[a]anthracene	µg kg^{-1} dw	<0.1	1888	-	-	-	-	1.56	40.94	4.76	1265	22	781	4.6	1888	<0.1	20.2
Chrysene	µg kg^{-1} dw	bdl-1.69	2327	20	42.5	-	-	1.69	51.48	bdl	1128	20	713	5.5	2327	-	-
Benzo[a]pyrene	µg kg^{-1} dw	bdl-<0.1	2756	6.7	36.9	bdl	125.8	0.83	53.31	2.06	141.89	28	1180	6.1	2756	<0.1	17.1
Benzo[ghi]perylene	µg kg^{-1} dw	bdl-<0.1	1924	27.1	51.4	bdl	67.9	1.36	59.09	bdl	1015	32	1160	5.9	1924	<0.1	25.1
Indeno[1,2,3-cd]pyrene	µg kg^{-1} dw	bdl-<0.1	1944	18.9	29.4	bdl	47.9	1	42.21	bdl	1158	29	1445	8.8	1944	<0.1	19.6
Dibenzo[ah]anthracene	µg kg^{-1} dw	bdl-0.33	1379	3.9	6	bdl	12	0.33	10.11	bdl	1379	17	631	1	402	-	-
Perylene	µg kg^{-1} dw	1.7	678	-	-	-	-	-	-	-	-	-	-	1.7	678	-	-
Benzo[b]fluoranthene	µg kg^{-1} dw	<0.1	3807	25.0	40.4	-	-	-	-	-	-	-	-	16.8	3807	<0.1	15.8
Dibenzothiophene	µg kg^{-1} dw	0.7	93.4	-	-	-	-	-	-	-	-	-	-	0.7	93.4	-	-
Benzo[k]fluoranthene	µg kg^{-1} dw	<0.1	16.6	11.6	16.6	-	-	-	-	-	-	-	-	-	-	<0.1	6.3
Stations selected				53, 57, 68		all		all		all		all		all		all	
Sampled section	cm			0	5	not specified		0	2	not specified		0	5	not specified		0	10
Organic carbon	%			-	-	-		0.18	1.32	-	-	-	-	-	-	-	-

[1]Caricchia et al., 1993; [2]Magi et al. 2002; Nota et al, 2001; [4]Bihari et al., 2006; [5]Cardellicchio et al., 2007; [6]Botsou&Hatzianestis, 2012; [7]Tsapakis et al., 2010

NAd: Northern Adriatic; Med: Mediterranean; bdl: below detection limit

Table 9. Ranges used for the quality check of the PAHs in sediments in the EMed and comparison with ranges in WMed coastal sediments.

Compound	Unit		EMed			WMed[1]	
			Min	Max		Min	Max
Naphthalene	µg kg^{-1} dw	RMinCO	0.22	76.3	RMaxC	-	-
Acenaphthene	µg kg^{-1} dw	RMinC	0.1	256	RMaxC	-	-
Acenaphtylene	µg kg^{-1} dw	RMinC	0.1	69.6	RMaxC	-	-
Fluorene	µg kg^{-1} dw	RMinC	0.1	172	RMaxC	-	-
Phenanthrene	µg kg^{-1} dw	RMinC	0.2	1571	RMaxC	-	-
Anthracene	µg kg^{-1} dw	RMinCO	0.04	765	RMaxC	-	-
Fluoranthene	µg kg^{-1} dw	RMinC	0.1	3089	RMaxC	4.5	8200
Pyrene	µg kg^{-1} dw	RMinC	0.1	2427	RMaxC	-	-
Benzo[a]anthracene	µg kg^{-1} dw	RMinC	0.1	1888	RMaxC	-	-
Chrysene	µg kg^{-1} dw	RMinCO	0.25	2327	RMaxC	-	-
Benzo[a]pyrene	µg kg^{-1} dw	RMinC	0.1	2756	RMaxC	<1	2340
Benzo[ghi]perylene	µg kg^{-1} dw	RMinC	0.1	1924	RMaxC	<1	2525
Indeno[1,2,3-cd]pyrene	µg kg^{-1} dw	RMinC	0.1	1944	RMaxC	<1	1900
Dibenzo[ah]anthracene	µg kg^{-1} dw	RMinCO	0.17	1379	RMaxC	-	-
Perylene	µg kg^{-1} dw	RMinCO	0.28	678	RMaxC	-	-
Benzo[b]fluoranthene	µg kg^{-1} dw	RMinC	0.1	3807	RMaxC	<1	2790
Dibenzothiophene	µg kg^{-1} dw	RMinCO	0.15	93.4	RMaxC	-	-
Benzo[k]fluoranthene	µg kg^{-1} dw	RMinC	0.1	-		<1	1320

[1]RNO, 1998 Med: Mediterranean

The **minimum value** of all RBC_{min} (Tab.6), RMinCO (Tab. 7) and RMinC (Tab. 8) was taken as the **lower limit** for the QC of the data and reported in Tab. 9.

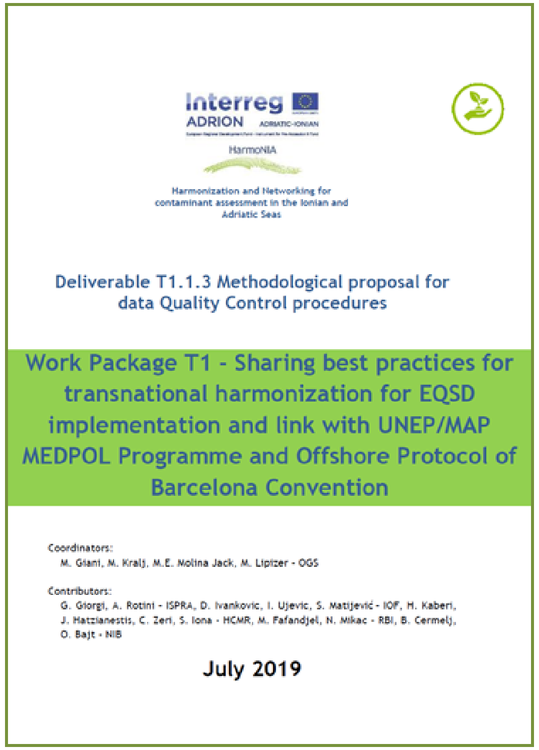
The **maximum value** of all RBC_{max} (Tab. 6), RMaxCO (Tab. 7) and RmaxC (Tab. 8) was taken as the **upper limit** for the QC of the data and reported in Tab. 9.

For the QC an **overall error** of **15%** can be assumed and applied to the range.

Criteria for the quality check based on ranges are:

- the value should be equal or higher than the minimum value of regional background concentration (RBCmin) and Regional Minimum Concentration for Offshore sediments (RMinCO) for the Eastern Mediterranean.
- the value should be equal or lower than the maximum value of Regional coastal maximum concentration (RMaxC), regional maximum Offshore concentration(RMaxCO) and Regional maximum Background Concentration (RBCmax) derived for Eastern Mediterranean area.
- data with “zero” value are not acceptable ->in these cases “0” value should be substituted with the appropriate LOD or LOQ value, when possible, and they should be labeled with the SeaDataNet QF 6 “value below detection limit” or Q “value below limit of quantification”.

Value	QV:SEA	Units	Modified-Value	HarmoNIA_QV:SEADATANET	Modified Units
0	0	ug/kg	0	6	ug/kg
0.1	0	ug/kg	0.1	0	ug/kg
0.04	0	ug/kg	0.04	0	ug/kg
0	0	ug/kg	0	6	ug/kg
0.16	0	ug/kg	0.16	0	ug/kg
0.02	0	ug/kg	0.02	0	ug/kg
0.77	0	ug/kg	0.77	0	ug/kg
33.4	0	ug/kg	33.4	0	ug/kg


Interreg ADRION ADRIATIC-IONIAN
HarmoNIA
Harmonization and Networking for contaminant assessment in the Ionian and Adriatic Seas

Deliverable T1.1.3 Methodological proposal for data Quality Control procedures

Work Package T1 - Sharing best practices for transnational harmonization for EQSD implementation and link with UNEP/MAP MEDPOL Programme and Offshore Protocol of Barcelona Convention

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July 2019

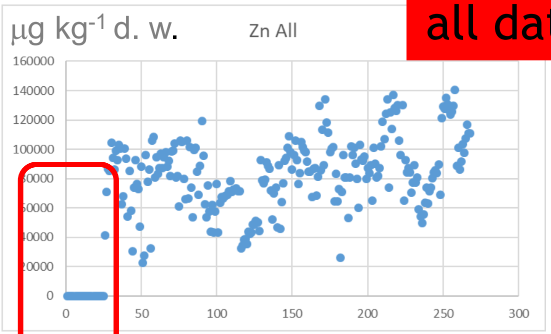
Selection of each substance for QC

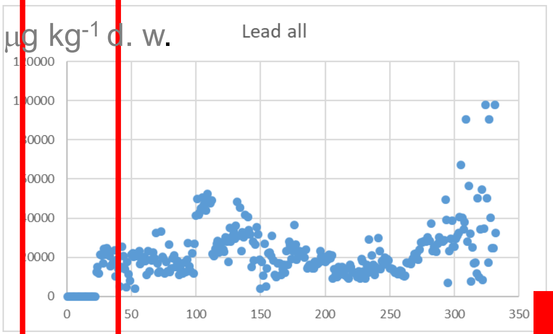
Inspect matrix characteristics: eg. Total sediment, <2000 µm, < 63 µm (what to do?)

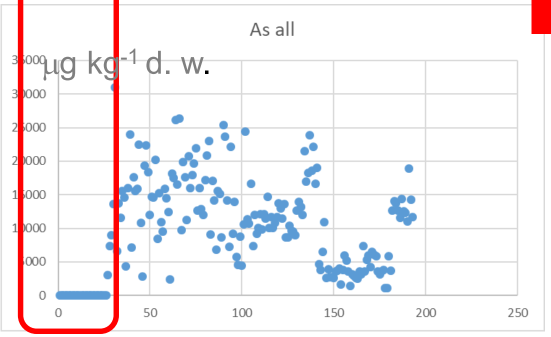
- Apply ranges to the **whole group** of data
- Apply ranges to a **subgroup** of data

Plot total group to identify macroscopic discrepancies

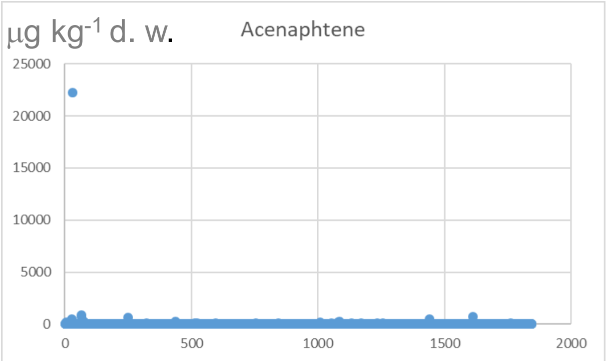
all data from same data originator

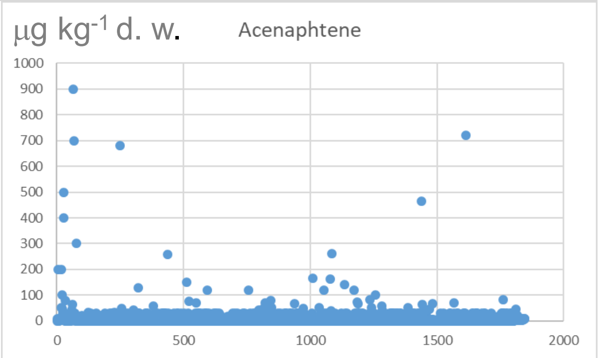


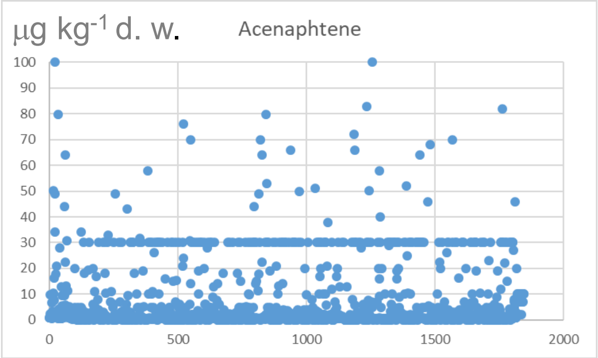




Contact originator



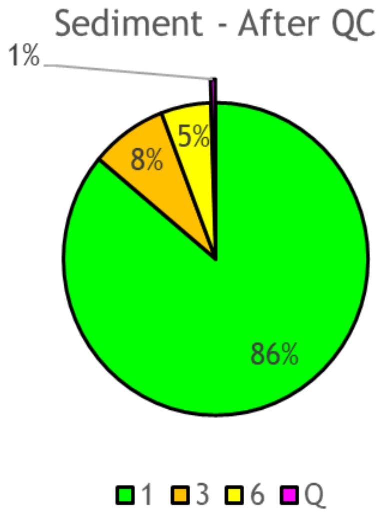


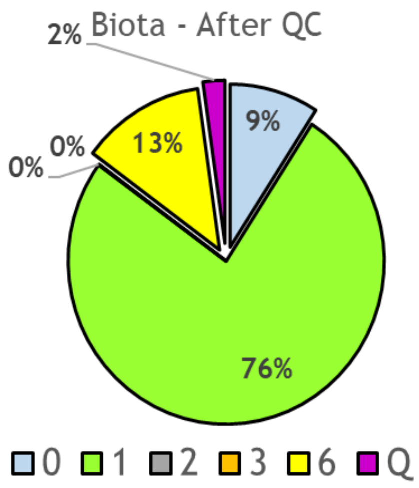


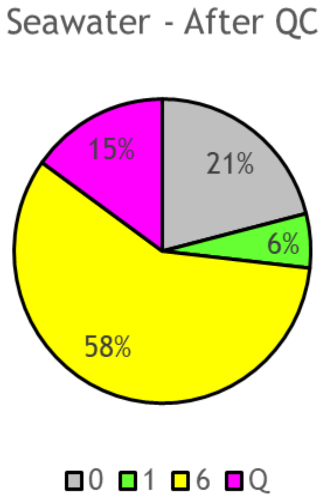
❖ HarmoNIA Quality Control

Outcomes:

- 3 datasets (one for each matrix)
- Harmonization, formal control, «zero concentration QC» and (sediment) range QC
- Work done: checking QF* (QF=6 to zero concentration, assigning QF=3 - Probably bad, QF = 5 – changed –ex. Wrong P01, unit, → **contact with originator**)







QF Code	QF name
0	no quality control
1	good value
2	probably good value
3	probably bad value
4	bad value
5	changed value
6	value below detection
7	value in excess
8	interpolated value
9	missing value
A	value phenomenon uncertain
Q	value below limit of quantification

*SeaDataNet standard QF scale

What has been done:

- Application of ranges to the whole group of data
- Application of ranges to a subgroup of data (sediment size classes)
- Up to know: manual work (very time consuming)
- Not feasible with complex datasets
- Improvement of data QC procedure: standard units allow comparison
- Ranges allowed identification of suspect or wrong values
- Aggregated collections for contaminants in water, sediment and biota that will be used for data products development
- A detailed protocol to carry out the format control for contaminants.
- This protocol could be useful on a wider scale within EMODnet Chemistry community

What could be improved:

- Availability of other data as grain size, Al, organic carbon content could improve the comparison and QC by adopting normalization procedures
- Comparable LOQ are needed to compare properly the data and represent them
- Need of comparable analytical approaches e.g. total metal concentration vs partial extraction, standard grain size fraction < 2mm vs <63 μm, extraction recoveries for each organic pollutant, increase use of CRMs
- Need of selection of a core of selected common contaminants among different member states