

# **Regional alliances and Sharing Information for PFC research**

**- intergovernmental partnership & cooperation -**

**Takeshi Nakano,  
Osaka University  
Research Center for Environmental Preservation**

47 prefectures in Japan

66 Env Sci Inst. located in  
local government



# The begining

cancer

PFC

**発がん性指摘 有機フッ素**

**猪名川で高濃度汚染**

**西宮など 住民の血中に蓄積**

高濃度のPFOA汚染が確認された近畿圏の3河川

京都府、大阪府、兵庫県にまたがる猪名川、宇治川、桂川。この3河川は、京都府の宇治市、大阪府の河内郡、兵庫県の高砂市を流れる。この3河川は、京都府の宇治市、大阪府の河内郡、兵庫県の高砂市を流れる。この3河川は、京都府の宇治市、大阪府の河内郡、兵庫県の高砂市を流れる。

Kansai area (Kyoto, Osaka, Kobe)  
river, drinking, human :  
High level of PFC (PFOA)

only PFOS/PFOA data  
Few data is available for  
precursors, source and  
emission industry

22 May 2007  
Kobe News Paper

# Persistent Organic Pollutants. Stockholm Convention

## The Initial 12 POPs

- PCBs
- Hexachlorobenzene
- PCDDs
- PCDFs
- Aldrin
- Dieldrin
- Endrin
- Chlordane
- Heptachlor
- Mirex
- Toxaphene
- DDT

## POPs added since 2009

- Tetrabromodiphenyl ether (TeBDE)
  - Pentabromodiphenyl ether (PeBDE)
  - Hexabromodiphenyl ether (HxBDE)
  - Heptabromodiphenyl ether (HpBDE)
  - Hexabromobiphenyl (HBB)
  - Pentachlorobenzene (PeCB)
  - Perfluorooctane sulfonic acid (PFOS)  
including perfluorooctane sulfonyl fluoride
  - $\alpha$ -hexachlorocyclohexane ( $\alpha$ -HCH)
  - $\beta$ -hexachlorocyclohexane ( $\beta$ -HCH)
  - $\gamma$ -hexachlorocyclohexane ( $\gamma$ -HCH, lindane)
  - Chlordecone
  - Endosulfan
- Hexabromocyclododecane (HBCDD)  
Hexachlorobutadiene (HCBD)  
Polychlorinated naphthalenes (PCN)  
Short-chain chlorinated paraffins (SCCPs)  
Decabromodiphenyl ether (c-decaBDE)

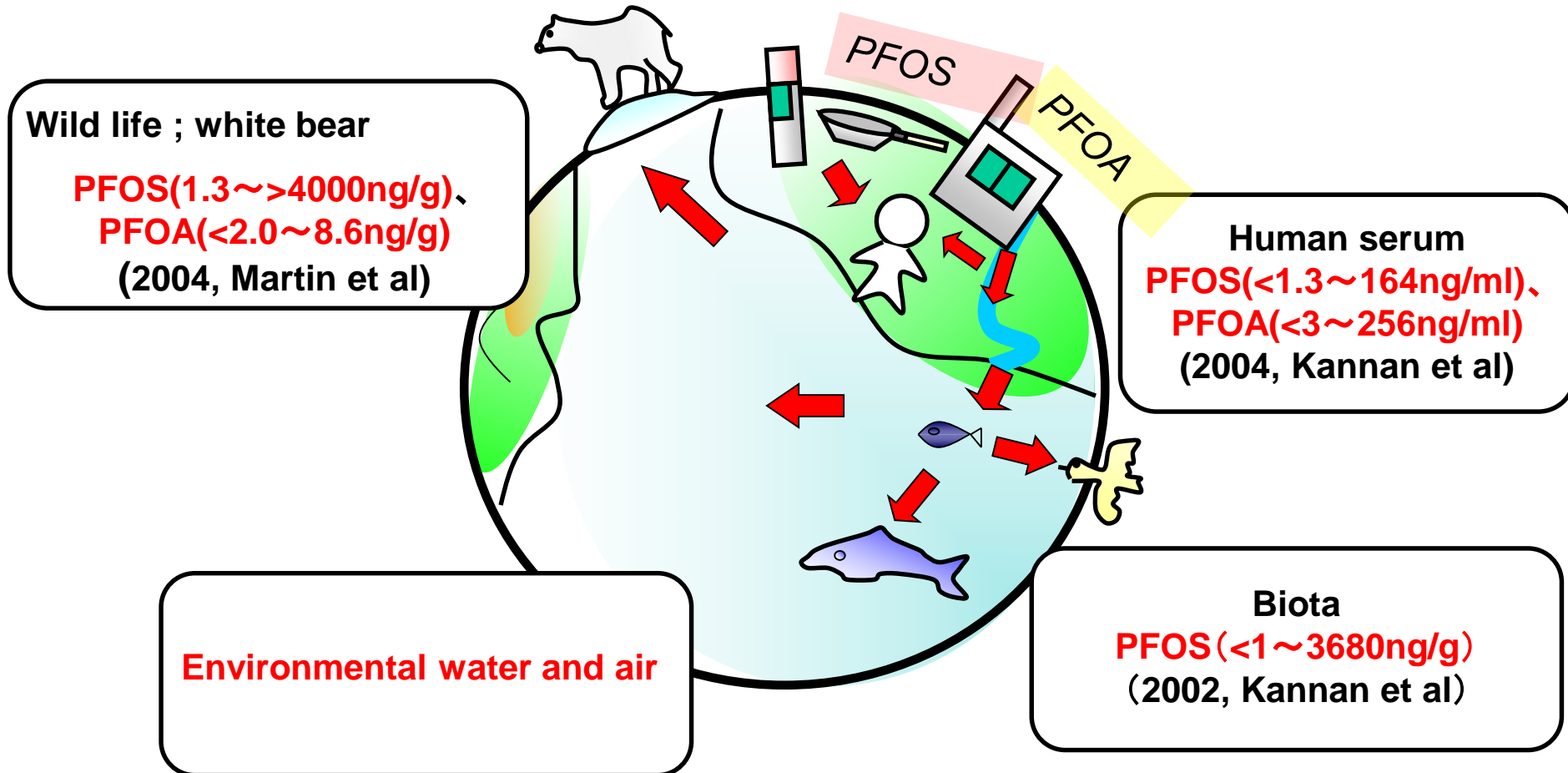
● Industrial chemical

● Unintentional by-product

● Pesticide

# PFOS/PFOA level

## PFOS/PFOA pollution enlargement globally







4 prefectures , 3 cities

Joint research to collaborate  
between 7 Env Sci Inst. in Kansai  
region



Environment Research and  
Technology Development Fund

[Overview of the Environment  
Research and Technology  
Development Fund](#)

[Research Fields](#)

**NEW**

[Assessment of Research  
Funding Systems](#)

[Related Materials](#)

**NEW**

[List of Research Projects  
Conducted](#)

**NEW**

[Major Achievements](#)


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## Related Materials

[Environment Research and Technology Development Fund FY2016 Pamphlet](#) **NEW**

The latest pamphlet on the Environment Research and Technology Development Fund. Click the link below to download.

[Environment Research and Technology Development Fund FY2016](#)  [3.72MB]

[What is the Environment Research and Technology  
Development Fund?](#)

[Research Fields](#)

[Strategic Research and Development Area](#)

[Common to All Fields / Cross-sectional through Different Fields](#)

[Low Carbon Field](#)

[Sound Material-cycle Field](#)

[Harmony with Nature Field](#)

[Safe and Secure Field](#)

[List of Research Projects Conducted in FY2016](#)

[Information on calls for proposals](#)



## Past Pamphlet



# Environment Research and Technology Development Fund

## Purpose

The Environment Research and Technology Development Fund (**ERTDF**) aims

- to contribute to the preservation of the environment in Japan and around the world
- to establish a sustainable society.

It will achieve this by assembling the collective strength of researchers within Japan from a range of fields to promote survey research and technology development in a comprehensive manner from an academic and international perspective.

## Features

The **ERTDF** was established by integrating the Global Environment Research Fund with the Environment Technology Development Fund with the Environment Technology Development Fund in FY2010 and the Grant-in-Aid for Scientific Research about Establishing a Sound Material-cycle Society in FY2011.

This has established a centralized contact-point, improving convenience for applicants. At the same time this move is expected to better facilitate cross-field research and development across multiple environmental fields



# Environment Research and Technology Development Fund

**If you don't try, nothing happens.**

- about 10 years ago

The Environment Research and Technology Development Fund (**ERTDF**) was open on the web page.

- we didn't know public offering started  
keyword was '**Regional Cooperation**' and '**Technology Development**'  
I got this information 10days before the deadline.

I have many friends and good relationship.

deadline was 10 days later

What can we do?

what topics? object, senario,

It's better to give up in this time.

only 10 days.

# Environment Research and Technology Development Fund

I called on my friend Yagi, Yamamoto Osamu, Shibata, Tsuda, Hattori, Takahashi

How do you think?

They completely agree with me. We should collaborate intergovernmental research/survey/monitoring. and They asked When is the deadline?

- 10 days later,

woops

If you don't try, nothing happens.

Anyway, I started to establish our mailing list to discuss and sharing information for submission. Usually it's hard to harmonize all steps for governmental institute. We need get permission from our boss and Director of institute.

They decided sub title of their research, and prepared material for submission. We have many steps for completing everything. It was very hard very high hurdle in front of us. Anyway we started to do something, we start and move just like a rolling stones.

We didn't have iCloud at that time, but we started to make materials like a using iCloud.

# Environment Research and Technology Development Fund

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# Study on sources, environmental level, and treatment technology of Organofluoro compounds (Principal Investigator: Takeshi Nakano)

**Kinki**

Survey on the contaminations of PFOS and related PFs in Lake Biwa water (Shiga)

A survey on pollution of organic PFCs in the area of Osaka Prefecture (Osaka pref.)

Evaluation of occurrence of PFOS, PFOS and related compounds around the manufacturing facility (Osaka city)

Understanding of the source and evaluation of transboundary pollution of fluorotelomer compounds(FTs) (Hyogo pref.)

Concentration level of PFCs in coastal seawater in Kobe (Kobe city)

Survey of the PFCs level and the type of discharging industries (Tokyo metro.)

Trend analysis of fluorosurfactants pollution by the archived samples in environmental specimen bank (NIES)

**Sharing information / Discussion : mailing list**

**Kanto**



フッ素系界面活性剤研究キックオフ会議  
平成20年10月16~17日 国立環境研究所地球温暖化研究棟 交流会議室



# Environment Research and Technology Development Fund

We need to complete also budget plan.

- sampler, instrument, calculation of business trip, presentation in international symposium, etc, etc,

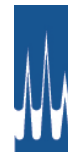
.

Anyway I decided to buy all PFC standards which was available at that time.

reported our joint research result

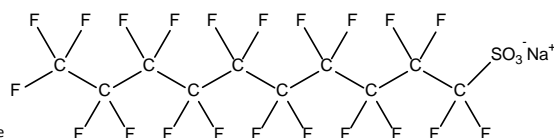
If Ministry of Environment satisfy our report, we can continue our research to the next project.

If no, it will be end.

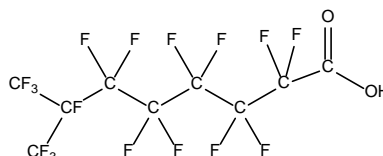


## Wellington offers a comprehensive line of **native** and **mass-labelled** perfluorinated compounds

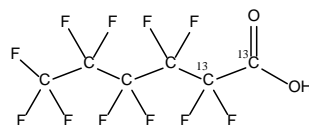
PFCA	Product Name
PFBA	Perfluoro-n-butanoic acid
PFPeA	Perfluoro-n-pentanoic acid
PFHxA	Perfluoro-n-hexanoic acid
PFHpA	Perfluoro-n-heptanoic acid
PFOA	Perfluoro-n-octanoic acid
T-PFOA	Technical Ammonium Perfluorooctanoate
PFNA	Perfluoro-n-nonanoic acid
ipPFNA	Perfluoro-7-methyloctanoic acid
PFDA	Perfluoro-n-decanoic acid
PFUdA	Perfluoro-n-undecanoic acid
PFDoA	Perfluoro-n-dodecanoic acid
PFTrDA	Perfluoro-n-tridecanoic acid
PFTeDA	Perfluoro-n-tetradecanoic acid
PFHxDA	Perfluoro-n-hexadecanoic acid
PFODA	Perfluoro-n-octadecanoic acid
P3MHpA	Perfluoro-3-methylheptanoic acid
P355TMHxA	Perfluoro-3,5,5-trimethylhexanoic acid
P4MOA	Perfluoro-4-methyloctanoic acid
P37DMOA	Perfluoro-3,7-dimethyloctanoic acid
M3PFBA	Perfluoro-n-[2,3,4-13C3]butanoic acid
MPFBA	Perfluoro-n-[1,2,3,4-13C4]butanoic acid
M3PFPeA	Perfluoro-n-[3,4,5-13C3]pentanoic acid
M5PFPeA	Perfluoro-n-[1,2,3,4,5-13C5]pentanoic acid
MPFHxA	Perfluoro-n-[1,2-13C2]hexanoic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
M4PFHpA	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid
M2PFOA	Perfluoro-n-[1,2-13C2]octanoic acid
MPFOA	Perfluoro-n-[1,2,3,4-13C4]octanoic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
MPFNA	Perfluoro-n-[1,2,3,4,5-13C5]nonanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
MPFDA	Perfluoro-n-[1,2-13C2]decanoic acid
MPFDA-A	Perfluoro-n-[1,2-13C2]decanoic acid (in acetonitrile)
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
MPFUdA	Perfluoro-n-[1,2-13C2]undecanoic acid
M7PFUdA	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoA	Perfluoro-n-[1,2-13C2]dodecanoic acid
M2PFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid
M2PFHxDA	Perfluoro-n-[1,2-13C2]hexadecanoic acid



**linear**



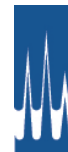
**branched**



**<sup>13</sup>C-labelled**

PFAS	Product Name
L-PFPtS	Sodium perfluoro-1-propanesulfonate
L-PFBs	Potassium perfluoro-1-butanesulfonate
L-PFPeS	Sodium perfluoro-1-pentanesulfonate
L-PFHxS	Sodium perfluoro-1-hexanesulfonate
br-PFHxSK	L-PFHxS with branched isomers (Potassium Salt)
L-PFHpS	Sodium perfluoro-1-heptanesulfonate
NaP3MHpS	Sodium Perfluoro-3-methylheptanesulfonate
NaP6MHpS	Sodium perfluoro-6-methylheptanesulfonate
L-PFOS	Sodium perfluoro-1-octanesulfonate
L-PFOSK	Potassium perfluoro-1-octanesulfonate
br-PFOSK	L-PFOSK with branched isomers
T-PFOS	Potassium perfluorooctanesulfonate (Technical Grade)
8Cl-PFOS	Sodium 8-chloroperfluoro-1-octanesulfonate
L-PFNS	Sodium perfluoro-1-nonanesulfonate
ipPFNS	Sodium perfluoro-7-methyloctanesulfonate
L-PFDS	Sodium perfluoro-1-decanesulfonate
L-PFDoS	Sodium perfluoro-1-dodecanesulfonate
PFECHS	Potassium perfluoro-4-ethylcyclohexanesulfonate (isomeric mixture)
M3PFBS	Sodium perfluoro-1-[2,3,4-13C3]butanesulfonate
MPFHxS	Sodium perfluoro-1-hexane[18O2]sulfonate
M3PFHxS	Sodium perfluoro-1-[1,2,3-13C3]hexanesulfonate
MPFOS	Sodium perfluoro-1-[1,2,3,4-13C4]octanesulfonate
M8PFOS	Sodium perfluoro-1-[13C8]octanesulfonate
PFC-MXA	Native PFCa Solution/Mixture
PFS-MXA	Native PFAS Solution/Mixture
PFAC-MXA	Native PFCAs and PFASs Solution/Mixture
PFAC-MXB	Native PFCAs and PFASs Solution/Mixture
PFAC-MXD	Native PFCAs and PFASs Solution/Mixture
MPFAC-MXA	Mass-Labelled PFCAs and PFASs Solution/Mixture
PFC-CVS-C	PFC-CVS-C Calibration Kit
MPFAC-C-ES	Mass-Labelled PFC Extraction Standards Solution
MPFAC-C-IS	Mass-Labelled PFC Injection Standards Solution
PFAC-MXC	Native PFC Stock Solution
EPA-537IS	Internal Standard Primary Dilution Standard
EPA-537SS	Surrogate Primary Dilution Standard
PFAC-24PAR	Native PFAS Precision and Recovery Standard Solution
MPFAC-24ES	Mass-Labelled PFAS Extraction Standard Solution
P1MHpS	Perfluoro-1-methylheptane sulfonate
P3MHpS	Perfluoro-3-methylheptane sulfonate;Perfluoro-3-methylheptanoic acid
P4MHpS	Perfluoro-4-methylheptane sulfonate;Perfluoro-4-methylheptanoic acid
P5MHpS	Perfluoro-5-methylheptane sulfonate;Perfluoro-5-methylheptanoic acid
P6MHpS	Perfluoro-6-methylheptane sulfonate;Perfluoro-6-methylheptanoic acid
P55DMHxS	Perfluoro-5,5-dimethylhexane sulfonate;Perfluoro-5,5-dimethylhexanoic acid
P44DMHxS	Perfluoro-4,4-dimethylhexane sulfonate;Perfluoro-4,4-dimethylhexanoic acid
P45DMHxS	Perfluoro-4,5-dimethylhexane sulfonate;Perfluoro-4,5-dimethylhexanoic acid
	Perfluoro-3,5-dimethylhexane sulfonate;Perfluoro-3,5-dimethylhexanoic acid

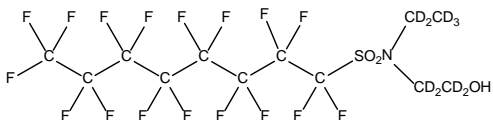
# FOCUS: PERFLUORINATED COMPOUNDS



## FOSA/FOSE/FOSAA

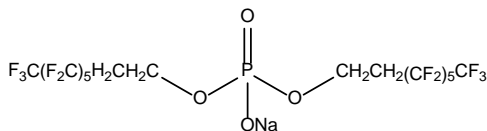
Product Name	Chemical Name
FOSA-I	Perfluoro-1-octanesulfonamide
N-MeFOSA-M	N-methylperfluoro-1-octanesulfonamide
N,N-Me2FOSA-M	N,N-dimethylperfluoro-1-octanesulfonamide
N-EtFOSA-M	N-ethylperfluoro-1-octanesulfonamide
M8FOSA-I	Perfluoro-1-[13C8]octanesulfonamide
d-N-MeFOSA-M	N-methyl-d3-perfluoro-1-octanesulfonamide
d-N-EtFOSA-M	N-ethyl-d5-perfluoro-1-octanesulfonamide
N-MeFOSE-M	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
N-EtFOSE-M	2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol
d7-N-MeFOSE-M	2-(N-methyl-d3-perfluoro-1-octanesulfonamido)ethan-d4-ol
d9-N-EtFOSE-M	2-(N-ethyl-d5-perfluoro-1-octanesulfonamido)ethan-d4-ol

Product Name	Chemical Name
FOSAA	Perfluoro-1-octanesulfonamidoacetic acid
N-MeFOSAA	N-methylperfluoro-1-octanesulfonamidoacetic acid
N-EtFOSAA	N-ethylperfluoro-1-octanesulfonamidoacetic acid
d3-N-MeFOSAA	N-methyl-d3-perfluoro-1-octanesulfonamidoacetic acid
d5-N-EtFOSAA	N-ethyl-d5-perfluoro-1-octanesulfonamidoacetic acid



## OP-PFCs

Product Name	Chemical Name
PFHxPA	Perfluorohexylphosphonic acid
PFOPA	Perfluorooctylphosphonic acid
PFDPA	Perfluorodecylphosphonic acid
Cl-PFHxPA	6-Chloroperfluorohexylphosphonic acid
Cl-PFOPA	8-Chloroperfluorooctylphosphonic acid
6:6PFPI	Sodium bis(perfluorohexyl)phosphinate
6:8PFPI	Sodium perfluorohexylperfluorooctylphosphinate
8:8PFPI	Sodium bis(perfluorooctyl)phosphinate
6:2PAP	Sodium 1H,1H,2H,2H-perfluorooctylphosphate
8:2PAP	Sodium 1H,1H,2H,2H-perfluorodecylphosphate
6:2diPAP	Sodium bis(1H,1H,2H,2H-perfluorooctyl)phosphate
8:2diPAP	Sodium bis(1H,1H,2H,2H-perfluorodecyl)phosphate
6:2/8:2diPAP	Sodium (1H,1H,2H,2H-perfluorooctyl-1H,1H,2H,2H-perfluorodecyl)phosphate
SAmPAP	Sodium 2-(N-ethylperfluorooctane-1-sulfonamido)ethyl phosphate
diSAmPAP	Sodium bis-[2-(N-ethylperfluorooctane-1-sulfonamido)ethyl] phosphate
M2-6:2PAP	Sodium 1H,1H,2H,2H-[1,2-13C2]perfluorooctylphosphate
M2-8:2PAP	Sodium 1H,1H,2H,2H-[1,2-13C2]perfluorodecylphosphate
M4-6:2diPAP	Sodium bis(1H,1H,2H,2H-[1,2-13C2]perfluorooctyl)phosphate
M4-8:2diPAP	Sodium bis(1H,1H,2H,2H-[1,2-13C2]perfluorodecyl)phosphate



## Telomer PFAS

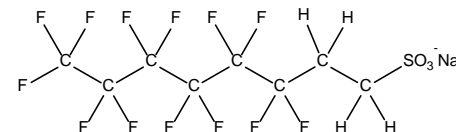
FBET	2-Perfluorobutyl ethanol (4:2)
5:2sFTOH	1-Perfluoropentyl ethanol (5:2 secondary)
FHET	2-Perfluorohexyl ethanol (6:2)
7:2sFTOH	1-Perfluoroheptyl ethanol (7:2 secondary)
FOET	2-Perfluorooctyl ethanol (8:2)
FDET	2-Perfluorodecyl ethanol (10:2)
MF BET	2-Perfluorobutyl-[1,1,2,2-2H4]-ethanol (4:2)
MFHET	2-Perfluorohexyl-[1,1-2H2]-[1,2-13C2]-ethanol (6:2)
M2FHET	2-Perfluorohexyl-[1,2-13C2]-ethanol (6:2)
MFOET	2-Perfluorooctyl-[1,1-2H2]-[1,2-13C2]-ethanol (8:2)
M2FOET	2-Perfluorooctyl-[1,2-13C2]-ethanol (8:2)
MFDET	2-Perfluorodecyl-[1,1-2H2]-[1,2-13C2]-ethanol (10:2)

FHEA	2-Perfluorohexyl ethanoic acid (6:2)
FOEA	2-Perfluorooctyl ethanoic acid (8:2)
FDEA	2-Perfluorodecyl ethanoic acid (10:2)
FPpPA	3-Perfluoropropyl propanoic acid (3:3)
FPePA	3-Perfluoropentyl propanoic acid (5:3)
FHpPA	3-Perfluoroheptyl propanoic acid (7:3)
FTA-MXA	Native FTA Solution/Mixture
MFHEA	2-Perfluorohexyl-[1,2-13C2]-ethanoic acid (6:2)
MFOEA	2-Perfluorooctyl-[1,2-13C2]-ethanoic acid (8:2)
MFDEA	2-Perfluorodecyl-[1,2-13C2]-ethanoic acid (10:2)
MFTA-MXA	Mass-Labelled FTA Solution/Mixture
FHUEA	2H-Perfluoro-2-octenoic acid (6:2)
FOUEA	2H-Perfluoro-2-decenoic acid (8:2)
FDUEA	2H-Perfluoro-2-dodecenoic acid (10:2)
MFHUEA	2H-Perfluoro-[1,2-13C2]-2-octenoic acid (6:2)
MFOUEA	2H-Perfluoro-[1,2-13C2]-2-decenoic acid (8:2)
MFDEUA	2H-Perfluoro-[1,2-13C2]-2-dodecenoic acid (10:2)

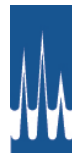
NaDONA	Sodium dodecafluoro-3H-4,8-dioxanonanoate
9Cl-PF3ONS	Potassium 9-chlorohexadecafluoro-3-oxanonane-1-sulfonate
11Cl-PF3OUDS	Potassium 11-chloroicosadecafluoro-3-oxaundecane-1-sulfonate
HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid (GenX)
M3HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-13C3-propanoic acid

4:2FTS	Sodium 1H,1H,2H,2H-perfluorohexane sulfonate (4:2)
6:2FTS	Sodium 1H,1H,2H,2H-perfluorooctane sulfonate (6:2)
8:2FTS	Sodium 1H,1H,2H,2H-perfluorodecane sulfonate (8:2)
10:2FTS	Sodium 1H,1H,2H,2H-perfluorododecane sulfonate (10:2)
M2-4:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]hexane sulfonate (4:2)
M2-6:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]octane sulfonate (6:2)
M2-8:2FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]decane sulfonate (8:2)

8:2FTOAc	1H,1H,2H,2H-Perfluorodecyl acetate
10:2FTOAc	1H,1H,2H,2H-Perfluorododecyl acetate
8:2FTAc	1H,1H,2H,2H-Perfluorodecyl acrylate
10:2FTAc	1H,1H,2H,2H-Perfluorododecyl acrylate

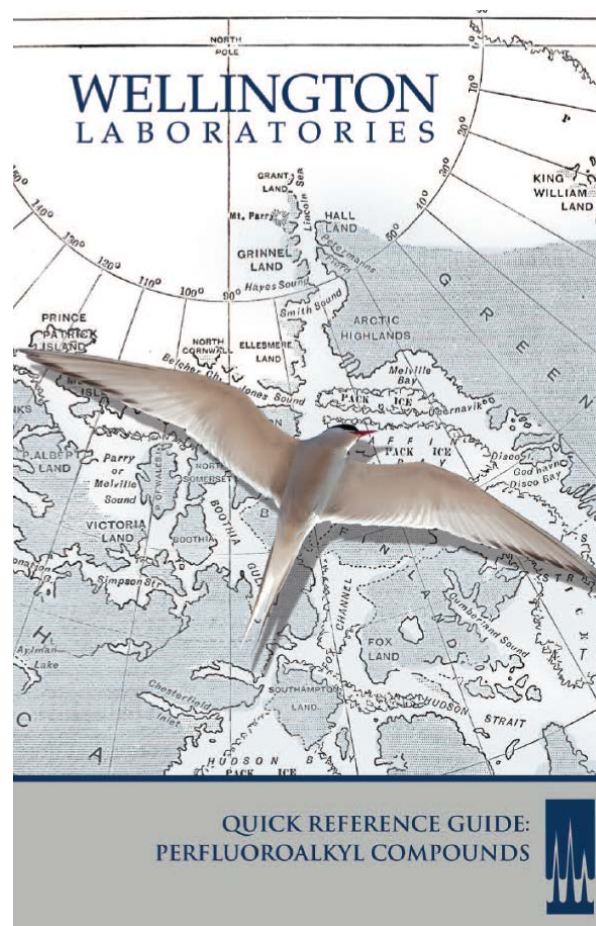


# FOCUS: PERFLUORINATED COMPOUNDS

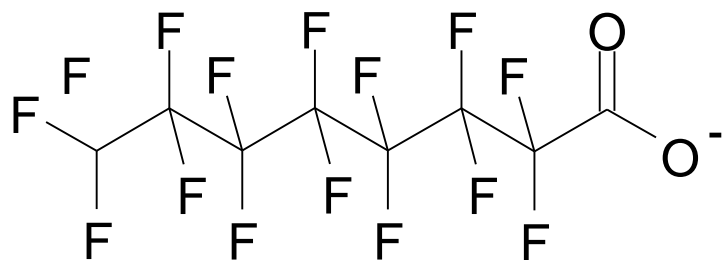


PFC Reference and Handling Guides are available on our web-site

[www.well-labs.com](http://www.well-labs.com)



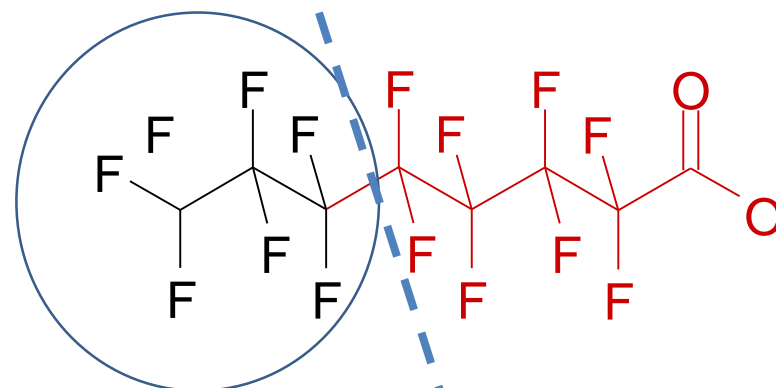
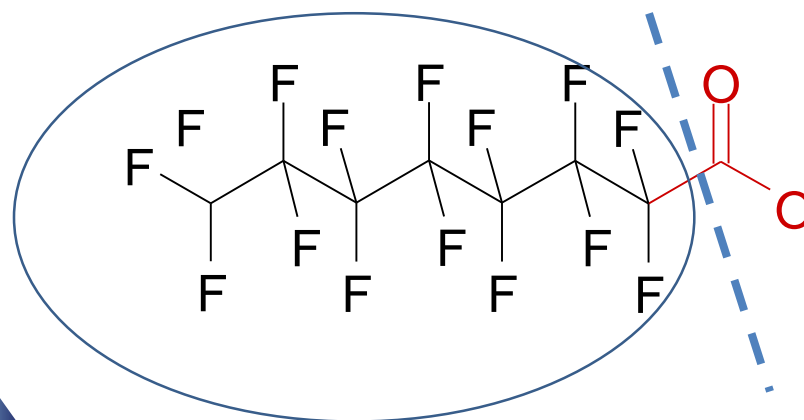
# MS/MS condition (PFOA)



$m/z = 413$



$m/z = 369$



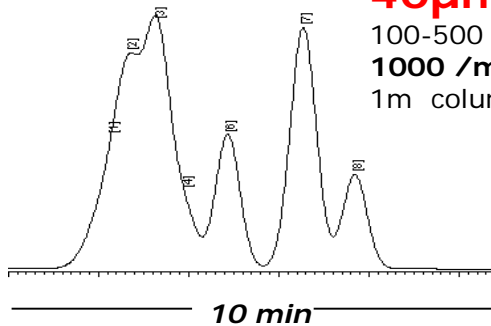
$m/z = 169$



# LC column particle size

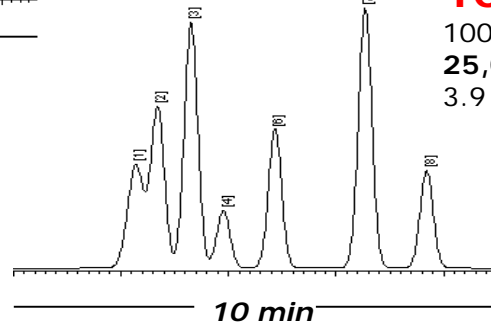
1970's-

**40 $\mu$ m** pellicular non-porous coated  
100-500 psi  
**1000 /m**  
1m column



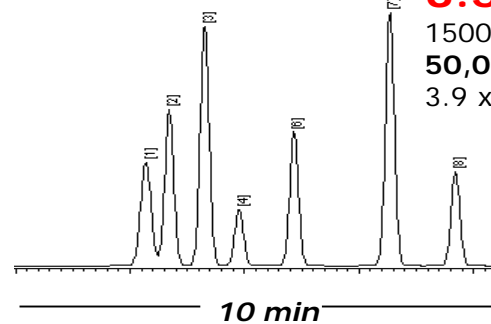
1975-

**10 $\mu$ m** Irregular micro-porous  
1000-2500 psi  
**25,000 /m**  
3.9 x 300mm

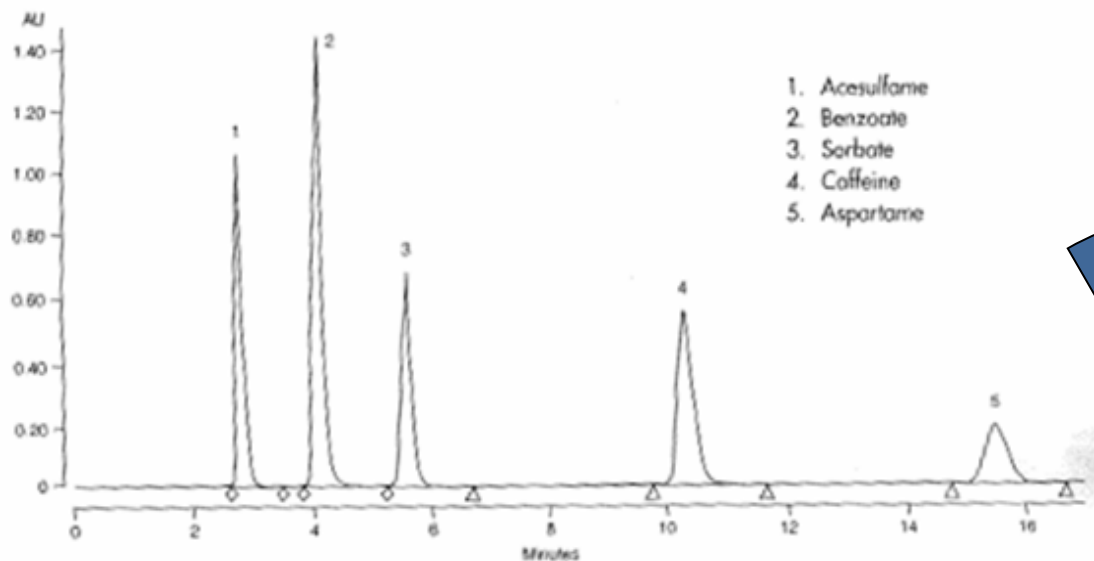


1980's-

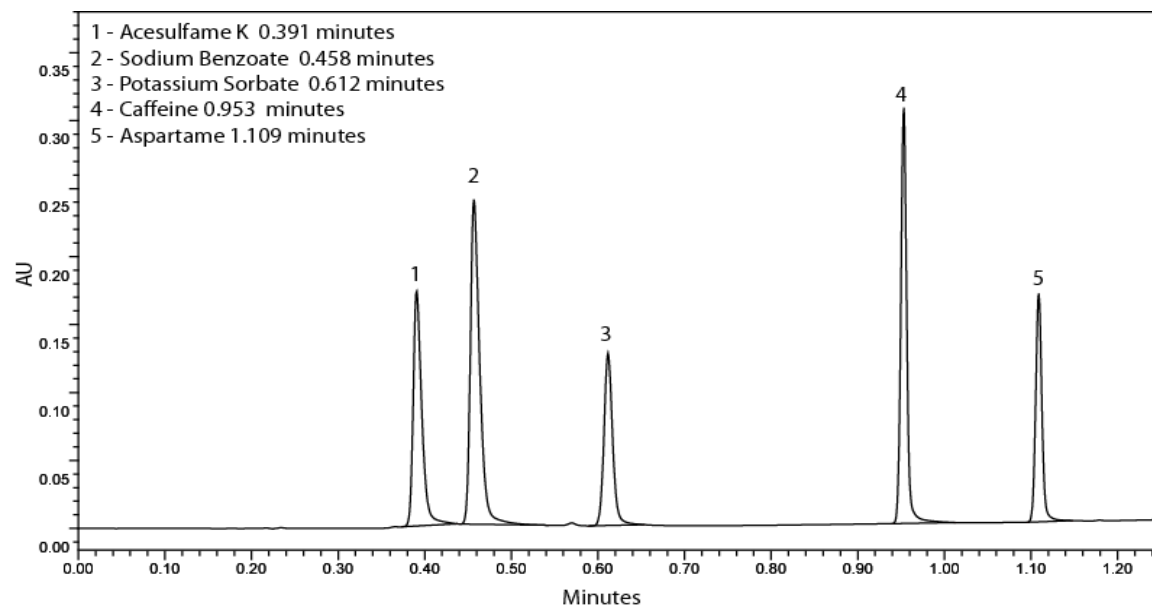
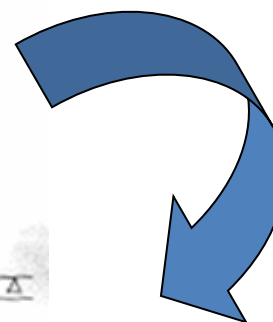
**3.5 - 5 $\mu$ m** spherical micro-porous  
1500-4000 psi  
**50,000 - 80,000 /m**  
3.9 x 300mm



# Method transfer



HPLC / 18min cycle



UPLC / 1.3min cycle

Ezaki (Waters), 2009

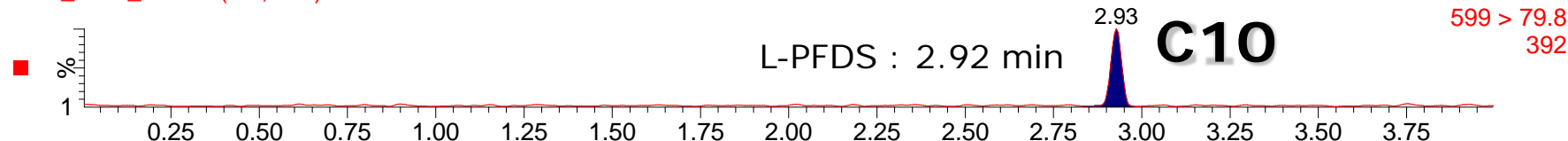
# PFASs

	Precursor ion ( <i>m/z</i> )	Product ion ( <i>m/z</i> )	Cone Voltage (V)	Collision energy (eV)
L-PFBS	299.0	79.8	45	30
L-PFHxS	399.0	79.8	50	40
L-PFHpS	449.0	79.8	60	40
L-PFOS	499.0	79.8	55	40
L-PFDS	599.0	79.8	55	50

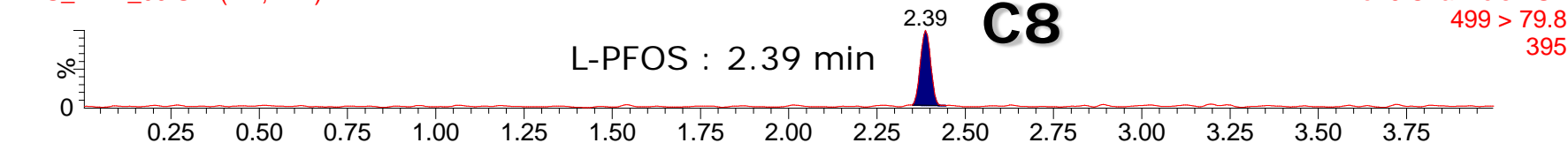
# PFASs (C4-C10) 5ng/L

5ng/L

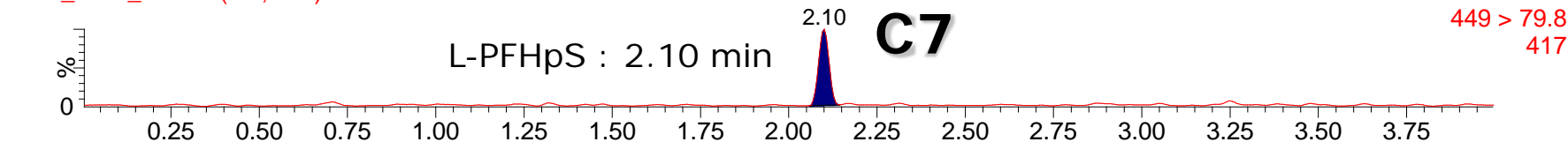
PFS\_MXA\_09 Sm (Mn, 2x2)



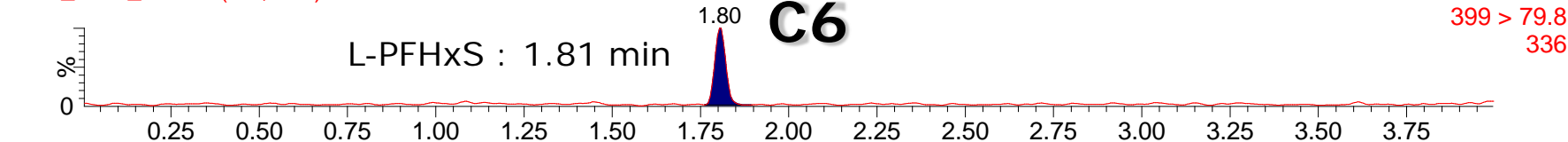
PFS\_MXA\_09 Sm (Mn, 2x2)



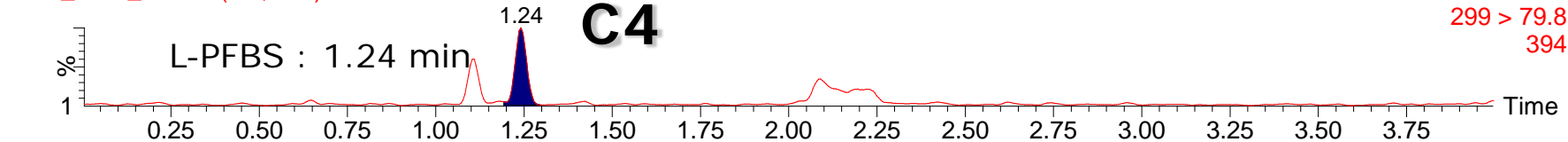
PFS\_MXA\_09 Sm (Mn, 2x2)



PFS\_MXA\_09 Sm (Mn, 2x2)



PFS\_MXA\_09 Sm (Mn, 2x2)



# PFCAs

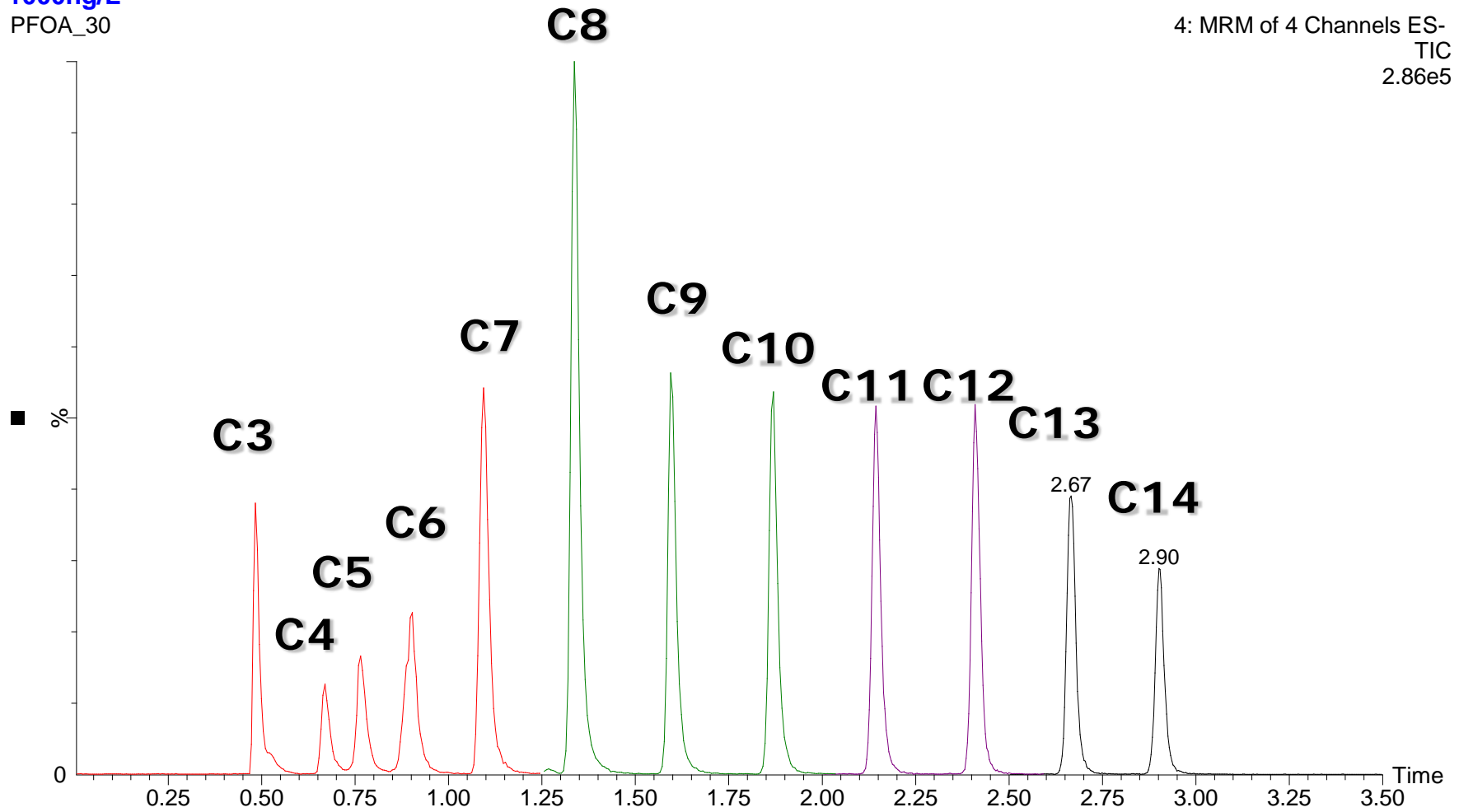
	Precursor ion ( <i>m/z</i> )	Product ion ( <i>m/z</i> )	Cone Voltage (V)	Collision energy (eV)
PFBA	213.0	168.9	15	10
PFPeA	263.0	218.9	15	10
PFHxA	313.0	268.9	15	10
	313.0	118.9	15	15
PFHpA	363.0	318.9	20	10
	363.0	168.9	20	15
PFOA	413.0	368.9	20	10
	413.0	168.9	20	15
PFNA	463.0	418.9	20	10
	463.0	218.9	20	15
PFDA	513.0	468.9	20	10
	513.0	218.9	20	15
PFUdA	563.0	518.9	25	10
	563.0	268.9	25	15
PFDoA	613.0	569.0	20	10
	613.0	268.9	20	20
PFTTrDA	663.0	619.0	25	10
	663.0	318.8	25	20
PFTeDA	713.0	669.0	25	10
	713.0	318.8	25	20



# PFCAs (C3-C14)

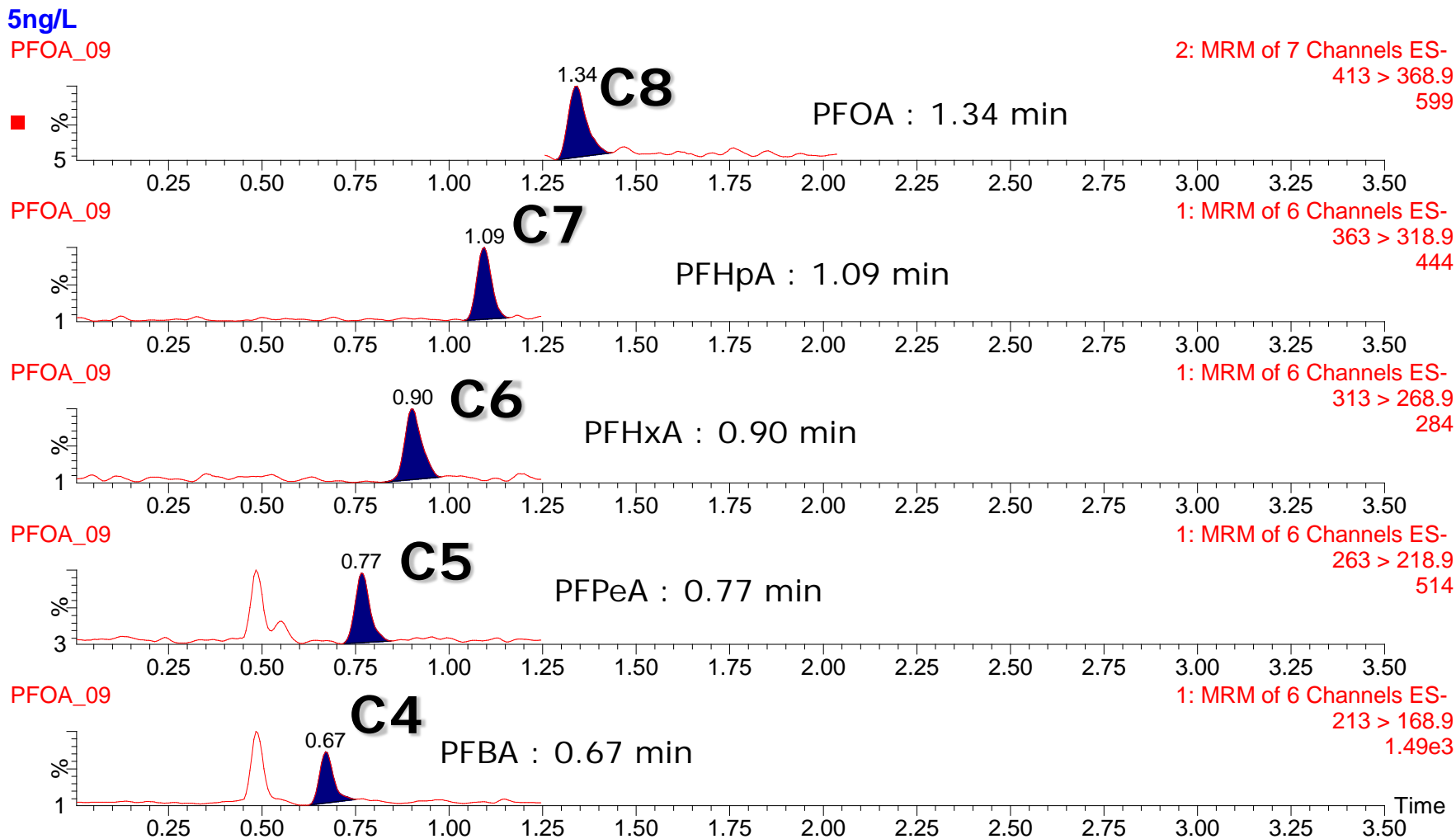
1000ng/L  
PFOA\_30

4: MRM of 4 Channels ES-  
TIC  
2.86e5

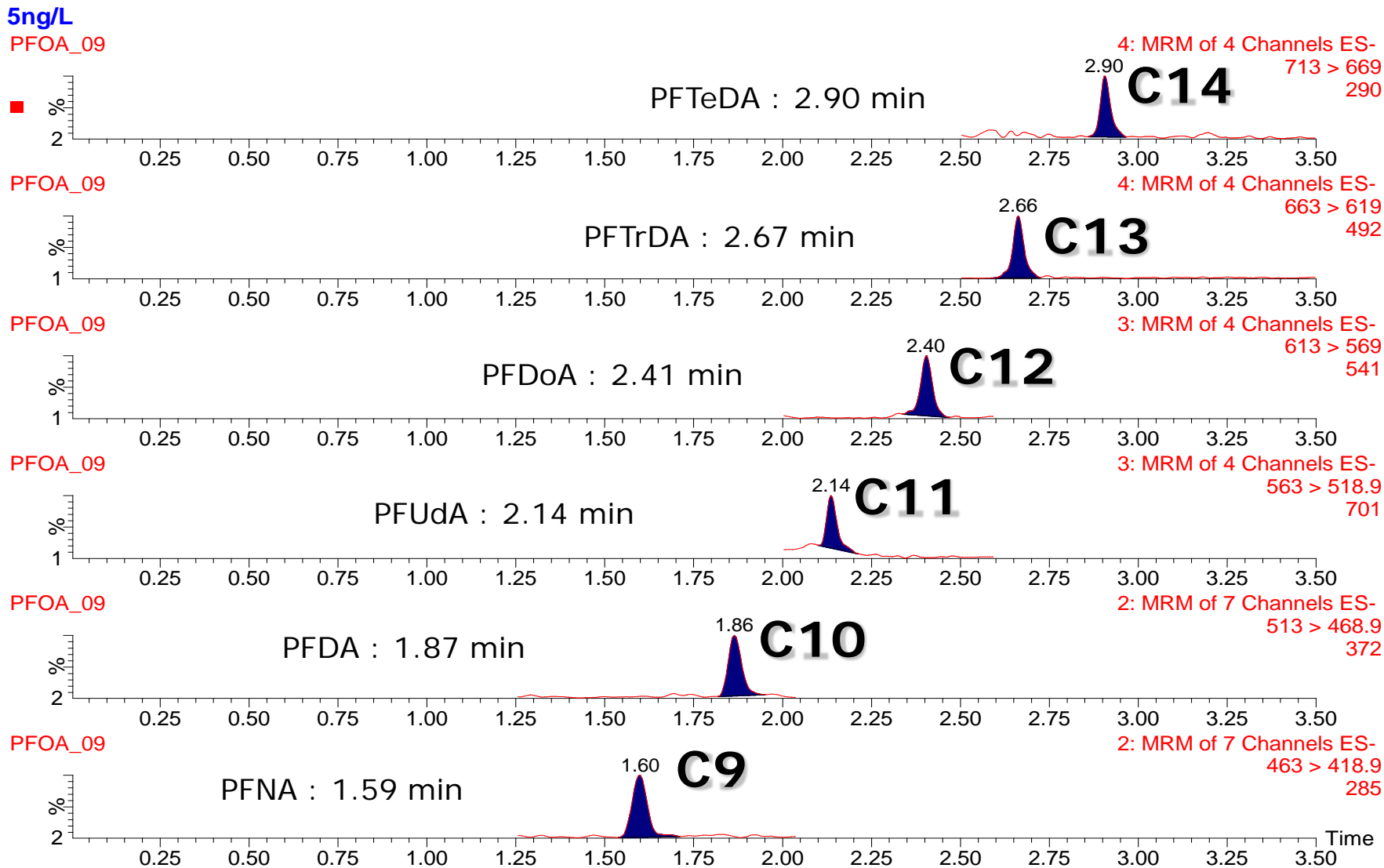


Ezaki (Waters), 2009

# PFCAs (C4-C8) 5ng/L

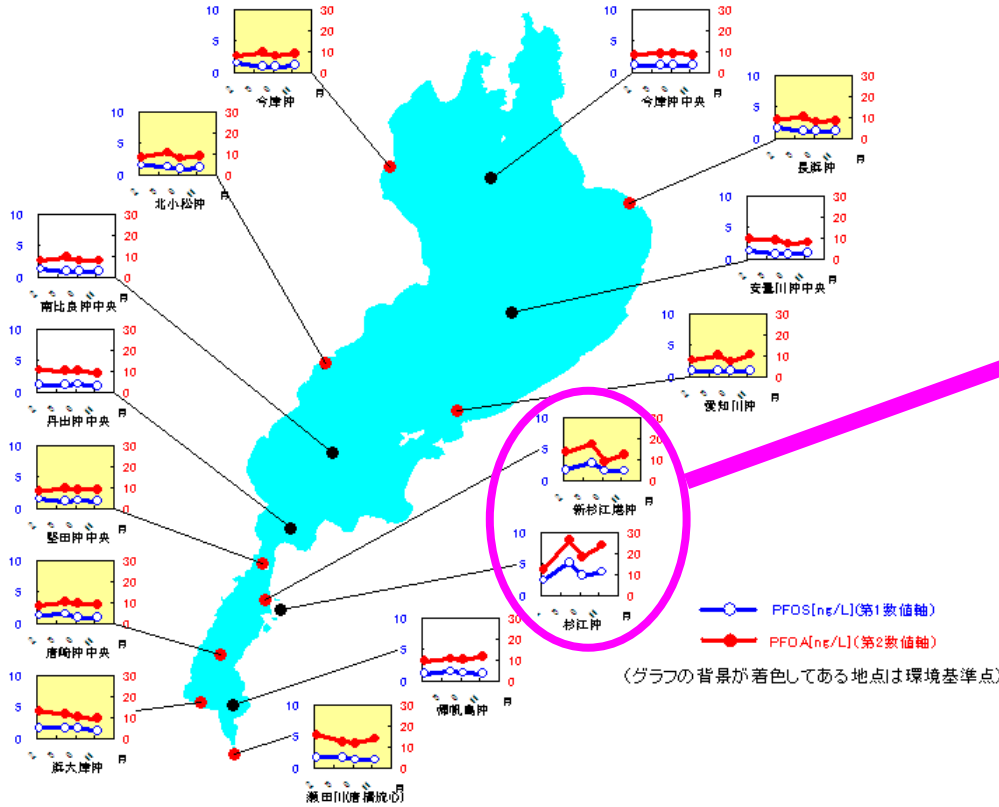


# PFCAs (C9-C14) 5ng/L



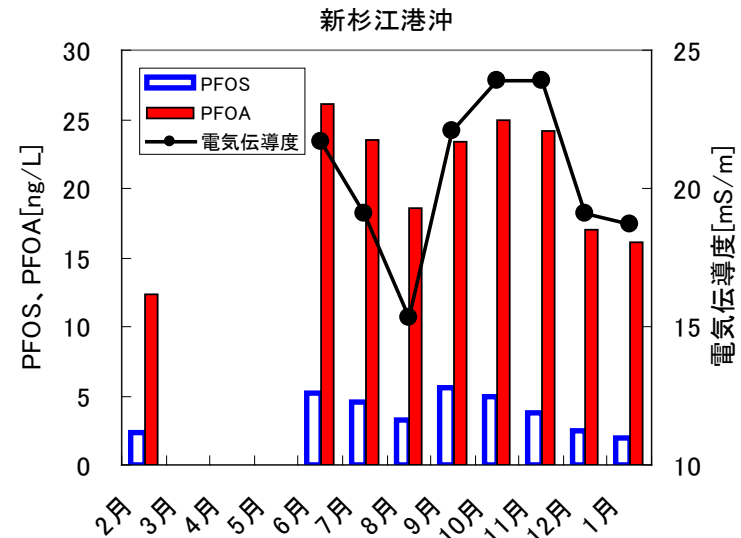
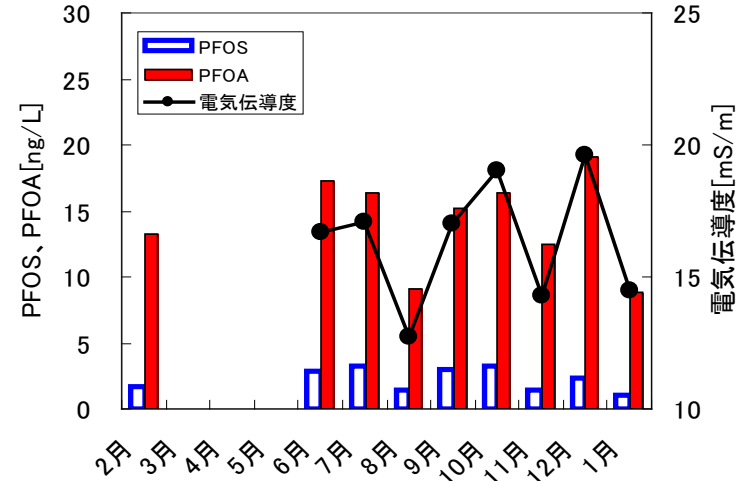
Ezaki (Waters), 2009

# PFC pollution in Lake Biwa water (Shiga Prefecture)



琵琶湖・瀬田川におけるPFOS・PFOA濃度の変動

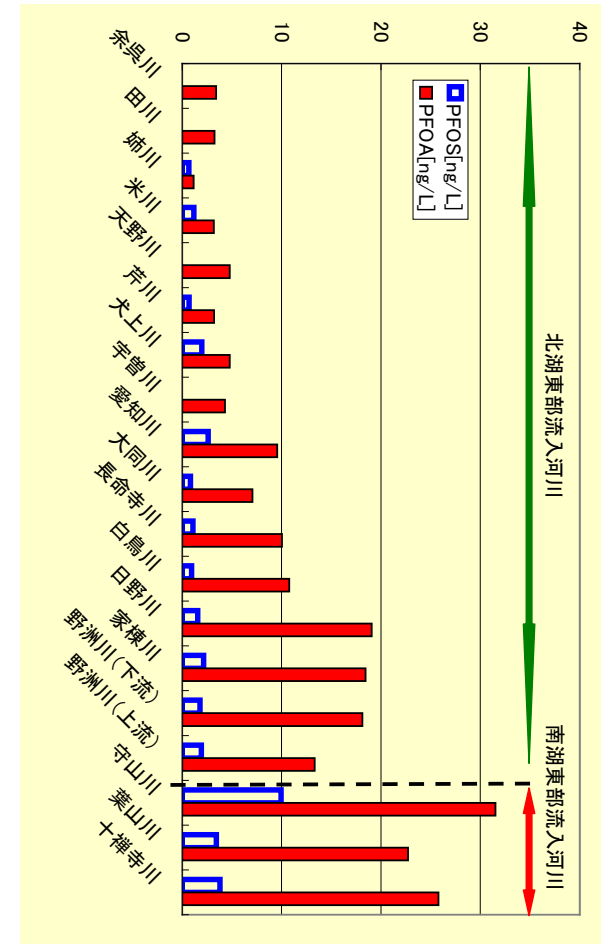
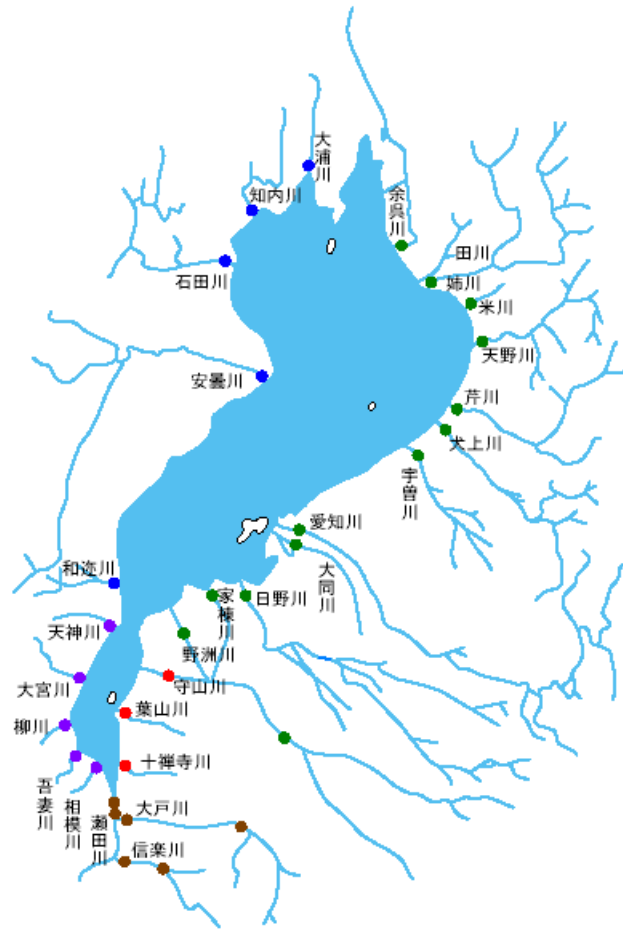
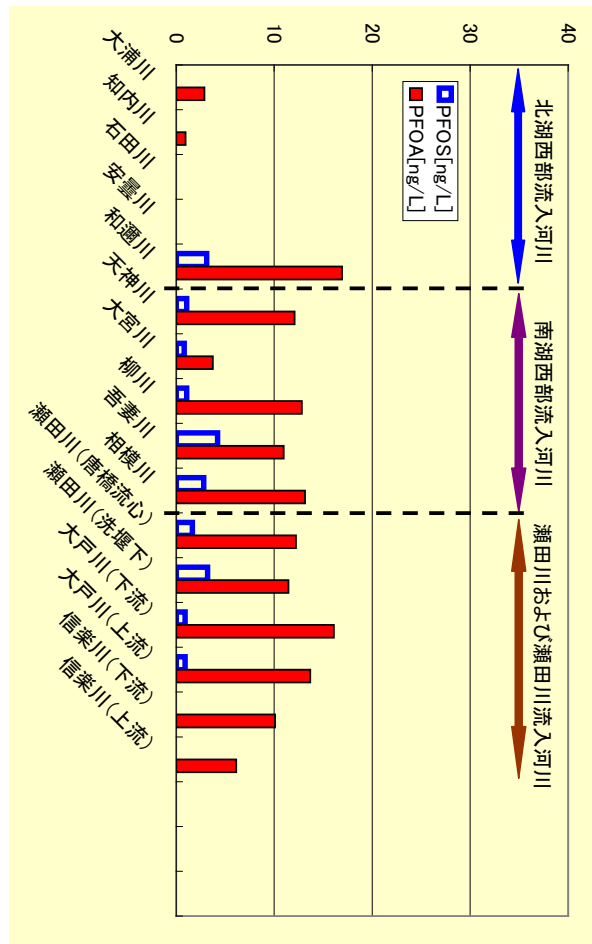
(2009年2、6、8、11月)



赤野井湾におけるPFOS、PFOA濃度、電気伝導度の変動

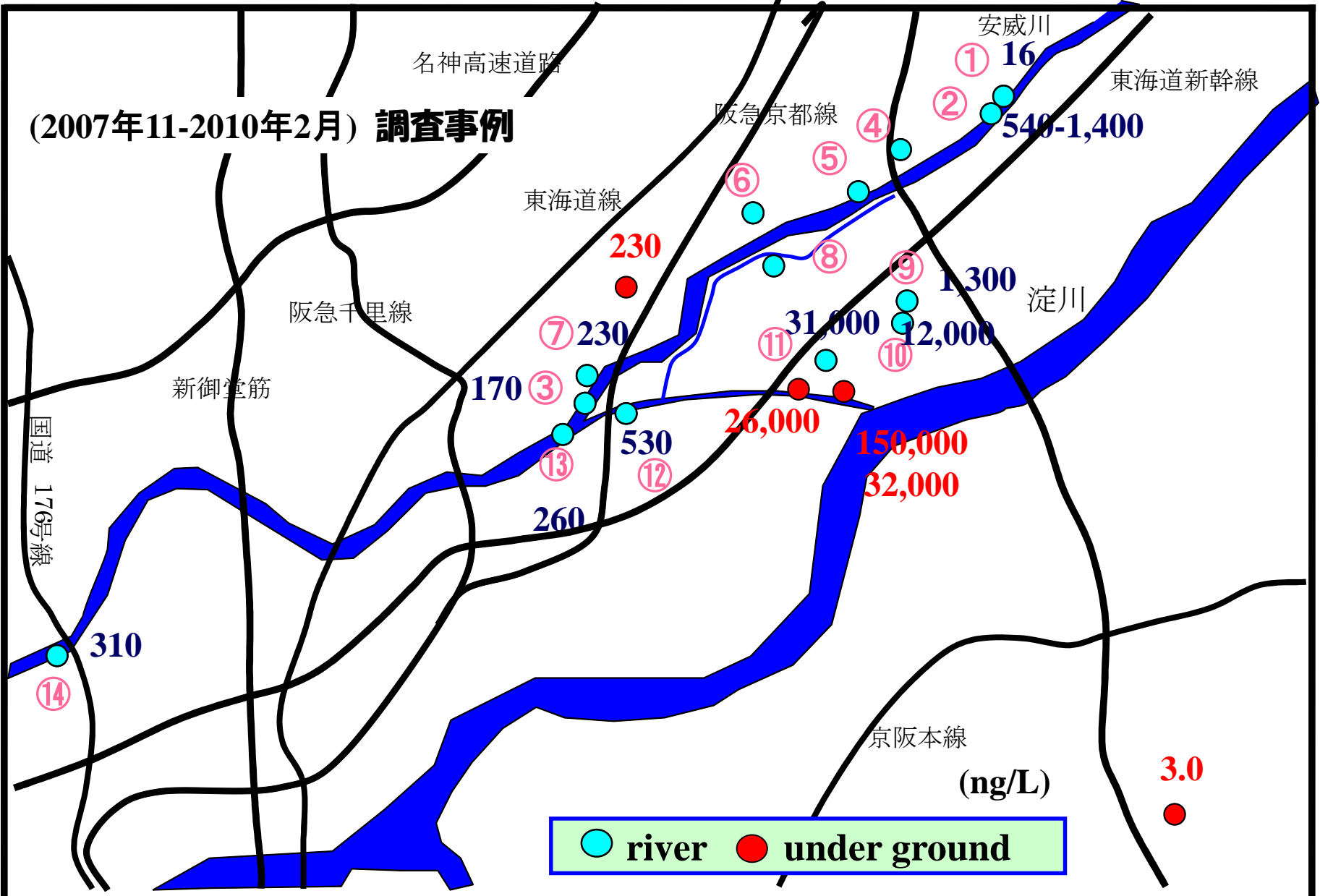
(2009年2月、6月～2010年1月)

# PFC pollution in Lake Biwa water (Shiga Prefecture)



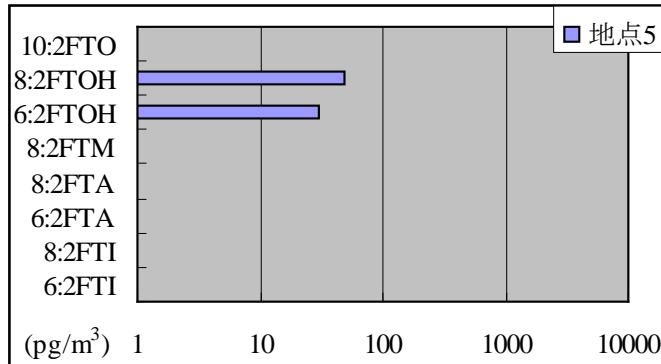
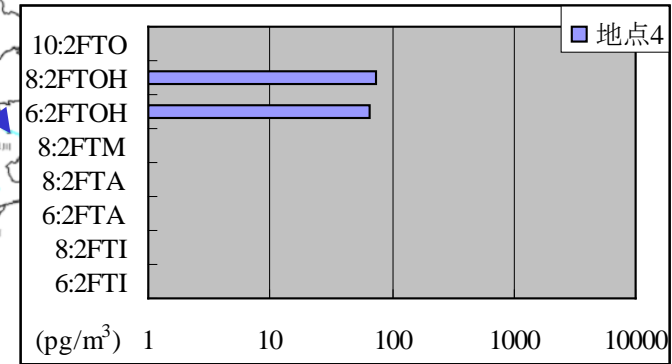
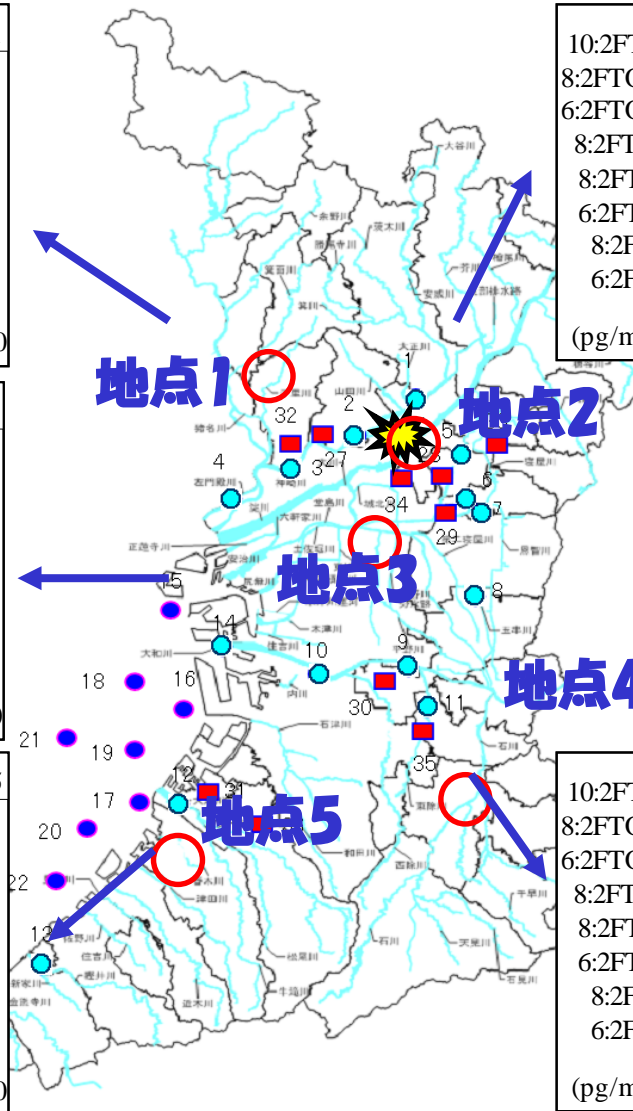
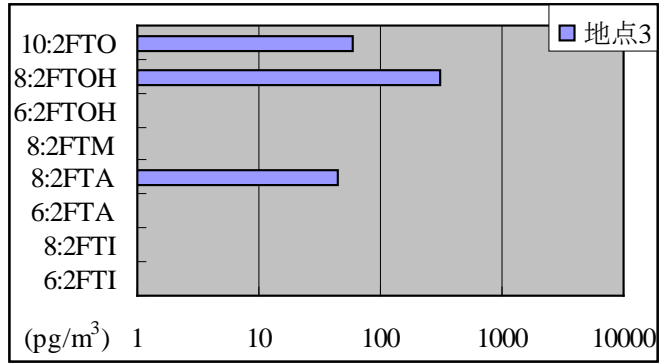
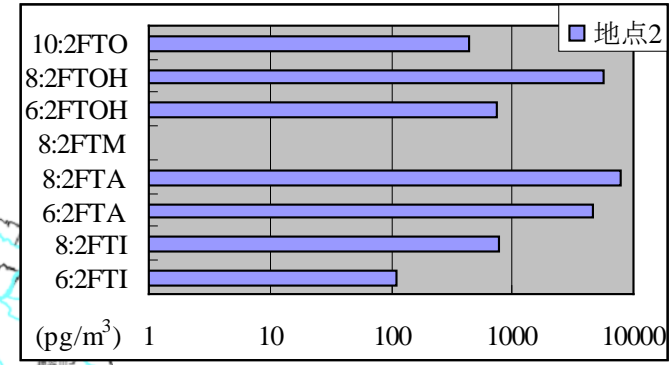
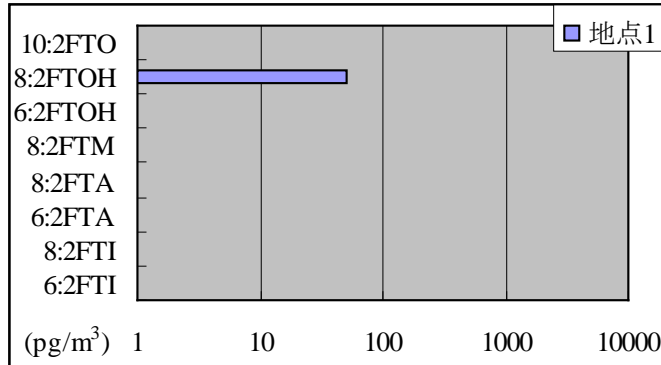
PFOS/PFOA level in river water

# Evaluation of emission from manufacturing / use site, and environmental survey (Osaka prefecture)



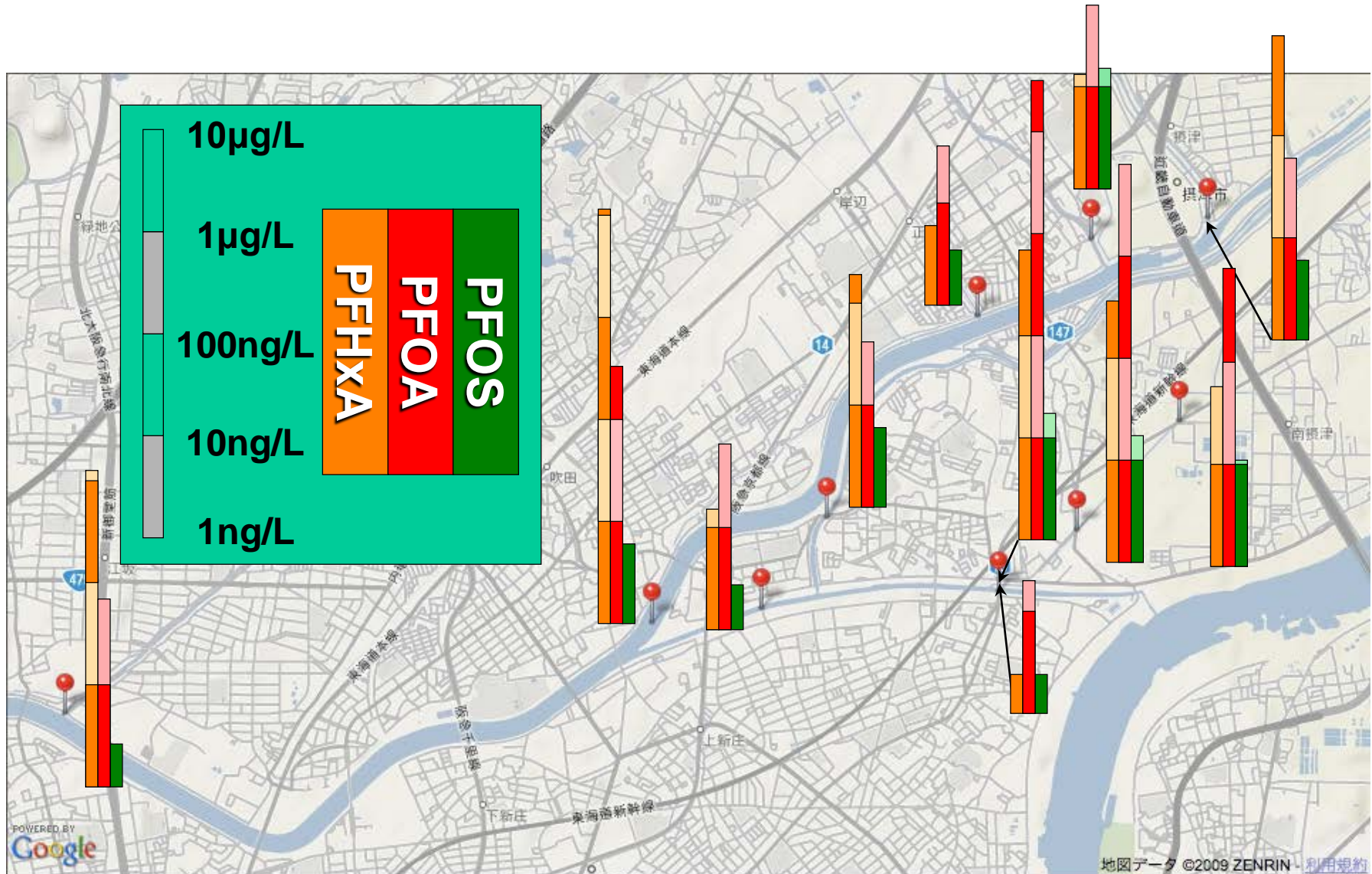
# Evaluation of emission from manufacturing / use site, and environmental survey (Osaka prefecture)

## Level of atmospheric telomers

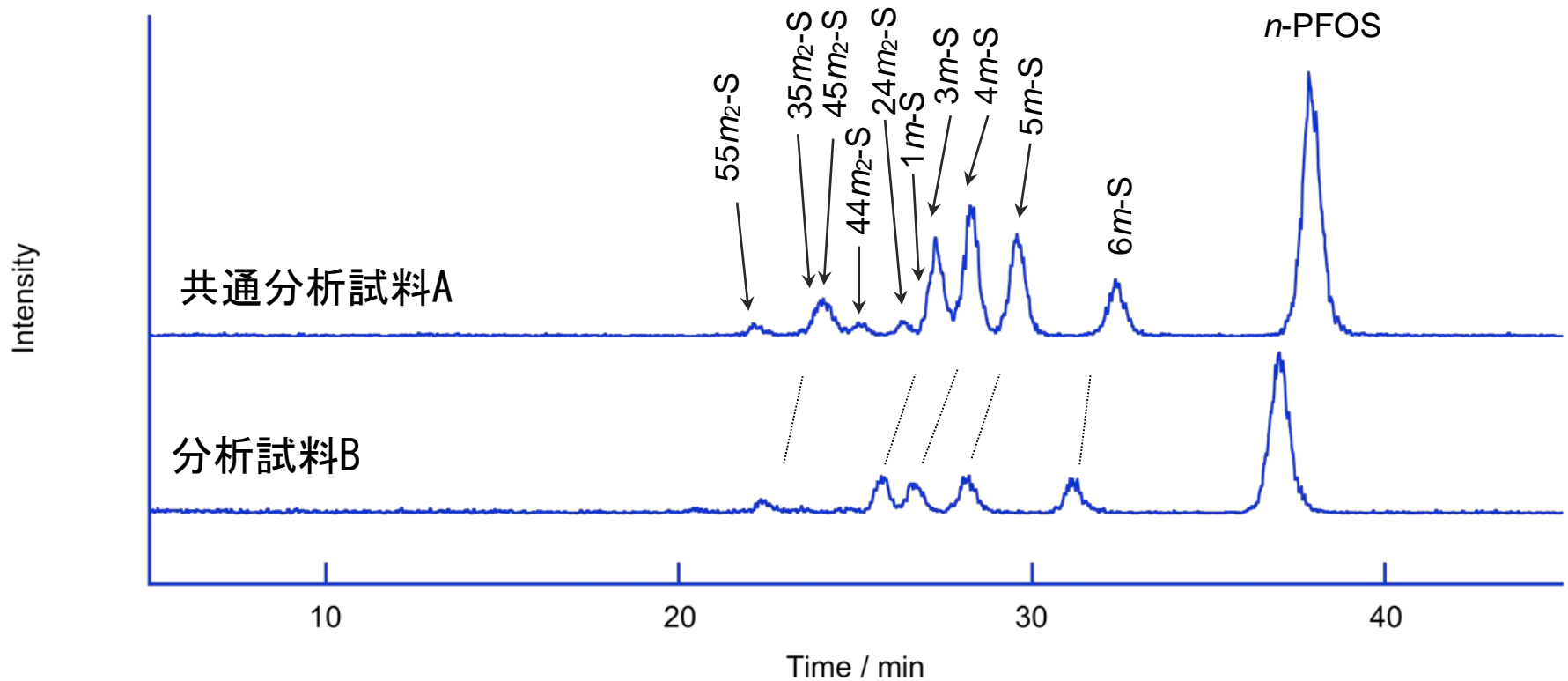




# Evaluation of emission from manufacturing / use site, and environmental survey (Osaka city)



# Evaluation of emission from manufacturing / use site, and environmental survey (Osaka city)



**Isomer specific analysis for PFOS**

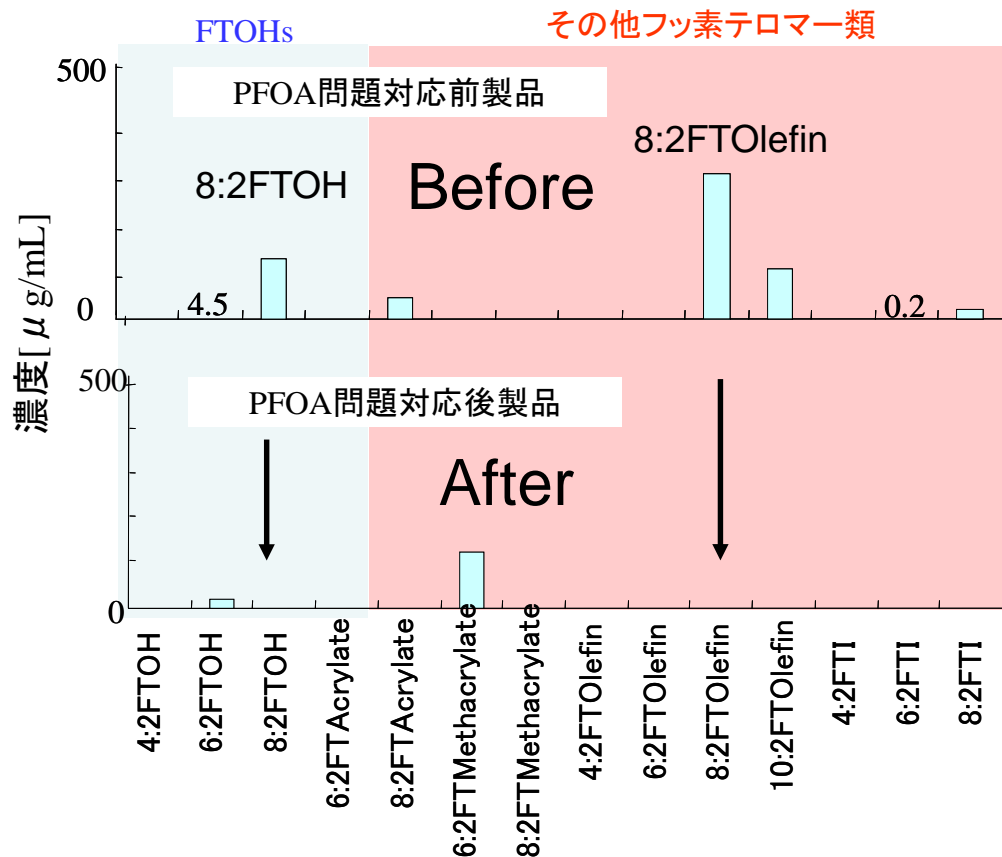
# Understanding emission source profile of fluorocarbon telomer and evaluation of transboundary pollution (Hyogo prefecture)

Fluorine-based water and oil repellents are considered as one of the sources.

→Headspace-GC/MS

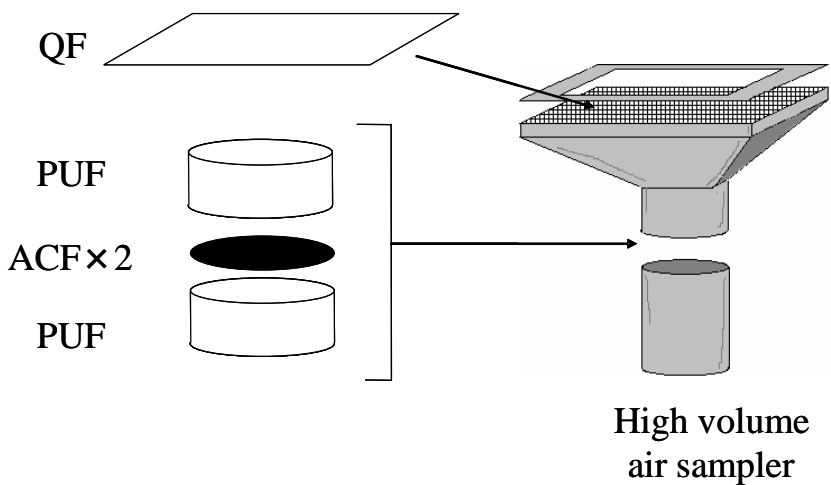


water and oil repellents  
フッ素系撥水・撥油剤(工業用表面加工処理剤)の  
濃度パターン例



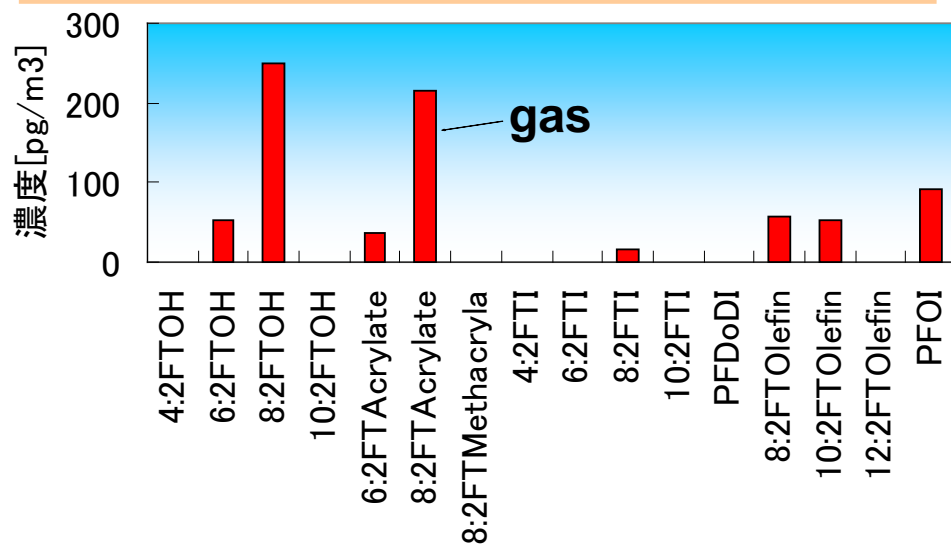
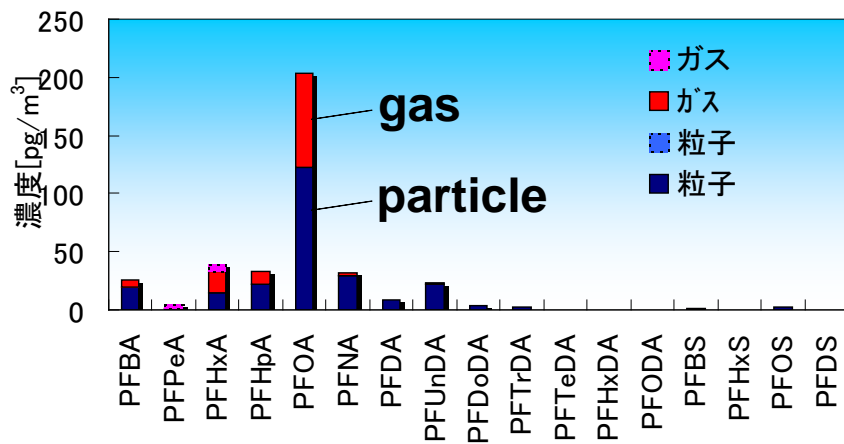
試料を精製水で希釈し、ヘッドスペース  
GC/MSにて分析

# Understanding emission source profile of fluorocarbon telomer and evaluation of transboundary pollution (Hyogo prefecture)



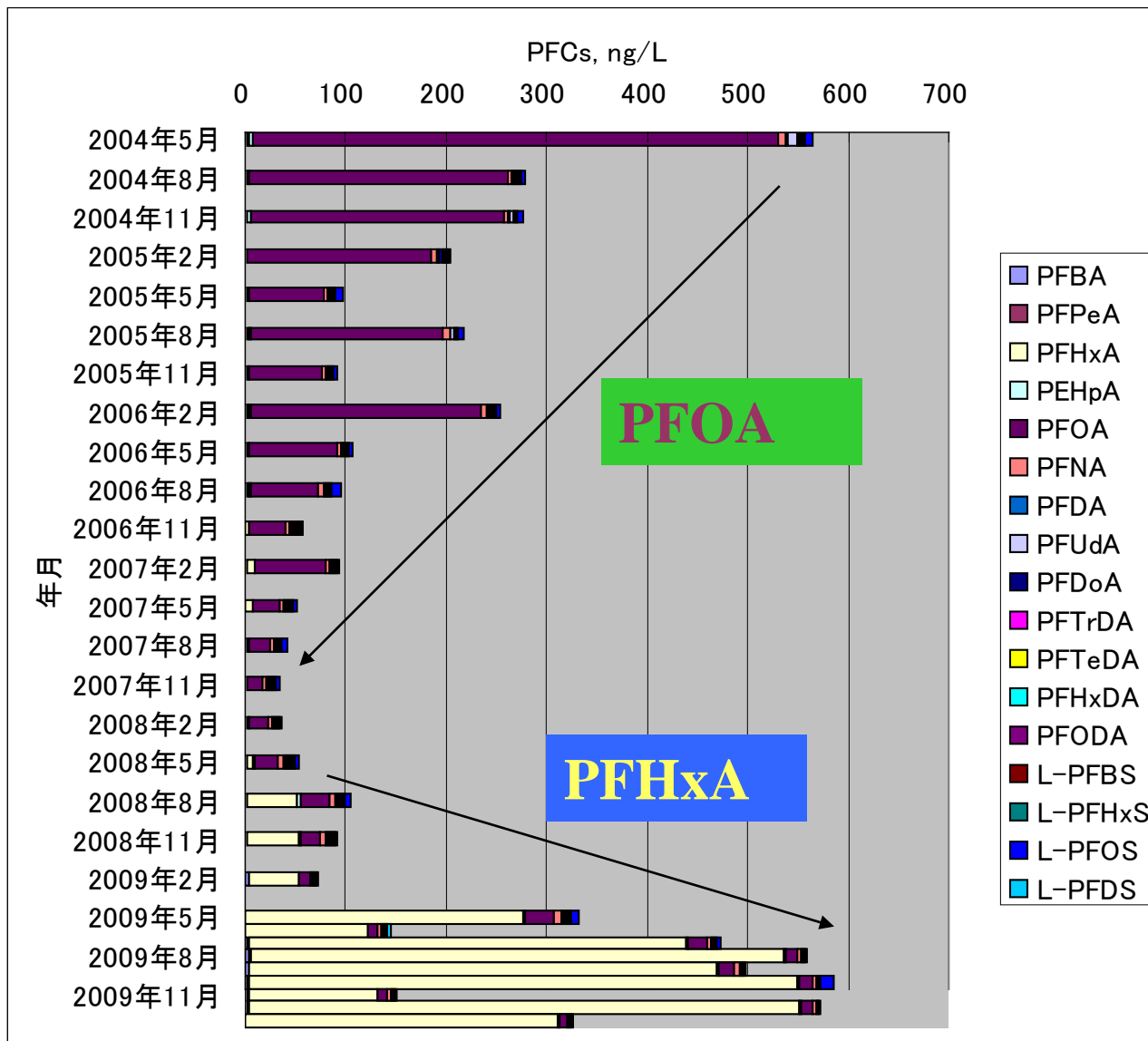
Simultaneous analysis for  
PFCAs/PFASs/telomers

- emission source profile
- back trajectory analysis
- transboundary pollution

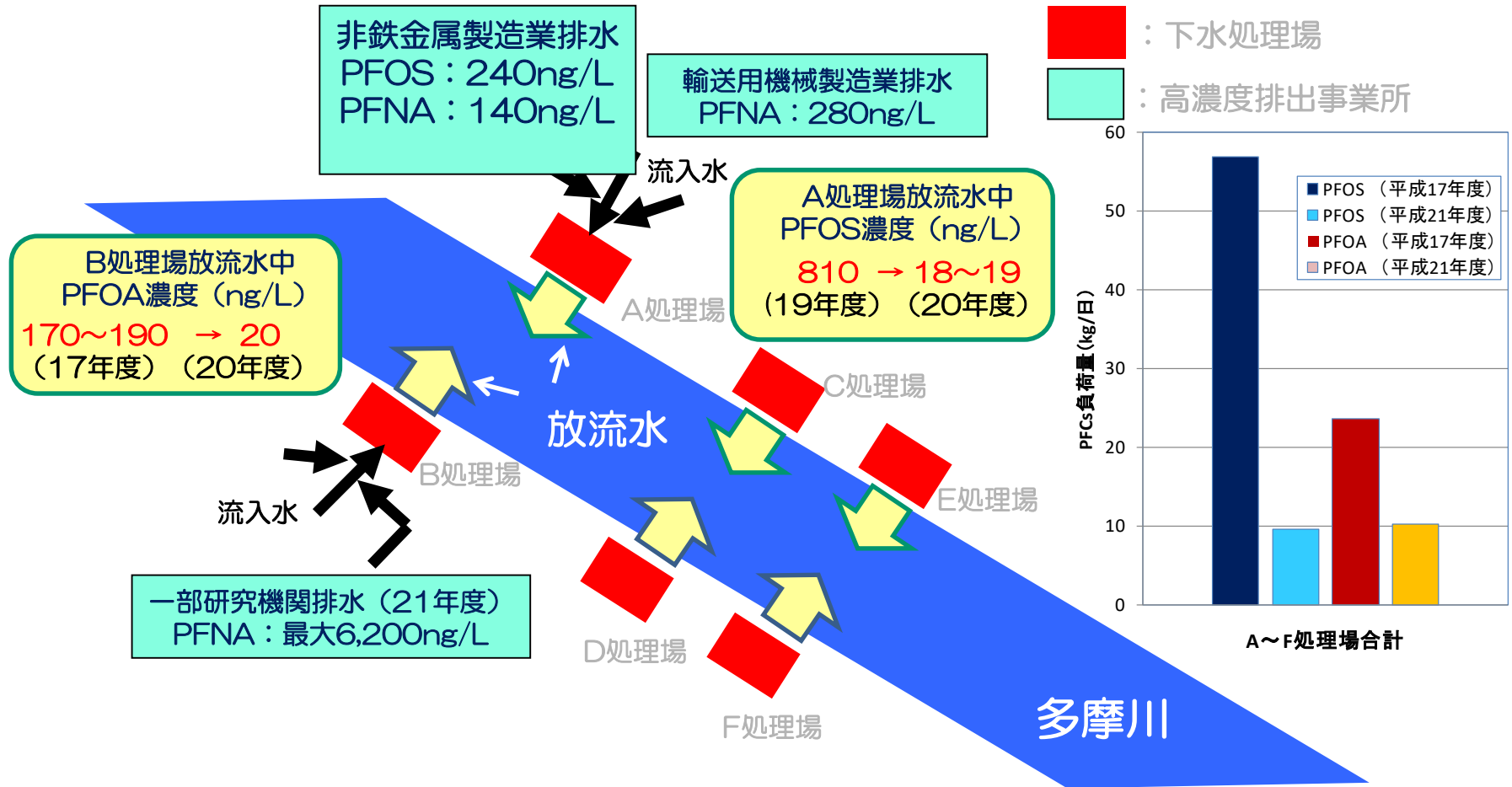


# PFCs pollution in the Kobe area from Osaka Bay (Kobe City)

## Trend of PFCs in surface water of Kobe coastal area



# PFCs and actual factory of use (Tokyo metropolitan)



Load from sewage treatment plant to Tama river → Both PFOS and PFOA decrease drastically after regulation



effect accompanying reduction countermeasure

## Dragonfly monitoring

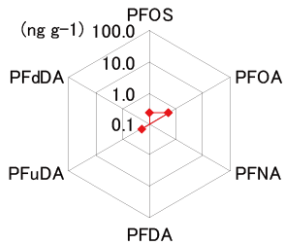


Yoshikane, Shibata et al (NIES)

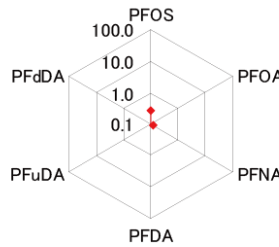


# PFCs levels in insects and insect-eating species at NIES 2)

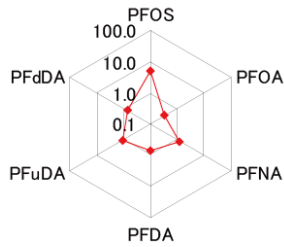
Butterfly  
*Cerastrina argiolus ladonides*



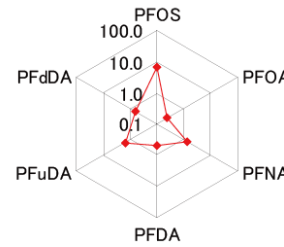
Grasshopper  
*Atractomorpha lata*



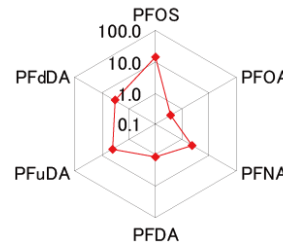
Dragonfly  
*Sympetrum infuscatum*



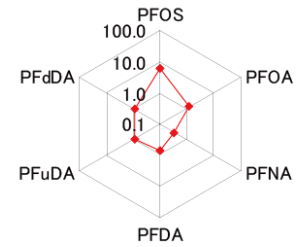
Mantis  
*Tenodera aridifolia*



Lizard  
*Takydromus tachydromoides*



Spider  
*Nephila clavata*



## Insect-eating species



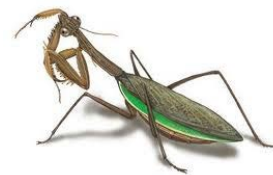
Butterfly



Grasshopper



Dragonfly



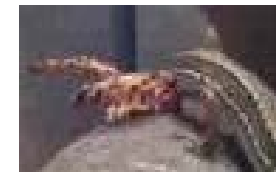
Mantis



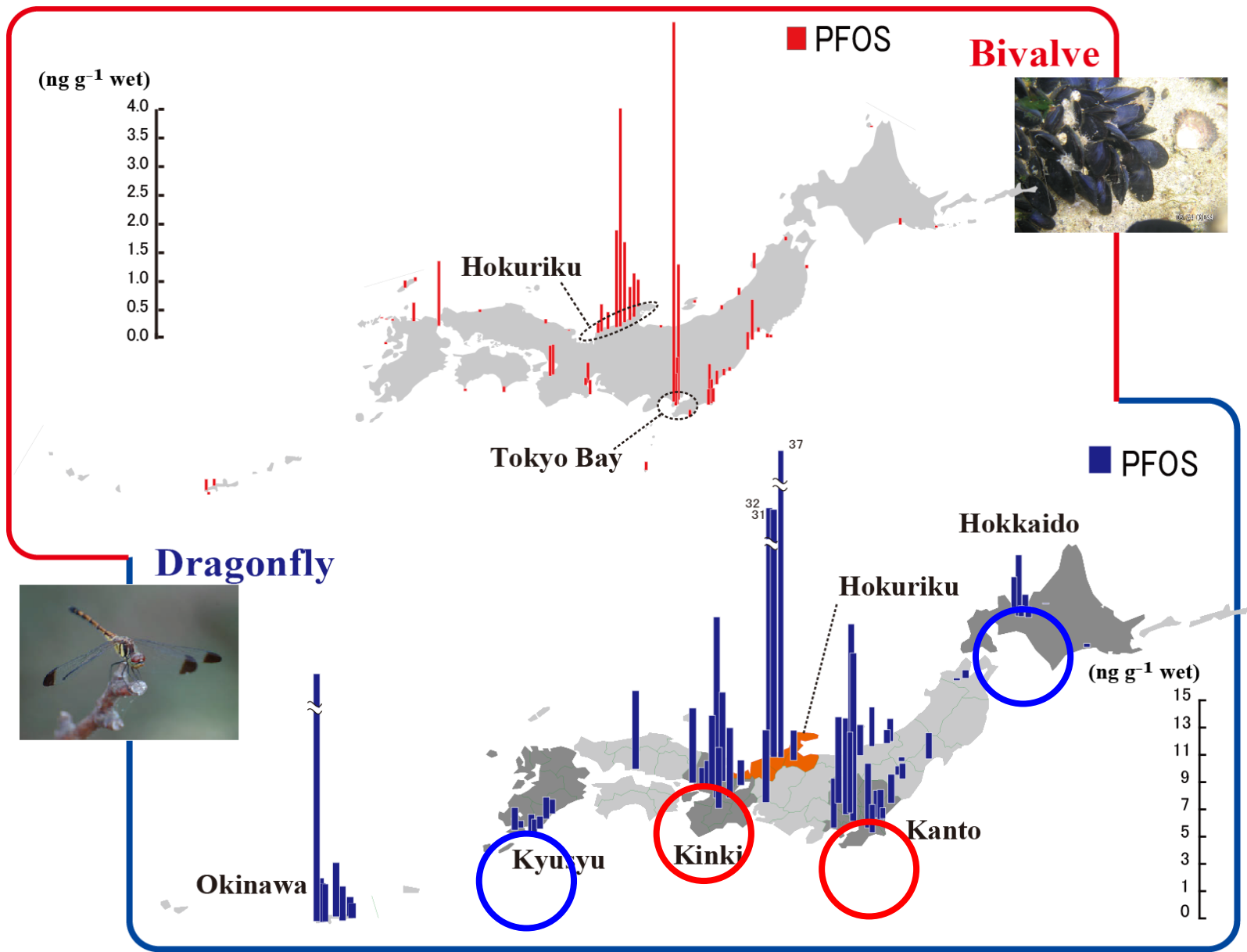
Lizard



Spider



Yoshikane, Shibata et al (NIES)



Yoshikane, Shibata et al (NIES)

# PFC monitoring in land area using dragonfly (2009, NIES)

