

PFAS in Water by Expert Laboratory

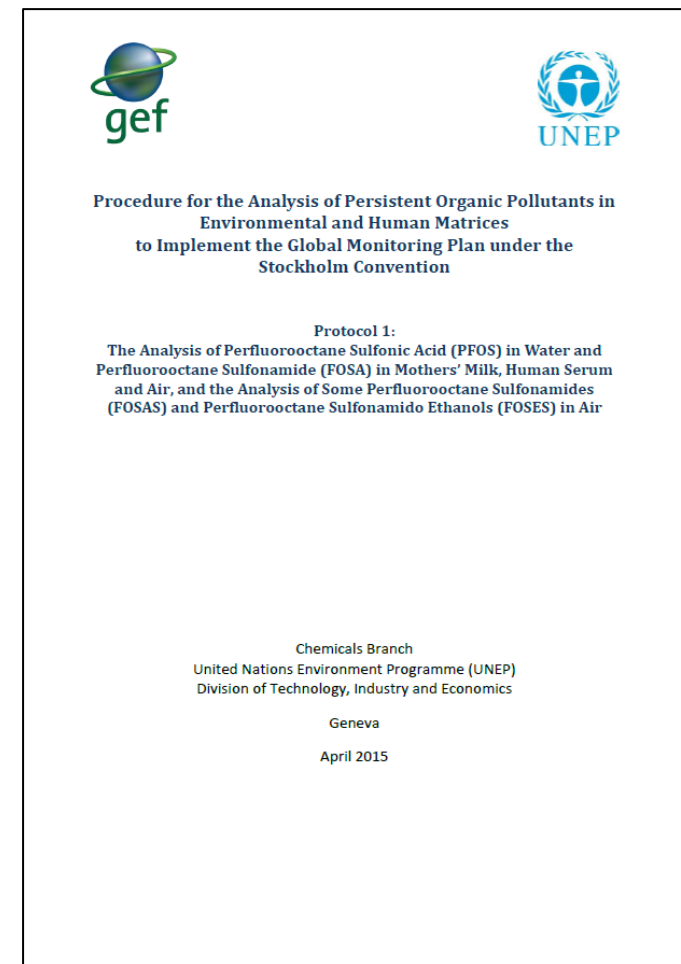
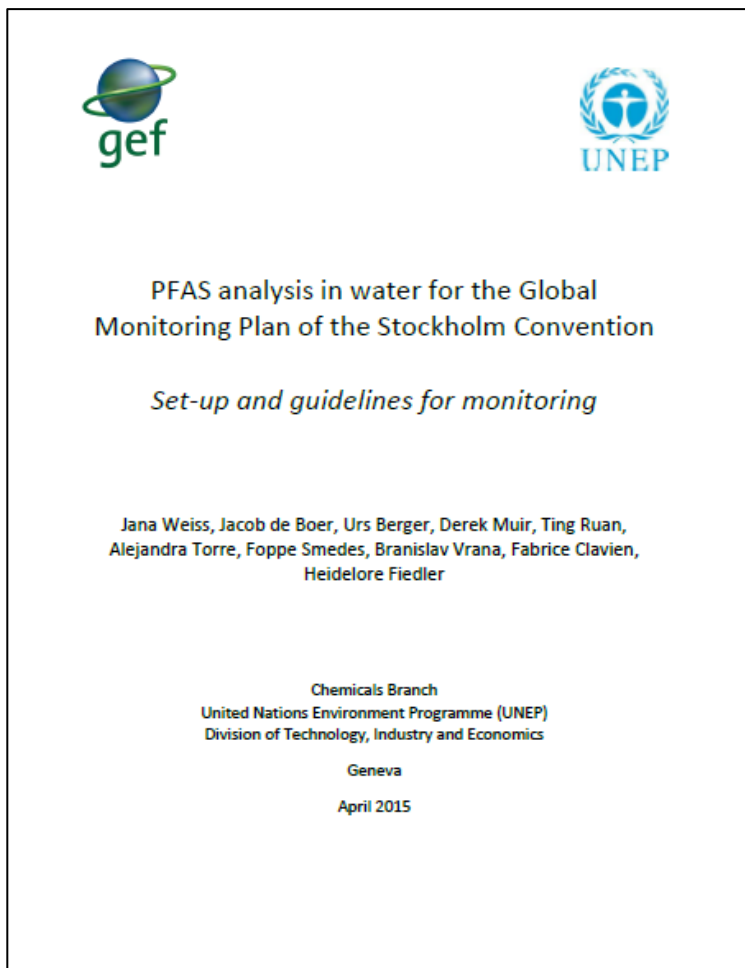


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Core matrix “water” – for PFAS only

- Water is a new core matrix and was not included in UNEP/GEF GMP1 projects;
- The guideline states: active sampling, 4-times per year, at mouth of river or estuaries;
- Analytes: PFOS; amended by PFOA (through listing at COP-9 in 2019) and PFHxS (through recommendation by POPRC in 2019);
- PFOS separated into linear and branched isomers (L-PFOS and br-PFOS); to follow EPA methods 533 and 537.1

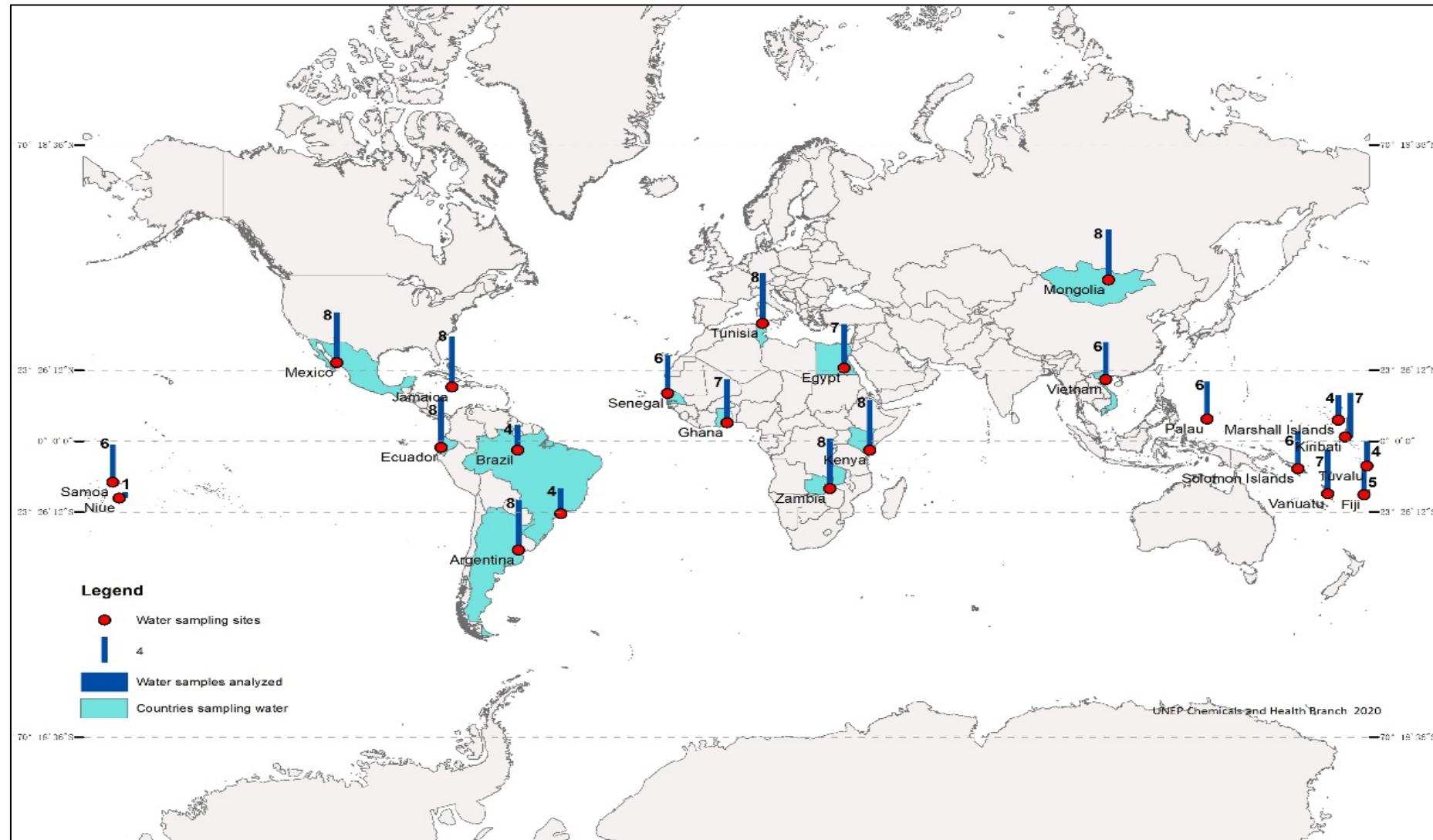
UNEP guidance documents



Results for PFAS in water

1. Across all projects

Number of water samples analyzed for PFASs



Summary (n=144)

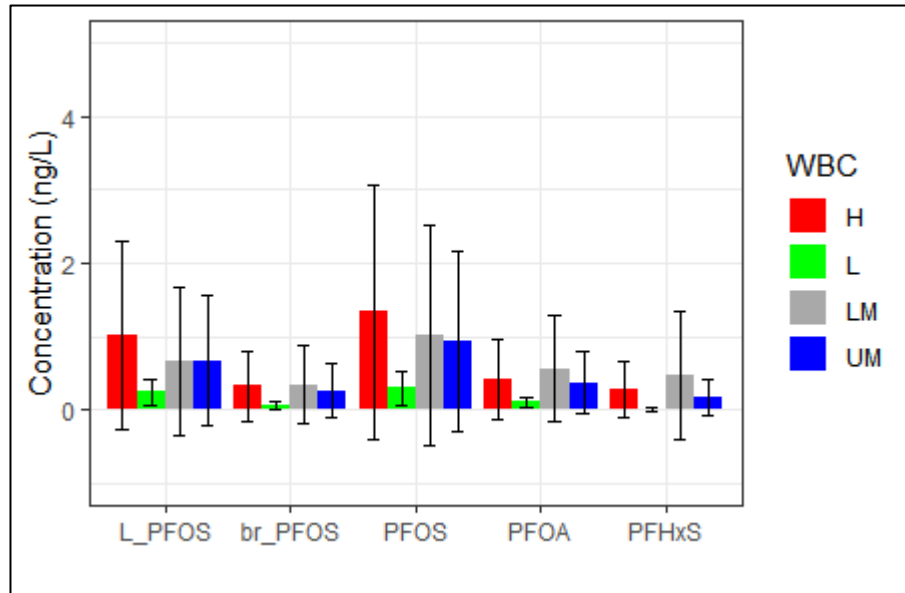
Distribution of sample origin and characteristics of the countries submitting GMP water samples
Concentrations in ng/L

	Africa (N=44)	Asia (N=14)	GRULAC (N=40)	PAC (N=46)	Overall (N=144)
PFOS					
Mean (SD)	0.637 (0.637)	0.107 (0.111)	1.61 (1.35)	1.04 (1.85)	0.985 (1.39)
Median [Min, Max]	0.446 [0, 2.64]	0.0688 [0, 0.441]	1.35 [0.0443, 5.32]	0.0688 [0, 6.23]	0.370 [0, 6.23]
PFOA					
Mean (SD)	0.732 (0.854)	0.166 (0.118)	0.621 (0.396)	0.161 (0.302)	0.464 (0.599)
Median [Min, Max]	0.377 [0.0521, 4.02]	0.132 [0, 0.459]	0.551 [0.0506, 1.44]	0.0526 [0, 1.51]	0.225 [0, 4.02]
PFHxS					
Mean (SD)	0.217 (0.403)	0.0132 (0.0189)	0.305 (0.295)	0.552 (1.05)	0.329 (0.670)
Median [Min, Max]	0.0570 [0, 1.63]	0 [0, 0.0474]	0.166 [0, 0.952]	0.0129 [0, 3.51]	0.0550 [0, 3.51]

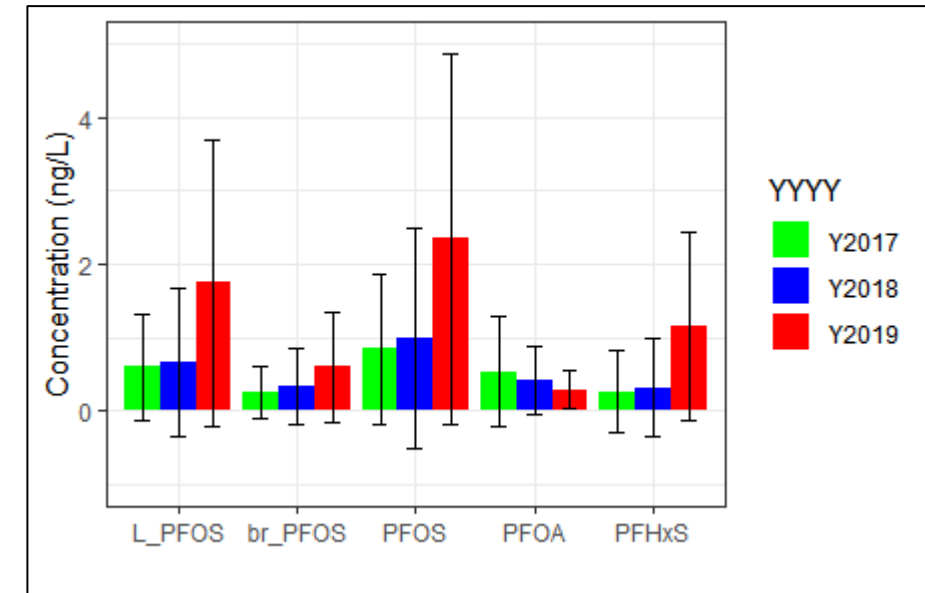
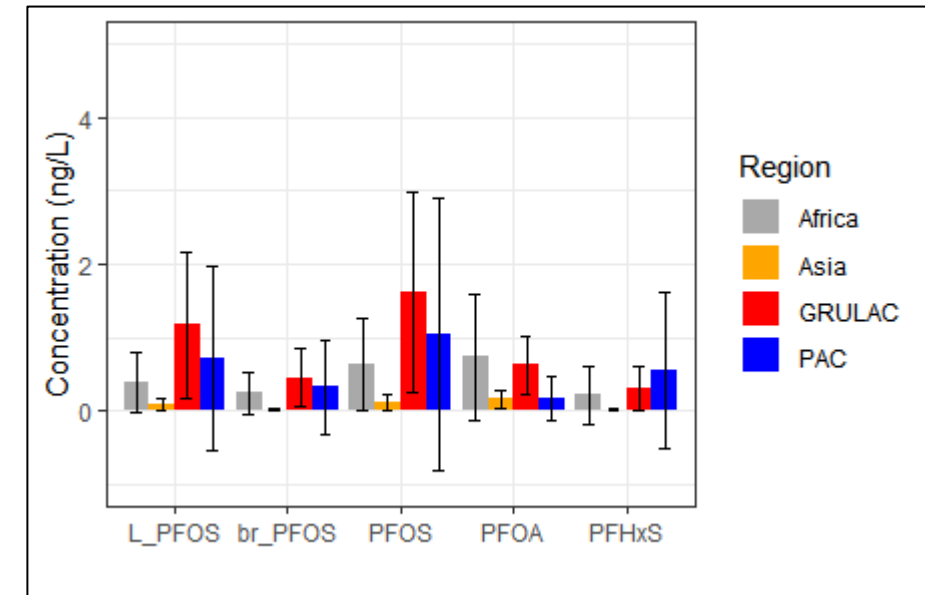
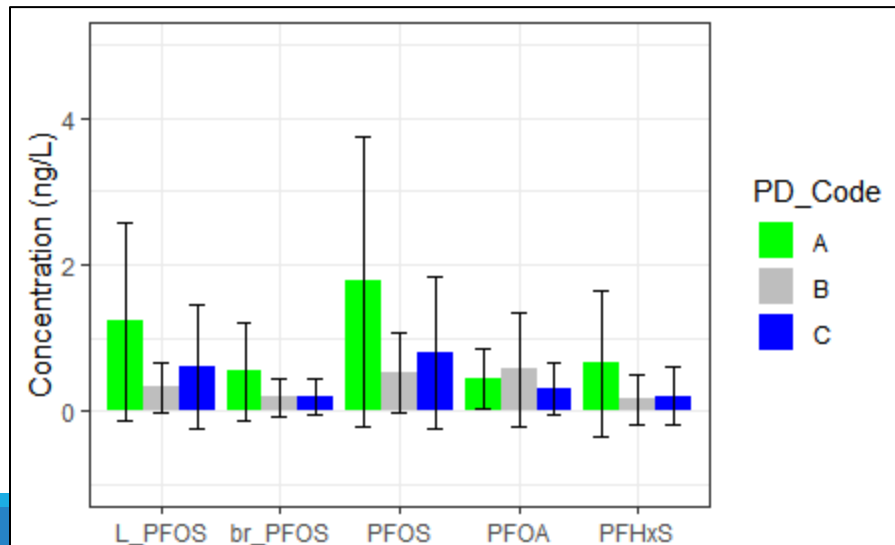
	Africa (N=44)	Asia (N=14)	GRULAC (N=40)	PAC (N=46)	Overall (N=144)
Region					
Africa	44 (100%)	0 (0%)	0 (0%)	0 (0%)	44 (30.6%)
Asia	0 (0%)	14 (100%)	0 (0%)	0 (0%)	14 (9.7%)
GRULAC	0 (0%)	0 (0%)	40 (100%)	0 (0%)	40 (27.8%)
PAC	0 (0%)	0 (0%)	0 (0%)	46 (100%)	46 (31.9%)
Year					
Y2017	24 (54.5%)	6 (42.9%)	20 (50.0%)	14 (30.4%)	64 (44.4%)
Y2018	20 (45.5%)	7 (50.0%)	20 (50.0%)	27 (58.7%)	74 (51.4%)
Y2019	0 (0%)	1 (7.1%)	0 (0%)	5 (10.9%)	6 (4.2%)
WBC					
L	4 (9.1%)	0 (0%)	0 (0%)	0 (0%)	4 (2.8%)
LM	40 (90.9%)	14 (100%)	0 (0%)	20 (43.5%)	74 (51.4%)
UM	0 (0%)	0 (0%)	36 (90.0%)	20 (43.5%)	56 (38.9%)
H	0 (0%)	0 (0%)	4 (10.0%)	6 (13.0%)	10 (6.9%)
PD_Code					
A	8 (18.2%)	8 (57.1%)	16 (40.0%)	14 (30.4%)	46 (31.9%)
B	29 (65.9%)	0 (0%)	16 (40.0%)	17 (37.0%)	62 (43.1%)
C	7 (15.9%)	6 (42.9%)	8 (20.0%)	15 (32.6%)	36 (25.0%)

Statistical summary of results for PFOS, PFOA and PFHxS according to project region

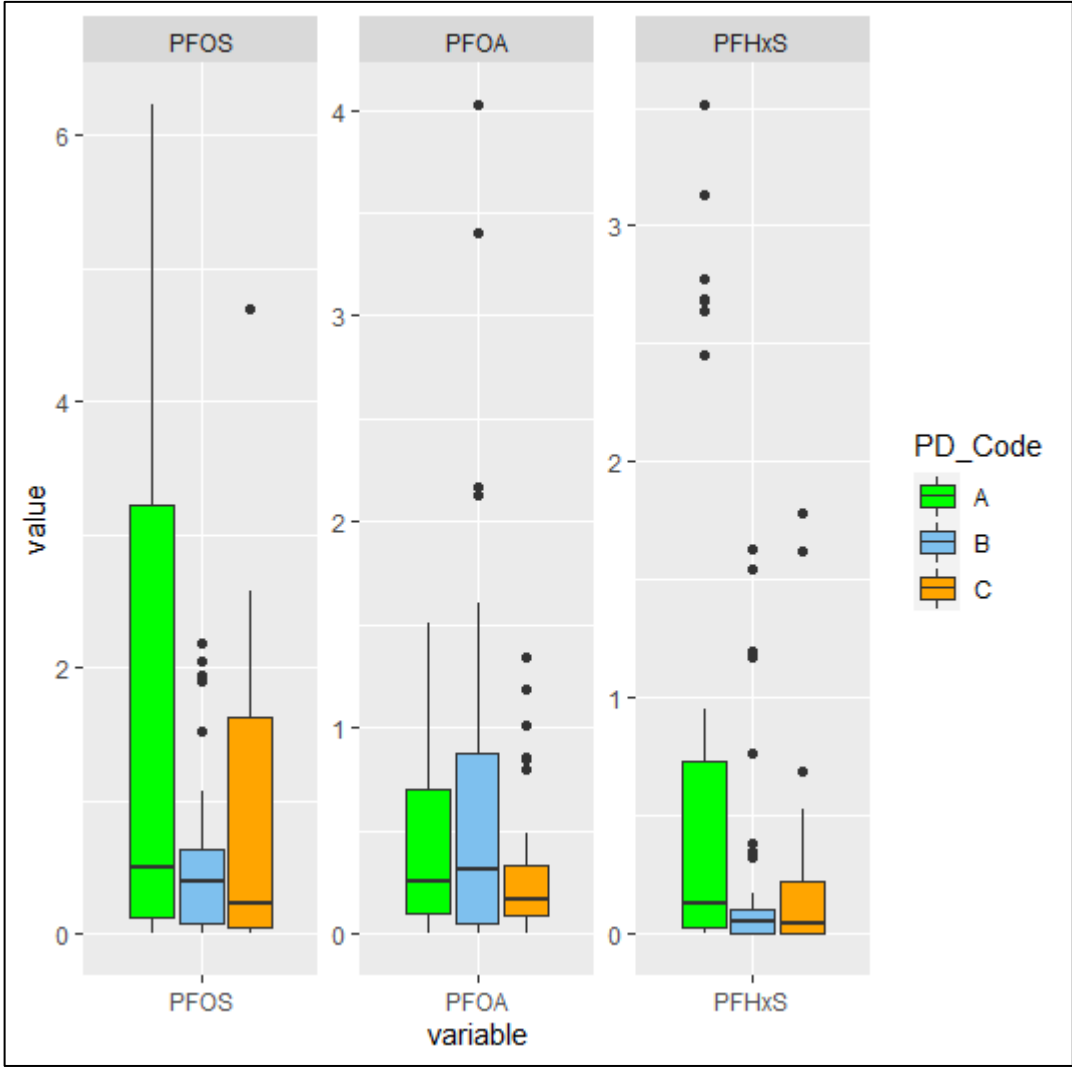
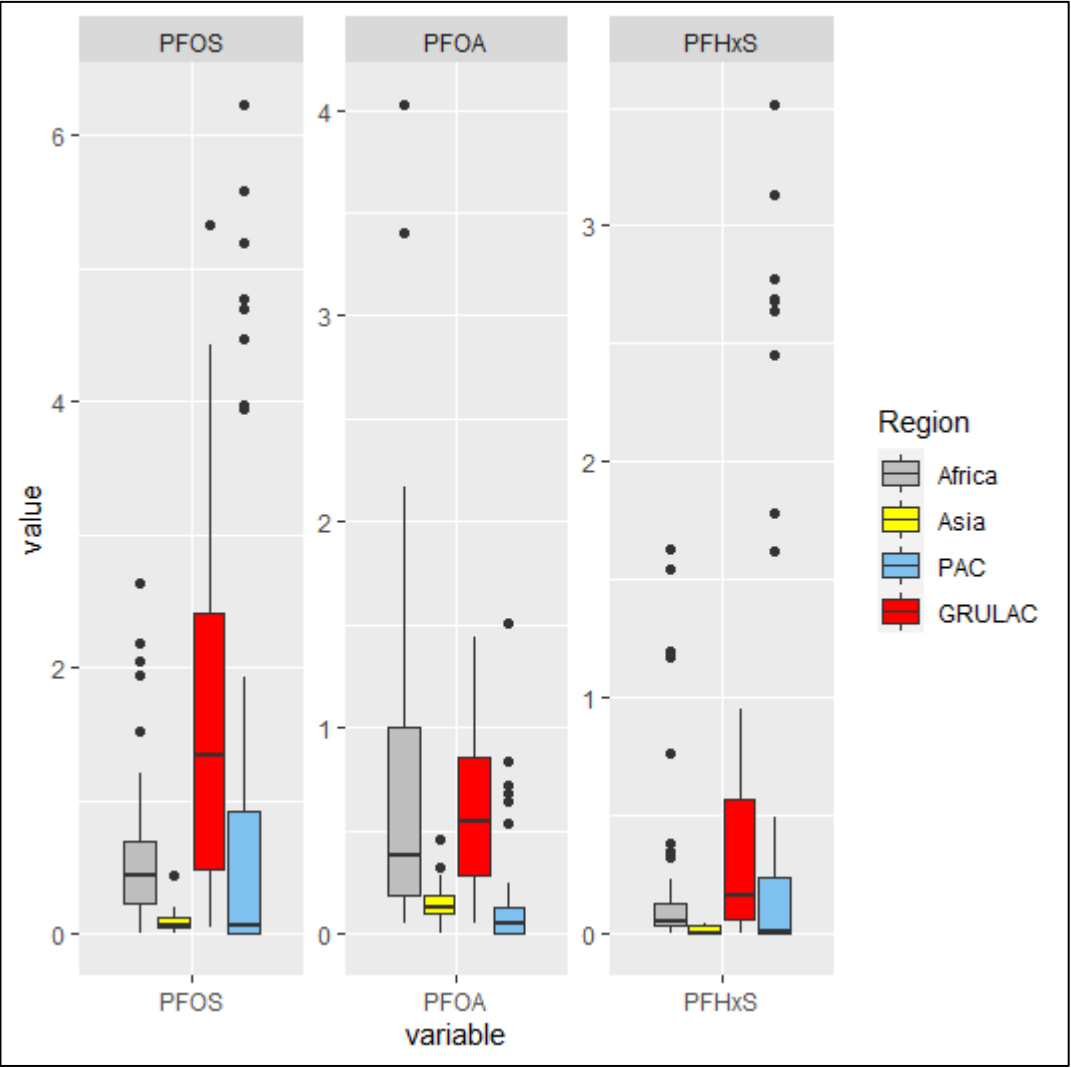
Mean values and SD (n=144)



PD_Code: Population density code using World Bank indicator;
WBC = World Bank classification of income

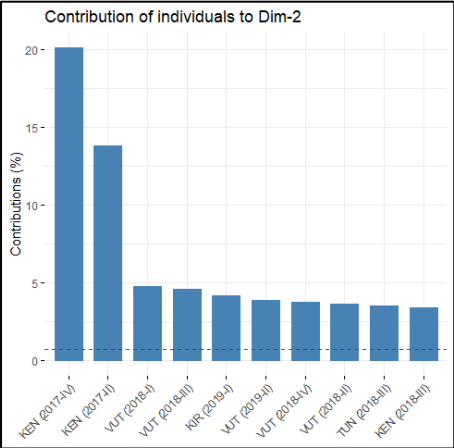
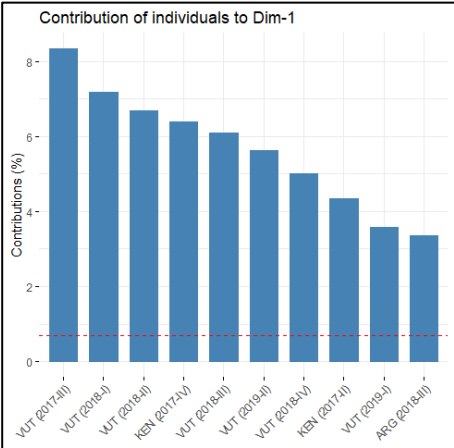
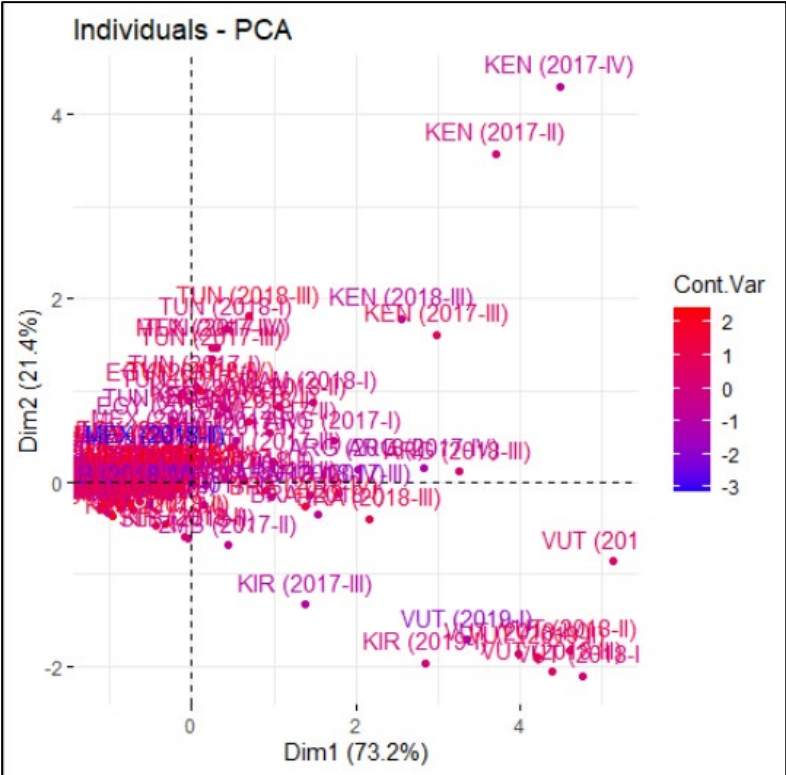
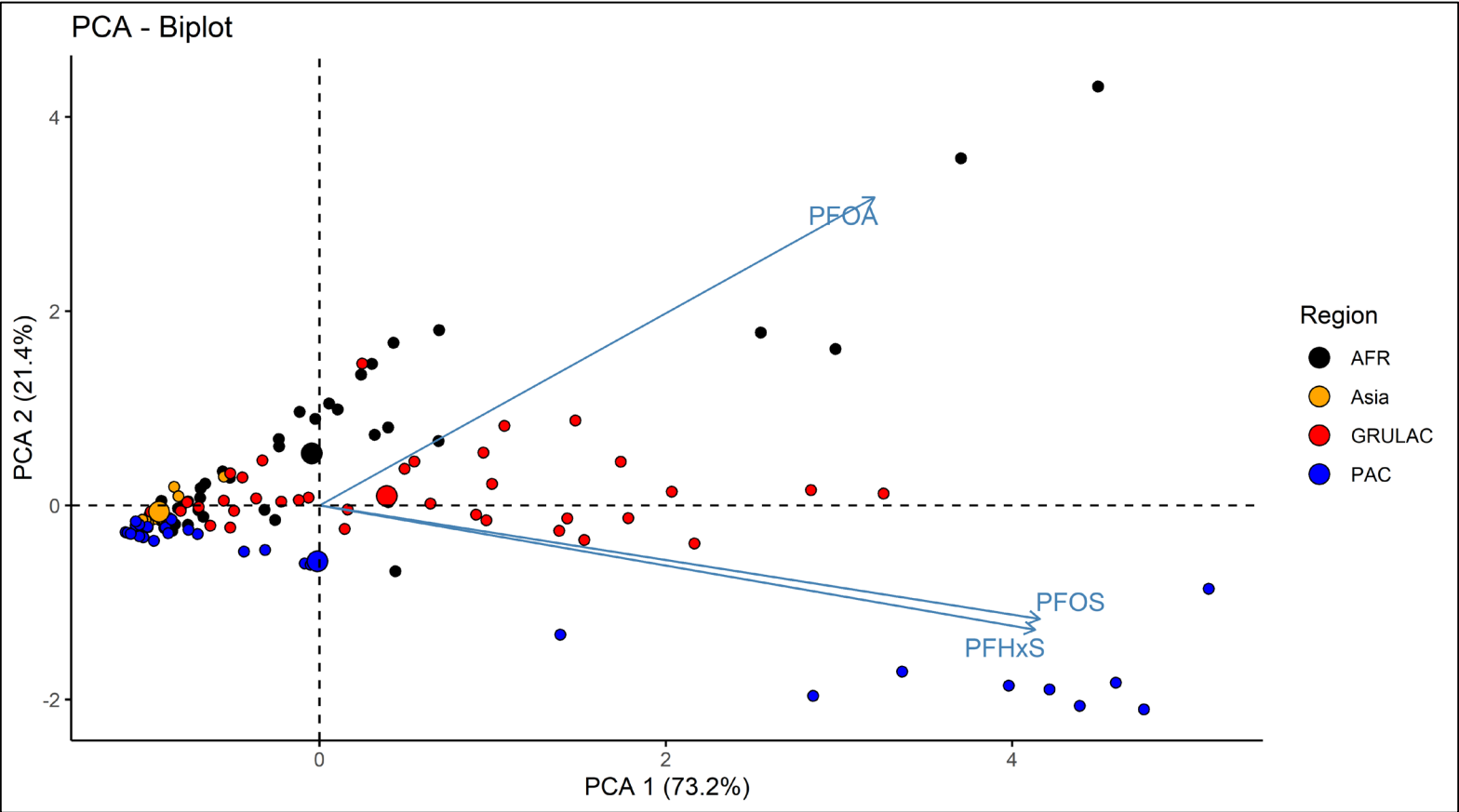


Overview PFAS per Region and PopDensity



Values in ng/L

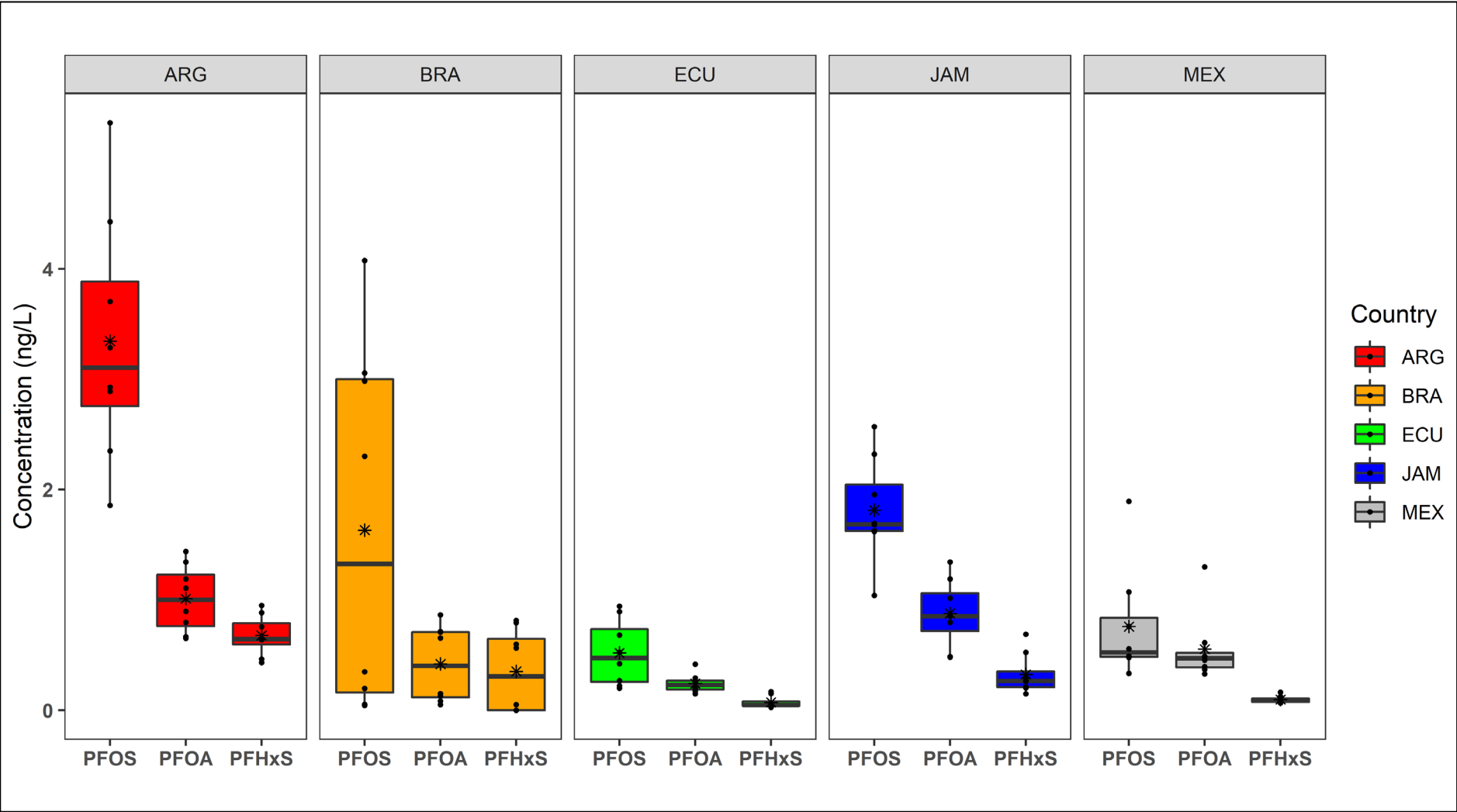
PCA biplot for region (n=144)



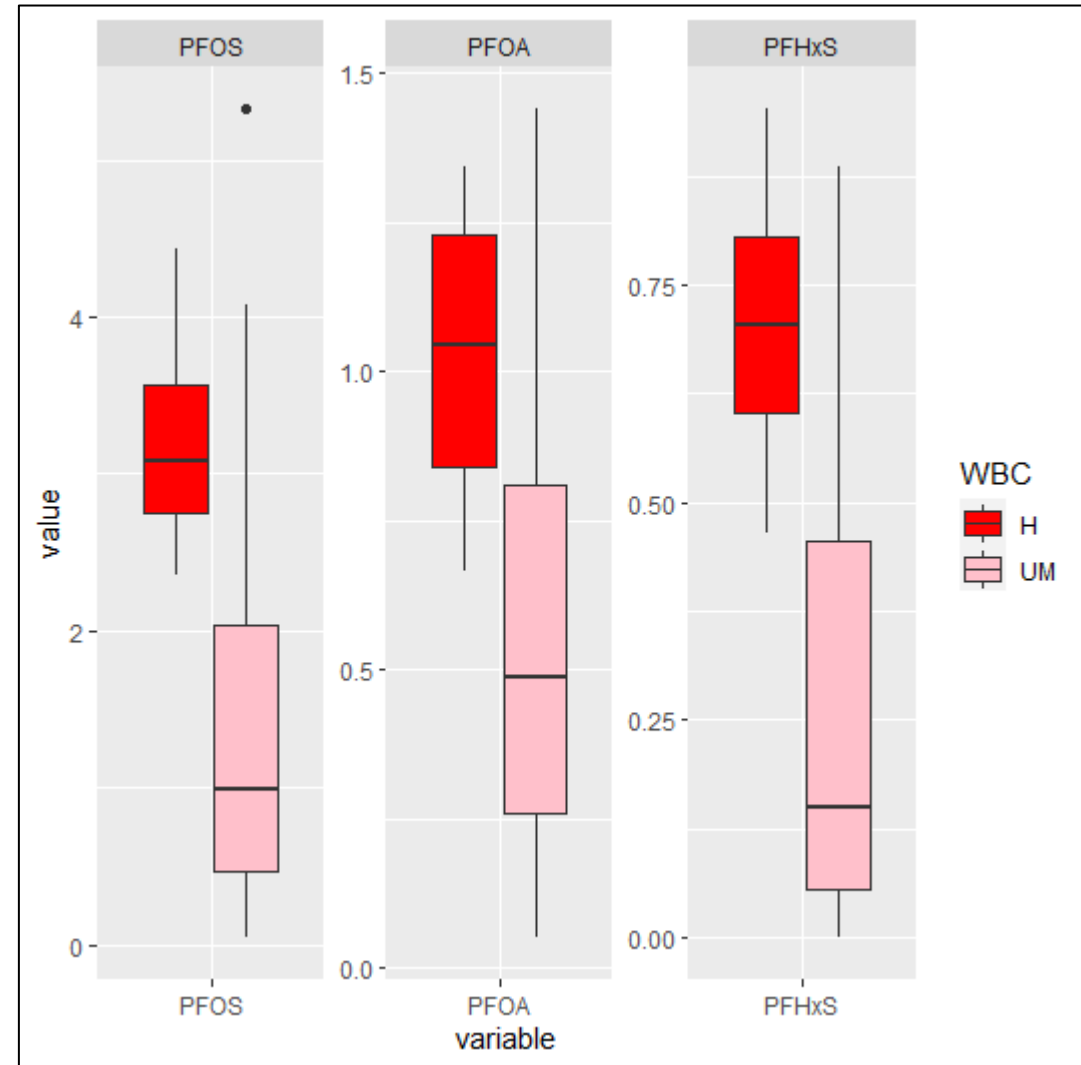
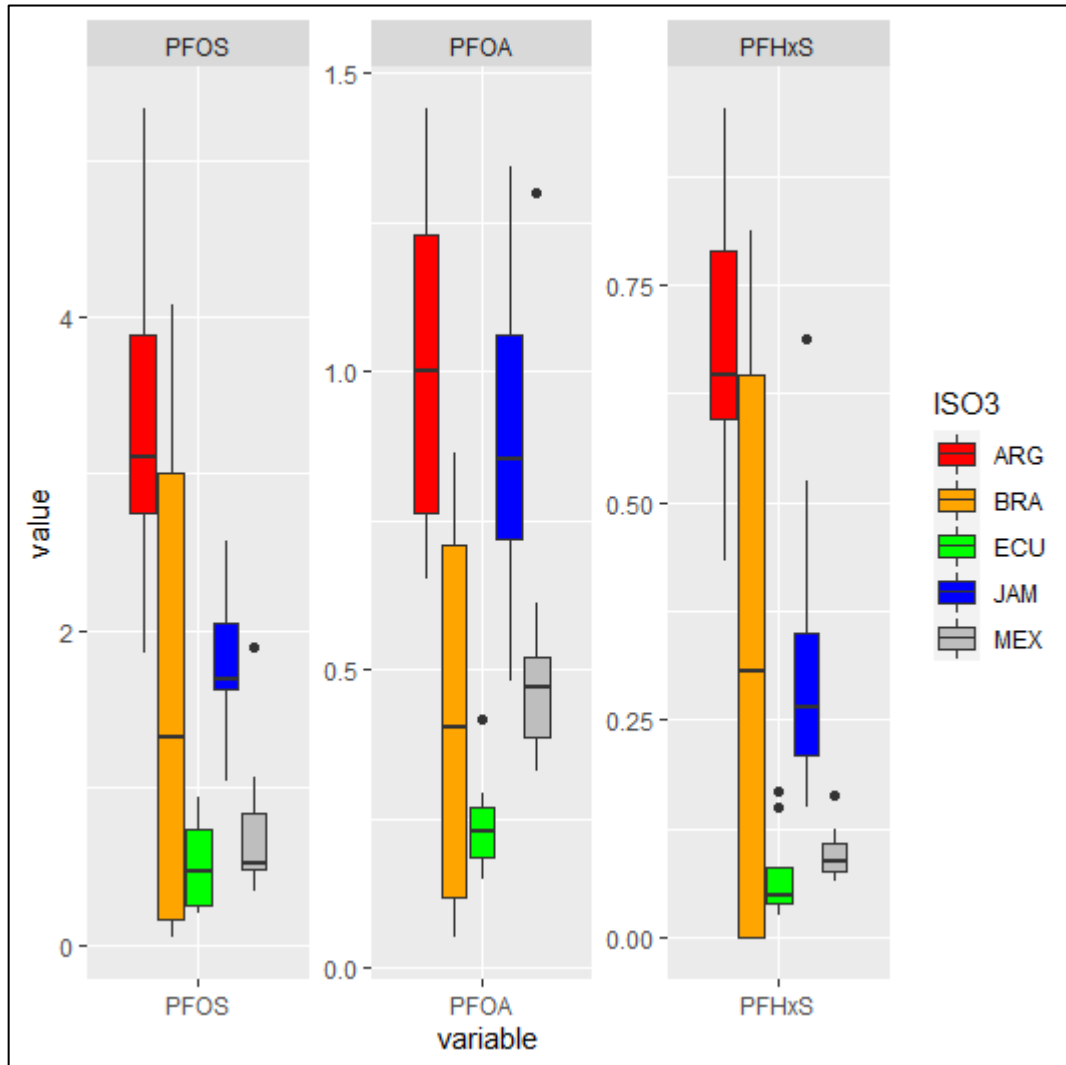
Results

4. GRULAC Region

Boxplot PFAS per country

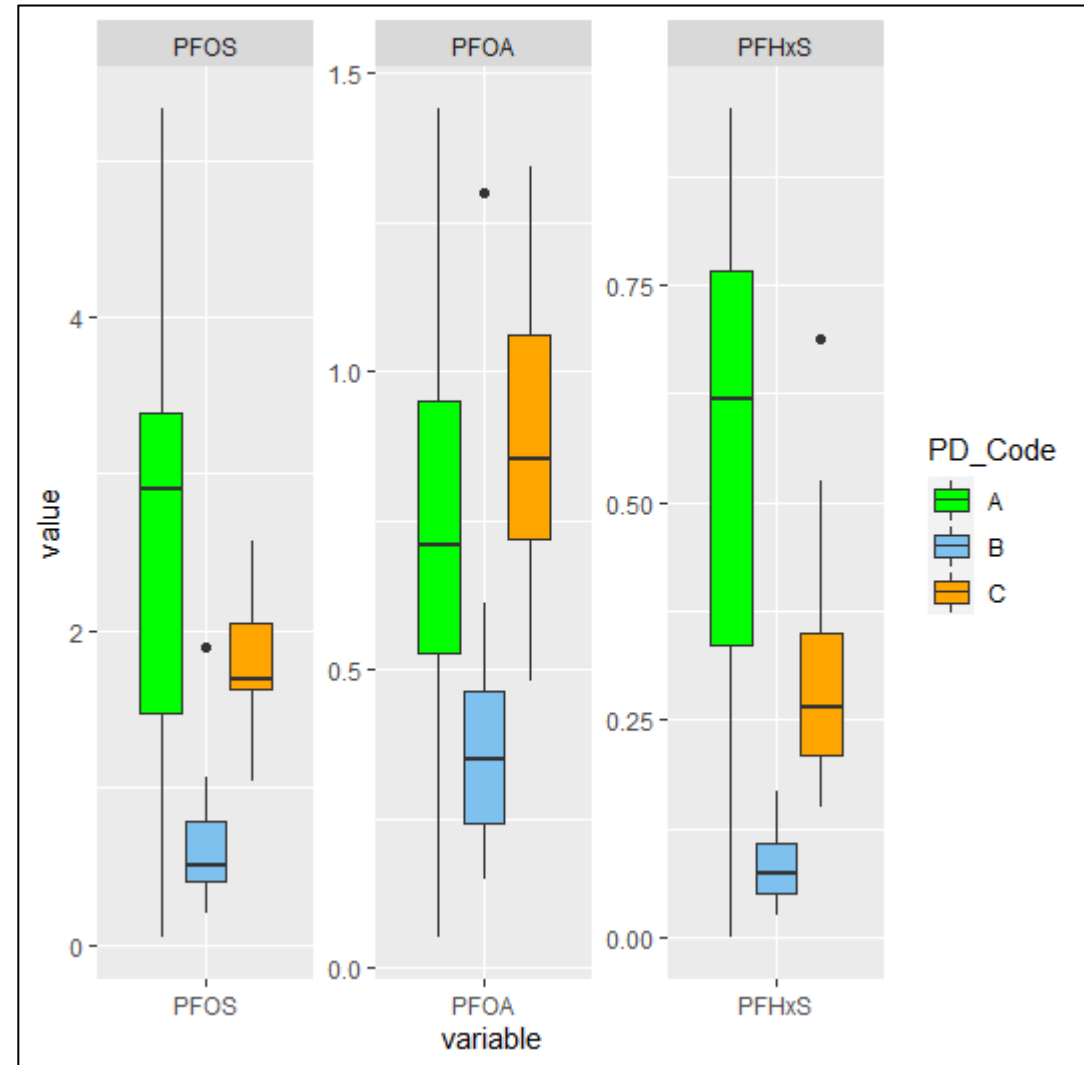
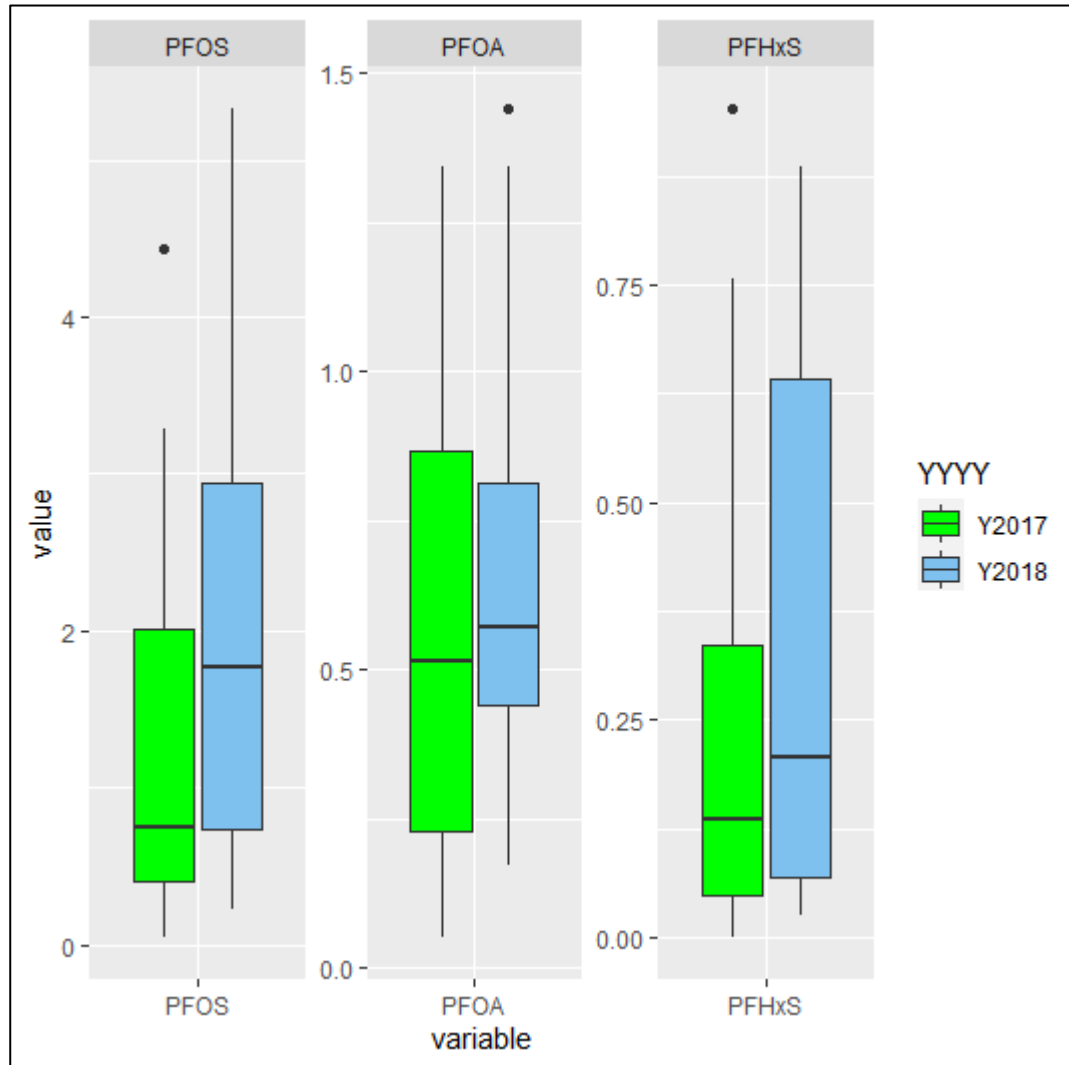


Overview PFAS per country and income



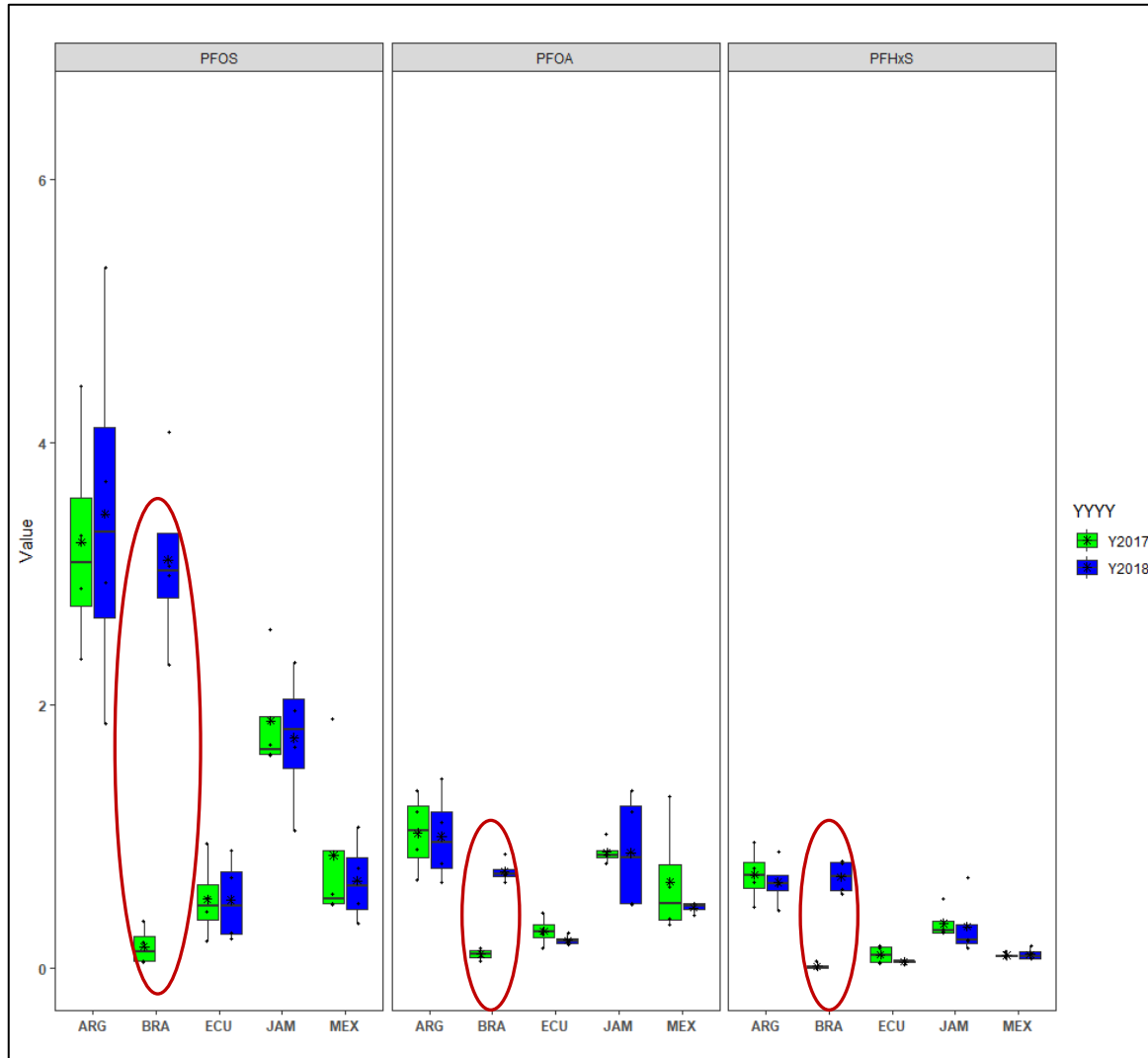
Values in ng/L

Overview PFAS per country and income

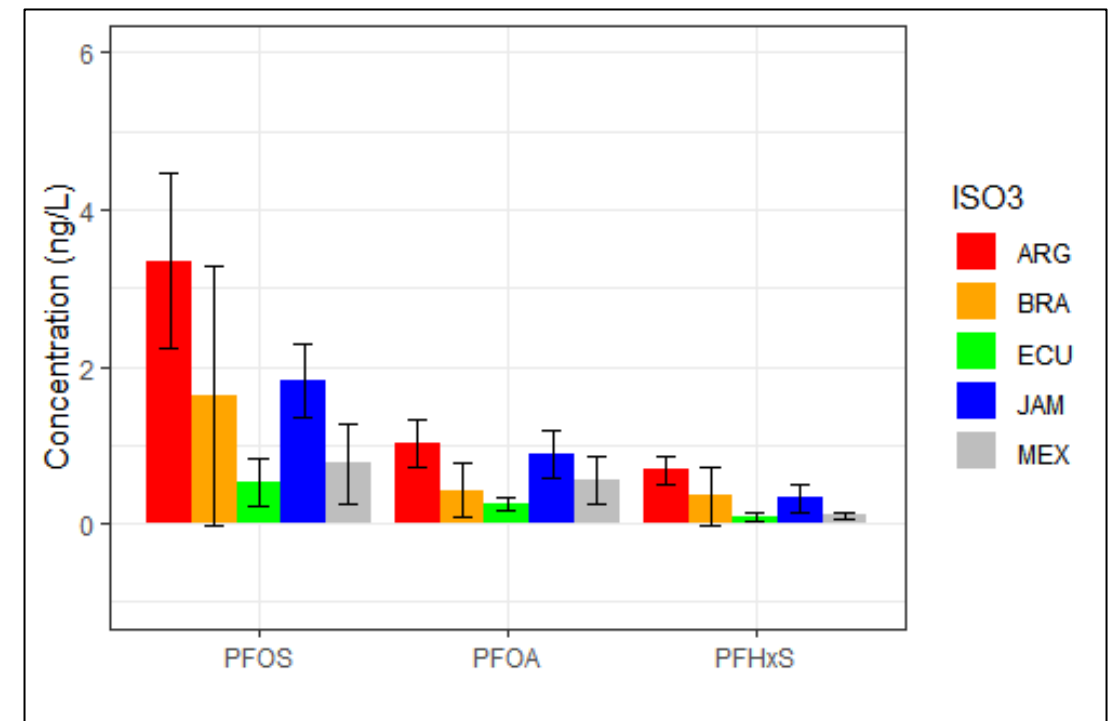


Values in ng/L

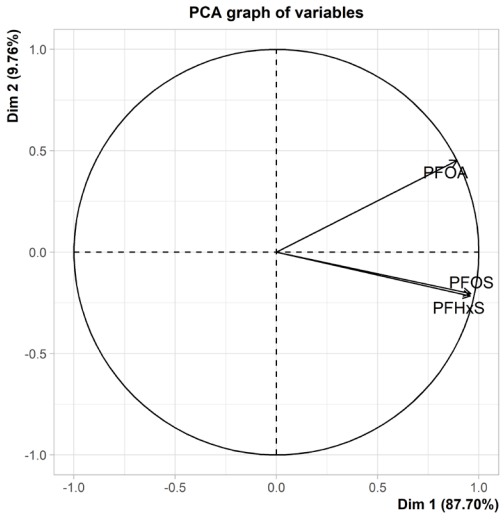
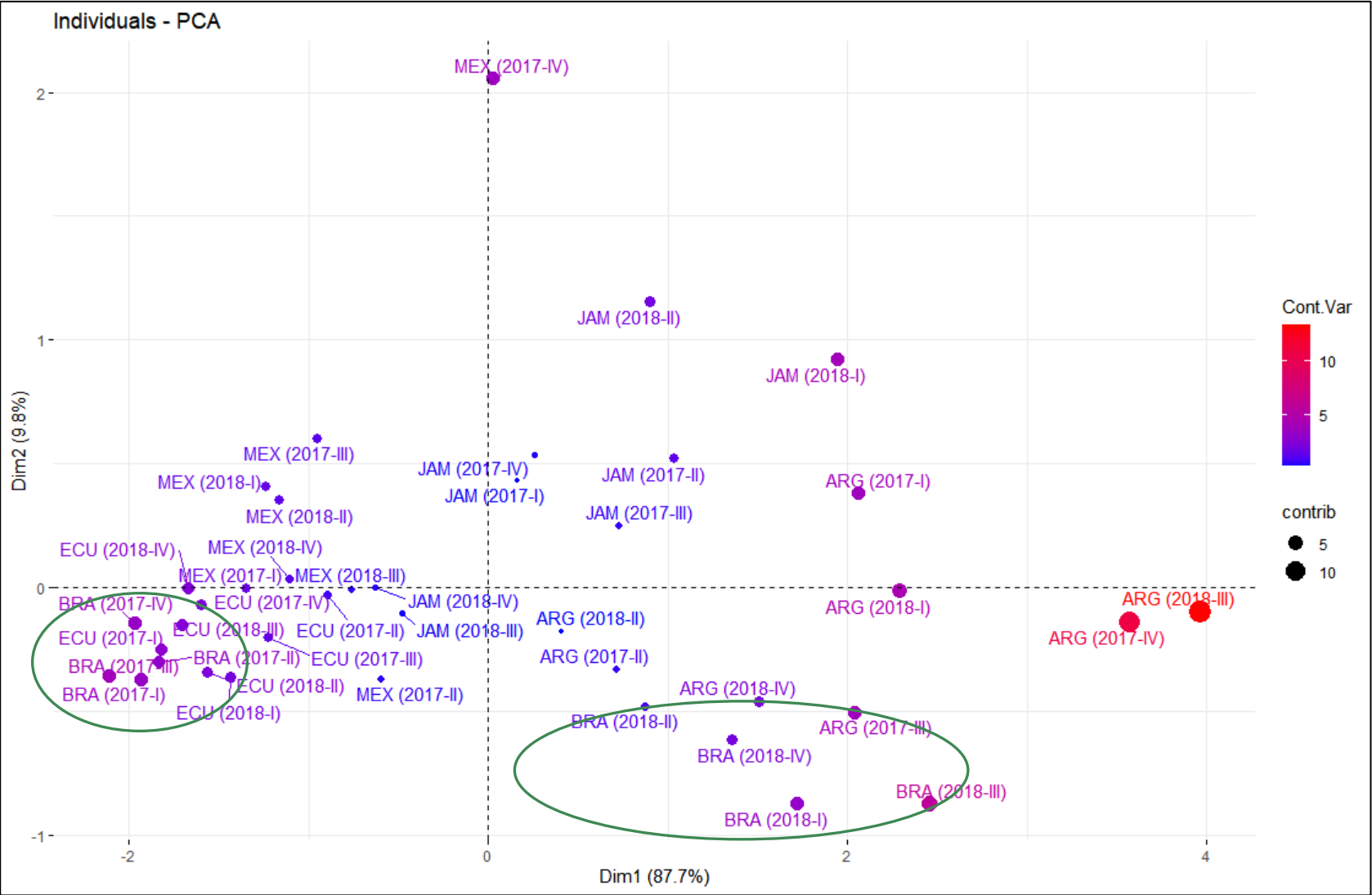
PFAS in water (GRULAC) per year



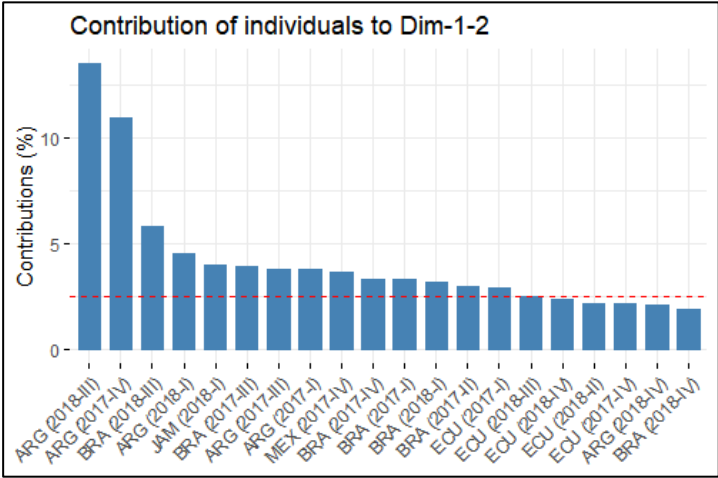
Mean values and standard deviation (SD)



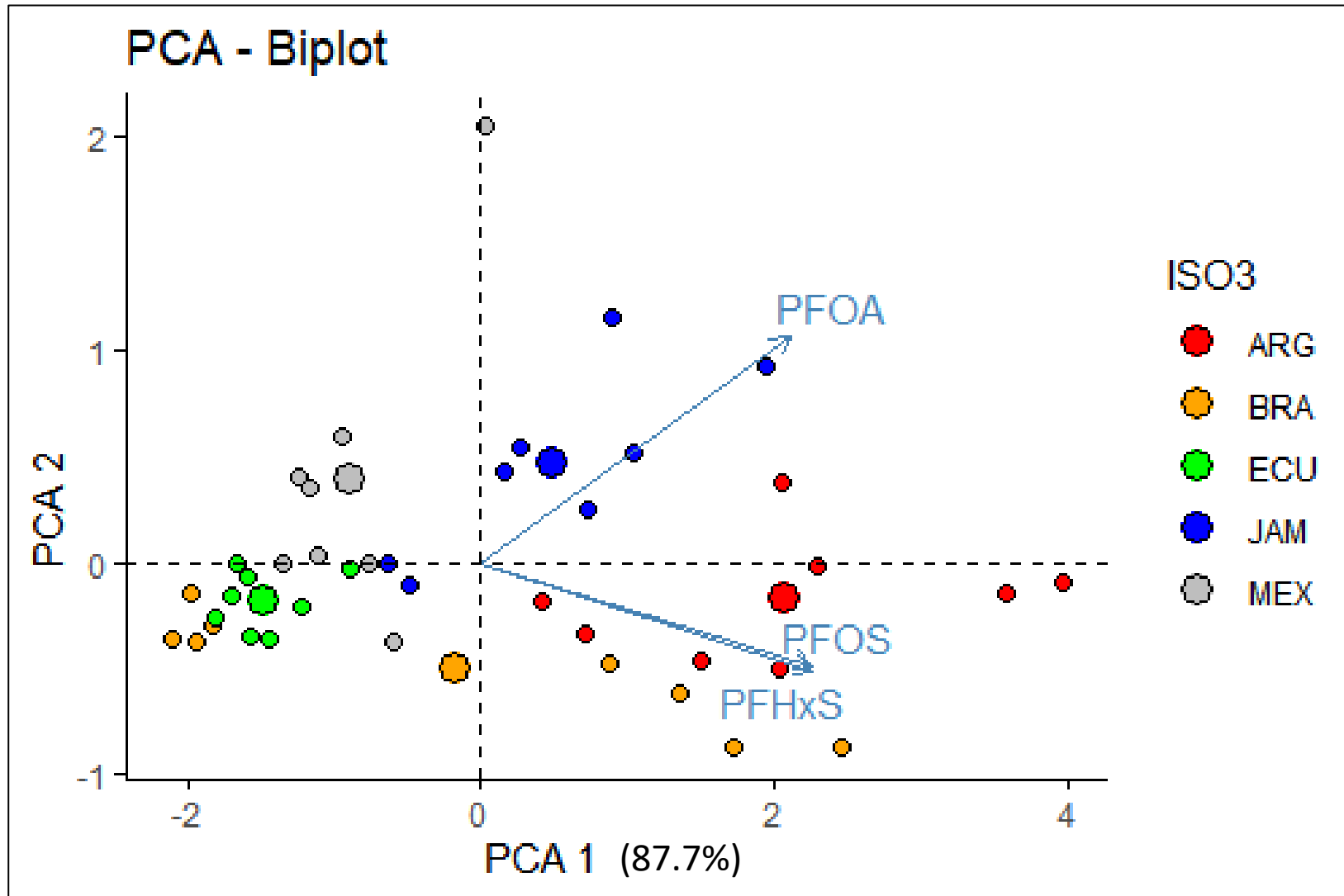
PCA, contributions



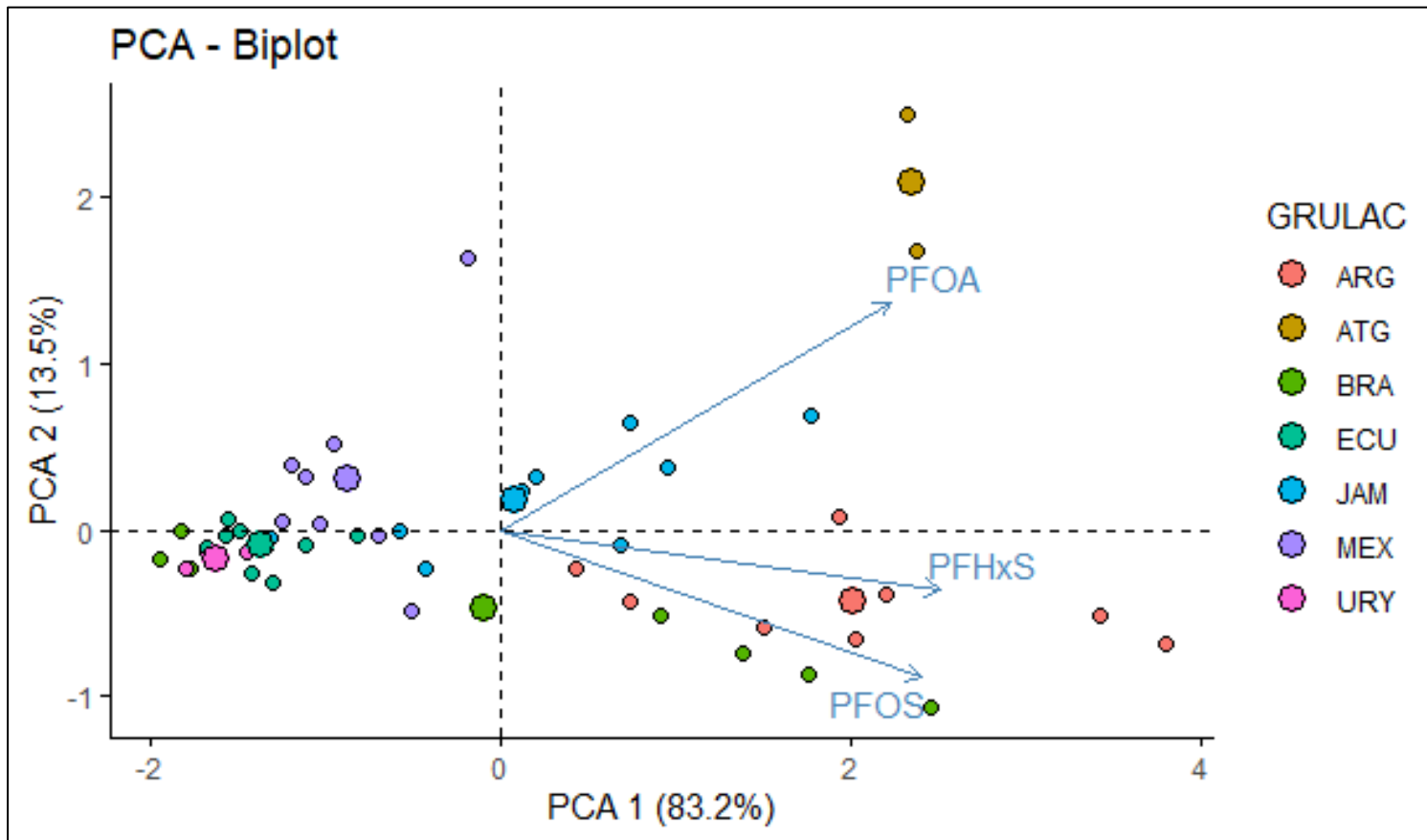
Observe different placing of BRA 2017 and BRA 2018 samples



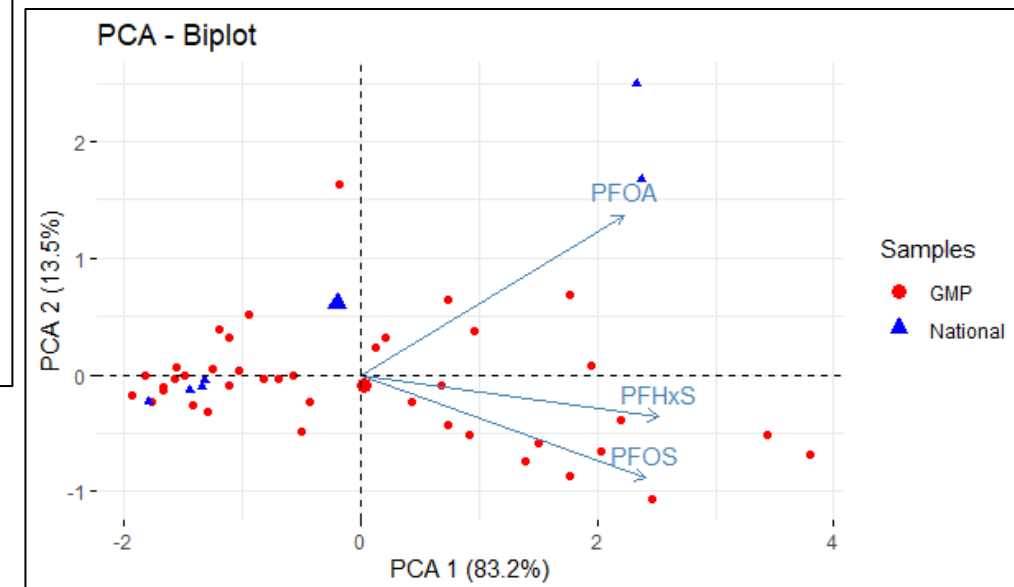
PCA for country (PFAS in water, GRULAC)



Water samples: GMP and national samples



Samples from Antigua and Barbuda (ATG) and Uruguay (URY) were national samples;
Also, 2 national samples from JAM (which were lower than the GMP samples)



Acknowledgment:

- This work was funded through a grant from UN Environment (funds from the Global Environment Facility – GEF) “Supporting implementation of the Global Monitoring Plan on POPs” to Örebro University;
- Thanks to Dr. Leo W.Y. Yeung for PFASs QA/QC, Siamak Sobhanei, Mohammad Sadia, and Abeer Baabish for PFASs lab work;
- Thanks to all national teams for providing the samples.

Thank you !