Per- and poly-fluorinated chemicals in branded waterproof clothing, footwear, hiking and camping equipment

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Contents

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1. Introduction

Finished textile products can contain certain hazardous chemicals used during their manufacture, either because of their use as components of materials incorporated within the product or due to residues remaining from the use within processes employed during manufacture.

This study follows on from, and extends, research recently published by Greenpeace that identified a range of hazardous chemicals in textile products sold by major brands, including per- and poly-fluorinated chemicals in certain items (Brigden et al. 2012, 2013; Greenpeace 2011, 2012a, 2012b, 2012c, 2013a, 2013b, 2013c, 2014a, 2014b). This study extends this work to include a set of 40 items intended for outdoor use, including clothing, footwear, hiking and camping products purchased in October-November 2015, which included articles sold by 11 different major brands and purchased in 19 countries/regions around the world. Details of the analyses carried out and information on the various chemicals quantified in this study are provided within this report.

2. Materials and methods

The 40 products were purchased in October and November 2015 either at the flagship stores of the brands, or other stores authorised to sell the branded products, or ordered online. The products included clothing items (jackets and trousers), footwear articles, as well as hiking and camping equipment including backpacks, sleeping bags, tents, a rope and a glove. While still in the store, purchased products were immediately sealed in individual identical clean polyethylene bags. Sealed bags containing the products were sent to an independent accredited laboratory for analysis. A summary of the number of products of each type, and the country of sale, is given in Table 1, with details of the individual articles provided in Appendix 1.

Product type Country of sale	jacket	trouser	footwear	backpack	sleeping bag	tent	rope	glove	
Austria	J-Wolfskin					J-Wolfskin			
Chile	Columbia				North Face				
China Mainland				Arc'teryx, Vaude					
Hong Kong		Patagonia	North Face						
Taiwan	Patagonia	Arc'teryx							
Denmark		Haglöfs		Haglöfs					
Finland	Haglöfs								
Germany	Vaude			J-Wolfskin, Columbia	Mammut				
Hungary				North Face					
Italy	Salewa	Salewa	Patagonia						
Korea	Blackyak			Patagonia					
Norway	Norrona		Haglöfs						
Russia		Columbia, J-Wolfskin							
Slovakia			Mammut	Mammut					
Slovenia		Mammut	Salewa						
Sweden	Arc'teryx, North Face								
Switzerland	Mammut					North Face	Mammut		
Turkey			Columbia, J-Wolfskin						
UK		North Face						North Face	
TOTAL	**11**	**8**	**7**	**8**	**2**	**2**	**1**	**1**	**40**

Table 1. Summary of the different types of products and the country of sale. J-Wolfskin=Jack Wolfskin

For each of the 40 articles, a section was analysed for a range of per- and poly-fluorinated compounds (PFCs). For some articles, one or more additional sections of different material from the article were separately analysed. Details of the part, or parts, of each article that were analysed, along with the individual PFCs quantified in each sample and their detection limits in individual samples are given in Appendix 1. A sample was cut from each article where there was no printing or labelling. Two separate analyses were carried out on each sample. One portion was extracted with methanol using Soxhlet extraction, the extract purified using solid phase extraction (SPE), and a range of ionic PFCs were quantified using high performance liquid chromatography (HPLC) combined with tandem mass spectrometry (HPLC-MS/MS). A second portion was extracted with methyl tertiary butyl ether (MTBE) using ultrasonic extraction and a range of volatile neutral PFCs were quantified using gas chromatography-mass spectrometry (GC-MS).

The two separate analyses carried out were:

(1) analysis for a range of long chain and short chain ionic PFC compounds, predominantly perfluorosulfonates (PFSAs, including perfluorooctane sulfonate or PFOS), and perfluorinated carboxylic acids (PFCAs, including perfluorooctanoic acid or PFOA).

(2) analysis for a range of long chain and short chain volatile PFCs which are used as precursors during manufacturing processes, consisting of certain fluorotelomer alcohols (FTOHs), fluorotelomer acrylates (FTAs, also known as polyfluorinated acrylates), and N-alkyl perfluorosulfonamides.

For both sets of PFCs (ionic and volatile), both long chain versions and short chain versions were quantified. The term ”long chain PFCs” refers to carbon chain lengths C8 and higher in the case of PFCAs and to carbon chain lengths C6 and higher in the case of PFSAs, as well as to substances such as long chain fluorotelomer compounds that have the potential to degrade to form long-chain PFCAs or PFSAs. Short chain PFCs refers to PFCAs or PFSAs with shorter chain lengths than these, or substances that have the potential to degrade to short chain PFCAs or PFSAs, including certain other long chain fluorotelomer compounds (OECD-UNEP 2013).

Fluorotelomer alcohols (FTOHs) and fluorotelomer acrylates (FTAs) can act as sources of PFCAs. Fluorotelomer alcohol (FTOHs) can be transformed into PFCAs either through biotransformation (Frömel & Knepper 2010, Butt *et al*. 2013), or abiotically in the atmosphere (Young & Mabury 2010). 6:2 FTOH can give rise to C6 compounds including PFHxA, while 8:2 FTOH can give rise to C8 compounds including PFOA, and similarly, 10:2 FTOH can yield C10 compounds, including PFDA. In addition, FTOHs are volatile and can be released from products under ambient conditions (Greenpeace 2013c, Langer et al. 2010, Schlummer et al. 2013). Humans occupationally exposed to high levels of 8:2 FTOH have been found to have relatively high concentrations of PFOA in their blood (Nilsson *et al.* 2013). In addition, there are indications that biotransformation can form intermediate products in the body that can be more harmful than the PFCA end product (Rand & Mabury 2012).

For a number of articles, a separate section of the same material from the article was subsequently analysed to gain an understanding of the variability in PFC concentrations for different parts of a fabric. This repeat analysis was carried out for ionic PFCs (4 jacket, 3 trouser, 5 footwear, 1 backpack

and 1 tent samples) and for volatile PFCs (5 jacket, 3 trouser, 6 footwear, 2 backpack, 2 sleeping bag and 1 tent samples). Details of these samples are given in Appendix 2.

A range of additional quality control checks were carried out including the analysis of blanks and the determination of the recovery of a range of deuterated and ^{13}C labelled ionic and volatile PFC standards. To check reproducibility of the extraction process, for each of 3 articles that were found to contain a wide range of ionic and volatile PFCs at relatively moderate to high concentrations (1 trouser, 1 backpack and 1 sleeping bag), a section of material was cut into multiple small pieces which were mixed and then separated into two approximately equal portions, which were analysed as 2 separate samples. Details of the three samples analysed in duplicate are given in Appendix 3.

3. Results and Discussion

The results for the various product categories are presented in the following sections. All results from the analyses of the individual articles are provided in Appendix 1.

One or more PFC was detected in material from 36 of the 40 articles, though the PFC concentrations and the composition of the PFCs present varied greatly between individual articles. Volatile PFCs were not detected as commonly as ionic PFCs, most notably for backpacks, though where volatile PFCs were detected they were generally found in considerably higher concentrations than ionic PFCs in the same article. A summary of the number of articles in which ionic and/or volatile PFCs were detected is given in Table 2, together with the range and median of the total concentrations by area of ionic PFCs in the various articles, and the same for volatile PFCs. Details of the concentrations of individual PFCs in all articles, both by mass (ng/kg) and by area (µg/m²), are given in Appendix 1, and are discussed by product type in the relevant sections below. Representations of the total ionic PFC and total volatile PFC concentrations are given in Figure 1a/b, together with a breakdown of individual ionic PFCs (Figure 2a/b) and individual volatile PFCs (Figure 3a/b).

			Ionic PFCs			volatile PFCs		
Article type	**No. of articles**	**No. in which PFCs were detected**	**No. of articles in which detected**	**total conc. range (µg/m^2)**	**total conc. median (µg/m^2)**	**No. of articles in which detected**	**total conc. range (µg/m^2)**	**total conc. median (µg/m^2)**
jacket	11	9	9	ND - 684	5.16	8	ND - 640	72
trousers	8	8	7	ND – 75.5	42.1	8	46 – 700	150
footwear	7	7	7	ND – 195	19.4	6	ND - 3100	1200
backpack	8	7	7	ND – 14.4	0.79	2	ND - 97	0
sleeping bag	2	2	2	0.17-12.0	0.83	2	31 – 67	51
tent	2	2	2	ND – 2.24	0.07	2	ND-57	0
glove	1	0	0	ND	-	0	ND	-

Table 2. Summary of articles in which PFCs were detected, together with the ranges and medians of the total concentrations by area for ionic PFCs and volatile PFCs (µg/m^2). The rope sample is not included as data are available only by mass (ng/kg). ND – not detected. Range and median values were calculated using both sets of data for those samples from which two sections of equivalent fabric were analysed.

The data for the duplicate analysis on three samples demonstrates acceptable reproducibility for the extraction and analysis method. For two samples (backpack BP05 and sleeping bag SB02), the difference between concentrations in the two duplicates was below 140%. For the third sample

(Trouser TR04), the difference between concentrations in the two duplicates was below 175% for all but one analyte (see Appendix 3 for details).

The data for the repeat analysis of two equivalent sections from a number of articles demonstrated that, in most cases, the concentrations of PFCs in the two sections were in good agreement. Where the concentration of all PFCs differed between the two sections by up to a factor of 2, the average concentration is given. For those materials where the concentration of one or more PFCs differed between the two sections by a factor of 3 or more, the data for both sections are presented and discussed separately (see Appendix 1 for details). For the samples where data for different section of the same fabric differed by a factor of 3 or more, the differences clearly reflect real variations in concentrations between different parts of the same fabric and do not result from the testing method, as confirmed by quality control checks (see Appendix 3).

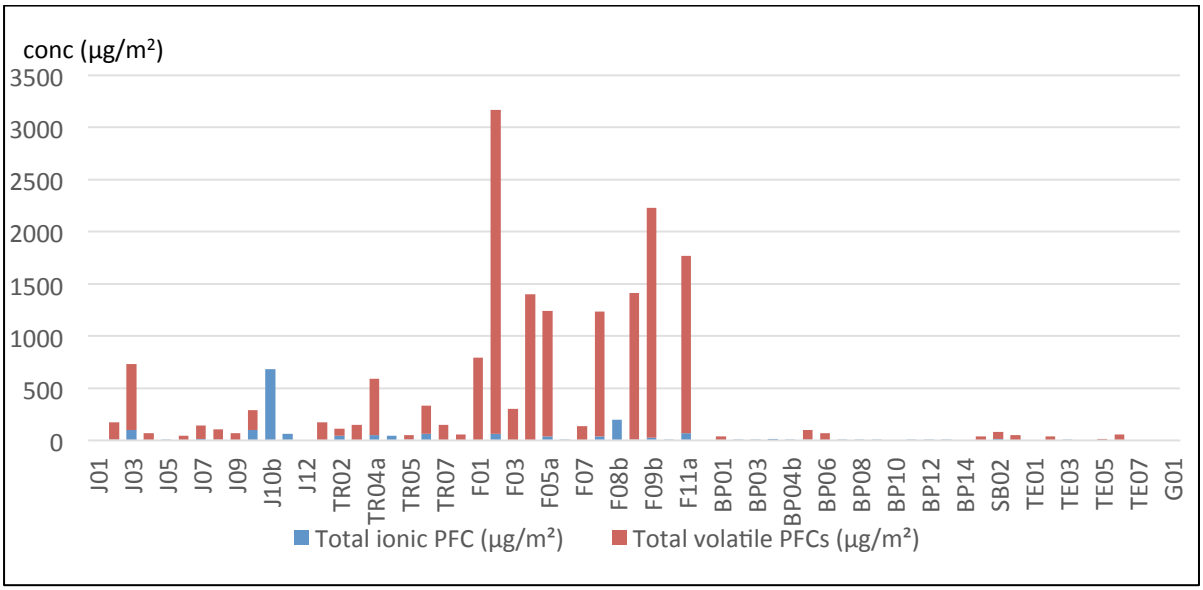

Figure 1a. Comparison of total ionic PFC concentrations and total volatile PFC concentrations by area (µg/m^2) for all samples except rope

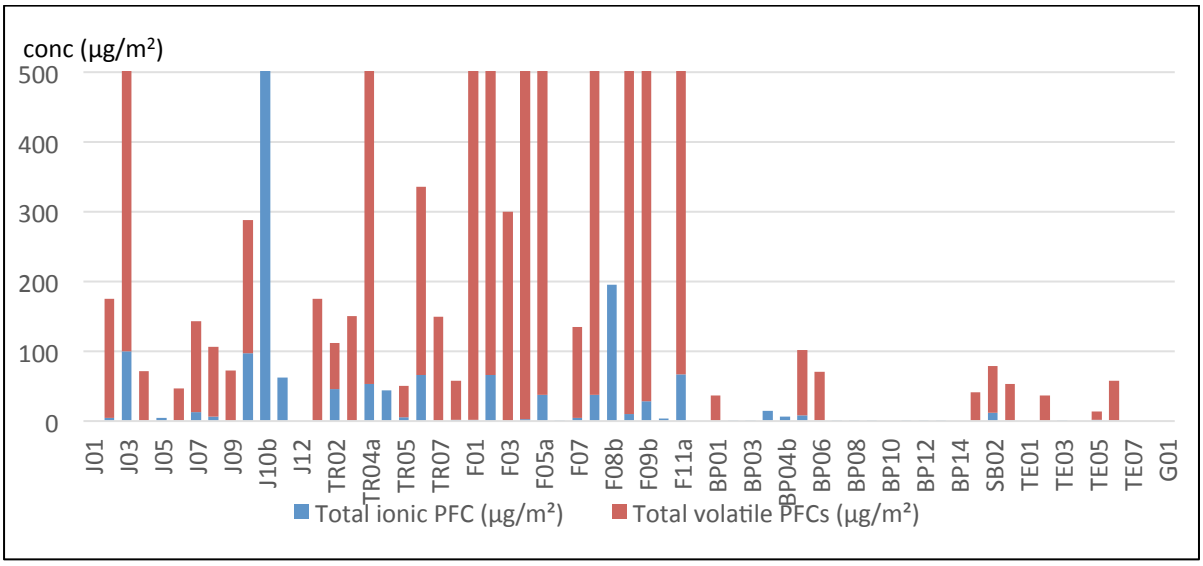

Figure 1b. Comparison of total ionic PFC concentrations and total volatile PFC concentrations by area (µg/m^2) for all samples except rope, with an expanded axis (0-500 µg/m^2)

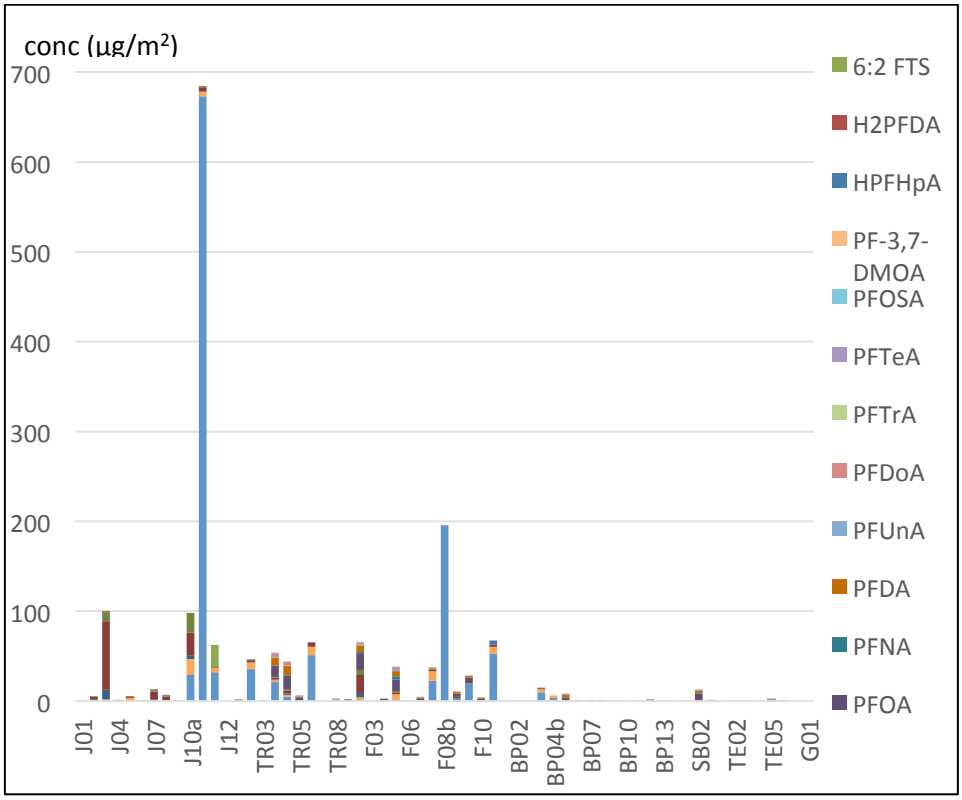

Figure 2a. Details of ionic PFC concentrations by area (µg/m^2) for all samples except rope

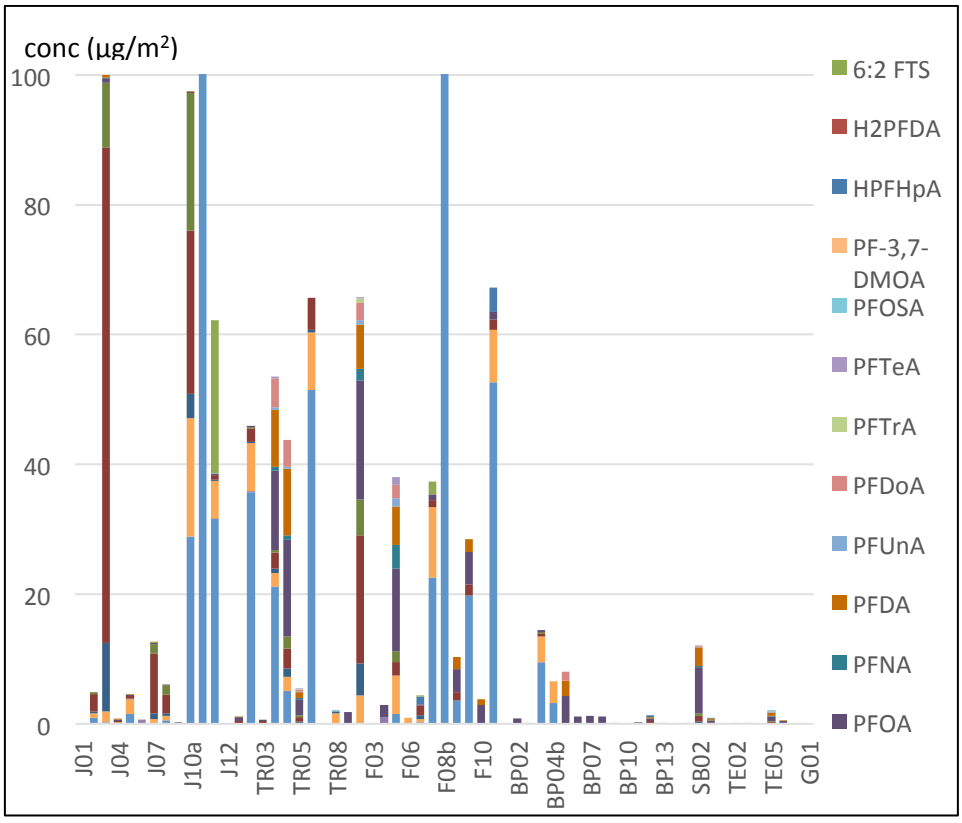

Figure 2b. Details of ionic PFC concentrations by area (µg/m^2) for all samples except rope, with an expanded axis (0-100 µg/m^2)

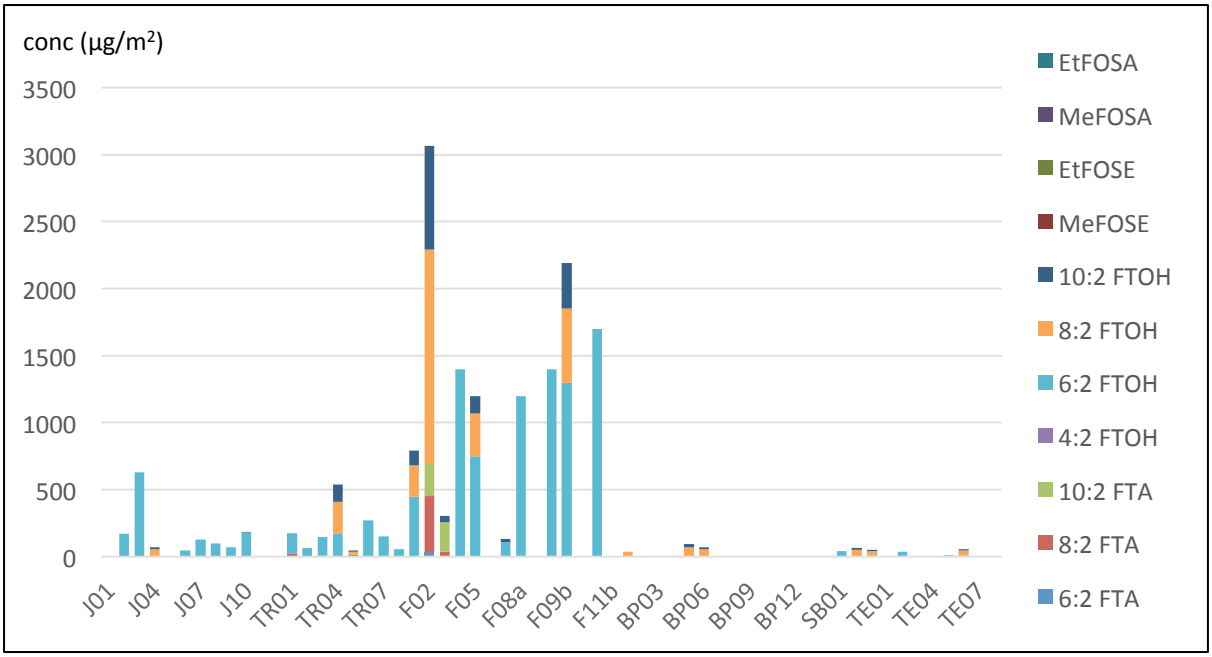

Figure 3a. Details of volatile PFC concentrations by area (µg/m^2) for all samples except rope

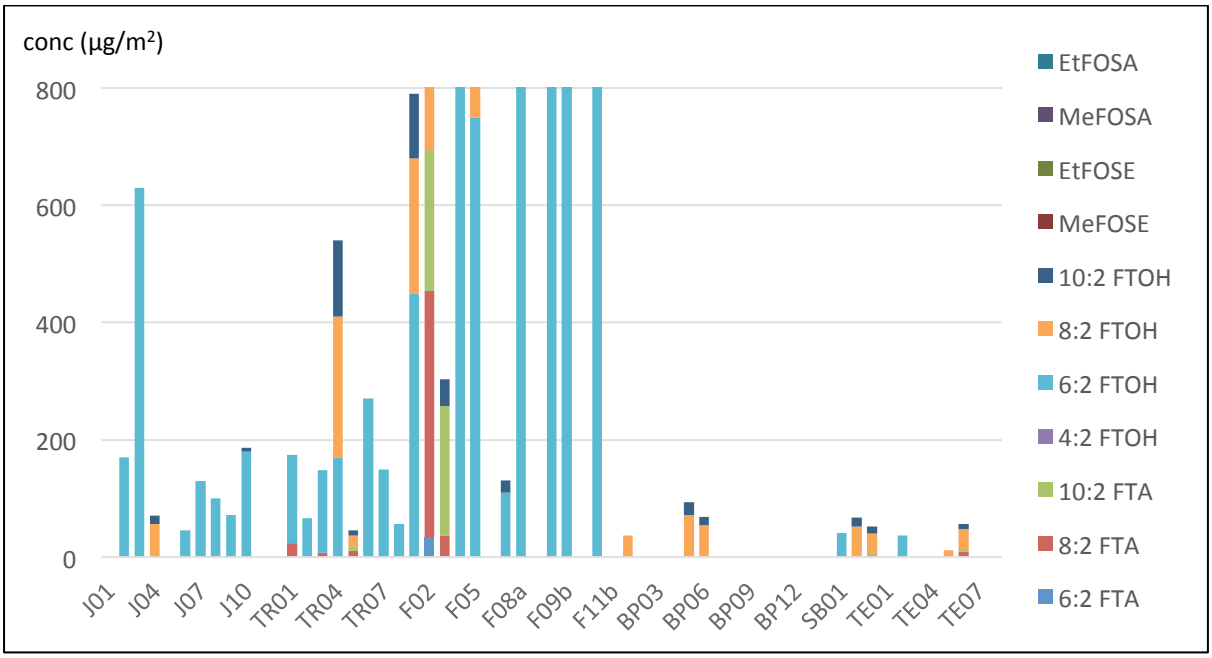

Figure 3b. Details of volatile PFC concentrations by area (µg/m^2) for all samples except rope, with an expanded axis (0-800 µg/m^2)

3.1 Jackets

Overall, for the samples from the 11 jackets, the volatile PFCs were the dominant PFCs by concentration. One or more volatile PFC was detected in a sample of fabric from a jacket sold by all but three brands (Vaude, J01; Salewa, J11; Jack Wolfskin, J12). The Jack Wolfskin jacket was labelled as '100% fluorocarbon free'. Similarly, no ionic PFCs were detected in the Vaude jacket (J01) or the

Jack Wolfskin jacket (J12), though the Salewa jacket (J11) had one of the highest concentrations of total ionic PFCs in jacket samples, as discussed below.

Of the other jackets, by far the most commonly detected volatile PFC was the short chain 6:2 FTOH, being the only volatile PFC in 6 jackets (Mammut, Norrona, Columbia, Haglöfs, Arc'teryx and The North Face), with the Patagonia jacket (J10) containing 6:2 FTOH and a relatively low concentration of 10:2 FTOH (6.7 $\mu g/m^2$, 3.9% of the total volatile PFC concentration).

Amongst all the jacket samples, the Norrona jacket (J03) had by far the highest concentration of 6:2 FTOH, and of total volatile PFCs, (630 $\mu g/m^2$), almost four times higher than the 6:2 FTOH concentration in the two samples with the next highest concentrations (Mammut, J02, 170 $\mu g/m^2$; Patagonia, J10, 180 $\mu g/m^2$).

In contrast, 6:2 FTOH was not detected in the inner fabric of the Blackyak jacket (J04), though this did contain the long chain 8:10 FTOH (56 $\mu g/m^2$) and 10:2 FTOH (15 $\mu g/m^2$).

No volatile PFCs were detected in the outer lining of the Blackyak jacket (J05). For all other jackets, only samples of the outer fabric were analysed.

In addition to the volatile PFCs, ionic PFCs were detected in all but 2 jackets (Vaude, J01; Jack Wolfskin, J12). As noted above, no volatile PFCs were detected in these 2 jackets. In addition, only relatively low concentrations of two ionic PFCs were detected in a The North Face jacket (J09), namely PFHxA (0.18 $\mu g/m^2$) and PFOA (0.11 $\mu g/m^2$).

Though the ionic PFC concentrations were notably lower than those of the volatile PFCs, these are still significant results. The highest total ionic PFC concentrations (both short and long chain) were found in samples from the Norona jacket (J03, 99.9 $\mu g/m^2$) and the Patagonia jacket (J10a, 97.4 $\mu g/m^2$ and J10b, 684 $\mu g/m^2$), followed by the Salewa jacket (J11, 62.4 $\mu g/m^2$), consisting of 14% (J03), 35% (J10a), 79% (J10b), and 100% (J11) of the total PFC concentrations for these samples, respectively.

The compositions of ionic PFCs in these three jackets were quite different to each other. For the Norona jacket (J03), by far the predominant ionic PFCs were short chain PFCAs; the C6 compound (76.4 $\mu g/m^2$ PFHxA), which was present together with the C4 (1.72 $\mu g/m^2$ PFBA), C5 (10.6 $\mu g/m^2$ PFPA) and C7 (9.97 $\mu g/m^2$ PFHpA) PFCAs, as well as lower concentrations of the short chain C4 sulfonate (0.22 $\mu g/m^2$ PFBS) and long chain PFCAs (including 0.67 $\mu g/m^2$ PFOA).

In contrast, for the Patagonia jacket (J10), the short chain C4 sulfonate (PFBS) was the predominant ionic PFC, at 28.9 $\mu g/m^2$ in one section (J10a) and at 673 $\mu g/m^2$ in the other (J10b). As seen for the Norona jacket (J03), the Patagonia jacket (J10) also contained relatively high concentrations of short chain PFCAs, including the C4 PFBA (18.2 $\mu g/m^2$ J10a, 4.95 $\mu g/m^2$ J10b), C6 PFHxA (25.1 $\mu g/m^2$ J10a, 4.27 $\mu g/m^2$ J10b) and C7 PFHpA (21.2 $\mu g/m^2$ J10a, 0.91 $\mu g/m^2$ J10b), and to a lesser extent the C5 PFPA (3.79 $\mu g/m^2$ J10a, 1.04 $\mu g/m^2$ J10b).

The composition was very different again for the Salewa jacket (J11). As for the Patagonia jacket (J10), the short chain C4 sulfonate (PFBS) was the predominant ionic PFC, at 31.6 $\mu g/m^2$.

Overall, the range of concentrations of ionic PFCs in the jacket samples was generally similar to those of trousers and footwear, and generally higher than those in backpacks, sleeping bags and tents. A similar pattern was seen for volatile PFCs, other than that the range of concentrations in the footwear samples was generally higher than for jackets samples

Two reports previously published by Greenpeace in 2012 and 2013 included results from the analysis of PFCs in a number of waterproof coats that were purchased in the year of publication in both cases (Greenpeace 2012c, 2013c). As in the current study, both ionic and volatile PFCs were commonly detected in waterproof jackets from both previous studies. Similarly, where volatile PFCs were detected they were present at considerably higher concentrations than ionic PFCs, as was the case in the current study.

Concentrations of volatile PFCs in the current study were in a similar range (ND – 630 μg/m^2)to those in the 2012 report (up to 464 μg/m^2), but generally lower than those from the 2013 report (48.9-2090 μg/m^2). For the 2012 study, both long and short chain volatile PFC compounds were detected across all the products. While the pattern was similar for the 2013 report, short chain volatiles PFCs were more prevalent than long chain versions.

Another study published in 2015, for products purchased in 2010, also detected both short and long chain volatile FTOHs, though in this case long chain versions (8:2 FTOH and 10:2 FTOH) dominated over short chain (6:2 FTOH), with concentrations above 100 μg/m^2 for both 8:2 FTOH and 10:2 FTOH (Kotthoff *et al.* 2015).

This trend from 2010 to 2013 continues with the current study, in which both short and long chain volatile PFCs were detected, but short chain versions were considerably more prevalent than long chain ones, which were detected in only 2 of the 12 jackets analysed.

Overall, total ionic PFC concentrations were somewhat higher in the current study (ND – 684 μg/m^2) than in the study from 2012 (0.58 – 10.96 μg/m^2) and that from 2013.

In addition, for the jackets from the 2012 and 2013 reports, both long and short chain ionic PFCs were commonly detected, being dominated by PFCAs, with the long chain PFOA being a predominant compound in many cases. In contrast, ionic PFCs detected in the current study were predominantly short chain PFCs. Furthermore, short chain sulfonates (PFSAs) were detected in many samples (especially the C4 PFBS), and these were the predominant ionic PFCs for some samples, with very high concentrations in two cases (28.9-672 μg/m^2). The long chain acid, PFOA, was detected in most samples, though at lower concentrations (0.07 – 0.67 μg/m^2) than those generally found in the 2012 (0.2-5.0 μg/m^2) and 2013 (0.1-6.3 μg/m^2) reports.

3.1 Trousers

As for the jacket samples, the volatile PFCs were the dominant PFCs by concentration. One or more volatile PFC was detected in all samples of trouser fabric. The highest total volatile PFC concentration was found in the Jack Wolfskin trousers (TR04, 530 μg/m^2), though some other samples also had high total volatile PFC concentrations, especially the Arc'teryx trousers (TR06, 270 μg/m^2).

The most commonly detected volatile PFC was the short chain 6:2 FTOH, identified in all but 1 sample (TR05, Patagonia), and was generally the PFC with the highest concentration in each sample, with the Arc'teryx trousers (TR006) containing the highest 6:2 FTOH concentration (270 μg/m^2). 6:2 FTOH was the only volatile PFC detected in 4 samples (TR02, Mammut; TR06, Arc'teryx; TR07, Haglöfs; TR08, Salewa), with 2 other samples containing around 90% FTOH and with the long chain acrylate 8:2 FTA as a minor component (TR01, The North Face; TR03, Columbia).

The composition for the Jack Wolfskin trousers (TR04) was somewhat different. Three telomer alcohols were detected, the short chain 6:2 FTOH, and the long chain 8:2 FTOH and 10:2 FTOH, with 8:2 FTOH concentration being slightly higher than the other two (240 μg/m^2).

The other exception for trouser fabric was the Patagonia trousers (TR05), for which the longer chain telomer alcohols 8:2 FTOH and 10:2 FTOH were detected, at notably lower concentrations than 6:2 FTOH in the other samples. In addition, the corresponding long chain fluorotelomer acrylates 8:2 FTA and 10:2 FTA were also found, at similar concentrations to the alcohols.

In addition to the volatile PFCs, ionic PFCs were detected in all but 1 sample (TR07, Haglöfs). Though the ionic PFC concentrations were notably lower than those of the volatile PFCs, these are still significant results.

For three samples, the ionic PFCs were dominated by the presence of the short chain (C4) sulfonate, PFBS. These were the Arc'teryx trousers (TR06, 51 μg/m^2), the Mammut trousers (TR02, 36 μg/m^2), and the Jack Wolfskin trousers (TR04 21 μg/m^2). The Mammut trousers (TR02) also contained a relatively low concentrations of the long chain C8 sulfonate, PFOS (0.17 μg/m^2).

These three samples also contained appreciable amounts of the C4 and C6 short chain PFCAs, PFBA and PFHxA. In addition, the Jack Wolfskin trousers (TR04) also contained higher concentrations of the long chain compounds PFOA (C8, 12.2 μg/m^2), PFDA (C10, 8.78 μg/m^2) and PFDoA (C12, 4.47 μg/m^2), as well as relatively lower concentrations of a range of other long chain PFCAs.

PFBS was not detected in the Patagonia trousers (TR05), though a wide range of short and long chain PFCAs were, from the short chain C4 compound PFBA to the long chain C14 compound PFTeA, with the predominant compound being the long chain C8 compound PFOA (2.47 μg/m^2).

Short chain ionic PFCs were also detected in the Salewa trousers (TR08), though at generally lower concentrations, with the main compound being the C4 PFBA (1.63 μg/m^2).

As mentioned above, no ionic PFCs were detected in the Haglöfs trousers (TR07), and the Columbia trousers (TR03) contained only relatively low concentrations of the short chain PFHxA (0.41 μg/m^2) and the long chain PFOA (0.20 μg/m^2). Similarly, The North Face trousers (TR01) contained the short chain PFHxA (0.44 μg/m^2) and two long chain compounds PFOA (0.58 μg/m^2) and PFDA (0.13 μg/m^2).

Overall, the range of concentrations of ionic PFCs in the trouser samples was generally similar to those of jackets and footwear, and generally higher than those in backpacks, sleeping bags and tents. A similar pattern was seen for volatile PFCs, other than that the range of concentrations in the footwear samples was generally higher than for trouser samples.

Two previous Greenpeace studies each analysed one waterproof trouser product, one purchased in 2012 (Greenpeace 2012c) and the other in 2013 (Greenpeace 2014a). The composition of PFCs for these two articles was somewhat different to that found in the current study. No volatile PFCs were detected in one study (Greenpeace 2014a), and only the long chain fluorotelomer acrylate 8:2 FTA (25.6 μg/m^2) detected in the other (Greenpeace 2012c).

Furthermore, one item in a previous study had a high concentration of the long chain (C6) sulfonate PFHxS (542 μg/m² and 64.2 μg/m² in two separate portions from the same article), a compound that was not detected in the current study. One of the portions also contained the short chain (C4) sulfonate PFBS (2.10 μg/m²), though this was at a notably lower concentration compared to those samples containing PFBS in the current study (21 to 51 μg/m²) (Greenpeace 2014a). This item also contained the short chain C6 and C4 PFCAs, at concentrations within the range found in the current study.

Similarly, for the other trouser article previously reported, a number of PFCAs were detected within the ranges found in the current study, including PFOA at 2.31 μg/m² (Greenpeace 2012c).

A 2015 paper reporting results for products purchased in 2010 did detect long chain FTOHs, though at lower concentrations than generally found in the current study, as well as both short and long chain ionic PFCAs at similar concentrations to the current study. No ionic sulfonates were detected (Kotthoff et al. 2015).

3.2 Footwear

As for jacket and trouser samples, volatile PFCs were generally the dominant PFCs by concentration for footwear samples. The Patagonia boot (F10) was the only footwear article in which no volatile PFCs were detected in any sample.

Where detected, the total concentrations of volatile PFCs were notably higher in most samples than for other types of product. 8 samples had a total volatile PFC concentration of over 1000 μg/m^2, representing articles from Haglöfs, Salewa, Mammut, The North Face, Jack Wolfskin and Columbia. One sample from the Haglöfs boot (F02) had the highest total volatile PFC concentration amongst all samples tested from all product types (3100 μg/m^2), almost exclusively composed of long chain volatile PFCs.

For each of 2 samples (F08, The North Face; F11, Columbia), volatile PFCs were present at over 1000 μg/m^2 in one section of fabric (F08a, F11a) but not detected in the second equivalent section of fabric in each case (F08b, F11b). Quality control checks confirm that such differences reflect real variations in concentrations between different parts of the same fabric.

For those samples in which volatile PFCs were detected, the short chain 6:2 FTOH was either the predominant or only volatile PFC detected, with the exception of 2 of the 3 samples from the Haglöfs boot (F02, outer part; F03, inner part). 6:2 FTOH was detected in one or more sample from all brands with the exception of Patagonia, and was detected at over 1000 μg/m^2 in one sample from each of the Salewa, The North Face, Jack Wolfskin and Columbia footwear.

Examples of long chain volatile PFCs, including telomer alcohols (8:2 FTOH and 10:2 FTOH) and fluorotelomer acrylates (8:2 FTA and 10:2 FTA) were detected in all samples from the Haglöfs (F01-F03) and Mammut (F05) footwear, with a relatively low amount in one sample from the The North Face boot (F07).

Ionic PFCs were detected in all footwear samples except one from Haglöfs (F03), though concentrations were generally considerably lower than volatile PFCs in the same sample. The total volatile PFC concentration was over 400 times that of the total ionic PFC concentration for 2 samples (F01, Haglöfs; F04, Salewa), though the total concentrations of ionic & volatile PFCs in the Salewa sample were amongst the lower examples from footwear.

For a Jack Wolfskin sample (F09), the equivalent ratio between volatile and ionic PFCs was approximately 100. Lower, but still significant, differences were seen between the total volatile PFC and total ionic PFC concentrations for samples from Mammut (F05), The North Face (F07, F08a) and Columbia (F11a).

Across footwear samples, the concentrations and composition of ionic PFCs varied greatly between individual samples. Examples of both short and long chain ionic PFCs were found, including examples of each with relatively high concentrations.

The highest concentration of ionic PFCs was for the short chain (C4) sulfonate, PFBS, in one section from a sample of the The North Face boot (F08b, 195 $\mu g/m^2$), with the concentration in the second section of this fabric (F08a) being 22.5 $\mu g/m^2$). A high concentration of PFBS was also found in a sample from the Columbia shoe (F11, 52.7 $\mu g/m^2$) and from the Jack Wolfskin boot (F09b, 19.8 $\mu g/m^2$; F09a 3.62 $\mu g/m^2$), and to a lesser extent in the Mammut boot (F05, 1.50 $\mu g/m^2$).

At least one samples from each of The North face, Columbia and Mammut footwear (though not the Jack Wolfskin boot) also contained the equivalent C4 PFCA (PFBA) in appreciable concentrations (between 5.99 and 10.9 $\mu g/m^2$).

Though PFBS was not detected in the Haglöf boot samples, one of these (F02) did contain PFBA in an appreciable concentration (4.39 $\mu g/m^2$), together with a range of other short chain and long chain ionic PFCAs, including the highest concentration of the long chain PFOA found in any footwear sample (18.3 $\mu g/m^2$).

Similarly, the Mammut sample (F05) also contained a wide range of short chain and long chain ionic PFCAs, from C4 (PFBA) to C14 (PFTeA), including the second highest PFOA concentration amongst footwear samples (12.7 $\mu g/m^2$).

The concentration by area of PFOA in the Haglöf sample (F02) was the highest amongst all samples of all product types, with that for the Mammut sample (F05) being the third highest.

PFOA was also detected above 1 $\mu g/m^2$ in a number of other samples, including from Haglöfs (F01, 1.83 $\mu g/m^2$), Jack Wolfskin (F09a, 3.53 $\mu g/m^2$; F09b, 4.99 $\mu g/m^2$), Patagonia (F10, 2.88 $\mu g/m^2$) andColumbia (F11, 1.23 $\mu g/m^2$). Similarly, the Salewa sample (F04) contained PFOA (1.80 $\mu g/m^2$) as well as the equivalent long chain sulfonate, PFOS (at 1.07 $\mu g/m^2$). Lower levels of PFOA were also detected in two The North face samples (F07, F08a) at 0.223 and 0.813 $\mu g/m^2$ respectively.

Other examples of short chain (PFHxA) and long chain (PFDA) ionic PFCs were also detected in a number of samples at between 1-2 μg/m^2.

Two additional ionic PFCs were detected in samples from the North Face shoe, HPFHpA (1.13 μg/m^2) and 6:2 FTS (0.251 μg/m^2 and 2.03 μg/m^2). These PFCs were detected in only a small number of samples across all product types in this study and in lower concentrations, with the exception of 6:2 FTS in one jacket (J11, 23.6 μg/m^2).

In a previous Greenpeace study (Greenpeace 2014a), ionic PFCs were detected in three footwear samples within the range of concentration found in the current study, though in the lower part of the range (2.23-19.7 μg/m^2). In that study, short chain (C4) PFCs dominated, as was the case for a number of samples in this study, though one sample from the previous study contained the long chain PFOS at 0.855 μg/m^2.

In contrast to this study, volatile PFCs were detected in only 1 of the 3 samples, and at lower concentrations than volatile PFCs in the current study (390 μg/m^2 total volatile PFCs). Only long chain volatile PFCs were detected.

It should be noted, however, that the footwear tested in the previous study was intended for normal everyday use rather than being intended for hiking.

3.3 Backpacks

A total of 14 samples were analysed, from 8 individual backpacks. Volatile PFCs were detected in three samples, the outer fabric from the Jack Wolfskin backpack (BP01), and both the bottom fabric (BP05) and blue outer fabric blue (BP06) from the Mammut backpack. No volatile PFCs were detected in samples from the other 6 backpacks

The long chain 8:2 FTOH was the only volatile PFC detected in the outer fabric of the Jack Wolfskin backpack (BP01), at 37 μg/m^2. For the 2 samples from the Mammut backpack, 8:2 FTOH was also detected in both, at 72 μg/m^2 in the bottom fabric (BP05) and 54 μg/m^2 in the outer fabric (BP06). The two samples from the Mammut backpack also contained the long chain 10:2 FTOH at 23 μg/m^2 and 15 μg/m^2 in the bottom fabric (BP05) and outer fabric (BP06), respectively.

The total concentration of volatile PFCs in the bottom fabric (BP05) of the Mammut backpack was 12 times the total ionic PFC concentration, and 60 times great in the outer fabric (BP06). No ionic PFCs were detected in the outer fabric of the Jack Wolfskin backpack (BP01) which contained a volatile PFC.

One or more ionic PFC was detected in 11 of the 14 samples, with examples from all but one backpack. No ionic, and no volatile PFCs, were detected in the Haglöfs backpack (BP14). Also, only a relatively low amount of a single compound, the long chain PFOA, was detected in the outer fabric of the Arc'teryx backpack (BP09, 0.14 μg/m^2), and similarly only PFOA was detected in the belt fabric of the Jack Wolfskin backpack, though at a moderately higher concentration (BP02, 0.79 μg/m^2). Similarly, a relatively low amount of PFOA was detected in the The North Face backpack (BP11, 0.09 μg/m^2), together with a slightly higher level of the short chain PFHxA (0.18 μg/m^2).

A number of short and long chain ionic PFCs were detected in the Columbia backpack (BP12 & BP13), all at relatively low to moderate concentrations, with individual PFCs in the range 0.09-0.44 μg/m^2 (including 0.44 μg/m^2 of the long chain PFOA in the light blue outer fabric (BP12).

For both samples from the Vaude backpack (BP07 & BP08), a single ionic PFC was detected, the long chain PFOA, at 1.1 - 1.2 μg/m^2.

The composition for the Mammut backpack samples (BP05 & BP06) was somewhat different. Both samples contained the long chain PFOA, at 4.24 μg/m2 (bottom fabric, BP05) and 1.16 μg/m^2 (blue outer fabric, BP06) respectively. In addition, other long chain PFCs were detected in the bottom fabric (BP05), namely the C10 (PFDA) and C12 (PFDoA) compounds, at 2.40 μg/m^2 and 1.43 μg/m^2, respectively.

In contrast, one fabric from the Patagonia backpack (BP04a, BP04b) contained the short chain sulfonate PFBS (BP04a 9.42 μg/m^2, BP04b 3.18 μg/m^2). This PFC was note detected in any of the other backpack samples, and the concentration in one of the Patagonia backpack samples (BP04a) was the highest of any ionic PFC in all backpack samples. This sample (BP04a) also contained other short chain PFCAs, including the C4 PFBA (3.98 μg/m^2), as well as a low to moderate concentrations of the long chain C8 PFCA (PFOA, 0.29 μg/m^2) and C8 PFSA (PFOS 0.09 μg/m^2).

The total ionic PFC concentrations for one fabric from the Patagonia backpack (BP04a, BP04b) and one from the Mammut backpack (BP05) were more than 5 times the total ionic PFC concentrations in all samples from all other backpacks.

Volatile and ionic PFCs were less commonly detected in backpack samples and, where detected, were present at generally lower concentrations compared to jackets, trousers, footwear. Where detected, volatile PFC concentrations were similar to those for sleeping bag and tent samples, though volatile PFCs were less frequently detected in backpack samples. Where detected, total ionic PFC concentrations were generally similar to those for sleeping bags and higher than those for tent samples.

No previous data for PFCs in backpack fabric could be found for comparison.

3.4 Sleeping bags

For one of the two sleeping bags (SB02 & SB03, The North Face), a range of long and short chain ionic PFCs, predominantly long chain PFCAs, as well as long chain volatile PFCs, were detected in both the outer (SB02) and inner (SB03) fabric, with higher concentrations in the outer fabric. For the outer fabric (SB02), the total volatile PFCs concentration was 92% of the total PFC concentration, with an equivalent figure of 98% for the inner fabric (SB03).

Of the PFCAs, the predominant compounds were the long chain C8 PFOA and C10 PFDA compounds for both the outer (SB02) and inner (SB03) fabric:

- The outer fabric (SB02) contained PFOA (7.10 μg/m^2, 59% of total ionic PFCs) and PFDA (2.84 μg/m^2, 24% of total ionic PFCs);

- The inner fabric (SB03) contained PFOA (0.36 μg/m^2, 43% of total ionic PFCs) and PFDA (0.20 μg/m^2, 24% of total ionic PFCs).

Other long chain PFCAs were also detected in both fabrics, including the C12 PFDoA.

Other ionic PFCs were also detected in the inner fabric of this sleeping bag (SB03), though at relatively low concentrations, namely HPFHpA (0.07 μg/m^2) and 6:2 FTS (0.02 μg/m^2). Overall in this study, neither of these two PFCs were detected in the majority of samples, with 6:2 FTS being found in only two jackets (J07 & J11) and two footwear samples (F07 & F08), at similar or somewhat higher concentrations, and with a notably higher concentration of 6:2 FTS for one jacket (J11, 23.6 μg/m^2).

The predominant volatile PFCs were the long chain telomer alcohols, 8:2 FTOH (52 μg/m^2 and 35 μg/m^2 in the outer and inner fabric respectively) and 10:2 FTOH (15 μg/m^2 and 12 μg/m^2 in the outer and inner fabric respectively). For both the outer and inner fabric, the concentrations of 8:2 FTOH and 10:2 FTOH were in a ratio of approximately 3:1, with these FTOHs composing 100% and 90% of the total volatiles concentration for the outer and inner fabric, respectively. Two long chain FTAs were also detected in the inner fabric; 8:2 FTA (3.3 μg/m^2) and 10:2 FTA (1.5 μg/m^2), at between 8 to 10 times less concentrations compared to the equivalent alcohols (8:2 FTOH and 10:2 FTOH).

The composition of individual volatile PFCs for both samples reflects that of ionic PFCs, with the C8 compound dominating, followed by the C10, and with the relative proportions of C8 and C10 compounds being in a similar ratio for both volatile and ionic PFCs. This suggests a link between the origin of the ionic and the volatile C8 and C10 compounds.

For the other sleeping bag (SB01, Mammut), only a single volatile PFC and a single ionic PFC were detected in the outer fabric. By far the predominant compound was the short chain volatile PFC, 6:2 FTOH (41 μg/m^2), at a similar concentration to that of the main FTOH (the long chain 8:2 FTOH, 52 μg/m^2) in the The North Face sleeping bag outer fabric (SB02). The ionic PFC in the Mammut sleeping bag, the short chain PFHpA, was present at a relatively low concentration (0.17 μg/m^2).

The outer fabric from the The North Face sleeping bag (SB02) contained the highest concentration of PFOA by mass (157000 ng/kg) of all samples from all 40 products. In addition, the total ionic concentration by mass was one of the highest. Furthermore, the total volatile concentrations by mass for the three sleeping bag samples were some of the highest of all samples, especially for the outer fabric of the The North Face sleeping bag (SB02, 1500 μg/kg). In addition, the individual concentrations of the long chain telomer alcohols, 8:2 FTOH and 10:2 FTOH, in the The North Face samples (SB02, SB03) were some of the highest concentrations by mass of all samples.

Though concentrations between individual samples varied greatly within different product types, some comparison can be made with other types of product. The range and median concentrations for both ionic and volatile PFCs in the three sleeping bag samples were similar to those for backpack samples. In contrast, concentrations of ionic and volatile PFCs in sleeping bags were generally lower than those in jackets, trousers and footwear, but generally higher than those in tent samples.

No previous data for PFCs in sleeping bag fabric could be found for comparison.

3.5 Tents

For one of the two tents (TE05-TE07, Jack Wolfskin), volatile PFCs were detected in two of the three fabrics samples analysed. Two long chain FTOHs were detected in the inner fabric (TE06), 8:2 FTOH (34 μg/m^2) and 10:2 FTOH (8.8 μg/m^2), as well as two long chain FTAs, 8:2 FTA (10 μg/m^2) and 10:2 FTA (3.7 μg/m^2). The FTA concentrations were between 2 to 3 times lower than the concentrations of the equivalent alcohols (8:2 FTOH and 10:2 FTOH). For the outer fabric (TE05), the only volatile PFC detected was 8:2 FTOH (12 μg/m^2).

Ionic PFCs were also detected in the two samples in which FTOHs were found, with total concentrations of ionic PFCs in the inner fabric (TE06, 0.58 μg/m^2) and outer fabric (TE05, 2.10 μg/m^2) constituting 1% and 15% of the total PFC concentration in these two fabrics, respectively. For the inner fabric (TE06) and outer fabric (TE05), the total volatile PFC concentration was 98 times and 5.7 times the total ionic PFC concentration in each sample, respectively.

Of the ionic PFCs, the long chain compound, PFOA, was the main compound in both the inner fabric (TE06) and outer fabric (TE05), at 0.35 μg/m^2 and 0.68 μg/m^2, respectively, with the outer fabric (TE05) also containing another long chain compound, PFDA, at a slightly lower concentration (0.56 μg/m^2).

The ionic PFCs in the Jack Wolfskin tent samples were dominated by short and long chain PFCAs, though a long chain sulphonamide, PFOSA, was also detected in the outer fabric (TE05, 0.13 μg/m^2). This was the only sample from this whole study in which this PFC was detected.

For the other tent (TE01-TE04, The North Face), the inner fabric (TE02) contained one volatile PFC, the short chain 6:2 FTOH (37 μg/m^2), constituting over 99.7% of the total PFC concentration. This compound is the shorter chain version of the FTOHs detected in the samples from the Jack Wolfskin tent (TE05, TE06). No volatile PFCs were detected in the other three samples from the The North Face tent (TE01, TE03, TE04). A relatively low concentration of a single short chain ionic PFC was also detected in the inner fabric (TE02, 0.09 μg/m^2 PFHxA). PFOA, the long chain equivalent of PFHxA, was detected at a similar level in the outer composite fabric (TE03, 0.04 μg/m^2 PFOA), with no ionic PFCs being detected in either the outer fabric (TE01) or the inner fabric (bottom) (TE04).

Though concentrations between individual samples varied considerably, especially for ionic PFCs, some comparison can be made with other types of product. Volatile PFCs were generally less prevalent in the tent samples compared to those from other types of product, with the exception of backpacks. Similarly, concentrations of ionic PFCs were generally far lower in the tent samples than those found in other types of product, with the possible exception of sleeping bags, though only 3 sleeping bag samples were analysed.

No previous data for PFCs in tent fabric could be found for comparison.

3.6 Rope

Three short chain PFCAs were detected in the sample of climbing rope (R01, Mammut), including PFBA (2570 ng/kg), PFPA (2350 ng/kg) and PFHxA (6510 ng/kg), as well as one short chain telomer alcohol, 6:2 FTOH (646 μg/kg). As the rope did not contain flat fabric, data are not given by area

(μg/m^2). As for other items in which both volatile and ionic PFCs were detected, the concentration of 6:2 FTOH was considerably higher than the total concentration of ionic PFCs (57 times higher).

Comparing with other types of products, the concentration by mass of 6:2 FTOH (the only volatile PFC detected) was in the range of FTOH concentrations by mass for jackets, trousers, footwear and sleeping bags, and somewhat higher than concentrations of FTOHs in samples from backpacks and tents. Long chain telomer alcohols, identified in many examples of the other product types, were not detected in the rope sample. The total ionic PFC concentration by mass in the rope (11400 ng/kg = 11.4 μg/kg) was in the range of equivalent concentrations of other product types.

It should be noted, however, that only a single sample of rope was analysed, and the PFC composition of other equivalent rope products could vary significantly, as was seen for other types of product. For each of the other types of product, there were individual examples with either a notably lower or higher concentration of total ionic PFCs. For volatile PFCs, the total concentration in many examples from other types of products were similar to that found in the rope, though again there were examples with either a lower or higher total volatile PFC concentration for many types of product. It is, therefore, not possible to make any general comparison between climbing rope and other the other types of products in terms of the PFC content.

No previous data for PFCs in climbing rope could be found for comparison

3.7 Glove

No PFCs were detected in the Glove (GL01). Though not directly comparable, PFCs were previously reported in waterproof gloves purchased in 2013 in a previous Greenpeace investigation, including PFOS (9.5 μg/m^2) in one glove and high concentrations of FTOHs in another (1900 μg/m^2) (Greenpeace 2013b).

Similarly, a 2015 report for products purchased in 2010 found the long chain sulfonate, PFOS, at over 100 μg/m^2 as well as FTOHs, predominantly the long chain 8:2 FTOH and 10:2 FTOH at over 10 μg/m^2 (Kotthoff et al. 2015)

4. Conclusions

This study has demonstrated the presence of PFCs within a broad range of outdoor products. Ionic and/or volatile PFCs of some type were detected in all of the products analysed, with the exception of 2 of the 11 Jackets (Vaude, J01 and Jack Wolfskin jacket, J12), 1 of the 8 backpacks (Haglöfs, BP14) and the one glove sample. For both ionic and volatile PFCs, concentrations varied considerably between individual articles within each product group, and also across all samples as a whole. In general, for articles in which both ionic and volatile PFCs were detected, volatile PFCs were present in considerable higher concentrations than ionic PFCs. For other articles, concentrations of volatile PFCs were higher than concentrations of ionic PFCs found the article, or than those typically found in other articles of the same type of product.

There were, however, examples for which neither ionic nor volatile PFCs were detected, including 2 jackets (Vaude, J01; Jack Wolfskin, J12), a backpack (Haglöfs, BP14), and the glove (The North Face, G01).

Specific volatile PFCs can degrade into specific ionic PFCs, including PFCAs. For example, 8:2 FTOH can give rise to the C8 PFCA, PFOA. For all samples, where a telomer alcohol (FTOH) and the corresponding PFCA were both detected (for example 8:2 FTOH and PFOA), the FTOH concentration was always higher than that of the corresponding PFCA, and often considerably higher. There was, however, no other consistent relationship between the FTOH concentration and that of the corresponding PFCA.

For 9 of the 11 brands included in this study, one or more article from each brand had a notably high concentration of at least one ionic PFC. In addition, one or more article from each brand had a notably high concentration of at least one volatile PFC. For Blackyak, this was also the case for volatile PFCs, but not for ionic PFCs. Although some ionic PFCs were detected in the Blackyak jacket, equivalent articles from other brands had considerably higher concentrations of ionic PFCs.

For Vaude, no volatile PFCs were detected in any of the 3 samples from 2 articles. Similarly, only a single ionic PFC, the long chain PFOA, was detected in the 2 samples from the Vaude backpack. The PFOA concentrations were significant, being just over 1 $\mu g/m^2$, and in the range for other backpack samples, though some other backpack samples had notably higher total ionic PFC concentrations.

It should be noted, however, that some brands were represented by more samples than others in this study, either due to a greater number of articles or a greater number of separate materials analysed compared to others brands. It is not possible, therefore, to directly compare the brands products as a whole on the basis of this study.

As well as the two sub groups of ionic and volatile compounds, PFCs can also be distinguished as either short chain or long chain compounds. Ionic PFCs can be either short chain or long chain, and volatile PFCs can be either short chain or long chain (see Section 2 for details).

For jackets, both ionic and volatile PFCs were predominantly short chain compounds. One sample had by far the highest concentration of the ionic C4 compound PFBS of all products in the study. Though one jacket had high concentration of long chain volatile PFCs (8:2 FTOH and 10:2 FTOH; Blackyak), for all other jackets only the short chain compound, 6:2 FTOH, was present when volatile PFC were detected

This pattern further supports a shift in the type of PFCs in jackets over time compared to what was discovered in previous Greenpeace reports from 2012 and 2013 (Greenpeace 2012c, 2013c) and a paper from another research group from 2015 based on products purchased in 2010 (Kotthoff et al. 2015). . Both short and long chain compounds were represented in jackets from these studies, with long chain compounds being the predominant ionic PFCs. Similarly, long chain volatile FTOHs were predominant in the products purchased in 2010 (Kotthoff et al. 2015), while short chain versions were more represented in the 2013 Greenpeace study. The current study suggests that a shift towards greater use of short chain PFCs continues, for both volatile and ionic compounds.

For trousers, backpacks and footwear, the current study found that both short and long chain ionic PFCs were similarly represented, though there was one notably high concentration of short chain (C4) ionic PFCs in one backpack (Patagonia).

The pattern, however, was somewhat different for volatile PFCs. Greater, though not exclusive, prevalence of short chain volatile PFCs was seen for trouser and footwear samples, though only long chain volatile PFCs were detected in backpack samples, with no volatile PFCs being detected in most backpack samples.

As for jackets, the current study does further support a shift towards short chain PFCs in trousers. Both short and long chain PFCs were similarly represented in a single article in a 2012 Greenpeace report (Greenpeace 2012c) and another report for products purchased in 2010, with only long chain volatile FTOHs detected in the 2010 item (Kotthoff et al. 2015). In contrast, the ionic PFCs identified were exclusively short chain compounds in a single article purchased in 2013, in which no volatile PFCs were detected (Greenpeace 2014a).

In contrast, short chain (C4) ionic PFCs dominated in footwear samples from one previous study, while both long and short chain ionic PFCs were found in the current study, which does not reflect a shift towards short chain PFCs for footwear, though this is based on only three samples in the previous study which may not have been representative of footwear in general sold at the time (Greenpeace 2014a). In this previous study, however, only 3 footwear articles were tested, and these were intended for normal everyday use rather than being intended for hiking, and so not directly comparable to the current study.

Both short and long chain ionic PFCs were similarly represented for sleeping bag and tent samples, though with only 2 articles for each product type it is difficult to draw any conclusions from these data regarding a pattern in the use of short or long chain compounds. For the rope sample, only short chain versions of both ionic and volatile PFCs were detected, though only a single article was tested.

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Appendix 1. Concentrations of PFCs in all articles tested

Jackets

Sample code	J01	J02	J03 (i)	J04	J05 (i)	J06	J07 (i)	J08	J09	J10a	J10b	J11	J12
Brand	Vaude	Mammut	Norrona	Blackyak		Columbia	Haglöfs	Arc'teryx	The North Face	Patagonia		Salewa	Jack Wolfskin
Product name	Fjordan men	Nordwand Pro HS Hooded	Lofoten Gore-tex pro	U-Jade # 1		Alpine action	L.I.M III	Alpha SL	Women Stratos	PATAGONIA MEN'S SUPER ALPINE		Ultar GTX ACT M	Amply 3in1
Part analysed	back part	back part	back part	inner	outer	back part	back part	back part	back part	mixed materials		back part	back part
Country of production	China	Turkey	China	Vietnam		Vietnam	China (Mainland)	China (Mainland)	Bangladesh	Vietnam		Vietnam	unknown
Place of sale	Germany	Switzerland	Norway	Korea		Chile	Finland	Sweden	Sweden	Taiwan		Italy	Austria
Ionic PFCs (ng/kg)													
PFBS	< 3970	**6000**	**1540**	< 528	**11300**	< 796	**1300**	**4620**	< 658	**235000**	**5470000**	**244000**	< 1050
PFHxS	< 3970	< 1010	< 769	< 528	< 746	**897**	< 847	< 938	< 658	< 714	< 3410	< 725	< 1050
PFHpS	< 3970	< 1010	< 769	< 528	< 746	< 796	< 847	< 938	< 658	< 714	< 3410	< 725	< 1050
PFOS	< 2650	< 671	< 513	< 352	< 498	**2620**	< 565	< 625	< 439	< 476	< 2270	**525**	< 697
PFDS	< 3970	< 1010	< 769	< 528	< 746	< 796	< 847	< 938	< 658	< 714	< 3410	< 725	< 1050
PFBA	< 2650	**3940**	**12300**	**3060**	**17300**	< 531	**7790**	**5700**	< 439	**148000**	**40200**	**44900**	< 697
PFPA	< 2650	**1740**	**75500**	< 352	**601**	< 531	**9770**	**3480**	< 439	**30800**	**8430**	**1440**	< 697
PFHxA	< 2650	**16600**	**546000**	**1310**	**3410**	< 531	**106000**	**25100**	**1260**	**204000**	**34700**	**4730**	< 697
PFHpA	< 2650	**2020**	**71300**	< 352	< 498	< 531	**17400**	**12300**	< 439	**172000**	**7400**	**632**	< 697
PFOA	< 2650	< 671	**4820**	**2320**	**1090**	**531**	**2280**	**625**	**744**	**1580**	< 2270	**1270**	< 697
PFNA	< 2650	< 671	**762**	< 352	< 498	< 531	< 565	< 625	< 439	< 476	< 2270	< 483	< 697
PFDA	< 2650	< 671	**2200**	**1900**	**681**	< 531	**1130**	< 625	< 439	**581**	< 2270	< 483	< 697
PFUnA	< 2650	< 671	< 513	< 352	< 498	< 531	< 565	< 625	< 439	< 476	< 2270	557	< 697
PFDoA	< 2650	< 671	< 513	**1240**	< 498	< 531	< 565	< 625	< 439	< 476	< 2270	< 483	< 697
PFTrA	< 2650	< 671	< 513	< 352	< 498	< 531	< 565	< 625	< 439	< 476	< 2270	< 483	< 697
PFTeA	< 2650	< 671	< 513	< 352	< 498	< 531	< 565	< 625	< 439	< 476	< 2270	< 483	< 697
PFOSA	< 529	< 336	< 513	< 352	< 498	< 531	< 565	< 625	< 439	< 476	< 2270	< 483	< 697
PF-3,7-DMOA	< 5290	< 1340	< 1030	< 704	< 995	< 1060	< 1130	< 1250	< 877	< 952	< 4550	< 966	< 1390
HPFHpA	< 5290	< 1340	< 1030	< 704	< 995	< 1060	< 1130	< 1250	< 877	< 952	< 4550	< 966	< 1390
H2PFDA	< 5290	< 1450	< 1030	< 704	< 995	< 1440	< 1640	< 5780	< 4810	< 3860	< 4550	< 966	< 1590
H4PFOS; 6:2 FTS	< 3970	< 1010	< 769	< 528	< 746	< 796	**1730**	< 2450	< 658	< 714	< 3410	**182000**	< 1050
Total ionic PFCs	-	**30300**	**714000**	**9830**	**34400**	**4050**	**147000**	**51800**	**2000**	**792000**	**5560000**	**480000**	-

Table A1a. Details of all jacket articles and concentrations of ionic PFCs* by mass (ng/kg). (i) average of 2 equivalent samples, see Appendix 2.

Sample code	J01	J02	J03 (i)	J04	J05 (i)	J06	J07 (i)	J08	J09	J10a	J10b	J11	J12
Brand	Vaude	Mammut	Norrona	Blackyak		Columbia	Haglöfs	Arc'teryx	The North Face	Patagonia		Salewa	Jack Wolfskin
Ionic PFCs (µg/m²)													
PFBS	<0.44	**0.97**	**0.21**	<0.05	**1.49**	<0.13	**0.11**	**0.53**	<0.09	**28.9**	**673**	**31.6**	<0,167
PFHxS	<0.44	<0.16	<0.11	<0.05	<0.10	**0.15**	<0.07	<0.11	<0.09	<0.09	<0.40	<0.09	<0,167
PFHpS	<0.44	<0.16	<0.11	<0.05	<0.10	<0.13	<0.07	<0.11	<0.09	<0.09	<0.40	<0.09	<0,167
PFOS	<0.29	<0.11	<0.07	<0.03	<0.07	**0.43**	<0.05	<0.07	<0.06	<0.06	<0.28	**0.07**	<0,111
PFDS	<0.44	<0.16	<0.11	<0.05	<0.10	<0.13	<0.07	<0.11	<0.09	<0.09	<0.40	<0.09	<0,167
PFBA	<0.29	**0.63**	**1.72**	**0.28**	**2.29**	<0.09	**0.67**	**0.66**	<0.06	**18.2**	**4.95**	**5.82**	<0,111
PFPA	<0.29	**0.28**	**10.6**	<0.03	**0.08**	<0.09	**0.84**	**0.40**	<0.06	**3.79**	**1.04**	**0.19**	<0,111
PFHxA	<0.29	**2.67**	**76.4**	**0.12**	**0.45**	<0.09	**9.15**	**2.90**	**0.18**	**25.1**	**4.27**	**0.61**	<0,111
PFHpA	<0.29	**0.33**	**9.97**	<0.03	<0.07	<0.09	**1.50**	**1.42**	<0.06	**21.2**	**0.91**	**0.08**	<0,111
PFOA	<0.29	<0.11	**0.67**	**0.21**	**0.14**	**0.09**	**0.20**	**0.07**	**0.11**	**0.19**	<0.28	**0.16**	<0,111
PFNA	<0.29	<0.11	**0.11**	<0.03	<0.07	<0.09	<0.05	<0.07	<0.06	<0.06	<0.28	<0.06	<0,111
PFDA	<0.29	<0.11	**0.31**	**0.17**	**0.09**	<0.09	**0.10**	<0.07	<0.06	**0.07**	<0.28	<0.06	<0,111
PFUnA	<0.29	<0.11	<0.07	<0.03	<0.07	<0.09	<0.05	<0.07	<0.06	<0.06	<0.28	0.072	<0,111
PFDoA	<0.29	<0.11	<0.07	**0.11**	<0.07	<0.09	<0.05	<0.07	<0.06	<0.06	<0.28	<0.06	<0,111
PFTrA	<0.29	<0.11	<0.07	<0.03	<0.07	<0.09	<0.05	<0.07	<0.06	<0.06	<0.28	<0.06	<0,111
PFTeA	<0.29	<0.11	<0.07	<0.03	<0.07	<0.09	<0.05	<0.07	<0.06	<0.06	<0.28	<0.06	<0,111
PFOSA	<0.06	<0.05	<0.07	<0.03	<0.07	<0.09	<0.05	<0.07	<0.06	<0.06	<0.28	<0.06	<0,111
PF-3,7-DMOA	<0.59	<0.22	<0.14	<0.06	<0.13	<0.17	<0.10	<0.14	<0.12	<0.12	<0.56	<0.13	<0,221
HPFHpA	<0.59	<0.22	<0.14	<0.06	<0.13	<0.17	<0.10	<0.14	<0.12	<0.12	<0.56	<0.13	<0,221
H2PFDA	<0.59	<0.23	<0.14	<0.06	<0.13	<0.24	<0.14	<0.67	<0.68	<0.50	<0.56	<0.13	<0,253
H4PFOS; 6:2 FTS	<0.44	<0.16	<0.07	<0.05	<0.10	<0.13	**0.15**	<0.28	<0.09	<0.09	<0.42	**23.6**	<0,167
Total ionic PFCs	-	**4.88**	**100**	**0.89**	**4.54**	**0.70**	**12.7**	**5.98**	**0.29**	**97.5**	**684**	**62.2**	-

Table A1b. Details of all jacket articles and concentrations of ionic PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2.

Sample code	J01	J02	J03 (i)	J04	J05 (i)	J06	J07 (i)	J08	J09	J10 (i)	J11 (i)	J12
Brand	Vaude	Mammut	Norrona	Blackyak		Columbia	Haglöfs	Arc'teryx	The North Face	Patagonia	Salewa	Jack Wolfskin
Volatile PFCs (µg/kg)												
6:2 FTA	< 24	< 21	< 20	< 27	< 19	< 19	< 21	< 22	< 21	< 20	< 20	< 19
8:2 FTA	< 24	< 21	< 20	< 36	< 19	< 19	< 21	< 22	< 21	< 20	< 20	< 19
10:2 FTA	< 24	< 21	< 20	< 27	< 19	< 19	< 21	< 22	< 21	< 20	< 20	< 19
4:2 FTOH	< 60	< 52	< 50	< 67	< 48	< 47	< 53	< 54	< 52	< 49	< 50	< 48
6:2 FTOH	< 240	**1100**	**4600**	< 270	< 190	**270**	**1600**	**850**	**500**	**1400**	< 212	< 190
8:2 FTOH	< 180	< 160	< 146	**680**	< 140	< 142	< 158	< 162	< 157	< 132	< 151	< 150
10:2 FTOH	< 60	< 52	< 49	**190**	< 57	< 47	< 53	< 54	< 52	**53**	< 50	< 48
MeFOSE	< 12	< 10	< 10	< 13	< 10	< 9	< 11	< 11	< 10	< 9	< 10	< 10
EtFOSE	< 12	< 10	< 10	< 13	< 10	< 9	< 11	< 11	< 10	< 9	< 10	< 10
MeFOSA	< 12	< 10	< 10	< 13	< 10	< 9	< 11	< 11	< 10	< 9	< 10	< 10
EtFOSA	< 12	< 10	< 10	< 13	< 10	< 9	< 11	< 11	< 10	< 9	< 10	< 10
Sum FTAs	-	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	-	**1100**	**4600**	**870**	-	**270**	**1600**	**850**	**500**	**1500**	-	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	-	**1100**	**4600**	**870**	-	**270**	**1600**	**850**	**500**	**1500**	-	-

Table A2a. Details of all jacket articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 equivalent samples, see Appendix 2.

Sample code	J01	J02	J03 (i)	J04	J05 (i)	J06	J07 (i)	J08	J09	J10 (i)	J11 (i)	J12
Brand	Vaude	Mammut	Norrona	Blackyak		Columbia	Haglöfs	Arc'teryx	The North Face	Patagonia	Salewa	Jack Wolfskin
Volatile PFCs (µg/m²)												
6:2 FTA	<2.6	<3.2	<2.8	<2.2	<2.4	<3.3	<1.7	<2.7	<3.1	<2.3	<2.5	<2.8
8:2 FTA	<2.6	<3.2	<2.8	<3.0	<2.4	<3.3	<1.7	<2.7	<3.1	<2.3	<2.5	<2.8
10:2 FTA	<2.6	<3.2	<2.8	<2.2	<2.4	<3.3	<1.7	<2.7	<3.1	<2.3	<2.5	<2.8
4:2 FTOH	<6.5	<8.0	<6.9	<5.6	<6.1	<8.1	<4.3	<6.5	<7.6	<5.6	<6.3	<7.1
6:2 FTOH	<26	**170**	**630**	<22	<24	**46**	**130**	**100**	**72**	**180**	<27	<28
8:2 FTOH	<19	<25	<20	**56**	<18	<24	<13	<20	<23	<17	<19	<22
10:2 FTOH	<6.5	<8.0	<6.8	**15**	<7.2	<8.1	<4.3	<6.5	<7.6	**6.7**	<6.3	<7.1
MeFOSE	<1.3	<1.5	<1.4	<1.1	<1.3	<1.5	<0.89	<1.3	<1.5	<1.1	<1.3	<1.5
EtFOSE	<1.3	<1.5	<1.4	<1.1	<1.3	<1.5	<0.89	<1.3	<1.5	<1.1	<1.3	<1.5
MeFOSA	<1.3	<1.5	<1.4	<1.1	<1.3	<1.5	<0.89	<1.3	<1.5	<1.1	<1.3	<1.5
EtFOSA	<1.3	<1.5	<1.4	<1.1	<1.3	<1.5	<0.89	<1.3	<1.5	<1.1	<1.3	<1.5
Sum FTAs	-	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	-	**170**	**630**	**71**	-	**46**	**130**	**100**	**72**	**190**	-	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	-	**170**	**630**	**71**	-	**46**	**130**	**100**	**72**	**190**	-	-

Table A2b. Details of all jacket articles and concentrations of volatile PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2.

Trousers

Sample code	TR01	TR02 (i)	TR03	TR04a (i)	TR04b/c (ii)	TR05	TR06 (i)	TR07	TR08
Brand	The North Face	Mammut	Columbia	Jack Wolfskin		Patagonia	Arc'teryx	Haglöfs	Salewa
Product name	Ravina	Nordwand Pro Man	Jump Off Cargo Men	Cloudburst Women		M's TORRENTSHELL	Beta AR Men's	Rugged II Mountain	Kali GTX M PNT
Part analysed	leg	leg	leg	leg		leg	mixed materials	mixed materials	mixed materials
Country of production	Bangladesh	Turkey	Vietnam	Vietnam		Vietnam	China (Mainland)	unknown	Vietnam
Place of sale	UK	Slovenia	Russia	Russia		Hong Kong	Taiwan	Denmark	Italy
Ionic PFCs (ng/kg)									
PFBS	< 593	**212000**	< 610	**187000**	**44500**	< 698	**183000**	< 847	< 3160
PFHxS	< 593	< 769	< 610	< 862	< 765	< 698	< 853	< 847	< 3160
PFHpS	< 593	< 769	< 610	< 862	< 765	< 698	< 853	< 847	< 3160
PFOS	< 395	**1020**	< 407	< 575	< 510	< 465	< 569	< 565	< 2110
PFDS	< 593	< 769	< 610	< 862	< 765	< 698	< 853	< 847	< 3160
PFBA	< 395	**43700**	< 407	**17600**	**19100**	**1050**	**31800**	< 565	**14500**
PFPA	< 395	**1051**	< 407	**6710**	**11400**	**1420**	**1510**	< 565	**2250**
PFHxA	**2050**	**12500**	**1840**	**21700**	**27800**	**6280**	**17500**	< 565	< 2110
PFHpA	< 395	**1300**	< 407	**3530**	**15800**	**2480**	< 569	< 565	< 2110
PFOA	**2670**	**659**	**906**	**108000**	**132000**	**20500**	< 569	< 565	< 2110
PFNA	< 395	< 513	< 407	**5670**	**6580**	**1670**	< 569	< 565	< 2110
PFDA	**611**	< 513	< 407	**77600**	**89700**	**7160**	< 569	< 565	< 2110
PFUnA	< 395	< 513	< 407	**2790**	**3140**	**666**	< 569	< 565	< 2110
PFDoA	< 395	< 513	< 407	**39500**	**36500**	**2420**	< 569	< 565	< 2110
PFTrA	< 395	< 513	< 407	< 575	< 520	**675**	< 569	< 565	< 2110
PFTeA	< 395	< 513	< 407	**2250**	< 510	**857**	< 569	< 565	< 2110
PFOSA	< 395	< 513	< 407	< 575	< 510	< 465	< 569	< 565	**2240**
PF-3,7-DMOA	< 791	< 1030	< 813	< 1150	< 1020	< 930	< 1140	< 1130	< 4220
HPFHpA	< 791	< 1030	< 813	< 1150	< 1020	< 930	< 1140	< 1130	< 4220
H2PFDA	< 791	< 1030	< 813	< 1150	< 1020	< 930	< 5280	< 1130	< 4220
H4PFOS; 6:2 FTS	< 593	< 769	< 610	< 862	< 765	< 698	< 853	< 847	< 3160
Total ionic PFCs	**5330**	**272000**	**2750**	**472000**	**387000**	**45200**	**234000**	-	**19000**

Table A3a. Details of all trouser articles and concentrations of ionic PFCs* by mass (ng/kg). (i) average of 2 equivalent samples, see Appendix 2; (ii) average of 2 homogenised samples, see Appendix 3.

Sample code	TR01	TR02 (i)	TR03	TR04a (i)	TR04b/c (ii)	TR05	TR06 (i)	TR07	TR08
Brand	The North Face	Mammut	Columbia	Jack Wolfskin		Patagonia	Arc'teryx	Haglöfs	Salewa
Ionic PFCs (µg/m²)									
PFBS	<0.13	**35.70**	<0.14	**21.2**	**5.04**	<0.08	**51.4**	<0.23	<0.36
PFHxS	<0.13	<0.13	<0.14	<0.10	<0.09	<0.08	<0.24	<0.23	<0.36
PFHpS	<0.13	<0.13	<0.14	<0.10	<0.09	<0.08	<0.24	<0.23	<0.36
PFOS	<0.09	**0.17**	<0.09	<0.07	<0.06	<0.06	<0,159	<0.16	<0.24
PFDS	<0.13	<0.13	<0.14	<0.10	<0.09	<0.08	<0.24	<0.23	<0.36
PFBA	<0.09	**7.38**	<0.09	**1.99**	**2.16**	**0.13**	**8.93**	<0.16	**1.63**
PFPA	<0.09	**0.18**	<0.09	**0.76**	**1.29**	**0.17**	**0.42**	<0.16	**0.25**
PFHxA	**0.44**	**2.11**	**0.41**	**2.46**	**3.14**	**0.76**	**4.91**	<0.16	<0.24
PFHpA	<0.09	**0.22**	<0.09	**0.40**	**1.79**	**0.30**	<0.16	<0.16	<0.24
PFOA	**0.58**	**0.11**	**0.20**	**12.2**	**14.9**	**2.47**	<0.16	<0.16	<0.24
PFNA	<0.09	<0.09	<0.09	**0.64**	**0.74**	**0.20**	<0.16	<0.16	<0.24
PFDA	**0.13**	<0.09	<0.09	**8.78**	**10.2**	**0.86**	<0.16	<0.16	<0.24
PFUnA	<0.09	<0.09	<0.09	**0.32**	**0.36**	**0.08**	<0.16	<0.16	<0.24
PFDoA	<0.09	<0.09	<0.09	**4.47**	**4.13**	**0.29**	<0.16	<0.16	<0.24
PFTrA	<0.09	<0.09	<0.09	<0.07	<0.06	**0.08**	<0.16	<0.16	<0.24
PFTeA	<0.09	<0.09	<0.09	**0.25**	<0.06	**0.1**	<0.16	<0.16	<0.24
PFOSA	<0.09	<0.09	<0.09	<0.07	<0.06	<0.06	<0.16	<0.16	**0.25**
PF-3,7-DMOA	<0.17	<0.17	<0.18	<0.13	<0.12	<0.11	<0.32	<0.31	<0.48
HPFHpA	<0.17	<0.17	<0.18	<0.13	<0.12	<0.11	<0.32	<0.31	<0.48
H2PFDA	<0.17	<0.17	<0.18	<0.13	<0.12	<0.11	<1.48	<0.31	<0.48
H4PFOS; 6:2 FTS	<0.13	<0.13	<0.14	<0.10	<0.09	<0.08	<0.24	<0.23	<0.36
Total ionic PFCs	**1.15**	45.90	**0.61**	**53.5**	**43.8**	**5.4**	**65.7**	-	**2.13**

Table A3b. Details of all trousers articles and concentrations of ionic PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2; (ii) average of 2 homogenised samples, see Appendix 3.

Sample code	TR01	TR02 (i)	TR03	TR04 (i)	TR05	TR06 (i)	TR07	TR08
Brand	The North Face	Mammut	Columbia	Jack Wolfskin	Patagonia	Arc'teryx	Haglöfs	Salewa
Volatile PFCs (µg/kg)								
6:2 FTA	< 22	< 23	< 17	< 22	< 21	< 21	< 18	< 24
8:2 FTA	**110**	< 21	**35**	< 22	**100**	< 21	< 18	< 24
10:2 FTA	< 22	< 21	< 17	< 22	**72**	< 21	< 18	< 24
4:2 FTOH	< 55	< 52	< 42	< 54	< 52	< 52	< 45	< 59
6:2 FTOH	**700**	**400**	**650**	**1500**	< 210	**880**	**570**	**510**
8:2 FTOH	< 160	< 160	< 130	**2100**	**170**	< 160	< 140	< 140
10:2 FTOH	< 55	< 52	< 42	**1100**	**79**	< 52	< 45	< 44
MeFOSE	< 11	< 10	< 8	< 11	< 10	< 10	< 9	< 9
EtFOSE	< 11	< 10	< 8	< 11	< 10	< 10	< 9	< 9
MeFOSA	< 11	< 10	< 8	< 11	< 10	< 10	< 9	< 9
EtFOSA	< 11	< 10	< 8	< 11	< 10	< 10	< 9	< 9
Sum FTAs	**110**	-	**35**	-	**170**	-	-	-
Sum FTOHs	**700**	**400**	**650**	**4700**	**250**	**880**	**570**	**510**
Sum FOSAs/Es	-	-	-	-	-	-	-	-
Total volatile PFCs	**810**	**400**	**690**	**4700**	**420**	**880**	**570**	**510**

Table A4a. Details of all trousers articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 equivalent samples, see Appendix 2.

Sample code	TR01	TR02 (i)	TR03	TR04 (i)	TR05	TR06 (i)	TR07	TR08
Brand	The North Face	Mammut	Columbia	Jack Wolfskin	Patagonia	Arc'teryx	Haglöfs	Salewa
Volatile PFCs (µg/m²)								
6:2 FTA	<4.9	<3.8	<3.8	<2.5	<2.3	<6.4	<4.8	<2.6
8:2 FTA	**24**	<3.5	**7.8**	<2.5	**11**	<6.4	<4.8	<2.6
10:2 FTA	<4.9	<3.5	<3.8	<2.5	**7.8**	<6.4	<4.8	<2.6
4:2 FTOH	<12	<8.7	<9.3	<6.2	<5.6	<15	<12	<6.5
6:2 FTOH	**150**	**66**	**140**	**170**	<22	**270**	**150**	**56**
8:2 FTOH	<37	<26	<28	**240**	**18**	<48	<36	<15
10:2 FTOH	<12	<8.7	<9.3	**130**	**8.6**	<16	<12	<4.9
MeFOSE	<2.4	<1.7	<1.8	<1.3	<1.1	<3.0	<2.4	<0.99
EtFOSE	<2.4	<1.7	<1.8	<1.3	<1.1	<3.0	<2.4	<0.99
MeFOSA	<2.4	<1.7	<1.8	<1.3	<1.	<3.0	<2.4	<0.99
EtFOSA	<2.4	<1.7	<1.8	<1.3	<1.1	<3.0	<2.4	<0.99
Sum FTAs	**24**	0.0	7.8	-	**19**	-	-	-
Sum FTOHs	**150**	**66**	**140**	**540**	**27**	**270**	**150**	**56**
Sum FOSAs/Es	-	-	-	-	-	-	-	-
Total volatile PFCs	**174**	**66**	**150**	**540**	**45**	**270**	**150**	**56**

Table A4b. Details of all trousers articles and concentrations of volatile PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2.

Footwear

Sample code	F01	F02 (i)	F03	F04 (i)	F05	F06	F07	F08a	F08b	F09a	F09b	F10	F11 (i)
Brand	Haglöfs			Salewa	Mammut	The North Face				Jack Wolfskin		Patagonia	Columbia
Product name	Haglöfs Grym HI GT men			Condor Evo GTX	Redburn Mid GTX Men	Men's HEDGEHOG HIKE MID GTX				ALL TERRAIN TEXAPORE MEN		Foot Tractor Wading Boots	women's Redmond™ low waterproof
Part analysed	suede part	outer part	inner part	leather part	mixed leather/fabric	leather outer part	inner part	outer part with foam		leather-fabric-mix		grey material	leather-fabric-mix
Country of production	Romania			Romania	China (Mainland)	China (Mainland)				Vietnam		China	Vietnam
Place of sale	Norway			Slovenia	Slovakia	Hong Kong				Turkey		Italy (Online shop)	Turkey
Ionic PFCs (ng/kg)													
PFBS	< 758	< 794	< 862	< 588	**1010**	< 750	**1330**	**22800**	**198000**	**1560**	**8530**	< 1340	**34300**
PFHxS	< 758	< 794	< 862	< 588	< 655	< 750	< 1140	< 926	< 13900	< 746	< 636	< 1340	< 1050
PFHpS	< 758	< 794	< 862	< 588	< 655	< 750	< 1140	< 926	< 13900	< 746	< 636	< 1340	< 1050
PFOS	< 505	< 529	< 575	**605**	< 437	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFDS	< 758	< 794	< 862	< 588	< 655	< 750	< 1140	< 926	< 13900	< 746	< 636	< 1340	< 1050
PFBA	< 505	**4190**	< 575	< 392	**4030**	**712**	**2300**	**11000**	< 9260	< 498	< 424	< 893	**5220**
PFPA	< 505	**4690**	< 575	< 392	< 437	< 500	**2470**	< 617	< 9260	< 498	< 424	< 893	< 702
PFHxA	< 505	**18800**	< 575	< 392	**1390**	< 500	**6890**	1180	< 9260	**550**	**723**	< 893	1020
PFHpA	< 505	**5330**	< 575	< 392	**1100**	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFOA	**2360**	**17500**	< 575	**1020**	**8580**	< 500	**1030**	**824**	< 9260	**1520**	**2150**	**3740**	**802**
PFNA	< 505	**1650**	< 575	< 392	**2470**	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFDA	< 505	**6470**	< 575	< 392	**4030**	< 500	< 758	< 617	< 9260	**800**	**865**	**1170**	< 702
PFUnA	< 505	**722**	< 575	< 392	**852**	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFDoA	< 505	**2500**	< 575	< 392	**1390**	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFTrA	< 505	**711**	< 575	< 392	< 437	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFTeA	< 505	**1720**	< 575	< 392	**773**	< 500	< 758	< 617	< 9260	< 498	< 424	< 893	< 702
PFOSA	< 505	< 529	< 575	< 392	< 437	< 500	< 758	< 617	< 463	< 498	< 424	< 446	< 702
PF-3,7-DMOA	< 1010	< 1060	< 1150	< 784	< 873	< 1000	< 1520	< 1230	< 18500	< 995	< 847	< 1790	< 1400
HPFHpA	< 1010	< 1060	< 1150	< 784	< 873	< 1000	**5200**	< 1230	< 18500	< 995	< 847	< 1790	**2430**
H2PFDA	< 1390	< 1370	< 1150	< 957	< 873	< 1000	< 7820	< 3620	< 65500	< 3280	< 847	< 1790	< 2780
H4PFOS; 6:2 FTS	< 758	< 794	< 862	< 588	< 655	< 750	**1160**	**2060**	< 13900	< 746	< 636	< 1340	< 1050
Total ionic PFCs	**2360**	**64300**	-	**1630**	**25600**	**712**	**20400**	**37900**	**198000**	**4430**	**12300**	**4910**	**42800**

Table 5a. Details of all footwear articles and concentrations of ionic PFCs* by mass (ng/kg) (i) average of 2 equivalent samples, see Appendix 2

Sample code	F01	F02 (i)	F03	F04 (i)	F05	F06	F07	F08a	F08b	F09a	F09b	F10	F11 (i)
Brand	Haglöfs			Salewa	Mammut	The North Face				Jack Wolfskin		Patagonia	Columbia
Ionic PFCs (µg/m²)													
PFBS	<0.59	<0.83	<0.31	<1.04	**1.50**	<1.02	**0.29**	**22.5**	**195**	**3.62**	**19.8**	<1.03	**52.7**
PFHxS	<0.59	<0.83	<0.31	<1.04	<0.97	<1.02	<0.25	<0.91	<13.7	<1.73	<1.48	<1.03	<1.61
PFHpS	<0.59	<0.83	<0.31	<1.04	<0.97	<1.02	<0.25	<0.91	<13.7	<1.73	<1.48	<1.03	<1.61
PFOS	<0.39	<0.55	<0.21	**1.07**	<0.65	<0.68	<0.16	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFDS	<0.59	<0.83	<0.31	<1.04	<0.97	<1.02	<0.25	<0.91	<13.7	<1.73	<1.48	<1.03	<1.61
PFBA	<0.39	**4.39**	<0.21	<0.69	**5.98**	**0.96**	**0.50**	**10.9**	<9.14	<1.16	<0.98	<0.69	**8.02**
PFPA	<0.39	**4.91**	<0.21	<0.69	<0.65	<0.68	**0.53**	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFHxA	<0.39	**19.7**	<0.21	<0.69	**2.06**	<0.68	**1.49**	**1.16**	<9.14	**1.28**	**1.68**	<0.69	**1.57**
PFHpA	<0.39	**5.59**	<0.21	<0.69	**1.63**	<0.68	<0.16	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFOA	**1.83**	**18.4**	<0.21	**1.80**	**12.7**	<0.68	**0.22**	**0.81**	<9.14	**3.53**	**4.99**	**2.88**	**1.23**
PFNA	<0.39	**1.73**	<0.21	<0.69	**3.66**	<0.68	<0.16	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFDA	<0.39	**6.78**	<0.21	<0.69	**5.98**	<0.68	<0.16	<0.61	<9.14	**1.86**	**2.01**	**0.900**	<1.08
PFUnA	<0.39	**0.76**	<0.21	<0.69	**1.26**	<0.68	<0.16	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFDoA	<0.39	**2.62**	<0.21	<0.69	**2.06**	<0.68	<0.16	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFTrA	<0.39	**0.75**	<0.21	<0.69	<0.65	<0.68	<0.16	<0.61	<9.14	<1.16	<0.98	<0.69	<1.08
PFTeA	<0.39	**0.18**	<0.21	<0.69	**1.15**	<0.68	<0.16	<0.6	<9.14	<1.16	<0.98	<0.69	<1.08
PFOSA	<0.39	<0.55	<0.21	<0.69	<0.65	<0.68	<0.16	<0.61	<0.46	<1.16	<0.98	<0.34	<1.08
PF-3,7-DMOA	<0.78	<1.11	<0.41	<1.38	<1.29	<1.35	<0.33	<1.21	<18.3	<2.31	<1.97	<1.38	<2.15
HPFHpA	<0.78	<1.11	<0.41	<1.38	<1.29	<1.35	**1.130**	<1.21	<18.3	<2.31	<1.97	<1.38	**3.73**
H2PFDA	<1.08	<1.44	<0.41	<1.69	<1.29	<1.35	<1.69	<3.57	<64.6	<7.61	<1.97	<1.38	<4.27
H4PFOS; 6:2 FTS	<0.59	<0.83	<0.31	<1.04	<0.97	<1.02	**0.25**	**2.03**	<13.7	<1.73	<1.48	<1.03	<1.61
Total ionic PFCs	**1.83**	**65.8**	-	**2.87**	**38.0**	**0.96**	**4.41**	**37.4**	**195**	**10.3**	**28.5**	**3.78**	**67.3**

Table A5b. Details of all footwear articles and concentrations of ionic PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2

Sample code	F01	F02 (i)	F03	F04 (i)	F05	F06	F07	F08a	F08b	F09a	F09b	F10 (i)	F11a	F11b
Brand	Haglöfs			Salewa	Mammut	The North Face				Jack Wolfskin		Patagonia	Columbia	
Volatile PFCs (µg/kg)														
6:2 FTA	< 18	**33**	< 25	< 18	< 18	< 17	< 24	< 26	< 20	< 18	< 17	< 20	< 19	< 19
8:2 FTA	< 18	**410**	**100**	< 18	< 18	< 17	< 24	< 26	< 20	< 18	< 17	< 20	< 19	< 19
10:2 FTA	< 18	**230**	**630**	< 18	< 18	< 17	< 24	< 26	< 20	< 18	< 17	< 20	< 19	< 19
4:2 FTOH	< 46	< 54	< 62	< 44	< 46	< 44	< 59	< 65	< 50	< 44	< 43	< 50	< 47	< 47
6:2 FTOH	**540**	< 220	< 250	**700**	**470**	< 175	**500**	**1300**	< 200	**530**	**470**	< 227	**860**	< 190
8:2 FTOH	**280**	**1600**	< 190	< 133	**200**	< 131	< 178	< 194	< 150	< 132	**210**	< 151	< 142	< 142
10:2 FTOH	**130**	**740**	**130**	< 44	**81**	< 44	**95**	< 65	< 50	< 44	**130**	< 67	< 47	< 47
MeFOSE	< 9	< 11	< 12	< 9	< 9	< 9	< 12	< 13	< 10	< 9	< 9	< 10	< 9	< 10
EtFOSE	< 9	< 11	< 12	< 9	< 9	< 9	< 12	< 13	< 10	< 9	< 9	< 10	< 9	< 10
MeFOSA	< 9	< 11	< 12	< 9	< 9	< 9	< 12	< 13	< 10	< 9	< 9	< 10	< 9	< 10
EtFOSA	< 9	< 11	< 12	< 9	< 9	< 9	< 12	< 13	< 10	< 9	< 9	< 10	< 9	< 10
Sum FTAs	0	**670**	**730**	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	**950**	**2300**	**130**	**700**	**750**	-	**600**	**1300**	-	**530**	**810**	-	**860**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**950**	**3000**	**860**	**700**	**750**	-	**600**	**1300**	-	**530**	**810**	-	**860**	-

Table A6a. Details of all footwear articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 equivalent samples, see Appendix 2

Sample code	F01	F02 (i)	F03	F04 (ii)	F05	F06	F07	F08a	F08b	F09a	F09b	F10 (i)	F11a	F11b
Brand	Haglöfs			Salewa	Mammut	The North Face				Jack Wolfskin		Patagonia	Columbia	
Volatile PFCs (µg/m²)														
6:2 FTA	<15	**34**	<8.9	<35	<29	<23	<5.2	<26	<20	<48	<45	<14	<37	<37
8:2 FTA	<15	**420**	**37**	<35	<29	<23	<5.2	<26	<20	<48	<45	<14	<37	<37
10:2 FTA	<15	**240**	**220**	<35	<29	<23	<5.2	<26	<20	<48	<45	<14	<37	<37
4:2 FTOH	<38	<56	<22	<85	<73	<60	<13	<64	<49	<117	<110	<35	<91	<91
6:2 FTOH	**450**	<230	<89	**1400**	**750**	<240	**110**	**1200**	<200	**1400**	**1300**	<160	**1700**	<370
8:2 FTOH	**230**	**1600**	<68	<260	**320**	<180	<39	<190	<150	<350	**550**	<100	<270	<270
10:2 FTOH	**110**	**770**	**46**	<85	**130**	<60	**21**	<64	<49	<120	**340**	<47	<91	<91
MeFOSE	<7.5	<11	<4.3	<17	<14	<12	<2.6	<13	<9.9	<24	<24	<6.9	<17	<19
EtFOSE	<7.5	<11	<4.3	<17	<14	<12	<2.6	<13	<9.9	<24	<24	<6.9	<17	<19
MeFOSA	<7.5	<11	<4.3	<17	<14	<12	<2.6	<13	<9.9	<24	<24	<6.9	<17	<19
EtFOSA	<7.5	<11	<4.3	<17	<14	<12	<2.6	<13	<9.9	<24	<24	<6.9	<17	<19
Sum FTAs	0.0	**690**	**260**	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	**790**	**2400**	**46**	**1400**	**1200**	-	**130**	**1200**	-	**1400**	**2200**	-	**1700**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**790**	**3100**	**300**	**1400**	**1200**	-	**130**	**1200**	-	**1400**	**2200**	-	**1700**	-

Table A6b. Details of all footwear articles and concentrations of volatile PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2

Backpacks

Sample code	BP01	BP02	BP03	BP04a	BP04b	BP05 (i)	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14
Brand	Jack Wolfskin		patagonia			Mammut		Vaude		Arc'teryx		The North Face	Columbia		Haglöfs
Product name	EDS DYNAMIC 48 PACK		ascensionist pack 45L			Trion element 30		Bulin 30		Alpha FL 30		Shadow 40+10	Silver Ridge 25L		Roc Rescue 40
Part analysed	outer	belt	outer	bottom		bottom	outer (blue)	outer (rigid)	outer (side)	outer	inner	outer (mixed materials)	outer (light blue)	outer (dark blue)	outer (orange)
Country of production	Vietnam		Philippines			Philippines		Germany		China (Mainland)		Vietnam	Vietnam		Vietnam
Place of sale	Germany		Korea			Slovakia		China (Mainland)		China (Mainland)		Hungary	Germany (Online Store)		Denmark
Ionic PFCs (ng/kg)															
PFBS	< 893	< 617	< 728	**43500**	**14700**	< 4290	< 5240	< 3090	< 4120	< 743	< 932	< 598	< 824	< 721	< 1060
PFHxS	< 893	< 617	< 728	< 628	< 3280	< 4290	< 5240	< 3090	< 4120	< 743	< 932	< 598	< 824	< 721	< 1060
PFHpS	< 893	< 617	< 728	< 628	< 3280	< 4290	< 5240	< 3090	< 4120	< 743	< 932	< 598	< 824	< 721	< 1060
PFOS	< 595	< 412	< 485	**432**	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFDS	< 893	< 617	< 728	< 628	< 3280	< 4290	< 5240	< 3090	< 4120	< 743	< 932	< 598	< 824	< 721	< 1060
PFBA	< 595	< 412	< 485	**18400**	**15600**	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFPA	< 595	< 412	< 485	< 418	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	**565**	< 481	< 704
PFHxA	< 595	< 412	< 485	**2260**	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	**789**	**2070**	< 481	< 704
PFHpA	< 595	< 412	< 485	**634**	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFOA	< 595	**1060**	**556**	**1320**	< 2180	**15800**	**6340**	**3140**	**5850**	**524**	< 621	**408**	**2660**	**554**	< 704
PFNA	< 595	< 412	< 485	< 418	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFDA	< 595	< 412	< 485	< 418	< 2180	**8930**	< 3500	< 2060	< 2800	< 495	< 621	< 398	**901**	< 481	< 704
PFUnA	< 595	< 412	< 485	< 418	< 2180	< 2530	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFDoA	< 595	< 412	< 485	< 418	< 2180	**5340**	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFTrA	< 595	< 412	< 485	< 418	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFTeA	< 595	< 412	< 485	< 418	< 2180	< 2860	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PFOSA	< 595	< 412	< 485	< 418	< 437	< 2530	< 3500	< 2060	< 2750	< 495	< 621	< 398	< 549	< 481	< 704
PF-3,7-DMOA	< 1190	< 823	< 971	< 837	< 4370	< 5710	< 6990	< 4120	< 5490	< 990	< 1240	< 797	< 1100	< 962	< 1410
HPFHpA	< 1190	< 823	< 971	< 837	< 4370	< 5710	< 6990	< 4120	< 5490	< 990	< 1240	< 797	**1780**	< 962	< 1410
H2PFDA	< 1190	< 823	< 971	< 837	< 13500	< 5710	< 6990	< 4120	< 15100	< 990	< 1240	< 2740	< 1100	< 962	< 2210
H4PFOS; 6:2 FTS	< 893	< 617	< 728	< 628	< 3280	< 4290	< 5240	< 3090	< 4120	< 743	< 932	< 598	< 824	< 721	< 1060
Total ionic PFCs	-	**1060**	**556**	**66500**	**30300**	**30100**	**6340**	**3140**	**5850**	**524**	-	**1200**	**7980**	**554**	-

Table A7a. Details of all backpack articles and concentrations of ionic PFCs* by mass (ng/kg). (i) average of 2 homogenised samples, see Appendix 3.

Sample code	BP01	BP02	BP03	BP04a	BP04b	BP05 (i)	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14
Brand	Jack Wolfskin		patagonia			Mammut		Vaude		Arc'teryx		The North Face	Columbia		Haglöfs
Ionic PFCs (µg/m²)															
PFBS	<0.15	<0.46	<0.11	**9.42**	**3.18**	<1.15	<0.96	<1.20	<0.77	<0.20	<0.08	<0.13	<0.13	<0.17	<0.45
PFHxS	<0.15	<0.46	<0.11	<0.14	<0.71	<1.15	<0.96	<1.20	<0.77	<0.20	<0.08	<0.13	<0.13	<0.17	<0.45
PFHpS	<0.15	<0.46	<0.11	<0.14	<0.71	<1.15	<0.96	<1.20	<0.77	<0.20	<0.08	<0.13	<0.13	<0.17	<0.45
PFOS	<0.10	<0.31	<0.11	**0.09**	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFDS	<0.15	<0.46	<0.11	<0.14	<0.71	<1.15	<0.96	<1.20	<0.77	<0.20	<0.08	<0.13	<0.13	<0.17	<0.45
PFBA	<0.10	<0.31	<0.07	**3.98**	**3.38**	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFPA	<0.10	<0.31	<0.070	<0.09	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	**0.09**	<0.11	<0.30
PFHxA	<0.10	<0.31	<0.070	**0.49**	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	**0.18**	**0.34**	<0.11	<0.30
PFHpA	<0.10	<0.31	<0.070	**0.14**	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFOA	<0.10	**0.79**	**0.08**	**0.29**	<0.47	**4.24**	**1.16**	**1.22**	**1.10**	**0.14**	<0.05	**0.09**	**0.44**	**0.13**	<0.30
PFNA	<0.10	<0.31	<0.070	<0.09	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFDA	<0.10	<0.31	<0.070	<0.09	<0.47	**2.40**	<0.64	<0.80	<0.53	<0.14	<0.05	<0.09	**0.15**	<0.11	<0.30
PFUnA	<0.10	<0.31	<0.070	<0.09	<0.47	<0.68	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFDoA	<0.10	<0.31	<0.070	<0.09	<0.47	**1.43**	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFTrA	<0.10	<0.31	<0.070	<0.09	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFTeA	<0.10	<0.31	<0.070	<0.09	<0.47	<0.77	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PFOSA	<0.10	<0.31	<0.070	<0.09	<0.09	<0.68	<0.64	<0.80	<0.52	<0.14	<0.05	<0.09	<0.09	<0.11	<0.30
PF-3,7-DMOA	<0.21	<0.61	<0.141	<0.18	<0.95	<1.53	<1.28	<1.60	<1.03	<0.27	<0.11	<0.18	<0.18	<0.23	<0.59
HPFHpA	<0.21	<0.61	<0.141	<0.18	<0.95	<1.53	<1.28	<1.60	<1.03	<0.27	<0.11	<0.18	**0.29**	<0.23	<0.59
H2PFDA	<0.21	<0.61	<0.141	<0.18	<2.92	<1.53	<1.28	<1.60	<2.84	<0.27	<0.11	<0.61	<0.18	<0.23	<0.93
H4PFOS; 6:2 FTS	<0.15	<0.46	<0.106	<0.14	<0.71	<1.15	<0.96	<1.20	<0.77	<0.20	<0.08	<0.13	<0.13	<0.17	<0.45
Total ionic PFCs	-	**0.79**	**0.08**	**14.4**	**6.56**	**8.07**	**1.16**	**1.22**	**1.10**	**0.14**	-	**0.270**	**1.31**	**0.13**	-

Table A7b. Details of all backpack articles and concentrations of ionic PFCs* by area (µg/m²). (i) average of 2 homogenised samples, see Appendix 3.

Sample code	BP01	BP02	BP03	BP04 (i)	BP05 (i)	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14
Brand	Jack Wolfskin		Patagonia		Mammut		Vaude		Arc'teryx		The North Face	Colombia		Haglöfs
Volatile PFCs (µg/kg)														
6:2 FTA	< 21	< 20	< 19	< 25	< 20	< 23	< 22	< 18	< 18	< 21	< 20	< 20	< 20	< 17
8:2 FTA	< 21	< 20	< 19	< 25	< 20	< 23	< 22	< 18	< 18	< 21	< 20	< 20	< 20	< 17
10:2 FTA	< 21	< 20	< 19	< 25	< 20	< 23	< 22	< 18	< 18	< 21	< 20	< 20	< 20	< 17
4:2 FTOH	< 52	< 49	< 49	< 61	< 50	< 56	< 54	< 45	< 44	< 53	< 49	< 51	< 50	< 43
6:2 FTOH	< 210	< 200	< 200	< 250	< 200	< 230	< 230	< 180	< 180	< 210	< 200	< 200	< 200	< 170
8:2 FTOH	**220**	< 150	< 150	< 180	**260**	**290**	< 160	< 130	< 130	< 160	< 150	< 150	< 150	< 130
10:2 FTOH	< 52	< 49	< 58	< 74	**80**	**80**	< 54	< 45	< 44	< 53	< 49	< 51	< 50	< 43
MeFOSE	< 10	< 10	< 10	< 12	< 10	< 11	< 11	< 9	< 9	< 11	< 10	< 10	< 10	< 9
EtFOSE	< 10	< 10	< 10	< 12	< 10	< 11	< 11	< 9	< 9	< 11	< 10	< 10	< 10	< 9
MeFOSA	< 10	< 10	< 10	< 12	< 10	< 11	< 11	< 9	< 9	< 11	< 10	< 10	< 10	< 9
EtFOSA	< 10	< 10	< 10	< 12	< 10	< 11	< 11	< 9	< 9	< 11	< 10	< 10	< 10	< 9
Sum FTAs	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	**220**	-	-	-	**340**	**370**	-	-	-	-	-	-	-	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**220**	-	-	-	**340**	**370**	-	-	-	-	-	-	-	-

Table A8a. Details of all backpack articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 equivalent samples, see Appendix 2

Sample code	BP01	BP02	BP03	BP04 (i)	BP05 (i)	BP06	BP07	BP08	BP09	BP10	BP11	BP12	BP13	BP14
Brand	Jack Wolfskin		Patagonia		Mammut		Vaude		Arc'teryx		The North Face			Haglöfs
Volatile PFCs (µg/m²)														
6:2 FTA	<3.6	<13	<2.8	<5.4	<5.7	<4.4	<8.0	<3.3	<4.9	<2.0	<4.3	<2.6	<4.7	<7.0
8:2 FTA	<3.6	<13	<2.8	<5.4	<5.7	<4.4	<8.0	<3.3	<4.9	<2.0	<4.3	<2.6	<4.7	<7.0
10:2 FTA	<3.6	<13	<2.8	<5.4	<5.7	<4.4	<8.0	<3.3	<4.9	<2.0	<4.3	<2.6	<4.7	<7.0
4:2 FTOH	<9.0	<32	<7.3	<13	<14	<11	<20	<8.3	<12	<5.0	<10	<6.7	<12	<18
6:2 FTOH	<36	<130	<30	<54	<57	<44	<85	<33	<48	<20	<42	<27	<47	<71
8:2 FTOH	**37**	<99	<22	<39	**72**	**54**	<59	<25	<36	<15	<31	<20	<35	<53
10:2 FTOH	<9.0	<32	<8.6	<16	**22**	**15**	<20	<8.3	<12	<5.0	<10	<6.7	<12	<18
MeFOSE	<1.7	<6.6	<1.5	<2.6	<2.8	<2.1	<4.0	<1.7	<2.5	<1.0	<2.1	<1.3	<2.4	<3.7
EtFOSE	<1.7	<6.6	<1.5	<2.6	<2.8	<2.1	<4.0	<1.7	<2.5	<1.0	<2.1	<1.3	<2.4	<3.7
MeFOSA	<1.7	<6.6	<1.5	<2.6	<2.8	<2.1	<4.0	<1.7	<2.5	<1.0	<2.1	<1.3	<2.4	<3.7
EtFOSA	<1.7	<6.6	<1.5	<2.6	<2.8	<2.1	<4.0	<1.7	<2.5	<1.0	<2.1	<1.3	<2.4	<3.7
Sum FTAs	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	**37**	-	-	-	**94**	**69**	-	-	-	-	-	-	-	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**37**	-	-	-	**94**	**69**	-	-	-	-	-	-	-	-

Table A8b. Details of all backpack articles and concentrations of volatile PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2

Sleeping bags, tents, rope and glove

Product type	sleeping bag			Tent							Rope	Gloves
Sample code	SB01	SB02 (ii)	SB03	TE01	TE02	TE03	TE04	TE05 (i)	TE06	TE07	R01	G01
Brand	Mammut	The North Face		The North Face				Jack Wolfskin			Mammut	The North Face
Product name	Alpine UL Winter	Snow Leopard		Talus 2				Gossamer			9.8 Eternity Dry	Men's Etip
Part analysed	outer	outer	inner	outer	inner	outer composite	inner (bottom)	outer	inner	inner gauze	rope	outer
Country of production	China (Mainland)	China (Mainland)		China (Mainland)				unknown			Switzerland	Columbia
Place of sale	Germany	Chile		Switzerland				Austria			Switzerland	UK
Ionic PFCs (ng/kg)												
PFBS	< 968	< 2080	< 319	< 573	< 617	< 806	< 3120	< 566	< 701	< 904	< 694	< 728
PFHxS	< 968	< 2080	< 319	< 573	< 617	< 806	< 3120	< 566	< 701	< 904	< 694	< 728
PFHpS	< 968	< 2080	< 319	< 573	< 617	< 806	< 3120	< 566	< 701	< 904	< 694	< 728
PFOS	< 645	< 1390	< 213	< 382	< 412	< 538	< 2080	< 377	< 467	< 602	< 463	< 485
PFDS	< 968	< 2080	< 319	< 573	< 617	< 806	< 3120	< 566	< 701	< 904	< 694	< 728
PFBA	< 645	**2090**	**285**	< 382	< 412	< 538	< 2080	**708**	< 467	< 602	**2570**	< 485
PFPA	< 645	**5520**	< 213	< 382	< 412	< 538	< 2080	**832**	< 467	< 602	**2350**	< 485
PFHxA	< 645	**18600**	**1440**	< 382	**1300**	< 538	< 2080	**2790**	**1130**	< 602	**6510**	< 485
PFHpA	**3770**	**8980**	**536**	< 382	< 412	< 538	< 2080	**1760**	< 467	< 602	< 463	< 485
PFOA	< 645	**157000**	**7670**	< 382	< 412	**568**	< 2080	**9800**	**3090**	< 602	< 463	< 485
PFNA	< 645	**4760**	**532**	< 382	< 412	< 538	< 2080	**1220**	< 467	< 602	< 463	< 485
PFDA	< 645	**62900**	**4160**	< 382	< 412	< 538	< 2080	**8100**	**912**	< 602	< 463	< 485
PFUnA	< 645	2070	**339**	< 382	< 412	< 538	< 2080	**607**	< 467	< 602	< 463	< 485
PFDoA	< 645	**4360**	**499**	< 382	< 412	< 538	< 2080	**2650**	< 467	< 602	< 463	< 485
PFTrA	< 645	< 1390	< 213	< 382	< 412	< 538	< 2080	< 377	< 467	< 602	< 463	< 485
PFTeA	< 645	< 1390	< 213	< 382	< 412	< 538	< 2080	< 377	< 467	< 602	< 463	< 485
PFOSA	< 645	< 708	< 2130	< 382	< 412	< 538	< 417	**1880**	< 467	< 602	< 463	< 485
PF-3,7-DMOA	< 1290	< 2780	< 426	< 763	< 823	< 1080	< 4170	< 755	< 935	< 1200	< 926	< 971
HPFHpA	< 1290	< 2780	**1560**	< 763	< 823	< 1080	< 4170	< 755	< 935	< 1200	< 926	< 971
H2PFDA	< 1900	< 2780	< 426	< 763	< 823	< 1080	< 4170	< 755	< 935	< 1200	< 926	< 971
H4PFOS; 6:2 FTS	< 968	< 2080	**494**	< 573	< 617	< 806	< 3120	< 566	< 701	< 904	< 694	< 728
Total ionic PFCs	**3770**	**266000**	**17500**	-	**1300**	**568**	-	**30300**	**5130**	-	**11400**	-

Table A9a. Details of all sleeping bag, tent, rope and glove articles and concentrations of ionic PFCs* by mass (ng/kg). (i) average of 2 equivalent samples, see Appendix 2; (ii) average of 2 homogenised samples, see Appendix 3.

Product type	sleeping bag			Tent							Rope	Gloves
Sample code	SB01	SB02 (ii)	SB03	TE01	TE02	TE03	TE04	TE05 (i)	TE06	TE07	R01	G01
Brand	Mammut	The North Face		The North Face				Jack Wolfskin			Mammut	The North Face
Ionic PFCs (µg/m²)												
PFBS	<0.04	<0.09	<0.02	<0.04	<0.04	<0.06	<0.21	<0.04	<0.08	<0.04	-	<0.11
PFHxS	<0.04	<0.09	<0.02	<0.04	<0.04	<0.06	<0.21	<0.04	<0.08	<0.04	-	<0.11
PFHpS	<0.04	<0.09	<0.02	<0.04	<0.04	<0.06	<0.21	<0.04	<0.08	<0.04	-	<0.11
PFOS	<0.03	<0.06	<0.01	<0.03	<0.03	<0.04	<0.14	<0.03	<0.05	<0.03	-	<0.07
PFDS	<0.04	<0.09	<0.02	<0.04	<0.04	<0.06	<0.21	<0.04	<0.08	<0.04	-	<0.11
PFBA	<0.03	**0.09**	**0.01**	<0.027	<0.03	<0.04	<0.14	**0.05**	<0.05	<0.03	-	<0.07
PFPA	<0.03	**0.25**	<0.01	<0.03	<0.03	<0.04	<0.14	**0.06**	<0.05	<0.03	-	<0.07
PFHxA	<0.03	**0.84**	**0.07**	<0.03	**0.09**	<0.04	<0.14	**0.19**	**0.13**	<0.03	-	<0.07
PFHpA	**0.17**	**0.41**	**0.03**	<0.03	<0.03	<0.04	<0.14	**0.12**	<0.05	<0.03	-	<0.07
PFOA	<0.03	**7.10**	**0.36**	<0.03	<0.03	**0.04**	<0.14	**0.68**	**0.35**	<0.03	-	<0.07
PFNA	<0.03	**0.22**	**0.03**	<0.03	<0.03	<0.04	<0.14	**0.08**	<0.05	<0.03	-	<0.07
PFDA	<0.03	**2.84**	**0.20**	<0.03	<0.03	<0.04	<0.14	**0.56**	**0.10**	<0.03	-	<0.07
PFUnA	<0.03	**0.09**	**0.02**	<0.03	<0.03	<0.04	<0.14	**0.04**	<0.05	<0.03	-	<0.07
PFDoA	<0.03	**0.20**	**0.02**	<0.03	<0.03	<0.04	<0.14	**0.18**	<0.05	<0.03	-	<0.07
PFTrA	<0.03	<0.06	<0.01	<0.03	<0.03	<0.04	<0.14	<0.03	<0.05	<0.03	-	<0.07
PFTeA	<0.03	<0.06	<0.01	<0.03	<0.03	<0.04	<0.14	<0.03	<0.05	<0.03	-	<0.07
PFOSA	<0.03	<0.03	<0.10	<0.03	<0.03	<0.04	<0.03	**0.13**	<0.05	<0.03	-	<0.07
PF-3,7-DMOA	<0.06	<0.13	<0.02	<0.06	<0.06	<0.08	<0.28	<0.05	<0.11	<0.05	-	<0.14
HPFHpA	<0.06	<0.13	**0.07**	<0.06	<0.06	<0.08	<0.28	<0.05	<0.11	<0.05	-	<0.14
H2PFDA	<0.09	<0.13	<0.02	<0.06	<0.06	<0.08	<0.28	<0.05	<0.11	<0.05	-	<0.14
H4PFOS; 6:2 FTS	<0.04	<0.09	**0.02**	<0.04	<0.04	<0.06	<0.21	<0.04	<0.08	<0.04	-	<0.11
Total ionic PFCs	**0.17**	**12.0**	**0.83**	-	**0.09**	**0.04**	-	**2.10**	**0.60**	-	-	-

Table A9b. Details of all sleeping bag, tent, rope and glove articles and concentrations of ionic PFCs* by area (µg/m²). (i) average of 2 equivalent samples, see Appendix 2; (ii) average of 2 homogenised samples, see Appendix 3.

Product type	sleeping bag			Tent							Rope	Gloves
Sample code	SB01	SB02 (i)	SB03 (i)	TE01	TE02	TE03	TE04	TE05 (i)	TE06	TE07	R01	G01
Brand	Mammut	The North Face		The North Face				Jack Wolfskin			Mammut	The North Face
Volatile PFCs (µg/kg)												
6:2 FTA	< 34	< 22	< 25	< 19	< 21	< 22	< 23	< 37	< 36	< 21	< 18	< 21
8:2 FTA	< 26	< 22	**74**	< 19	< 21	< 22	< 23	< 21	**83**	< 21	< 18	< 21
10:2 FTA	< 26	< 22	**34**	< 19	< 21	< 22	< 23	< 21	**30**	< 21	< 18	< 21
4:2 FTOH	< 66	< 55	< 62	< 49	< 53	< 55	< 56	< 51	< 45	< 53	< 45	< 52
6:2 FTOH	**1100**	< 222	< 247	< 200	**520**	< 220	< 230	< 210	< 180	< 210	**650**	< 209
8:2 FTOH	< 200	**1200**	**790**	< 150	< 160	< 170	< 170	**170**	**280**	< 160	< 134	< 157
10:2 FTOH	< 66	**340**	**270**	< 49	< 63	< 66	< 56	< 51	**72**	< 53	< 45	< 52
MeFOSE	< 13	< 11	< 12	< 10	< 11	< 11	< 11	< 10	< 9	< 11	< 9	< 10
EtFOSE	< 13	< 11	< 12	< 10	< 11	< 11	< 11	< 10	< 9	< 11	< 9	< 10
MeFOSA	< 13	< 11	< 12	< 10	< 11	< 11	< 11	< 10	< 9	< 11	< 9	< 10
EtFOSA	< 13	< 11	< 12	< 10	< 11	< 11	< 11	< 10	< 9	< 11	< 9	< 10
Sum FTAs	-	-	**108**	-	-	-	-	-	**110**	0	-	-
Sum FTOHs	**1100**	**1500**	**1100**	-	**520**	-	-	**170**	**350**	-	**650**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**1100**	**1500**	**1200**	-	**520**	-	-	**170**	**470**	-	**650**	-

Table A10a. Details of all sleeping bag, tent, rope and glove articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 equivalent samples, Appendix 2

Product type	sleeping bag			Tent							Rope	Gloves
Sample code	SB01	SB02 (i)	SB03 (i)	TE01	TE02	TE03	TE04	TE05 (i)	TE06	TE07	R01	G01
Brand	Mammut	The North Face		The North Face				Jack Wolfskin			Mammut	The North Face
Volatile PFCs (µg/m²)												
6:2 FTA	<1.3	<0.97	<1.1	<1.3	<1.5	<1.5	<1.5	<2.6	<4.4	<0.95	-	<6.3
8:2 FTA	<0.98	<0.97	**3.3**	<1.3	<1.5	<1.5	<1.5	<1.5	**10**	<0.95	-	<6.3
10:2 FTA	<0.98	<0.97	**1.5**	<1.3	<1.5	<1.5	<1.5	<1.5	**3.7**	<0.95	-	<6.3
4:2 FTOH	<2.5	<2.4	<2.7	<3.2	<3.8	<3.8	<3.7	<3.7	<5.5	<2.4	-	<16
6:2 FTOH	**41**	<9.8	<11	<13	**37**	<15	<15	<15	<22	<9.6	-	<63
8:2 FTOH	<7.6	**52**	**35**	<9.9	<11	<11	<11	**12**	**34**	<7.30	-	<47
10:2 FTOH	<2.5	**15**	**12**	<3.2	<4.5	<4.5	<3.7	<3.7	**8.8**	<2.4	-	<16
MeFOSE	<0.49	<0.48	<0.5	<0.66	<0.78	<0.75	<0.72	<0.71	<1.1	<0.50	-	<3
EtFOSE	<0.49	<0.48	<0.5	<0.66	<0.78	<0.75	<0.72	<0.71	<1.1	<0.50	-	<3
MeFOSA	<0.49	<0.48	<0.5	<0.66	<0.78	<0.75	<0.72	<0.71	<1.1	<0.50	-	<3
EtFOSA	<0.49	<0.48	<0.5	<0.66	<0.78	<0.75	<0.72	<0.71	<1.1	<0.50	-	<3
Sum FTAs	-	-	**4.8**	-	-	-	-	-	**14**	-	-	-
Sum FTOHs	**41**	**67**	**47**	-	**37**	-	-	**12**	**43**	-	-	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**41**	**67**	**52**	-	**37**	-	-	**12**	**57**	-	-	-

Table A10b. Details of all sleeping bag, tent, rope and glove articles and concentrations of volatile PFCs* by area (µg/m²). (i) average of 2 equivalent samples, Appendix 2

* Individual PFCs included the following;

Ionic PFCs; Perfluorobutane sulfonate (PFBS), perfluorohexane sulfonate (PFHxS), perfluoroheptane sulfonate (PFHpS), perfluorooctane sulfonate (PFOS), perfluorodecane sulfonate (PFDS), perfluorobutanoate (PFBA), perfluoropentanoate (PFPA), perfluorohexanoate (PFHxA), perfluoroheptanoate (PFHpA), perfluorooctanoate (PFOA), perfluorononanoate (PFNA), perfluorodecanoate (PFDA), perfluoroundecanoate (PFUnA), perfluorododecanoate (PFDoA), perfluorotridecanoate (PFTrA), perfluorotetradecanoate (PFTeA), perfluorooctane sulfonamide (PFOSA), perfluoro-3,7-dimethyloctanoate (PF-3,7-DMOA), 7H-dodecafluoroheptanoate (HPFHpA), 2H,2H-Perfluorodecanoate (H2PFDA), 2H,2H,3H,3H-Perfluoroundecanoate (H4PFUnA)

Volatile PFCs; 1H,1H,2H,2H-Perfluoroctylacrylate (6:2 FTA), 1H,1H,2H,2H-Perfluorodecylacrylate (8:2 FTA), 1H,1H,2H,2H-Perfluorododecylacrylate (10:2 FTA), 1H,1H,2H,2H-Perfluoro-1-hexanol (4:2 FTOH), 1H,1H,2H,2H-Perfluoro-1-oktanol (6:2 FTOH), 1H,1H,2H,2H-Perfluoro-1-decanol (8:2 FTOH), 1H,1H,2H,2H-Perfluoro-1-dodecanol (10:2 FTOH), 2-(N-methylperfluoro-1-octanesulfonamido)-ethanol (MeFOSE), 2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol (EtFOSE), N-methylperfluoro-1-octansulfonamide (MeFOSA), N-ethylperfluoro-1-octanesulfonamide (EtFOSA)

Appendix 2. Analysis of 2 separate sections of the same material from a number of articles

Product type	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Trouser	Trouser	Trouser	Trouser	Trouser	Trouser
Sample code	J03a	J03b	J05	J05b	J07a	J07b	J10a	J10b	TR02a	TR02b	TR04a	TR04b/c[(i)]	TR06a	TR06b
Brand	Norrona		Blackyak		Haglöfs		Patagonia		Mammut		Jack Wolfskin		Arc'teryx	
Ionic PFCs (ng/kg)														
PFBS	**1470**	**1600**	**15200**	**7310**	**1300**	< 3380	**235000**	**5470000**	**190000**	**233000**	**187000**	**44500**	**137000**	**229000**
PFHxS	< 769	< 728	< 746	< 3390	< 847	< 3380	< 714	< 3410	< 769	< 566	< 862	< 765	< 853	< 732
PFHpS	< 769	< 728	< 746	< 3390	< 847	< 3380	< 714	< 3410	< 769	< 566	< 862	< 765	< 853	< 732
PFOS	< 513	**843**	< 498	< 2260	< 565	< 2250	< 476	< 2270	**827**	**1220**	< 575	< 510	< 569	< 488
PFDS	< 769	< 728	< 746	< 3390	< 847	< 3380	< 714	< 3410	< 769	< 566	< 862	< 765	< 853	< 732
PFBA	**11700**	**12900**	**19100**	**15500**	**9580**	**5990**	**148000**	**40200**	**42800**	**44600**	**17600**	**19100**	**38800**	**24800**
PFPA	**91700**	**59200**	**601**	< 2260	**8440**	**11100**	**30800**	**8430**	**1450**	**652**	**6710**	**11400**	**2000**	**1010**
PFHxA	**536000**	**556000**	**4360**	**2450**	**134000**	**77800**	**204000**	**34700**	**12100**	**12900**	**21700**	**27800**	**21800**	**13200**
PFHpA	**62800**	**79700**	< 498	< 2260	**20200**	**14500**	**172000**	**7400**	**1230**	**1370**	**3530**	**15800**	< 569	< 488
PFOA	**4320**	**5320**	**1090**	< 2260	**2280**	< 2250	**1580**	< 2270	**526**	**791**	**108000**	**132000**	< 569	**1190**
PFNA	**769**	**754**	< 498	< 2260	< 565	< 2250	< 476	< 2270	< 513	< 377	**5670**	**6580**	< 569	< 488
PFDA	**2170**	**2230**	**681**	< 2260	**1130**	< 2250	**581**	< 2270	< 513	< 377	**77600**	**89700**	< 569	< 488
PFUnA	< 513	< 485	< 498	< 2260	< 565	< 2250	< 476	< 2270	< 513	< 377	**2790**	**3140**	< 569	< 488
PFDoA	< 513	**544**	< 498	< 2260	< 565	< 2250	< 476	< 2270	< 513	< 377	**39500**	**36500**	< 569	< 488
PFTrA	< 513	< 485	< 498	< 2260	< 565	< 2250	< 476	< 2270	< 513	< 377	< 575	< 520	< 569	< 488
PFTeA	< 513	< 485	< 498	< 2260	< 565	< 2250	< 476	< 2270	< 513	< 377	**2250**	< 510	< 569	< 488
PFOSA	< 513	**521**	< 498	< 452	< 565	< 450	< 476	< 2270	< 513	< 377	< 575	< 510	< 569	< 488
PF-3,7-DMOA	< 1030	< 971	< 995	< 4520	< 1130	< 4500	< 952	< 4550	< 1030	< 755	< 1150	< 1020	< 1140	< 976
HPFHpA	< 1030	< 971	< 995	< 4520	< 1130	< 4500	< 952	< 4550	< 1030	< 755	< 1150	< 1020	< 1140	< 976
H2PFDA	< 1030	< 971	< 995	< 4520	< 1640	< 8200	< 3860	< 4550	< 1030	< 755	< 1150	< 1020	< 5280	< 1770
H4PFOS; 6:2 FTS	< 769	< 728	< 746	< 3390	**1730**	< 3380	< 714	< 3410	< 769	< 566	< 862	< 765	< 853	< 732
Total ionic PFC	**711000**	**720000**	**41000**	**25300**	**177000**	**109000**	**792000**	**5560000**	**249000**	**295000**	**472000**	**387000**	**200000**	**269000**

Table A11a. Details of jackets and trouser articles and concentrations of ionic PFCs* by mass (ng/kg). (i) average of 2 homogenised samples, see Appendix 3.

Product type	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Trouser	Trouser	Trouser	Trouser	Trouser	Trouser
Sample code	J03a	J03b	J05a	J05b	J07a	J07b	J10a	J10b	TR02a	TR02b	TR04a	TR04b/c[(i)]	TR06a	TR06b
Brand	Norrona		Blackyak		Haglöfs		Patagonia		Mammut		Jack Wolfskin		Arc'teryx	
Ionic PFCs (µg/m²)														
PFBS	**0.21**	**0.22**	**2.01**	**0.97**	**0.11**	<0.29	**28.9**	**673**	**32.1**	**39.4**	**21.2**	**5.04**	**38.5**	**64.3**
PFHxS	<0.11	<0.10	<0.10	<0.45	<0.07	<0.29	<0.09	<0.42	<0.13	<0.10	<0.10	<0.09	<0.24	<0.21
PFHpS	<0.11	<0.10	<0.10	<0.45	<0.07	<0.29	<0.09	<0.42	<0.13	<0.10	<0.10	<0.09	<0.24	<0.21
PFOS	<0.07	**0.12**	<0.07	<0.30	<0.05	<0.19	<0.06	<0.28	**0.14**	**0.21**	<0.07	<0.06	<0.16	<0.14
PFDS	<0.11	<0.10	<0.10	<0.45	<0.07	<0.29	<0.09	<0.42	<0.13	<0.10	<0.10	<0.09	<0.24	<0.21
PFBA	**1.64**	**1.82**	**2.53**	**2.05**	**0.83**	**0.52**	**18.2**	**4.95**	**7.23**	**7.54**	**1.99**	**2.16**	**10.9**	**6.96**
PFPA	**12.8**	**8.28**	**0.08**	<0.30	**0.73**	**0.96**	**3.79**	**1.04**	**0.25**	**0.11**	**0.76**	**1.29**	**0.56**	**0.28**
PFHxA	**75**	**77.8**	**0.58**	**0.32**	**11.6**	**6.72**	**25.1**	**4.27**	**2.04**	**2.18**	**2.46**	**3.14**	**6.12**	**3.71**
PFHpA	**8.79**	**11.20**	<0.07	<0.30	**1.75**	**1.25**	**21.2**	**0.91**	**0.21**	**0.23**	**0.4**	**1.79**	<0.16	<0.14
PFOA	**0.6**	**0.74**	**0.14**	<0.30	**0.2**	<0.19	**0.19**	<0.28	**0.09**	**0.13**	**12.2**	**14.9**	<0.16	**0.33**
PFNA	**0.11**	**0.11**	<0.07	<0.30	<0.05	<0.19	<0,06	<0.28	<0.09	<0.06	**0.64**	**0.74**	<0.16	<0.14
PFDA	**0.3**	**0.31**	**0.09**	<0.30	**0.10**	<0.19	**0.07**	<0.28	<0.09	<0.06	**8.78**	**10.2**	<0.16	<0.14
PFUnA	<0.07	<0.07	<0.07	<0.30	<0.05	<0.19	<0.06	<0.28	<0.09	<0.06	**0.32**	**0.36**	<0.16	<0.14
PFDoA	<0.07	**0.08**	<0.07	<0.30	<0.05	<0.19	<0.06	<0.28	<0.09	<0.06	**4.47**	**4.13**	<0.16	<0.14
PFTrA	<0.07	<0.07	<0.07	<0.30	<0.05	<0.19	<0.06	<0.28	<0.09	<0.06	<0.07	<0.06	<0.16	<0.14
PFTeA	<0.07	<0.07	<0.07	<0.30	<0.05	<0.19	<0.06	<0.28	<0.09	<0.06	**0.25**	<0.06	<0.16	<0.14
PFOSA	<0.07	**0.07**	<0.07	<0.06	<0.05	<0.04	<0.06	<0.28	<0.09	<0.06	<0.07	<0.06	<0.16	<0.14
PF-3,7-DMOA	<0.14	<0.14	<0.13	<0.60	<0.10	<0.39	<0.12	<0.56	<0.17	<0.13	<0.13	<0.12	<0.32	<0.27
HPFHpA	<0.14	<0.14	<0.13	<0.60	<0.10	<0.39	<0.12	<0.56	<0.17	<0.13	<0.13	<0.12	<0.32	<0.27
H2PFDA	<0.14	<0.14	<0.13	<0.60	<0.14	<0.71	<0.47	<0.56	<0.17	<0.13	<0.13	<0.12	<1.48	<0.50
H4PFOS; 6:2 FTS	<0.11	<0.10	<0.10	<0.45	**0.15**	<0.29	<0.09	<0.42	<0.13	<0.10	<0.10	<0.09	<0.24	<0.21
Total ionic PFC	**99.5**	**101**	**5.43**	**3.34**	**15.5**	**9.45**	**97.4**	**684**	**42.1**	**49.8**	**53.5**	**43.8**	**56.1**	**75.6**

Table A11b. Details of jackets and trouser articles and concentrations of ionic PFCs* by area (µg/m²). (i) average of 2 homogenised samples, see Appendix 3.

Product type	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Shoe	Shoe	Backpack	Backpack	Tent	Tent
Sample code	F02a	F02b	F04a	F04b	F08a	F08b	F09a	F09b	F11a	F11b	BP04a	BP04b	TE05a	TE05b
Brand	Haglöfs		Salewa		The North Face		Jack Wolfskin		Columbia		patagonia		Jack Wolfskin	
Ionic PFCs (ng/kg)														
PFBS	< 676	< 794	< 588	< 7810	**22800**	**198000**	**1560**	**8530**	**22800**	**45800**	**43500**	**14700**	< 566	< 4310
PFHxS	< 676	< 794	< 588	< 7810	< 926	< 13900	< 746	< 636	< 1050	< 5510	< 628	< 3280	< 566	< 4310
PFHpS	< 676	< 794	< 588	< 7810	< 926	< 13900	< 746	< 636	< 1050	< 5510	< 628	< 3280	< 566	< 4310
PFOS	< 450	< 529	**605**	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	**432**	< 2180	< 377	< 2870
PFDS	< 676	< 794	< 588	< 7810	< 926	< 13900	< 746	< 636	< 1050	< 5510	< 628	< 3280	< 566	< 4310
PFBA	**4070**	**4300**	< 392	< 5210	**11000**	< 9260	< 498	< 424	**6440**	**4000**	**18400**	**15600**	**708**	< 2870
PFPA	**4740**	**4630**	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	< 418	< 2180	**832**	< 2870
PFHxA	**18000**	**19600**	< 392	< 5210	**1180**	< 9260	**550**	**723**	**1020**	< 3680	**2260**	< 2180	**2790**	< 2870
PFHpA	**5530**	**5130**	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	**634**	< 2180	**1760**	< 2870
PFOA	**15300**	**19700**	**1020**	< 5210	**824**	< 9260	**1520**	**2150**	**802**	< 3680	**1320**	< 2180	**10800**	**8800**
PFNA	**1640**	**1660**	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	< 418	< 2180	**1220**	< 2870
PFDA	**5580**	**7350**	< 392	< 5210	< 617	< 9260	**800**	**865**	< 702	< 3680	< 418	< 2180	**9140**	**7050**
PFUnA	**673**	**770**	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	< 418	< 2180	**607**	< 2870
PFDoA	**2800**	**2190**	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	< 418	< 2180	**2650**	< 2870
PFTrA	**893**	< 529	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	< 418	< 2180	< 377	< 2870
PFTeA	**2900**	< 529	< 392	< 5210	< 617	< 9260	< 498	< 424	< 702	< 3680	< 418	< 2180	< 377	< 2870
PFOSA	< 450	< 529	< 392	< 521	< 617	< 463	< 498	< 424	< 702	< 368	< 418	< 437	**1880**	< 2870
PF-3,7-DMOA	< 901	< 1060	< 784	< 10400	< 1230	< 18500	< 995	< 847	< 1400	< 7350	< 837	< 4370	< 755	< 5750
HPFHpA	< 901	< 1060	< 784	< 10400	< 1230	< 18500	< 995	< 847	**2430**	< 7350	< 837	< 4370	< 755	< 5750
H2PFDA	< 1310	< 1370	< 957	< 15500	< 3620	< 65500	< 3280	< 847	< 2780	< 7350	< 837	< 13500	< 755	< 10800
H4PFOS; 6:2 FTS	< 676	< 794	< 588	< 7810	**2060**	< 13900	< 746	< 636	< 1050	< 5510	< 628	< 3280	< 566	< 4310
Total ionic PFC	**62100**	**65300**	**1630**	-	**37900**	**198000**	**4430**	**12300**	**33500**	**49800**	**66500**	**30300**	**32400**	**15900**

Table A12a. Details of footwear, backpack and tent articles and concentrations of ionic PFCs* by mass (ng/kg)

Product type	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Shoe	Shoe	Backpack	Backpack	Tent	Tent
Sample code	F02a	F02b	F04a	F04b	F08a	F08b	F09a	F09b	F11a	F11b	BP04a	BP04b	TE05a	TE05b
Brand	Haglöfs		Salewa		The North Face		Jack Wolfskin		Columbia		patagonia		Jack Wolfskin	
Ionic PFCs (µg/m²)														
PFBS	<0.71	<0.83	<1.04	<13.8	**22.5**	**195**	**3.62**	**19.8**	**35**	**70.3**	**9.42**	**3.18**	<0.04	<0.3
PFHxS	<0.71	<0.83	<1.04	<13.8	<0.91	<13.7	<1.73	<1.48	<1.61	<8.46	<0.14	<0.71	<0.04	<0.3
PFHpS	<0.71	<0.83	<1.04	<13.8	<0.91	<13.7	<1.73	<1.48	<1.61	<8.46	<0.14	<0.71	<0.04	<0.3
PFOS	<0.47	<0.55	**1.07**	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	**0.09**	<0.47	<0.03	<0.2
PFDS	<0.71	<0.83	<1.04	<13.8	<0.91	<13.7	<1.73	<1.48	<1.61	<8.46	<0.14	<0.71	<0.04	<0.3
PFBA	**4.27**	**4.51**	<0.69	<9.2	**10.9**	<9.14	<1.16	<0.98	**9.89**	**6.14**	**3.98**	**3.38**	**0.05**	<0.2
PFPA	**4.97**	**4.85**	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	<0.09	<0.47	**0.06**	<0.2
PFHxA	**18.9**	**20.6**	<0.69	<9.2	**1.16**	<9.14	**1.28**	**1.68**	**1.57**	<5.65	**0.49**	<0.47	**0.19**	<0.2
PFHpA	**5.8**	**5.38**	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	**0.14**	<0.47	**0.12**	<0.2
PFOA	**16.0**	**20.7**	**1.8**	<9.2	**0.81**	<9.14	**3.53**	**4.99**	**1.23**	<5.65	**0.29**	<0.47	**0.75**	**0.61**
PFNA	**1.72**	**1.74**	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	<0.09	<0.47	**0.08**	<0.2
PFDA	**5.85**	**7.71**	<0.69	<9.2	<0.61	<9.14	**1.86**	**2.01**	<1.08	<5.65	<0.09	<0.47	**0.63**	**0.49**
PFUnA	**0.71**	**0.81**	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	<0.09	<0.47	**0.04**	<0.2
PFDoA	**2.94**	**2.30**	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	<0.09	<0.47	**0.18**	<0.2
PFTrA	**0.94**	<0.55	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	<0.09	<0.47	<0.03	<0.2
PFTeA	**3.04**	<0.55	<0.69	<9.2	<0.61	<9.14	<1.16	<0.98	<1.08	<5.65	<0.09	<0.47	<0.03	<0.2
PFOSA	<0.47	<0.55	<0.69	<9.2	<0.61	<0.46	<1.16	<0.98	<1.08	<5.65	<0.09	<0.09	**0.13**	<0.2
PF-3,7-DMOA	<0.94	<1.11	<1.38	<18.4	<1.21	<18.3	<2.31	<1.97	<2.15	<11.3	<0.18	<0.95	<0.05	<0.4
HPFHpA	<0.94	<1.11	<1.38	<18.4	<1.21	<18.3	<2.31	<1.97	**3.73**	<11.3	<0.18	<0.95	<0.05	<0.4
H2PFDA	<1.37	<1.44	<1.69	<27.4	<3.57	<64.6	<7.61	<1.97	<4.27	<11.3	<0.18	<2.92	<0.05	<0.75
H4PFOS; 6:2 FTS	<0.71	<0.83	<1.04	<13.8	**2.03**	<13.7	<1.73	<1.48	<1.61	<8.46	<0.14	<0.71	<0.04	<0.3
Total ionic PFC	**65.1**	**68.6**	**2.87**	-	**37.4**	**195**	**10.3**	**28.5**	**51.4**	**76.4**	**14.4**	**6.56**	**2.23**	**1.10**

Table A12b. Details of footwear, backpack and tent articles and concentrations of ionic PFCs* by area (µg/m²)

Product type	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Trouser	Trouser	Trouser	Trouser	Trouser	Trouser
Sample code	J03a	J03b	J05a	J05b	J07a	J07b	J10a	J10b	J11a	J11b	TR02a	TR02b	TR04a	TR04b/c[(i)]	TR06a	TR06b
Brand	Norrona		Blackyak		Haglöfs		Patagonia		Salewa		Mammut		Jack Wolfskin		Arc'teryx	
Volatile PFCs (µg/kg)																
6:2 FTA	< 23	< 20	< 19	< 19	< 21	< 20	< 18	< 20	< 20	< 20	< 21	< 23	< 22	< 20	< 21	< 27
8:2 FTA	< 23	< 20	< 19	< 19	< 21	< 20	< 18	< 20	< 20	< 20	< 21	< 21	< 22	< 20	< 21	< 21
10:2 FTA	< 23	< 20	< 19	< 19	< 21	< 20	< 18	< 20	< 20	< 20	< 21	< 21	< 22	< 20	< 21	< 21
4:2 FTOH	< 57	< 50	< 48	< 49	< 53	< 51	< 44	< 49	< 50	< 49	< 52	< 52	< 54	< 50	< 52	< 51
6:2 FTOH	**4600**	**4500**	< 190	< 190	**1300**	**1900**	**1300**	**1500**	< 210	< 200	**420**	**380**	**1000**	**1900**	**840**	**920**
8:2 FTOH	< 170	< 150	< 140	< 150	< 160	< 150	< 130	< 150	< 150	< 150	< 160	< 160	**1200**	**2900**	< 160	< 150
10:2 FTOH	< 68	< 49	< 57	< 49	< 53	< 51	**53**	< 49	< 50	< 49	< 52	< 52	**1000**	**1300**	< 52	< 51
MeFOSE	< 11	< 10	< 10	< 10	< 11	< 10	< 9	< 10	< 10	< 10	< 10	< 10	< 11	< 10	< 10	< 10
EtFOSE	< 11	< 10	< 10	< 10	< 11	< 10	< 9	< 10	< 10	< 10	< 10	< 10	< 11	< 10	< 10	< 10
MeFOSA	< 11	< 10	< 10	< 10	< 11	< 10	< 9	< 10	< 10	< 10	< 10	< 10	< 11	< 10	< 10	< 10
EtFOSA	< 11	< 10	< 10	< 10	< 11	< 10	< 9	< 10	< 10	< 10	< 10	< 10	< 11	< 10	< 10	< 10
Sum FTAs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	**4600**	**4500**	-	-	**1300**	**1900**	**1400**	**1500**	-	-	**420**	**380**	**3300**	**6100**	**840**	**920**
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**4600**	**4500**	-	-	**1300**	**1900**	**1400**	**1500**	-	-	**420**	**380**	**3300**	**6100**	**840**	**920**

Table A13a. Details of jackets and trouser articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 homogenised samples, see Appendix 3.

Product type	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket	Trouser	Trouser	Trouser	Trouser	Trouser	Trouser
Sample code	J03a	J03b	J05a	J05b	J07a	J07b	J10a	J10b	J11a	J11b	TR02a	TR02b	TR04a	TR04b/c[(i)]	TR06a	TR06b
Brand	Norrona		Blackyak		Haglöfs		Patagonia		Salewa		Mammut		Jack Wolfskin		Arc'teryx	
Volatile PFCs (µg/m²)																
6:2 FTA	<3.2	<2.8	<2.4	<2.4	<1.7	<1.6	<2.3	<2.5	<2.5	<2.5	<3.5	<3.8	<2.5	<2.3	<6.4	<8.2
8:2 FTA	<3.2	<2.8	<2.4	<2.4	<1.7	<1.6	<2.3	<2.5	<2.5	<2.5	<3.5	<3.8	<2.5	<2.3	<6.4	<6.4
10:2 FTA	<3.2	<2.8	<2.4	<2.4	<1.7	<1.6	<2.3	<2.5	<2.5	<2.5	<3.5	<3.8	<2.5	<2.3	<6.4	<6.4
4:2 FTOH	<7.9	<6.9	<6.1	<6.2	<4.3	<4.2	<5.6	<6.2	<6.3	<6.1	<8.7	<8.7	<6.2	<5.7	<16	<15
6:2 FTOH	**640**	**630**	<24	<25	**110**	**150**	**170**	**190**	<27	<25	**69**	**63**	**120**	**220**	**250**	**280**
8:2 FTOH	<24	<20	<18	<18	<13	<13	<17	<19	<19	<18	<26	<26	**140**	**340**	<48	<47
10:2 FTOH	<9.4	<6.8	<7.2	<6.2	<4	<4.2	**6.7**	<6.2	<6.3	<6.1	<8.7	<8.7	**110**	**150**	<16	<15
MeFOSE	<1.5	<1.4	<1.3	<1.3	<0.89	<0.81	<1.1	<1.3	<1.3	<1.3	<1.7	<1.7	<1.3	<1.1	<3	<3
EtFOSE	<1.5	<1.4	<1.3	<1.3	<0.89	<0.81	<1.1	<1.3	<1.3	<1.3	<1.7	<1.7	<1.3	<1.1	<3	<3
MeFOSA	<1.5	<1.4	<1.3	<1.3	<0.89	<0.81	<1.1	<1.3	<1.3	<1.3	<1.7	<1.7	<1.3	<1.1	<3	<3
EtFOSA	<1.5	<1.4	<1.3	<1.3	<0.89	<0.81	<1.1	<1.3	<1.3	<1.3	<1.7	<1.7	<1.3	<1.1	<3	<3
Sum FTAs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum FTOHs	**640**	**630**	-	-	**110**	**150**	**180**	**190**	-	-	**69**	**63**	**370**	**710**	**250**	**280**
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	**640**	**630**	-	-	**110**	**150**	**180**	**190**	-	-	**69**	**63**	**370**	**710**	**250**	**280**

Table A13b. Details of jackets and trouser articles and concentrations of volatile PFCs* by area (µg/m²). (i) average of 2 homogenised samples, see Appendix 3.

Product type	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Shoe	Shoe
Sample code	F10a	F10b	F02a	F02b	F04a	F04b	F08a	F08b	F09a	F09b	F11a	F11b
Brand	Patagonia		Haglöfs		Salewa		The North Face		Jack Wolfskin		Columbia	
Volatile PFCs (µg/kg)												
6:2 FTA	< 20	< 20	**21**	**44**	< 18	< 21	< 26	< 20	< 18	< 17	< 19	< 19
8:2 FTA	< 20	< 20	**390**	**430**	< 18	**38**	< 26	< 20	< 18	< 17	< 19	< 19
10:2 FTA	< 20	< 20	**240**	**230**	< 18	< 21	< 26	< 20	< 18	< 17	< 19	< 19
4:2 FTOH	< 50	< 49	< 54	< 51	< 44	< 52	< 65	< 50	< 44	< 43	< 47	< 47
6:2 FTOH	< 230	< 200	< 220	< 200	**810**	**600**	**1300**	< 200	**530**	**470**	**860**	< 190
8:2 FTOH	< 150	< 150	**1600**	**1600**	< 133	< 160	< 194	< 150	< 130	**210**	< 140	< 140
10:2 FTOH	< 67	< 50	**770**	**700**	< 44	< 52	< 65	< 50	< 44	**130**	< 47	< 47
MeFOSE	< 10	< 10	< 11	< 10	< 9	< 10	< 13	< 10	< 9	< 9	< 9	< 10
EtFOSE	< 10	< 10	< 11	< 10	< 9	< 10	< 13	< 10	< 9	< 9	< 9	< 10
MeFOSA	< 10	< 10	< 11	< 10	< 9	< 10	< 13	< 10	< 9	< 9	< 9	< 10
EtFOSA	< 10	< 10	< 11	< 10	< 9	< 10	< 13	< 10	< 9	< 9	< 9	< 10
Sum FTAs	-	-	**650**	**700**	-	**38**	-	-	-	-	-	-
Sum FTOHs	-	-	**2400**	**2300**	**810**	**600**	**1300**	-	**530**	**810**	**860**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	-	-	**3000**	**3000**	**810**	**640**	**1300**	-	**530**	**810**	**860**	-

Table A13a. Details of footwear articles and concentrations of volatile PFCs* by mass (µg/kg)

Product type	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Boot	Shoe	Shoe
Sample code	F10a	F10b	F02a	F02b	F04a	F04b	F08a	F08b	F09a	F09b	F11a	F11b
Brand	Patagonia		Haglöfs		Salewa		The North Face		Jack Wolfskin		Columbia	
Volatile PFCs (µg/m²)												
6:2 FTA	<14	<14	**22**	**46**	<35	<40	<26	<20	<48	<45	<37	<37
8:2 FTA	<14	<14	**400**	**440**	<35	**70**	<26	<20	<48	<45	<37	<37
10:2 FTA	<14	<14	**250**	**230**	<35	<40	<26	<20	<48	<45	<37	<37
4:2 FTOH	<35	<34	<56	<53	<85	<100	<64	<49	<120	<110	<91	<91
6:2 FTOH	<160	<140	<230	<210	**1600**	**1200**	**1200**	<20	**1400**	**1300**	**1700**	<370
8:2 FTOH	<100	<100	**1700**	**1600**	<260	<300	<190	<150	<350	**550**	<270	<270
10:2 FTOH	<47	<34	**790**	**740**	<85	<100	<64	<49	<120	**340**	<91	<91
MeFOSE	<6.9	<6.9	<11	<10	<17	<19	<13	<9.9	<24	<24	<17	<19
EtFOSE	<6.9	<6.9	<11	<10	<17	<19	<13	<9.9	<24	<24	<17	<19
MeFOSA	<6.9	<6.9	<11	<10	<17	<19	<13	<9.9	<24	<24	<17	<19
EtFOSA	<6.9	<6.9	<11	<10	<17	<19	<13	<9.9	<24	<24	<17	<19
Sum FTAs	-	-	**670**	**720**	-	**70**	-	-	-	-	-	-
Sum FTOHs	-	-	**2500**	**2400**	**1600**	**1200**	**1200**	-	**1400**	**2200**	**1700**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	-	-	**3000**	**3100**	**1600**	**1300**	**1200**	-	**1400**	**2200**	**1700**	-

Table A13b. Details of footwear, backpack and tent articles and concentrations of volatile PFCs* by area (µg/m²)

Product type	Backpack	Backpack	Backpack	Backpack	sleeping bag	sleeping bag	sleeping bag	sleeping bag	Tent	Tent
Sample code	BP04a	BP04b	BP05a	BP05b/c[(i)]	SB02a	SB02b/c[(i)]	SB03a	SB03b	TE05a	TE05b
Brand	Patagonia		Mammut		The North Face		The North Face		Jack Wolfskin	
Volatile PFCs (µg/kg)										
6:2 FTA	< 25	< 20	< 20	< 20	< 22	< 21	< 25	< 23	< 37	< 20
8:2 FTA	< 25	< 20	< 20	< 20	< 22	< 21	**74**	**35**	< 21	< 20
10:2 FTA	< 25	< 20	< 20	< 20	< 22	< 21	**34**	< 21	< 21	< 20
4:2 FTOH	< 61	< 51	< 50	< 51	< 55	< 51	< 62	< 51	< 51	< 51
6:2 FTOH	< 250	< 210	< 200	< 210	< 200	< 210	< 250	< 210	< 210	< 200
8:2 FTOH	< 180	< 150	**260**	**250**	**1200**	**1200**	**790**	**550**	**170**	< 150
10:2 FTOH	< 74	< 51	**83**	**76**	**370**	**320**	**270**	**110**	< 51	< 51
MeFOSE	< 12	< 10	< 10	< 10	< 11	< 10	< 12	< 10	< 10	< 10
EtFOSE	< 12	< 10	< 10	< 10	< 11	< 10	< 12	< 10	< 10	< 10
MeFOSA	< 12	< 10	< 10	< 10	< 11	< 10	< 12	< 10	< 10	< 10
EtFOSA	< 12	< 10	< 10	< 10	< 11	< 10	< 12	< 10	< 10	< 10
Sum FTAs	-	-	-	-	-	-	**110**	**35**	-	-
Sum FTOHs	-	-	**340**	**330**	**1600**	**1500**	**1100**	**660**	**170**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	-	-	**340**	**330**	**1600**	**1500**	**1200**	**700**	**170**	-

Table A13a. Details of backpack, sleeping bag and tent articles and concentrations of volatile PFCs* by mass (µg/kg). (i) average of 2 homogenised samples, see Appendix 3

Product type	Backpack	Backpack	Backpack	Backpack	sleeping bag	sleeping bag	sleeping bag	sleeping bag	Tent	Tent
Sample code	BP04a	BP04b	BP05a	BP05b/c[(i)]	SB02a	SB02b/c[(i)]	SB03a	SB03b	TE05a	TE05b
Brand	Patagonia		Mammut		The North Face		The North Face		Jack Wolfskin	
Volatile PFCs (µg/m²)										
6:2 FTA	<5.4	<4.3	<5.7	<5.7	<1	<0.92	<1.1	<1	<2.6	<1.4
8:2 FTA	<5.4	<4.3	<5.7	<5.7	<1	<0.92	**3.3**	**1.5**	<1.5	<1.4
10:2 FTA	<5.4	<4.3	<5.7	<5.7	<1	<0.92	**1.5**	<0.92	<1.5	<1.4
4:2 FTOH	<13	<11	<14	<14	<2.4	<2.3	<2.7	<2.2	<3.7	<3.7
6:2 FTOH	<54	<44	<57	<58	<9.8	<9.1	<11	<9.2	<15	<15
8:2 FTOH	<39	<33	**74**	**71**	**51**	**53**	**35**	**24**	**12**	<11
10:2 FTOH	<16	<11	**23**	**22**	**16**	**14**	**12**	**4.8**	<3.7	<3.7
MeFOSE	<2.6	<2.2	<2.8	<2.8	<0.5	<0.44	<0.52	<0.44	<0.71	<0.71
EtFOSE	<2.6	<2.2	<2.8	<2.8	<0.5	<0.44	<0.52	<0.44	<0.71	<0.71
MeFOSA	<2.6	<2.2	<2.8	<2.8	<0.5	<0.44	<0.52	<0.44	<0.71	<0.71
EtFOSA	<2.6	<2.2	<2.8	<2.8	<0.5	<0.44	<0.52	<0.44	<0.71	<0.71
Sum FTAs	-	-	-	-	-	-	**4.8**	**1.5**	-	-
Sum FTOHs	-	-	**97**	**93**	**67**	**67**	**47**	**29**	**12**	-
Sum FOSAs/Es	-	-	-	-	-	-	-	-	-	-
Total volatile PFCs	-	-	**97**	**93**	**67**	**67**	**52**	**30**	**12**	-

Table A13b. Details of backpack, sleeping bag and tent articles and concentrations of volatile PFCs* by area (µg/m²).(i) average of 2 homogenised samples, see Appendix 3.

Appendix 3. Analysis of material from 3 articles in duplicate

Product type	trouser		backpack		Sleeping bag	
Sample code	TR04b	TR04c	BP05a	BP05b	SB02a	SB02b
Brand	Jack Wolfskin		Mammut		The North Face	
Ionic PFCs (ng/kg)						
PFBS	**50400**	**38600**	< 4290	< 3790	< 1790	< 2080
PFHxS	< 765	< 714	< 4290	< 3790	< 1790	< 2080
PFHpS	< 765	< 714	< 4290	< 3790	< 1790	< 2080
PFOS	< 510	< 476	< 2860	< 2530	< 1190	< 1390
PFDS	< 765	< 714	< 4290	< 3790	< 1790	< 2080
PFBA	**21300**	**17000**	< 2860	< 2530	**2590**	**1590**
PFPA	**11600**	**11300**	< 2860	< 2530	**6440**	**4600**
PFHxA	**27300**	**28300**	< 2860	< 2530	**22000**	**15100**
PFHpA	**18400**	**13200**	< 2860	< 2530	**10200**	**7760**
PFOA	**136000**	**128000**	**16300**	**15300**	**180000**	**134000**
PFNA	**6810**	**6350**	< 2860	< 2530	**5440**	**4070**
PFDA	**91700**	**87700**	**9070**	**8780**	**65300**	**60400**
PFUnA	**3380**	**2900**	**2930**	< 2530	**2210**	**1930**
PFDoA	**37000**	**35900**	**5670**	**5010**	**4300**	**4410**
PFTrA	< 520	< 486	< 2860	< 2530	< 1190	< 1390
PFTeA	< 510	< 476	< 2860	< 2530	**1270**	< 1390
PFOSA	< 510	< 476	< 2530	< 2860	< 607	< 708
PF-3,7-DMOA	< 1020	< 952	< 5710	< 5050	< 2380	< 2780
HPFHpA	< 1020	< 952	< 5710	< 5050	< 2380	< 2780
H2PFDA	< 1020	< 952	< 5710	< 5050	< 2380	< 2780
H4PFOS; 6:2 FTS	< 765	< 714	< 4290	< 3790	< 1790	< 2080
Total ionic PFC	**404000**	**369000**	**34000**	**29000**	**300000**	**234000**

Table A13a. Details of all articles and concentrations of ionic PFCs* by mass (ng/kg)

Product type	trouser		backpack		Sleeping bag	
Sample code	TR04b	TR04c	BP05a	BP05b	SB02a	SB02b
Brand	Jack Wolfskin		Mammut		The North Face	
Ionic PFCs (µg/m²)						
PFBS	**5.71**	**4.37**	<1.15	<1.02	<0.08	<0.09
PFHxS	<0.09	<0.08	<1.15	<1.02	<0.08	<0.09
PFHpS	<0.09	<0.08	<1.15	<1.02	<0.08	<0.09
PFOS	<0.06	<0.05	<0.80	<0.68	<0.05	<0.06
PFDS	<0.09	<0.08	<1.15	<1.02	<0.08	<0.09
PFBA	**2.41**	**1.92**	<0.80	<0.68	**0.12**	**0.07**
PFPA	**1.31**	**1.27**	<0.80	<0.68	**0.29**	**0.21**
PFHxA	**3.90**	**3.20**	<0.80	<0.68	**1.00**	**0.68**
PFHpA	**2.08**	**1.49**	<0.80	<0.68	**0.46**	**0.35**
PFOA	**15.4**	**14.5**	**4.38**	**4.11**	**8.15**	**6.06**
PFNA	**0.77**	**0.72**	<0.80	<0.68	**0.25**	**0.18**
PFDA	**10.4**	**9.93**	**2.44**	**2.36**	**2.95**	**2.73**
PFUnA	**0.38**	**0.33**	**0.79**	<0.68	**0.10**	**0.09**
PFDoA	**4.19**	**4.06**	**1.52**	**1.35**	**0.20**	**0.20**
PFTrA	<0.06	<0.06	<0.77	<0.68	<0.05	<0.06
PFTeA	<0.06	<0.05	<0.77	<0.68	**0.06**	<0.06
PFOSA	<0.06	<0.05	<0.68	<0.68	<0.03	<0.03
PF-3,7-DMOA	<0.12	<0.11	<1.53	<1.36	<0.11	<0.13
HPFHpA	<0.12	<0.11	<1.53	<1.36	<0.11	<0.13
H2PFDA	<0.12	<0.11	<1.53	<1.36	<0.11	<0.13
H4PFOS; 6:2 FTS	<0.09	<0.08	<1.15	<1.02	<0.08	<0.09
Total	**46.6**	**41.8**	**9.10**	**7.80**	**13.6**	**10.6**

Table A13b. Details of all articles and concentrations of ionic PFCs* by area (µg/m²)

Product type	trouser		backpack		Sleeping bag	
Sample code	TR04b	TR04c	BP05a	BP05b	SB02a	SB02b
Brand	Jack Wolfskin		Mammut		The North Face	
Volatile PFCs (µg/kg)						
6:2 FTA	< 20	< 20	< 20	< 20	< 21	< 20
8:2 FTA	< 20	< 20	< 20	< 20	< 21	< 25
10:2 FTA	< 20	< 20	< 20	< 20	< 21	< 20
4:2 FTOH	< 50	< 50	< 50	< 51	< 51	< 49
6:2 FTOH	**1400**	**2400**	< 200	< 210	< 210	< 200
8:2 FTOH	**1200**	**4700**	**270**	**230**	**1000**	**1400**
10:2 FTOH	**930**	**1600**	**78**	**74**	**280**	**350**
MeFOSE	< 10	< 10	< 10	< 10	< 10	< 10
EtFOSE	< 10	< 10	< 10	< 10	< 10	< 10
MeFOSA	< 10	< 10	< 10	< 10	< 10	< 10
EtFOSA	< 10	< 10	< 10	< 10	< 10	< 10
Sum FTAs	-	-	-	-	-	-
Sum FTOHs	**3500**	**8700**	**350**	**300**	**1300**	**1800**
Sum FOSAs/Es	-	-	-	-	-	-
Total volatile PFCs	**3500**	**8700**	**350**	**300**	**1300**	**1800**

Table A14a. Details of all articles and concentrations of volatile PFCs* by mass (µg/kg)

Product type	trouser		backpack		Sleeping bag	
Sample code	TR04b	TR04c	BP05a	BP05b	SB02a	SB02b
Brand	Jack Wolfskin		Mammut		The North Face	
Volatile PFCs (µg/m²)						
6:2 FTA	<2.3	<2.3	<5.7	<5.7	<0.9	<0.9
8:2 FTA	<2.3	<2.3	<5.7	<5.7	<0.9	<1.1
10:2 FTA	<2.3	<2.3	<5.7	<5.7	<0.9	<0.9
4:2 FTOH	<5.7	<5.7	<14	<14	<2.6	<2.2
6:2 FTOH	**160**	**270**	<57	<58	<9.1	<8.7
8:2 FTOH	**140**	**530**	**76**	**65**	**45**	**62**
10:2 FTOH	**110**	**180**	**22**	**21**	**12**	**15**
MeFOSE	<1.1	<1.1	<2.8	<2.8	<0.4	<0.4
EtFOSE	<1.1	<1.1	<2.8	<2.8	<0.4	<0.4
MeFOSA	<1.1	<1.1	<2.8	<2.8	<0.4	<0.4
EtFOSA	<1.1	<1.1	<2.8	<2.8	<0.4	<0.4
Sum FTAs	-	-	-	-	-	-
Sum FTOHs	**410**	**980**	**98**	**86**	**57**	**77**
Sum FOSAs/Es	-	-	-	-	-	-
Total volatile PFCs	**410**	**980**	**98**	**86**	**57**	**77**

Table A14b. Details of all articles and concentrations of volatile PFCs* by area (µg/m²)