

Accessory publication**Polyfluoroalkyl compounds in the Canadian Arctic atmosphere**

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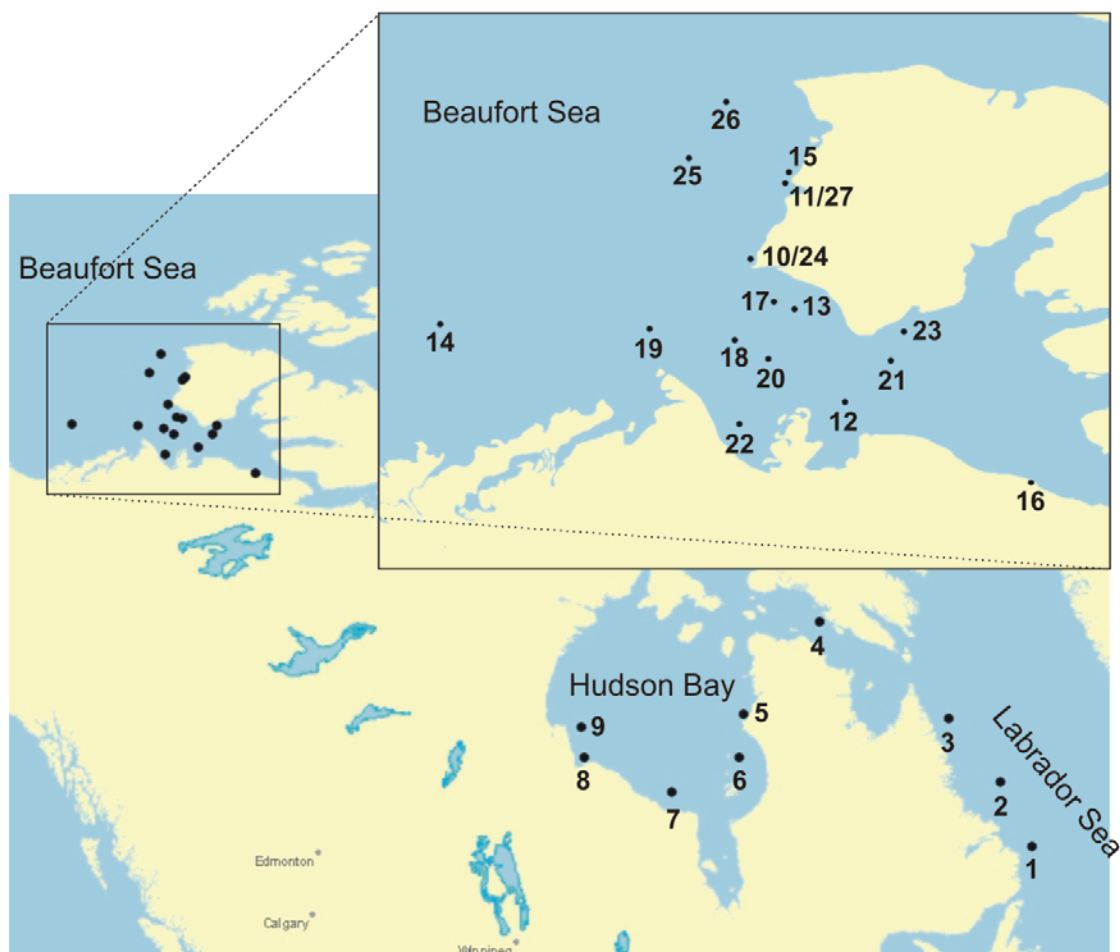


Fig. A1. Sampling locations of the air sampling sites in the Labrador Sea, Hudson Bay and Beaufort Sea.

Table A1. Sampling location, air volume and air temperature

| Sample number | Start time and location | | | Stop time and location | | | | | | | | | |
|-----------------|-------------------------|---------|--------------|------------------------|------------------|----------|-----------|---------------|------------------|----------|-----------|------------------------------|------------------|
| | Sample ID | Legs | Location | Start date | Time (hours GMT) | Latitude | Longitude | Start date | Time (hours GMT) | Latitude | Longitude | Air volume (m ³) | Temperature (°C) |
| 1 | IPY001 | LEG 1 | Labrador sea | 28-Jul-2007 | 2230 | 51°32'N | 56°24'W | 29-Jul-2007 | 2330 | 56°06'N | 57°15'W | 378 | 15.5 |
| 2 | IPY002 | | Labrador sea | 29-Jul-2007 | 2345 | 56°06'N | 57°15'W | 30-Jul-2007 | 2240 | 56°47'N | 57°20'W | 351 | 8.9 |
| 3 | IPY003 | | Labrador sea | 2-Aug-2007 | 2240 | 59°05'N | 63°32'W | 3-Aug-2007 | 2221 | 59°03'N | 63°34'W | 368 | 7.6 |
| 4 | IPY004 | | Hudson Bay | 3-Aug-2007 | 2230 | 61°33'N | 68°08'W | 4-Aug-2007 | 2100 | 62°29'N | 76°15'W | 349 | 4.2 |
| 5 | IPY005 | | Hudson Bay | 5-Aug-2007 | 1430 | 60°12'N | 78°35'W | 6-Aug-2007 | 1002 | 58°22'N | 78°29'W | 288 | 8.5 |
| 6 | IPY006 | | Hudson Bay | 6-Aug-2007 | 1017 | 58°22'N | 78°29'W | 7-Aug-2007 | 1034 | 56°36'N | 79°11'W | 367 | 8.5 |
| 7 | IPY007 | | Hudson Bay | 11-Aug-2007 | 2240 | 55°48'N | 83°19'W | 12-Aug-2007 | 2200 | 56°19'N | 85°22'W | 344 | 6.1 |
| 8 | IPY008 | | Hudson Bay | 13-Aug-2007 | 2345 | 57°34'N | 91°25'W | 14-Aug-2007 | 1800 | 57°27'N | 91°53'W | 269 | 10.0 |
| 9 | IPY009 | | Hudson Bay | 14-Aug-2007 | 2340 | 57°25'N | 91°51'W | 15-Aug-2007 | 2300 | 59°59'N | 91°58'W | 382 | 8.9 |
| 10 ^A | IPY010 | LEG 8B | Beaufort Sea | 21-May-2008 | 2030 | 71°29'N | 124°25'W | 23-May-2008 | 1230 | 72°39'N | 127°23'W | 341 | -2.1 |
| 11 ^A | IPY011 | | Beaufort Sea | 28-May-2008 | 1700 | 74°31'N | 124°07'W | 30-May-2008 | 1330 | 71°34'N | 125°18'W | 367 | -2.6 |
| 12 | IPY013 | | Beaufort Sea | 2-Jun-2008 | 0040 | 70°37'N | 123°11'W | 3-Jun-2008 | 1240 | 69°52'N | 123°45'W | 315 | -1.5 |
| 13 | IPY014 | LEG 9B | Beaufort Sea | 27-Jun-2008 | 1500 | 71°33'N | 124°21'W | 28-Jun-2008 | 1345 | 71°18'N | 125°11'W | 349 | 6.8 |
| 14 | IPY015 | | Beaufort Sea | 30-Jun-2008 | 0030 | 70°59'N | 133°46'W | 1-Jul-2008 | 0230 | 71°28'N | 133°56'W | 393 | -0.4 |
| 15 | IPY017 | | Beaufort Sea | 7-Jul-2008 | 0050 | 74°40'N | 122°28'W | 8-Jul-2008 | 0725 | 71°43'N | 126°29'W | 475 | 11.6 |
| 16 | IPY018 | LEG 10A | Beaufort Sea | 19-Jul-2008 | 0050 | 68°00'N | 114°38'W | 20-Jul-2008 | 2247 | 70°39'N | 123°00'W | 709 | 10.1 |
| 17 | IPY019 | | Beaufort Sea | 22-Jul-2008 | 1342 | 71°53'N | 125°25'W | 23-Jul-2008 | 2336 | 71°51'N | 125°33'W | 513 | 4.4 |
| 18 | IPY020 | | Beaufort Sea | 26-Jul-2008 | 1735 | 71°04'N | 126°02'W | 27-Jul-2008 | 1726 | 71°00'N | 126°55'W | 366 | -2.1 |
| 19 | IPY021 | | Beaufort Sea | 27-Jul-2008 | 1807 | 71°00'N | 126°55'W | 28-Jul-2008 | 1738 | 71°33'N | 130°42'W | 368 | -0.3 |
| EC | | | | | | | | | | | | | |
| 20 | IPY022 | | Beaufort Sea | 1-Aug-2008 | 1643 | 71°17'N | 128°28'W | 2-Aug-2008 | 1819 | 70°39'N | 122°59'W | 408 | 0.6 |
| 21 | PFA01 | LEG 7B | Beaufort Sea | 15-April-2008 | 1500 | 70°49'N | 122°26'W | 17-April-2008 | 1545 | 70°43'N | 122°80'W | 925 | -13.8 |
| 22 | PFA175 | LEG 8A | Beaufort Sea | 15-May-2008 | 1500 | 69°57'N | 126°10'W | 17-May-2008 | 1424 | 69°57'N | 126°10'W | 1027 | -1.9 |
| 23 | PFA225 | LEG 8B | Beaufort Sea | 20-May-2008 | 1426 | 71°34'N | 119°36'W | 22-May-2008 | 1424 | 70°42'N | 124°18'W | 865 | -1.8 |
| 24 ^A | PFA245 | | Beaufort Sea | 22-May-2008 | 1516 | 70°42'N | 124°18'W | 24-May-2008 | 1506 | 72°37'N | 126°02'W | 874 | -1.2 |
| 25 | PFA265 | | Beaufort Sea | 24-May-2008 | 1540 | 72°37'N | 126°02'W | 26-May-2008 | 1540 | 74°70'N | 128°56'W | 865 | 0.0 |
| 26 | PFA285 | | Beaufort Sea | 26-May-2008 | 1640 | 74°70'N | 128°56'W | 28-May-2008 | 1614 | 74°30'N | 124°60'W | 866 | -2.8 |
| LEC | | | | | | | | | | | | | |
| 27 ^A | PFA315 | | Beaufort Sea | 28-May-2008 | 1614 | 74°30'N | 124°60'W | 31-May-2008 | 1038 | 71°12'N | 124°41'W | 1199 | -1.5 |

^AOverlapping sampling from Environment Canada (EC) and Lancaster Environment Centre (LEC)

Table A2. PFC analytes, abbreviations, supplier and purity used from Environment Canada (EC)

| Analyte | Abbreviation | Supplier (purity) |
|---|-------------------------------------|--------------------------------|
| Target analytes | | |
| Perfluorobutane sulfonate | PFBS | Wellington Laboratories (>98%) |
| Perfluorohexane sulfonate | PFHxS | Wellington Laboratories (>98%) |
| Perfluorooctane sulfonate | PFOS | Aldrich (98%) |
| Perfluorodecane sulfonate | PFDS | Wellington Laboratories (>98%) |
| Perfluorobutanoate | PFBA | Wellington Laboratories (>98%) |
| Perfluoropentanoate | PFPA | Wellington Laboratories (>98%) |
| Perfluorohexanoate | PFHxA | Wellington Laboratories (>98%) |
| Perfluoroheptanoate | PFHpA | Aldrich (99%) |
| Perfluorooctanoate | PFOA | Aldrich (96%) |
| Perfluorononanoate | PFNA | Aldrich (97%) |
| Perfluorodecanoate | PFDA | Aldrich (98%) |
| Perfluoroundecanoate | PFUnDA | Aldrich (98%) |
| Perfluorododecanoate | PFDoDA | Aldrich (98%) |
| Perfluorotetradecanoate | PFTeDA | Aldrich (98%) |
| Perfluorooctane sulfonamide | PFOSA | Wellington Laboratories (>98%) |
| <i>N</i> -methyl perfluorooctane sulfonamide | MeFOSA | Wellington Laboratories (>98%) |
| <i>N</i> -ethyl perfluorooctane sulfonamide | EtFOSA | Wellington Laboratories (>98%) |
| <i>N</i> -methyl perfluorooctane sulfonamidoethanol | MeFOSE | Wellington Laboratories (>98%) |
| <i>N</i> -ethyl perfluorooctane sulfonamidoethanol | EtFOSE | Wellington Laboratories (>98%) |
| Perfluorohexyl ethanol | 6:2 FTOH | Wellington Laboratories (>98%) |
| Perfluorooctyl ethanol | 8:2 FTOH | Wellington Laboratories (>98%) |
| Perfluorodecyl ethano | 10:2 FTOH | Wellington Laboratories (>98%) |
| Mass-labelled internal standards (IS) | | |
| Perfluoro-(¹⁸ O ₂)-hexane sulfonate | ¹⁸ O ₂ PFHxS | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₄)-octane sulfonate | ¹³ C ₄ PFOS | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₄)-butanoate | ¹³ C ₄ PFBA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₂)-hexanoate | ¹³ C ₂ PFHxA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₄)-octanoate | ¹³ C ₄ PFOA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₅)-nonanoate | ¹³ C ₅ PFNA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₂)-decanoate | ¹³ C ₂ PFDA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₂)-undecanoate | ¹³ C ₂ PFUnDA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₂)-dodecanoate | ¹³ C ₂ PFDoDA | Wellington Laboratories (>98%) |
| 2-perfluorohexyl-(¹³ C ₂)-ethanol | ¹³ C 6:2 FTOH | Wellington Laboratories (>98%) |
| 2-perfluorooctyl-(¹³ C ₂)-ethanol | ¹³ C 8:2 FTOH | Wellington Laboratories (>98%) |
| 2-perfluorodecyl-(¹³ C ₂)-ethanol | ¹³ C 10:2 FTOH | Wellington Laboratories (>98%) |
| Methyl-d ₃ -perfluorooctane sulfonamide | d ₃ MeFOSA | Wellington Laboratories (>98%) |
| Ethyl-d ₅ -perfluorooctane sulfonamide | d ₅ EtFOSA | Wellington Laboratories (>98%) |
| Methyl-d ₇ -perfluorooctane sulfonamido ethanol | d ₇ MeFOSE | Wellington Laboratories (>98%) |
| Ethyl-d ₉ -perfluorooctane sulfonamido ethanol | d ₉ EtFOSE | Wellington Laboratories (>98%) |
| Injection standards (InjS) | | |
| <i>N,N</i> -dimethylperfluoro-1-octanesulfonamide | <i>N,N</i> -Me ₂ FOSA | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₈)-octane sulfonate | ¹³ C ₈ PFOS | Wellington Laboratories (>98%) |
| Perfluoro-(¹³ C ₈)-octanoate | ¹³ C ₈ PFOA | Wellington Laboratories (>98%) |

Table A3. Solvents used for PFC analysis by Environment Canada (EC)

| Solvent | Supplier (purity) |
|------------------------------------|--|
| Methanol | EMD Chemicals, Gibbstown, NJ, USA (LC-MS, OmniSolv, >99.99%) |
| Acetone | EMD Chemicals, Gibbstown, NJ, USA (OmniSolv, 99.98%) |
| Petroleum ether | EMD Chemicals, Gibbstown, NJ, USA (OmniSolv, >99.99%) |
| Iso-octane (2,2,4-trimethylpentan) | EMD Chemicals, Gibbstown, NJ, USA (OmniSolv, 99.97%) |
| Dichloromethane | EMD Chemicals, Gibbstown, NJ, USA (LC-MS, OmniSolv, >99.99%) |

Table A4. PFC analytes, abbreviations, supplier and purity used from Lancaster Environment Centre (LEC)

| Analyte | Abbreviation | Supplier (purity) |
|--|----------------------------------|--------------------------------|
| Target analytes | | |
| <i>N</i> -methyl perfluorooctane sulfonamide | MeFOSA | Wellington Laboratories (>98%) |
| <i>N</i> -ethyl perfluorooctane sulfonamide | EtFOSA | Wellington Laboratories (>98%) |
| <i>N</i> -methyl perfluorooctane sulfonamidoethanol | MeFOSE | Wellington Laboratories (>98%) |
| <i>N</i> -ethyl perfluorooctane sulfonamidoethanol | EtFOSE | Wellington Laboratories (>98%) |
| Perfluorohexyl ethanol | 6:2 FTOH | Wellington Laboratories (>98%) |
| Perfluorooctyl ethanol | 8:2 FTOH | Wellington Laboratories (>98%) |
| Perfluorodecyl ethanol | 10:2 FTOH | Wellington Laboratories (>98%) |
| Mass-labelled internal standards (IS) | | |
| 2-perfluorohexyl-(¹³ C ₂)-ethanol | ¹³ C 6:2 FTOH | Wellington Laboratories (>98%) |
| 2-perfluorooctyl-(¹³ C ₂)-ethanol | ¹³ C 8:2 FTOH | Wellington Laboratories (>98%) |
| 2-perfluorodecyl-(¹³ C ₂)-ethanol | ¹³ C 10:2 FTOH | Wellington Laboratories (>98%) |
| Methyl-d ₃ -perfluorooctane sulfonamide | d ₃ MeFOSA | Wellington Laboratories (>98%) |
| Ethyl-d ₅ -perfluorooctane sulfonamide | d ₅ EtFOSA | Wellington Laboratories (>98%) |
| Methyl-d ₇ -perfluorooctane sulfonamido ethanol | d ₇ MeFOSE | Wellington Laboratories (>98%) |
| Ethyl-d ₉ -perfluorooctane sulfonamido ethanol | d ₉ EtFOSE | Wellington Laboratories (>98%) |
| Injection standards (InjS) | | |
| <i>N,N</i> -dimethylperfluoro-1-octanesulfonamide | <i>N,N</i> -Me ₂ FOSA | Wellington Laboratories (>98%) |
| ¹³ C hexachlorobenzene | ¹³ C-HCB | Dr. Ehrenstorfer, GmbH (>99%) |

Table A5. Solvent used for PFC analysis by Lancaster Environment Centre (LEC)

| Solvent | supplier (purity) |
|---------------|--|
| Ethyl acetate | Fisher-Scientific, UK (>99.5% (GLC) specified) |

Table A6. Results of the intercomparison study between Environment Canada (EC) and Lancaster Environment Centre (LEC) for FTOHs, FOSAs and FOSEs in the gas phase (pg m^{-3})

<x, below the respective method detection limit. n.q., not quantifiable; RSD, relative standard deviation

| | Sample number | Sample ID | 6:2 FTOH | 8:2 FTOH | 10:2 FTOH | MeFOSA | EtFOSA | MeFOSE | EtFOSE |
|---------|---------------|-----------|----------|----------|-----------|--------|--------|--------|--------|
| EC | 10 | IPY010 | 8.92 | 26.0 | 7.51 | <0.3 | 0.72 | <0.6 | <0.1 |
| LEC | 24 | PFA245 | 3.09 | 23.0 | 12.3 | 1.18 | 0.37 | n.q. | n.q. |
| RSD (%) | | | 69 | 8.7 | 34 | – | 46 | – | – |
| Factor | | | 3.0 | 1.1 | 1.6 | – | 2.0 | – | – |
| EC | 11 | IPY011 | 9.45 | 53.7 | 16.4 | <0.3 | 1.02 | <0.6 | <0.1 |
| LEC | 27 | PFA315 | 10.6 | 29.0 | 16.6 | 1.10 | 0.42 | 0.80 | 0.10 |
| RSD (%) | | | 8.3 | 42 | 0.8 | – | 60 | – | – |
| Factor | | | 1.1 | 1.9 | 1.0 | – | 2.5 | – | – |

Table A7. FTOHs, FOSAs and FOSEs gas phase concentrations from Environment Canada (EC) and Lancaster Environment Centre (LEC) (pg m^{-3})

BDL, below detection limit; n.q., not quantifiable

| | Sample number | Sample ID | 6:2 FTOH | 8:2 FTOH | 10:2 FTOH | MeFOSA | EtFOSA | MeFOSE | EtFOSE |
|-----|---------------|-----------|----------|----------|-----------|--------|--------|--------|--------|
| EC | 1 | IPY001 | 3.94 | 36.2 | 20.7 | 3.21 | 1.50 | 19.3 | 1.32 |
| | 2 | IPY002 | 6.72 | 40.7 | 15.1 | 0.52 | 0.65 | 10.2 | 0.83 |
| | 3 | IPY003 | BDL | 43.2 | 14.9 | 3.61 | 0.51 | 7.79 | 0.95 |
| | 4 | IPY004 | BDL | 33.0 | 10.9 | 1.79 | 1.12 | 4.77 | 0.94 |
| | 5 | IPY005 | 12.7 | 62.1 | 15.6 | 3.18 | 0.64 | 12.2 | 1.01 |
| | 6 | IPY006 | 7.49 | 36.4 | 11.7 | 0.53 | 0.71 | 10.7 | 1.25 |
| | 7 | IPY007 | 3.92 | 33.8 | 8.22 | 1.15 | BDL | BDL | 0.55 |
| | 8 | IPY008 | 16.2 | 50.4 | 16.6 | 0.97 | 0.41 | 8.90 | 1.37 |
| | 9 | IPY009 | 28.8 | 77.8 | 22.1 | 0.38 | BDL | 12.7 | 0.47 |
| | 10 | IPY010 | 8.92 | 26.0 | 7.51 | BDL | 0.72 | BDL | BDL |
| | 11 | IPY011 | 9.45 | 53.7 | 16.4 | BDL | 1.02 | BDL | BDL |
| | 12 | IPY013 | BDL | 44.4 | 15.7 | BDL | 0.94 | BDL | BDL |
| | 13 | IPY014 | 24.0 | 83.0 | 30.8 | 1.31 | 0.52 | 21.8 | 1.26 |
| | 14 | IPY015 | 26.4 | 52.7 | 23.3 | 0.90 | 0.47 | 17.0 | 0.97 |
| | 15 | IPY017 | 5.79 | 54.2 | 22.6 | 1.72 | 1.65 | 16.0 | 0.48 |
| | 16 | IPY018 | 9.79 | 31.9 | 12.2 | 1.95 | 0.35 | BDL | 0.36 |
| | 17 | IPY019 | 2.79 | 28.6 | 7.49 | 0.85 | 0.29 | 5.31 | 0.51 |
| | 18 | IPY020 | 6.95 | 38.8 | 15.9 | 0.67 | 0.36 | 22.3 | 0.77 |
| | 19 | IPY021 | 5.47 | 34.0 | 10.0 | 0.60 | 0.27 | 8.67 | 0.60 |
| | 20 | IPY022 | 2.01 | 42.2 | 10.7 | 0.39 | 0.24 | 6.41 | 0.37 |
| LEC | 21 | PFA215 | n.q. | 15.0 | 6.69 | 0.28 | 0.10 | n.q. | n.q. |
| | 22 | PFA175 | 2.07 | 14.5 | 3.53 | 0.52 | 0.21 | 1.08 | 0.17 |
| | 23 | PFA225 | 2.95 | 17.6 | 5.54 | 0.55 | 0.15 | 4.05 | 0.51 |
| | 24 | PFA245 | 3.09 | 23.0 | 12.3 | 1.18 | 0.37 | n.q. | n.q. |
| | 25 | PFA265 | n.q. | 34.7 | 15.1 | 1.33 | 0.36 | 0.97 | n.q. |
| | 26 | PFA285 | 5.47 | 31.0 | 11.1 | 0.60 | 0.24 | 1.81 | 0.20 |
| | 27 | PFA315 | 10.6 | 29.0 | 16.6 | 1.10 | 0.42 | 0.80 | 0.10 |

Table A8. FTOHs, FOSAs and FOSEs particle phase concentrations from Environment Canada (EC) ($\mu\text{g m}^{-3}$)

BDL, below detection limit

| Sample number | Sample ID | 6:2 FTOH | 8:2 FTOH | 10:2 FTOH | MeFOSA | EtFOSA | MeFOSE | EtFOSE |
|---------------|-----------|----------|----------|-----------|--------|--------|--------|--------|
| 1 | IPY001 | BDL | 0.66 | 0.56 | 0.17 | 0.11 | 1.41 | 0.64 |
| 2 | IPY002 | BDL | 0.88 | 0.15 | BDL | BDL | 1.12 | 0.10 |
| 3 | IPY003 | BDL | 0.44 | 0.21 | BDL | BDL | 0.96 | 0.42 |
| 4 | IPY004 | BDL | BDL | BDL | BDL | BDL | BDL | 0.22 |
| 5 | IPY005 | BDL | 0.10 | BDL | BDL | BDL | BDL | 0.38 |
| 6 | IPY006 | BDL | 0.05 | 0.08 | BDL | BDL | 1.78 | 0.88 |
| 8 | IPY008 | BDL | BDL | 0.14 | BDL | BDL | BDL | 0.07 |
| 9 | IPY009 | BDL | 0.10 | 0.07 | BDL | BDL | BDL | 0.59 |
| 10 | IPY010 | BDL | BDL | BDL | BDL | 0.15 | BDL | 3.19 |
| 13 | IPY014 | BDL | 0.60 | 0.64 | 0.21 | 0.06 | 7.35 | 1.22 |
| 14 | IPY015 | BDL | 0.13 | BDL | 0.16 | 0.03 | 3.82 | 0.95 |
| 15 | IPY017 | BDL | 0.06 | 0.20 | 0.07 | BDL | 2.60 | 0.20 |
| 16 | IPY018 | BDL | 0.96 | 0.34 | BDL | BDL | 2.42 | 0.22 |
| 17 | IPY019 | BDL | BDL | 0.24 | BDL | BDL | 4.69 | BDL |
| 18 | IPY020 | BDL | 0.93 | 0.31 | 0.26 | BDL | 0.53 | 0.67 |
| 20 | IPY022 | BDL | 0.10 | BDL | BDL | BDL | 0.55 | BDL |

Table A9. PFCAs particle phase concentrations from Environment Canada (EC) ($\mu\text{g m}^{-3}$)

BDL, below detection limit

| Sample number | Sample ID | PFDA | PFUnDA | PFDoDA | PFTeDA |
|---------------|-----------|-------|--------|--------|--------|
| 1 | IPY001 | 0.012 | 0.020 | 0.035 | 0.012 |
| 2 | IPY002 | 0.009 | 0.076 | 0.056 | 0.014 |
| 3 | IPY003 | BDL | BDL | 0.022 | 0.007 |
| 4 | IPY004 | BDL | BDL | 0.012 | BDL |
| 5 | IPY005 | BDL | 0.015 | 0.066 | 0.013 |
| 6 | IPY006 | BDL | BDL | BDL | BDL |
| 8 | IPY008 | BDL | 0.065 | 0.081 | 0.030 |
| 9 | IPY009 | BDL | 0.019 | 0.023 | 0.007 |
| 10 | IPY010 | BDL | BDL | 0.011 | BDL |
| 13 | IPY014 | BDL | BDL | BDL | BDL |
| 14 | IPY015 | BDL | BDL | BDL | BDL |
| 15 | IPY017 | BDL | BDL | 0.018 | BDL |
| 16 | IPY018 | BDL | BDL | BDL | BDL |
| 17 | IPY019 | BDL | BDL | BDL | BDL |
| 18 | IPY020 | BDL | BDL | BDL | BDL |
| 20 | IPY022 | BDL | BDL | BDL | BDL |