Supplement of

The ESA MIPAS/Envisat level2-v8 dataset: 10 years of measurements retrieved with ORM v8.22

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S1 Supporting material

S1.1 MicroWindows and file format

This section contains the tables with the list of the MWs (cm\(^{-1}\)) and altitude range (km) used for the retrievals of MIPAS measurements in the FR nominal mode and OR nominal and middle atmosphere modes. Note that specific spectral points within the MWs might be excluded from the retrieval to minimise the total errors. The last table reports the information on the format of the database files.

Table S1. List of \(pT\) microwindows

| Label   | Spectral Range (cm\(^{-1}\)) | Altitude Range (km) |
|---------|-----------------------------|---------------------|
| **FR Mode** |                             |                     |
| PT__0511 | 789.0000 - 792.0000         | 6.0 - 68.0          |
| PT__0512 | 727.7750 - 730.0500         | 12.0 - 60.0         |
| PT__0513 | 757.3000 - 760.2250         | 6.0 - 52.0          |
| PT__0514 | 739.8250 - 742.8250         | 27.0 - 68.0         |
| PT__0515 | 755.0000 - 757.0500         | 6.0 - 36.0          |
| PT__0516 | 732.7500 - 733.5500         | 15.0 - 39.0         |
| PT__0517 | 686.0250 - 688.5000         | 27.0 - 60.0         |
| PT__0518 | 700.7000 - 703.5000         | 21.0 - 42.0         |
| PT__0519 | 719.9500 - 722.9500         | 12.0 - 68.0         |
| PT__0520 | 731.4000 - 732.2750         | 12.0 - 36.0         |
| **OR Mode** |                             |                     |
| PT__0361 | 740.9375 - 743.9375         | 15.0 - 70.0         |
| PT__0362 | 791.6250 - 792.2500         | 9.0 - 21.0          |
| PT__0363 | 937.5000 - 940.5000         | 6.0 - 23.0          |
| PT__0364 | 942.3125 - 944.6250         | 6.0 - 27.0          |
| PT__0365 | 703.3750 - 703.8750         | 21.0 - 37.0         |
| PT__0366 | 719.0625 - 720.6250         | 27.0 - 66.0         |
| **MA Mode** |                             |                     |
| PT__0361 | 740.9375 - 743.9375         | 15.0 - 70.0         |
| PT__0365 | 703.3750 - 703.8750         | 21.0 - 37.0         |
| PT__0366 | 719.0625 - 720.6250         | 27.0 - 66.0         |
| PT__0421 | 692.6250 - 695.6250         | 18.0 - 57.0         |
| PT__0422 | 1043.7500 - 1046.7500       | 18.0 - 69.0         |
| PT__0423 | 687.0625 - 690.0625         | 54.0 - 87.0         |
| PT__0424 | 716.0000 - 719.0000         | 18.0 - 45.0         |
| PT__0425 | 1032.7500 - 1035.7500       | 21.0 - 51.0         |
| PT__0426 | 690.1250 - 692.5625         | 18.0 - 57.0         |
| PT__0427 | 712.8125 - 715.6250         | 18.0 - 45.0         |
| PT__0428 | 720.6875 - 722.3750         | 57.0 - 93.0         |
| PT__0429 | 1062.6250 - 1065.6250       | 18.0 - 69.0         |
| PT__0430 | 698.1250 - 701.1250         | 18.0 - 57.0         |
Table S2. List of H$_2$O microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode** |                           |                     |
| H2O_0511 | 1576.2250 - 1579.2250      | 15.0 - 68.0         |
| H2O_0512 | 782.9500 - 785.6000        | 6.0 - 30.0          |
| H2O_0513 | 1573.2000 - 1576.1500      | 15.0 - 68.0         |
| H2O_0514 | 1616.7500 - 1619.7250      | 15.0 - 68.0         |
| H2O_0515 | 807.7000 - 809.6000        | 6.0 - 21.0          |
| H2O_0516 | 1652.4250 - 1655.4250      | 15.0 - 68.0         |
| **OR Mode** |                           |                     |
| H2O_0341 | 1574.1250 - 1577.1250      | 12.0 - 70.0         |
| H2O_0342 | 1224.8125 - 1227.8125      | 6.0 - 25.0          |
| H2O_0343 | 1434.1875 - 1437.1875      | 18.0 - 70.0         |
| H2O_0344 | 1402.5625 - 1405.5625      | 6.0 - 70.0          |
| H2O_0345 | 953.6250 - 956.6250        | 6.0 - 21.0          |
| **MA Mode** |                           |                     |
| H2O_0341 | 1574.1250 - 1577.1250      | 18.0 - 69.0         |
| H2O_0343 | 1434.1875 - 1437.1875      | 18.0 - 69.0         |
| H2O_0431 | 1621.8125 - 1624.8125      | 18.0 - 102.0        |
| H2O_0432 | 1456.3125 - 1459.3125      | 18.0 - 87.0         |
| H2O_0433 | 1693.5625 - 1696.5625      | 18.0 - 78.0         |
| H2O_0434 | 1669.0625 - 1672.0625      | 51.0 - 87.0         |
| H2O_0435 | 1615.8750 - 1618.8750      | 18.0 - 63.0         |
| H2O_0436 | 1666.0000 - 1669.0000      | 18.0 - 102.0        |
| H2O_0437 | 1684.6875 - 1687.6875      | 18.0 - 69.0         |
| H2O_0438 | 1417.0625 - 1420.0625      | 18.0 - 81.0         |
| H2O_0439 | 1570.5000 - 1573.0625      | 18.0 - 102.0        |
**Table S3.** List of O$_3$ microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|-----------------------------|----------------------|
| **FR Mode** |                             |                      |
| O3__0511 | 763.6000 - 766.6000         | 6.0 - 60.0           |
| O3__0512 | 1043.8500 - 1046.8500       | 6.0 - 68.0           |
| O3__0513 | 1123.8500 - 1126.8500       | 6.0 - 68.0           |
| O3__0514 | 773.2500 - 776.2500         | 9.0 - 60.0           |
| O3__0515 | 736.0500 - 739.0500         | 12.0 - 60.0          |
| O3__0516 | 756.5250 - 759.5250         | 6.0 - 68.0           |
| O3__0517 | 1032.9000 - 1035.9000       | 30.0 - 68.0          |
| O3__0518 | 749.9000 - 752.9000         | 9.0 - 39.0           |
| **OR Mode** |                             |                      |
| O3__0331 | 1123.5625 - 1126.5625       | 7.5 - 70.0           |
| O3__0343 | 1043.8750 - 1046.8750       | 27.0 - 70.0          |
| O3__0333 | 1117.0000 - 1120.0000       | 6.0 - 46.0           |
| O3__0334 | 729.2500 - 732.2500         | 15.0 - 46.0          |
| O3__0335 | 756.6250 - 759.6250         | 7.5 - 37.0           |
| **MA Mode** |                             |                      |
| O3__0331 | 1123.5625 - 1126.5625       | 7.5 - 70.0           |
| O3__0343 | 1043.8750 - 1046.8750       | 27.0 - 70.0          |
| O3__0334 | 729.2500 - 732.2500         | 15.0 - 46.0          |
| O3__0335 | 756.6250 - 759.6250         | 7.5 - 37.0           |
| O3__0421 | 1040.2500 - 1043.2500       | 30.0 - 87.0          |
| O3__0422 | 760.0000 - 762.9375         | 18.0 - 102.0         |
| O3__0423 | 1032.0000 - 1035.0000       | 57.0 - 102.0         |
| O3__0424 | 736.4375 - 739.4375         | 18.0 - 57.0          |
| O3__0425 | 716.6250 - 719.5625         | 18.0 - 72.0          |
| O3__0426 | 1035.0625 - 1038.0625       | 45.0 - 84.0          |
| O3__0427 | 750.1875 - 753.1875         | 18.0 - 39.0          |
| O3__0428 | 1026.8750 - 1029.8750       | 54.0 - 84.0          |
| O3__0429 | 753.5625 - 756.5625         | 18.0 - 99.0          |
| O3__0430 | 1048.6250 - 1051.6250       | 48.0 - 87.0          |
### Table S4. List of HNO<sub>3</sub> microwindows

| Label   | Spectral Range (cm<sup>-1</sup>) | Altitude Range (km) |
|---------|---------------------------------|---------------------|
| **FR Mode**                                  |                    |
| HNO30511 | 885.0000 888.0000               | 6.0 68.0            |
| HNO30512 | 877.8000 880.8000               | 6.0 60.0            |
| HNO30513 | 866.5000 869.5000               | 6.0 68.0            |
| HNO30514 | 869.5250 872.5250               | 6.0 68.0            |
| HNO30515 | 761.0750 764.0750               | 6.0 52.0            |
| HNO30516 | 888.0250 891.0250               | 6.0 68.0            |
| HNO30517 | 863.4750 866.4750               | 9.0 68.0            |
| HNO30518 | 881.9750 884.9750               | 9.0 68.0            |
| **OR Mode**                                  |                    |
| HNO30331 | 877.0000 880.0000               | 6.0 70.0            |
| HNO30332 | 836.8750 839.8750               | 6.0 46.0            |
| HNO30333 | 893.6250 896.6250               | 6.0 70.0            |
| HNO30334 | 859.5625 862.5625               | 7.5 70.0            |
| HNO30335 | 918.9375 921.9375               | 7.5 43.0            |
| **MA Mode**                                  |                    |
| HNO30331 | 877.0000 880.0000               | 6.0 70.0            |
| HNO30333 | 893.6250 896.6250               | 6.0 70.0            |
| HNO30334 | 859.5625 862.5625               | 7.5 70.0            |
| HNO30421 | 887.0000 890.0000               | 18.0 102.0          |
| HNO30422 | 864.2500 867.2500               | 18.0 102.0          |
| HNO30423 | 867.3125 870.3125               | 18.0 102.0          |
| HNO30424 | 760.1250 763.1250               | 18.0 54.0           |
| HNO30425 | 1324.2500 1327.2500             | 27.0 63.0           |
| HNO30426 | 883.9375 886.9375               | 18.0 102.0          |
| HNO30427 | 904.4375 907.4375               | 18.0 102.0          |
| HNO30428 | 890.0625 893.0625               | 18.0 102.0          |
| HNO30429 | 1315.9375 1318.9375             | 30.0 66.0           |
Table S5. List of CH₄ microwindows

| Label  | Spectral Range (cm⁻¹) | Altitude Range (km) |
|--------|-----------------------|---------------------|
| **FR Mode** |                        |                     |
| CH4_0511 | 1227.9000 1230.9000 | 6.0 68.0            |
| CH4_0512 | 1304.4500 1307.4500 | 18.0 68.0           |
| CH4_0513 | 1215.6750 1218.6750 | 6.0 68.0            |
| CH4_0514 | 1294.8250 1297.8250 | 12.0 60.0           |
| CH4_0515 | 1238.0000 1241.0000 | 6.0 68.0            |
| CH4_0516 | 1233.6250 1236.6250 | 6.0 60.0            |
| CH4_0517 | 1300.7250 1303.7250 | 36.0 68.0           |
| CH4_0518 | 1222.3000 1225.3000 | 6.0 68.0            |
| CH4_0519 | 1246.4250 1249.4250 | 6.0 60.0            |
| **OR Mode** |                        |                     |
| CH4_0331 | 1228.4375 1231.4375 | 6.0 66.0            |
| CH4_0332 | 1304.5625 1307.5625 | 19.5 70.0           |
| CH4_0333 | 1281.5625 1284.5625 | 12.0 40.0           |
| CH4_0334 | 1219.0625 1222.0625 | 7.5 23.0            |
| CH4_0335 | 1233.8125 1236.8125 | 6.0 18.0            |
| **MA Mode** |                        |                     |
| CH4_0331 | 1228.4375 1231.4375 | 6.0 66.0            |
| CH4_0332 | 1304.5625 1307.5625 | 19.5 70.0           |
| CH4_0333 | 1281.5625 1284.5625 | 12.0 40.0           |
| CH4_0421 | 1340.1250 1343.1250 | 18.0 75.0           |
| CH4_0422 | 1234.3750 1237.3750 | 18.0 102.0          |
| CH4_0423 | 1301.5000 1304.5000 | 18.0 75.0           |
| CH4_0424 | 1259.1875 1262.1875 | 18.0 63.0           |
| CH4_0425 | 1274.5625 1277.5625 | 18.0 87.0           |
| CH4_0426 | 1336.5000 1339.5000 | 18.0 66.0           |
| CH4_0427 | 1269.1875 1272.1875 | 18.0 102.0          |
| CH4_0428 | 1245.0000 1248.0000 | 18.0 57.0           |
| CH4_0429 | 1324.6875 1327.6875 | 18.0 81.0           |
Table S6. List of \( \text{N}_2\text{O} \) microwindows

| Label  | Spectral Range (cm\(^{-1}\)) | Altitude Range (km) |
|--------|------------------------------|---------------------|
| **FR Mode**                  |                              |                     |
| N2O_0511 | 1271.6250 - 1274.6250        | 12.0 60.0           |
| N2O_0512 | 1159.7500 - 1162.7500        | 6.0 47.0            |
| N2O_0513 | 1268.6000 - 1271.6000        | 12.0 68.0           |
| N2O_0514 | 1289.0000 - 1291.9500        | 12.0 68.0           |
| N2O_0515 | 1231.8500 - 1234.8250        | 6.0 24.0            |
| N2O_0516 | 1264.8250 - 1267.8250        | 9.0 60.0            |
| N2O_0517 | 1256.6000 - 1259.6000        | 9.0 68.0            |
| N2O_0518 | 1140.7250 - 1143.6500        | 6.0 42.0            |
| **OR Mode**                  |                              |                     |
| N2O_0331 | 1271.6250 - 1274.6250        | 15.0 58.0           |
| N2O_0332 | 1230.3750 - 1233.3125        | 6.0 21.0            |
| N2O_0333 | 1233.5625 - 1235.8125        | 7.5 34.0            |
| N2O_0334 | 1276.3125 - 1279.3125        | 15.0 58.0           |
| N2O_0335 | 1256.6875 - 1259.6250        | 9.0 27.0            |
| **MA Mode**                  |                              |                     |
| N2O_0331 | 1271.6250 - 1274.6250        | 15.0 58.0           |
| N2O_0334 | 1276.3125 - 1279.3125        | 15.0 58.0           |
| N2O_0421 | 1261.6875 - 1264.6875        | 18.0 102.0          |
| N2O_0422 | 1258.5000 - 1261.5000        | 18.0 63.0           |
| N2O_0423 | 1264.7500 - 1267.7500        | 18.0 57.0           |
| N2O_0424 | 1288.8125 - 1291.8125        | 18.0 102.0          |
| N2O_0425 | 1268.5625 - 1271.5625        | 18.0 60.0           |
| N2O_0426 | 1280.0000 - 1282.8750        | 18.0 102.0          |
| N2O_0427 | 1283.4375 - 1286.4375        | 18.0 102.0          |
**Table S7.** List of NO₂ microwindows

| Label    | Spectral Range (cm⁻¹) | Altitude Range (km) |
|----------|-----------------------|---------------------|
| **FR Mode** |                       |                     |
| NO2_0511 | 1623.2250 1626.2250   | 15.0 68.0           |
| NO2_0512 | 1612.4500 1615.4500   | 15.0 68.0           |
| NO2_0513 | 1598.8000 1601.8000   | 12.0 68.0           |
| NO2_0514 | 1627.5500 1630.5500   | 15.0 60.0           |
| NO2_0515 | 1602.5250 1605.5250   | 12.0 68.0           |
| NO2_0516 | 1595.7750 1598.7750   | 12.0 68.0           |
| **OR Mode** |                       |                     |
| NO2_0341 | 1604.4375 1607.4375   | 6.0 70.0            |
| NO2_0342 | 1626.0000 1629.0000   | 15.0 70.0           |
| NO2_0343 | 1612.8125 1615.8125   | 6.0 70.0            |
| NO2_0344 | 1622.9375 1625.9375   | 25.0 70.0           |
| NO2_0345 | 1570.5000 1573.5000   | 15.0 27.0           |
| **MA Mode** |                       |                     |
| NO2_0342 | 1626.0000 1629.0000   | 15.0 70.0           |
| NO2_0343 | 1612.8125 1615.8125   | 6.0 70.0            |
| NO2_0344 | 1622.9375 1625.9375   | 25.0 70.0           |
| NO2_0421 | 1617.2500 1620.2500   | 18.0 102.0          |
| NO2_0422 | 1597.0000 1600.0000   | 18.0 81.0           |
| NO2_0426 | 1629.0625 1632.0625   | 18.0 81.0           |
| NO2_0427 | 1632.7500 1635.5000   | 18.0 75.0           |
| NO2_0423 | 1584.0625 1587.0625   | 18.0 102.0          |
| NO2_0428 | 1579.3750 1582.3750   | 18.0 81.0           |
| NO2_0425 | 1593.3125 1596.1875   | 18.0 102.0          |

**Table S8.** List of CFC-11 microwindows

| Label    | Spectral Range (cm⁻¹) | Altitude Range (km) |
|----------|-----------------------|---------------------|
| **FR Mode** |                       |                     |
| F11_0511 | 849.4250 852.4250     | 6.0 68.0            |
| F11_0512 | 841.9000 844.9000     | 6.0 47.0            |
| **OR Mode** |                       |                     |
| F11_0331 | 849.5000 852.5000     | 7.5 58.0            |
| F11_0332 | 842.9375 845.9375     | 6.0 70.0            |
| **MA Mode** |                       |                     |
| F11_0331 | 849.5000 852.5000     | 18.0 57.0           |
| F11_0332 | 842.9375 845.9375     | 18.0 69.0           |
Table S9. List of CFC-12 microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode** |                            |                     |
| F12_0511 | 921.3250 - 924.3250        | 6.0 - 68.0          |
| F12_0512 | 1159.8750 - 1162.8500     | 6.0 - 36.0          |
| F12_0513 | 918.3000 - 921.3000       | 6.0 - 33.0          |
| F12_0514 | 924.3750 - 927.3750       | 6.0 - 52.0          |
| **OR Mode** |                            |                     |
| F12_0331 | 921.0000 - 924.0000       | 6.0 - 46.0          |
| F12_0332 | 937.0625 - 940.0625       | 12.0 - 43.0         |
| F12_0333 | 933.6250 - 936.6250       | 6.0 - 37.0          |
| F12_0334 | 917.9375 - 920.9375       | 6.0 - 70.0          |
| F12_0335 | 857.5000 - 860.5000       | 7.5 - 21.0          |
| **MA Mode** |                            |                     |
| F12_0331 | 921.0000 - 924.0000       | 18.0 - 45.0         |
| F12_0332 | 937.0625 - 940.0625       | 18.0 - 42.0         |
| F12_0333 | 933.6250 - 936.6250       | 18.0 - 36.0         |
| F12_0334 | 917.9375 - 920.9375       | 18.0 - 69.0         |
| F12_0335 | 857.5000 - 860.5000       | 18.0 - 21.0         |

Table S10. List of ClONO$_2$ microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode** |                            |                     |
| CLNO0511 | 777.6500 - 780.6250        | 15.0 - 42.0         |
| CLNO0512 | 1290.5750 - 1293.5750     | 12.0 - 42.0         |
| CLNO0513 | 808.8500 - 811.8500       | 9.0 - 36.0          |
| CLNO0514 | 805.8250 - 808.8250       | 6.0 - 39.0          |
| **OR Mode** |                            |                     |
| CLNO0331 | 777.4375 - 780.4375       | 18.0 - 37.0         |
| CLNO0332 | 1736.6875 - 1739.6875     | 7.5 - 50.0          |
| CLNO0333 | 807.3750 - 810.3750       | 15.0 - 34.0         |
| CLNO0334 | 1743.8125 - 1746.1875     | 10.5 - 31.0         |
| CLNO0335 | 1724.0000 - 1727.0000     | 13.5 - 40.0         |
| **MA Mode** |                            |                     |
| CLNO0331 | 777.4375 - 780.4375       | 18.0 - 36.0         |
| CLNO0332 | 1736.6875 - 1739.6875     | 18.0 - 48.0         |
| CLNO0333 | 807.3750 - 810.3750       | 18.0 - 33.0         |
| CLNO0334 | 1743.8125 - 1746.1875     | 18.0 - 30.0         |
| CLNO0335 | 1724.0000 - 1727.0000     | 18.0 - 39.0         |
### Table S11. List of N$_2$O$_5$ microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|-----------------------------|----------------------|
| **FR Mode** |                             |                      |
| N2O50511 | 1236.0750 1239.0750          | 6.0 52.0             |
| N2O50512 | 1225.7500 1228.7500          | 15.0 52.0            |
| N2O50513 | 1244.6750 1247.6500          | 15.0 52.0            |
| N2O50514 | 1363.2750 1366.2750          | 18.0 52.0            |
| N2O50515 | 1220.9500 1223.9500          | 15.0 52.0            |
| N2O50516 | 1239.1000 1242.1000          | 15.0 52.0            |
| N2O50517 | 1230.3750 1233.3750          | 15.0 52.0            |
| **OR Mode** |                             |                      |
| N2O50351 | 1225.2500 1228.2500          | 13.5 70.0            |
| N2O50352 | 1237.4375 1240.4375          | 18.0 70.0            |
| N2O50353 | 1230.3125 1233.3125          | 18.0 70.0            |
| N2O50354 | 1244.5625 1247.5625          | 16.5 70.0            |
| N2O50355 | 1220.0000 1223.0000          | 13.5 70.0            |
| **MA Mode** |                             |                      |
| N2O50351 | 1225.2500 1228.2500          | 18.0 69.0            |
| N2O50352 | 1237.4375 1240.4375          | 18.0 69.0            |
| N2O50353 | 1230.3125 1233.3125          | 18.0 69.0            |
| N2O50354 | 1244.5625 1247.5625          | 18.0 69.0            |
| N2O50355 | 1220.0000 1223.0000          | 18.0 69.0            |

### Table S12. List of C$_2$H$_6$ microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|-----------------------------|----------------------|
| **FR Mode** |                             |                      |
| C2H60511 | 819.5250 822.5250           | 6.0 33.0             |
| C2H60512 | 829.7000 832.7000           | 6.0 33.0             |
| C2H60513 | 836.7000 839.7000           | 6.0 42.0             |
| **OR Mode** |                             |                      |
| C2H60301 | 842.5625 845.4375           | 7.5 21.0             |
| C2H60302 | 836.0000 839.0000           | 7.5 31.0             |
| C2H60303 | 832.9375 835.9375           | 7.5 27.0             |
| C2H60304 | 819.1875 821.0000           | 9.0 29.0             |
| C2H60305 | 822.0000 825.0000           | 7.5 21.0             |
**Table S13.** List of CCl₄ microwindows

| Label     | Spectral Range (cm⁻¹) | Altitude Range (km) |
|-----------|-----------------------|---------------------|
| **FR Mode** |                       |                     |
| CCL40511  | 796.3750 - 799.3750   | 6.0 - 30.0          |
| CCL40512  | 800.2750 - 803.2750   | 6.0 - 24.0          |
| CCL40513  | 792.7000 - 795.7000   | 6.0 - 33.0          |
| CCL40514  | 771.8000 - 773.7750   | 6.0 - 30.0          |
| **OR Mode** |                       |                     |
| CCL40301  | 792.8125 - 795.8125   | 9.0 - 34.0          |

**Table S14.** List of COF₂ microwindows

| Label     | Spectral Range (cm⁻¹) | Altitude Range (km) |
|-----------|-----------------------|---------------------|
| **FR Mode** |                       |                     |
| COF20511  | 773.3750 - 776.3750   | 6.0 - 47.0          |
| COF20512  | 1233.4500 - 1236.4500 | 6.0 - 39.0          |
| COF20513  | 1230.4250 - 1233.4250 | 6.0 - 42.0          |
| COF20514  | 1248.2500 - 1251.2500 | 6.0 - 68.0          |
| COF20515  | 1227.1250 - 1230.1250 | 6.0 - 47.0          |
| **OR Mode** |                       |                     |
| COF20301  | 1230.3750 - 1233.3750 | 12.0 - 40.0         |
| COF20302  | 1233.6875 - 1235.8125 | 7.5 - 19.5          |
| COF20303  | 772.0000 - 775.0000   | 18.0 - 43.0         |
| COF20304  | 1225.7500 - 1228.6875 | 16.5 - 46.0         |
| COF20305  | 1222.4375 - 1225.4375 | 10.5 - 54.0         |

**Table S15.** List of CFC-14 microwindows

| Label     | Spectral Range (cm⁻¹) | Altitude Range (km) |
|-----------|-----------------------|---------------------|
| **FR Mode** |                       |                     |
| F14_0511  | 1282.0000 - 1285.0000 | 9.0 - 68.0          |
| F14_0512  | 1285.0250 - 1288.0250 | 9.0 - 47.0          |
| F14_0513  | 1278.8250 - 1281.8250 | 9.0 - 60.0          |
| F14_0514  | 1256.4500 - 1259.4500 | 9.0 - 30.0          |
| **OR Mode** |                       |                     |
| F14_0301  | 1283.3125 - 1286.3125 | 9.0 - 43.0          |
| F14_0302  | 1280.2500 - 1283.2500 | 37.0 - 62.0         |
| F14_0303  | 1277.3125 - 1280.1875 | 6.0 - 25.0          |
| F14_0304  | 1256.6875 - 1258.2500 | 9.0 - 29.0          |
| F14_0305  | 1266.0000 - 1267.5625 | 6.0 - 21.0          |
Table S16. List of HCFC-22 microwindows

| Label   | Spectral Range (cm\(^{-1}\)) | Altitude Range (km) |
|---------|-------------------------------|---------------------|
|         | FR Mode                       |                     |
| F22_0511 | 806.9250 – 809.9250            | 6.0 – 30.0          |
| F22_0512 | 826.6500 – 829.6500            | 6.0 – 52.0          |
| F22_0513 | 818.6750 – 821.6750            | 12.0 – 39.0         |
| F22_0514 | 803.6500 – 806.6500            | 6.0 – 27.0          |
|         | OR Mode                       |                     |
| F22_0301 | 828.4375 – 829.1250            | 6.0 – 34.0          |
| F22_0302 | 806.5000 – 809.5000            | 7.5 – 19.5          |
| F22_0303 | 820.3750 – 823.3750            | 6.0 – 37.0          |
| F22_0304 | 803.4375 – 806.4375            | 6.0 – 37.0          |
| F22_0305 | 836.5625 – 839.5625            | 9.0 – 34.0          |

Table S17. List of HCN microwindows

| Label   | Spectral Range (cm\(^{-1}\)) | Altitude Range (km) |
|---------|-------------------------------|---------------------|
|         | FR Mode                       |                     |
| HCN_0511 | 743.3000 – 746.2500            | 9.0 – 68.0          |
| HCN_0512 | 711.4750 – 713.7000            | 15.0 – 60.0         |
| HCN_0513 | 753.2250 – 754.1250            | 6.0 – 30.0          |
| HCN_0514 | 747.1750 – 747.8500            | 6.0 – 27.0          |
| HCN_0515 | 761.9250 – 762.5250            | 6.0 – 24.0          |
|         | OR Mode                       |                     |
| HCN_0301 | 747.1875 – 747.6875            | 6.0 – 18.0          |
| HCN_0302 | 744.1875 – 745.0625            | 9.0 – 29.0          |
| HCN_0303 | 711.0625 – 714.0625            | 6.0 – 70.0          |
| HCN_0304 | 1370.0000 – 1372.1250          | 6.0 – 23.0          |
| HCN_0305 | 762.0000 – 762.3750            | 9.0 – 21.0          |

Table S18. List of HOCl microwindows

| Label   | Spectral Range (cm\(^{-1}\)) | Altitude Range (km) |
|---------|-------------------------------|---------------------|
|         | FR Mode                       |                     |
| HOCL0511 | 1254.5250 – 1257.5250          | 6.0 – 68.0          |
| HOCL0512 | 1231.7500 – 1234.7500          | 9.0 – 52.0          |
|         | OR Mode                       |                     |
| HOCL0301 | 1226.9375 – 1229.9375          | 6.0 – 70.0          |
**Table S19.** List of OCS microwindows

| Label      | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|------------|----------------------------|---------------------|
| **FR Mode**                          |                            |                     |
| OCS_0511   | 863.7000                   | 866.7000            | 6.0                 | 27.0                |
| OCS_0512   | 844.2750                   | 847.2750            | 6.0                 | 68.0                |
| OCS_0513   | 2050.7250                  | 2053.5750           | 6.0                 | 42.0                |
| OCS_0514   | 849.4500                   | 852.4500            | 6.0                 | 36.0                |
| OCS_0515   | 867.9500                   | 870.9500            | 6.0                 | 39.0                |
| **OR Mode**                          |                            |                     |
| OCS_0301   | 843.6250                   | 846.6250            | 6.0                 | 27.0                |
| OCS_0302   | 2050.1875                  | 2053.1875           | 6.0                 | 37.0                |
| OCS_0303   | 847.8750                   | 850.8750            | 6.0                 | 27.0                |
| OCS_0304   | 840.5625                   | 843.5625            | 6.0                 | 27.0                |
| OCS_0305   | 854.0000                   | 857.0000            | 6.0                 | 40.0                |

**Table S20.** List of SF₆ microwindows

| Label      | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|------------|----------------------------|---------------------|
| **FR Mode**                          |                            |                     |
| SF6_0511   | 945.7250                   | 948.7250            | 6.0                 | 39.0                |
| SF6_0512   | 949.6500                   | 952.6500            | 6.0                 | 27.0                |
| SF6_0513   | 941.8000                   | 944.8000            | 6.0                 | 36.0                |
| **OR Mode**                          |                            |                     |
| SF6_0301   | 945.0000                   | 948.0000            | 6.0                 | 23.0                |
| SF6_0302   | 940.8125                   | 943.8125            | 6.0                 | 15.0                |
| SF6_0303   | 948.0625                   | 949.5625            | 13.5                | 34.0                |
| SF6_0304   | 949.6250                   | 951.6250            | 6.0                 | 16.5                |
| SF6_0305   | 938.8125                   | 940.7500            | 6.0                 | 25.0                |

**Table S21.** List of C₂H₂ microwindows

| Label      | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|------------|----------------------------|---------------------|
| **FR Mode**                          |                            |                     |
| C2H20511   | 766.3750                   | 767.5000            | 6.0                 | 36.0                |
| C2H20512   | 771.0250                   | 772.6500            | 6.0                 | 27.0                |
| C2H20513   | 774.9500                   | 776.3750            | 6.0                 | 18.0                |
| **OR Mode**                          |                            |                     |
| C2H20301   | 763.2500                   | 766.1875            | 6.0                 | 23.0                |
| C2H20302   | 769.9375                   | 772.8750            | 6.0                 | 16.5                |
| C2H20303   | 766.3125                   | 767.5625            | 6.0                 | 19.5                |
**Table S22.** List of CH$_3$Cl microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode** |                            |                     |
| CHCL0511 | 745.4500 - 746.7500          | 6.0 - 42.0          |
| CHCL0512 | 748.4750 - 749.7500          | 6.0 - 42.0          |
| CHCL0513 | 751.5250 - 752.5750          | 6.0 - 30.0          |
| CHCL0514 | 754.4000 - 755.7500          | 6.0 - 39.0          |
| **OR Mode** |                            |                     |
| CHCL0301 | 748.5000 - 749.3125          | 6.0 - 12.0          |
| CHCL0302 | 1458.4375 - 1461.4375        | 6.0 - 31.0          |
| CHCL0303 | 745.3125 - 746.6250          | 6.0 - 31.0          |
| CHCL0304 | 738.1875 - 741.1875          | 6.0 - 40.0          |
| CHCL0305 | 751.5625 - 752.6875          | 7.5 - 21.0          |

**Table S23.** List of ClO microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode** |                            |                     |
| CLO_0511 | 855.8000 - 858.8000         | 12.0 - 42.0         |
| **OR Mode** |                            |                     |
| CLO_0301 | 853.7500 - 856.7500         | 13.5 - 66.0         |

**Table S24.** List of COCl$_2$ microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode** |                            |                     |
| COCL0511 | 843.6250 - 846.6250         | 6.0 - 36.0          |
| COCL0512 | 849.2000 - 852.2000         | 6.0 - 36.0          |
| COCL0513 | 860.2750 - 863.2750         | 6.0 - 24.0          |
| COCL0514 | 838.2750 - 840.9500         | 6.0 - 27.0          |
| **OR Mode** |                            |                     |
| COCL0301 | 843.8125 - 846.8125         | 10.5 - 37.0         |
| COCL0302 | 848.0000 - 851.0000         | 9.0 - 37.0          |
| COCL0303 | 839.2500 - 842.2500         | 13.5 - 54.0         |
| COCL0304 | 859.7500 - 862.7500         | 9.0 - 29.0          |
| COCL0305 | 854.0000 - 857.0000         | 9.0 - 31.0          |
### Table S25. List of CFC-113 microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode**                          |
| F1130511 | 915.5500 918.5500         | 6.0 18.0            |
| F1130512 | 1215.2000 1216.5750       | 6.0 27.0            |
| F1130513 | 823.7750 826.7750         | 9.0 21.0            |
| F1130514 | 908.7250 911.7250         | 6.0 27.0            |
| **OR Mode**                          |
| F1130301 | 905.0625 908.0625         | 9.0 27.0            |
| F1130302 | 823.3125 826.3125         | 9.0 23.0            |
| F1130303 | 901.0625 904.0625         | 10.5 21.0           |
| F1130304 | 918.5000 921.4375         | 9.0 19.5            |
| F1130305 | 915.4375 918.4375         | 7.5 23.0            |

### Table S26. List of CFC-114 microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode**                          |
| F1140511 | 850.0500 851.7500         | 6.0 18.0            |
| F1140512 | 848.3000 850.0250         | 6.0 27.0            |
| F1140513 | 851.7750 854.7750         | 6.0 30.0            |
| F1140514 | 840.2000 842.7000         | 6.0 21.0            |
| **OR Mode**                          |
| F1140301 | 848.0000 850.0625         | 9.0 21.0            |
| F1140302 | 850.1250 851.7500         | 13.5 25.0           |
| F1140303 | 854.4375 857.3750         | 6.0 21.0            |
| F1140304 | 837.5625 840.5625         | 7.5 21.0            |

### Table S27. List of H$_2$O$_2$ microwindows

| Label   | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|---------|----------------------------|---------------------|
| **FR Mode**                          |
| H2O20511 | 1248.4750 1251.4750       | 6.0 68.0            |
| H2O20512 | 1232.7000 1235.7000       | 6.0 47.0            |
| **OR Mode**                          |
| H2O20301 | 1232.4375 1235.3750       | 6.0 16.5            |
| H2O20302 | 1230.3125 1232.3750       | 6.0 15.0            |
Table S28. List of HDO microwindows

| Label    | Spectral Range (cm$^{-1}$) | Altitude Range (km) |
|----------|---------------------------|---------------------|
| **FR Mode**                                  |                       |                     |
| HDO_0511 | 1420.6750 - 1423.6500     | 12.0 - 68.0         |
| HDO_0512 | 1218.6750 - 1221.6500     | 6.0 - 30.0          |
| HDO_0513 | 1370.8750 - 1373.7500     | 12.0 - 52.0         |
| HDO_0514 | 1433.4250 - 1436.4250     | 12.0 - 68.0         |
| HDO_0515 | 1450.7500 - 1453.7500     | 12.0 - 47.0         |
| HDO_0516 | 1468.4250 - 1471.4250     | 12.0 - 60.0         |
| **OR Mode**                                  |                       |                     |
| HDO_0301 | 1420.6875 - 1423.6875     | 7.5 - 58.0          |
| HDO_0302 | 1218.8125 - 1221.8125     | 6.0 - 21.0          |
| HDO_0303 | 1450.7500 - 1453.7500     | 6.0 - 40.0          |
| HDO_0304 | 1468.3125 - 1471.3125     | 6.0 - 50.0          |
| HDO_0305 | 1412.6250 - 1415.6250     | 6.0 - 40.0          |
Table S29. List of the variables contained in the standard and extended files. The variables names are preceded by their type (i.e. int = integer variable, float=real variable). The dimension of each variable is reported in the parentheses. Beware that some variables are reported in a different way in the standard and in the extended files. To get the complete information we suggest to read the document https://earth.esa.int/eogateway/documents/20142/37627/IODD+mipasNetCDF4.pdf/21dd1b7f-e581-1205-9d62-e098a1773f57

| standard file                      | extended file                     |
|------------------------------------|-----------------------------------|
| double time(time)                  | double time(time)                 |
| char L1b_id(time, len_L1bid)       | char L1b_id(time, len_L1bid)      |
| int processor_patchlevel(time)     | int processor_patchlevel(time)    |
| byte auxdata_subversion(time)      | byte auxdata_subversion(time)     |
| int orbit_id(time)                 | int orbit_id(time)                |
| int scan_id(time)                  | int scan_id(time)                 |
| byte obs_mode_flag(time)           | byte obs_mode_flag(time)          |
| float chi2(time)                   | float chi2(time)                  |
| float cost_function(time)          | float cost_function(time)         |
| float lambda_marq(time)            | float lambda_marq(time, targets)  |
| byte day�试(time)                 | byte day_night(time)              |
| float longitude(time)              | float longitude(time)             |
| float latitude(time)               | float latitude(time)              |
| float solar_zenith_angle(time)     | float solar_zenith_angle(time)    |
| float orbital_coordinate(time)     | float orbital_coordinate(time)    |
| float ECMWF_altitude_shift(time)   | float ECMWF_altitude_shift(time)  |
| byte conv_id(time)                 | byte conv_id(time)                |
| byte quality_flag(time)            | byte质量_flag(time)              |
| byte post_quality_flag(time)       | byte post_quality_flag(time)      |
| float pressure(time, level)        | float longitude_profile(time, level) |
| float pressure_error(time, level)  | float pressure_profile(time, level) |
| float height(time, level)          | float pressure(time, level)       |
| float height_error(time, level)    | float pressure_error(time, level) |
| float temperature(time, level)     | float pressure(time, level)       |
| float temperature_error(time, level)| float pressure(time, level)       |
| float profile(time, level)         | float pressure_error(time, level) |
| float profile_error(time, level)   | float pressure(time, level)       |
| float covariance_matrix(time, cmdim) | float pressure(time, level)       |
| float averaging_kernel(time, level, level) | float pressure(time, level)       |
| float extended_height(time, extended_level) | float extended_height(time, extended_level) |
| float extended_pressure(time, extended_level) | float extended_pressure(time, extended_level) |
| float extended_profile(time, extended_level) | float extended_profile(time, extended_level) |
| float_a_priori_profile(time, level) | float_a_priori_profile(time, level) |
| float_a_priori_covariance(time, cmdim) | float_a_priori_covariance(time, cmdim) |
| float error_p_time(time, cmdim)    | float extended_left_gradient(time, n_gradients, extended_level) |
|                                    | float extended_right_gradient(time, n_gradients, extended_level) |
|                                    | float a_priori_state_vector(time, parameters) |
|                                    | float a_priori_full_covariance(time, cmdim) |