The ESA MIPAS/ENVISAT Level2-v8 dataset: 10 years of measurements retrieved with ORM v8 - Supporting Material

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Abstract. The observations acquired during the full mission of the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) instrument, on board the European Space Agency ENVISAT satellite, have been analysed with version 8.22 of the Optimised Retrieval Model (ORM), originally developed as the scientific prototype of the ESA level 2 processor for MIPAS observations. The results of the analyses have been included into the MIPAS level 2 version 8 (level2-v8) database containing atmospheric fields of pressure, temperature and volume mixing ratio of MIPAS main targets H_2O, O_3, HNO_3, CH_4, N_2O, and NO_2, along with the minor gases $CFC-11$, $ClONO_2$, N_2O_5, $CFC-12$, COF_2, CCl_4, CF_4, $HCFC-22$, C_2H_2, CH_3Cl, $COCl_2$, C_2H_6, OCS, HDO. The database covers all the measurements acquired by MIPAS in the nominal measurement mode of the Full Resolution (FR) part of the mission (from July 2002 to March 2004) and all the observation modes of the Optimised Resolution (OR) part (from January 2005 to April 2012). The number of species included in the MIPAS level2-v8 data-set

makes it of particular importance for the studies of stratospheric chemistry. The database is considered by ESA the final release of the MIPAS level 2 products.

The ORM algorithm is operated at the vertical grid coincident to the tangent altitudes of the observations or to a subset of them, spanning (in the nominal mode) the altitude range from 6 to 68 km in the FR phase and from 6 to 70 km in the OR period. In the latitude domain, FR profiles are spaced by about 4.7 degrees while the OR profiles are spaced by about 3.7 degrees. For each retrieved species the auxiliary data and the retrieval choices are described. Each product is characterised in terms of the retrieval error, spatial resolution, and 'useful' vertical range in both phases of the MIPAS mission. These depend on the characteristics of the measurements (spectral and vertical resolution of the measurements), on the retrieval choices (number of spectral points included in the analyses, number of altitudes included in the vertical retrieval grid), and on the information content of the measurements for each trace species. For temperature, water vapour, ozone and nitric acid the number of degrees of freedom is significantly larger in the OR phase than in the FR one, mainly due to the finer vertical measurement grid. In the FR phase some trace species are characterised by a smaller retrieval error with respect to the OR phase, mainly due to the larger number of spectral points used in the analyses, along with the reduced vertical resolution. The way of handling possible caveats (negative VMR, vertical grid representation) is discussed. The quality of the retrieved profiles is assessed through four criteria, two providing information on the successful convergence of the retrieval iterations, one on the capability of the retrieval to reproduce the measurements, and one on the presence of outliers. An easy way to identify and filter the problematic profiles with the information contained in the output files is provided. MIPAS level2-v8 data are available to the scientific community through the ESA portal https://earth.esa.int/eogateway/.

S1 Supporting material

S2 MicroWindows

this sections 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.

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_2O 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_3 microwindows

Label	Spectral Range (cm^{-1})		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 CH_4 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 N_2O 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	1259.5625	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 NO_2 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_2O_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	12.0	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_2H_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 CCl_4 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 COF_2 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 SF_6 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 C_2H_2 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_3Cl 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_2O_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

S3 Output file variables

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)
	int gauss_iterations(time)
	int marquardt_iterations(time)
float lambda_marq(time)	float lambda_marq(time, targets)
byte day_night(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 post_quality_flag(time)	
	float longitude_profile(time,level)
	float latitude_profile(time,level)
	float orbital_coordinate_profile(time,level)
float pressure(time, level)	float pressure(time,level)
float pressure_error(time, level)	float pressure_error(time,level)
float height(time, level)	float height(time, level)
float height_error(time, level)	
float temperature(time, level)	float temperature(time, level)
float temperature_error(time, level)	float temperature_error(time, level)
float profile(time, level)	
float profile_error(time, level)	
float covariance_matrix(time, cmdim)	
float averaging_kernel(time, level, level)	
	int nparam_per_target(time, targets)
	byte param_units_flag(time, targets)
	int selected_occupation_matrixflag(time)
	byte effective_occupation_matrix(time, mwindows,level)
	byte retrieval_vectors(time, species, level)
	float state_vector(time, parameters)
	float full_covariance_matrix(time, cmdim)
	float full_averaging_kernel(time, parameters, parameters)
float extended_height(time, extended_level)	float extended_height(time, extended_level)
float extended_pressure(time, extended_level)	
float extended_profile(time, extended_level)	
float a_priori_profile(time, level)	
float a_priori_covariance(time, cmdim)	
float error_p_t_cm(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)