4.6.3 CO_2

In the operational processor, CO_2 emission features are used for the pT retrieval on the assumption that the CO_2 profile is fixed. In order to remove this assumption, microwindows have been selected for such a joint retrieval of CO_2, pressure and temperature, including the same *a priori* pointing information as used for the p, T retrieval. A related problem is that, since variations in CO_2 are generally small, a correspondingly more severe definition of 'useful' accuracy is required: $\pm 3\%$ (instead of $\pm 30\%$ used for other molecules).

Table 33: Joint CO_2, p, T Microwindows

MW	Waveno. Range		Alt.		NPts	NUse
1	685.200	688.200	6	68	2057	773
2	1931.750	1934.425	6	36	1188	548
3	1683.575	1684.800	6	30	450	274
4	739.325	742.325	47	68	484	334
5	696.325	696.775	6	52	285	284
6	713.800	714.475	15	39	252	252
7	688.225	688.650	6	52	270	261
8	1282.975	1283.925	6	24	273	157
9	1653.425	1654.425	6	30	369	254
10	1634.975	1635.375	6	30	153	119
				Total:	5781	3256

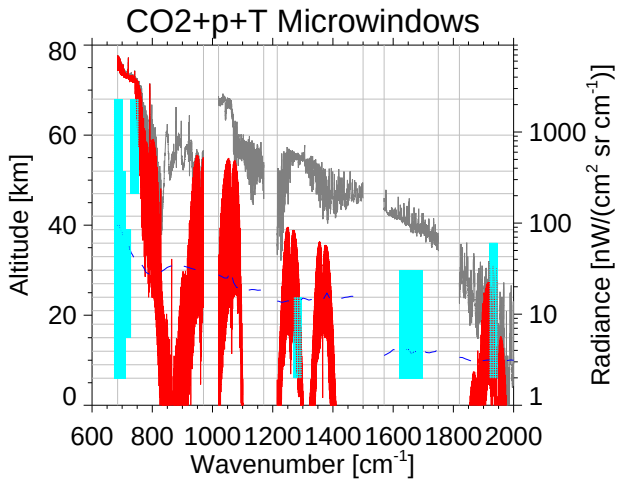

Figure 67: Joint CO_2, p, T microwindows and CO_2 spectrum.

Selected microwindows (limited to 10) are listed in Table 33 and plotted in Fig. 67. Note that several microwindows are selected in the relatively transparent 1650 cm^{-1} region which contains no CO2 lines. These may be using the O_2 continuum feature or weak CH_4 lines. Expected accuracy profiles for the retrieved parameters are shown in Figs. 68 and 69.

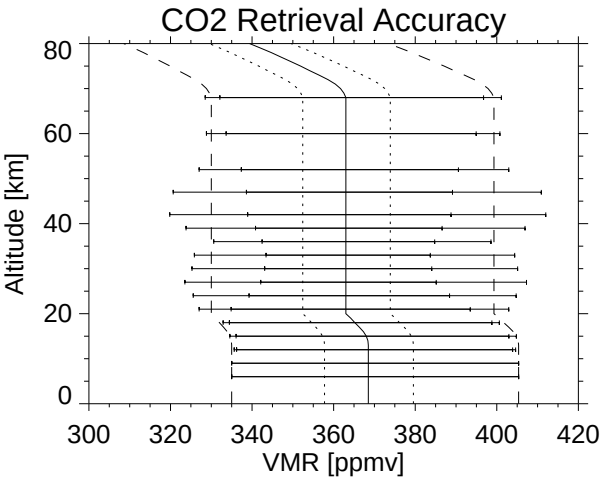

Figure 68: Assumed CO_2 profile and retrieval errors. Dashed lines indicate $\pm 10\%$ *a priori* uncertainty, dotted lines indicated $\pm 3\%$ 'useful' accuracy. Error bars indicate accuracy (outer marks) and precision (inner marks).

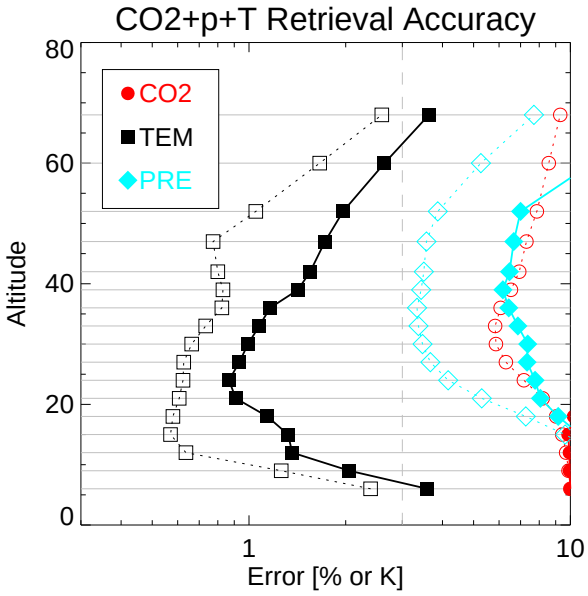

Figure 69: Retrieval errors for the joint CO_2, pressure and temperature microwindows. Solid symbols/lines are accuracy, open symbols/dashed lines are precision.

The results show that while temperature is retrieved with comparable accuracy to the current p, T retrieval (see, for example, Fig. 2), there are problems distinguishing CO_2 and pressure and neither is retrieved with useful accuracy. However, this includes a large ($\pm 25\%$) continuum uncertainty error. If the O_2 continuum in particular were better defined, this might provide independent pressure information at low altitudes.