

Testing pvoconvert and comparing to sc_td results

Earlier testing of the output of pvoconvert showed a potential indexing issue, with the wrong sky positions being assigned to each time slot. After a little work on pvoconvert, and the development of pvosummary to summarise the contents of .fits files, we now want to run through a full test, comparing to the results from sc_td to see if the problem still occurs.

Use the tape file S08103 from /pulsar/psr9/tpool directory (which was where Lucyna was working on it):

```
> cd $PVO/testing (this is just my local working directory)
> cp /pulsar/psr9/tpool/S08103 .
```

We can use sc_td to produce the .dat and .hdr files from this:

```
> sc_td -d d -A -n 1 -s S08103
```

This also produces a summary file that summarises the positions, times and block numbers for each separate file that is produced.

We also use pvoconvert to produce FITS files from S08103:

```
> pvoconvert S08103
```

Now that all the data is present, we can compare the results of the different programs.

By using pvosummary, we get a summary of the positions and date/times of each FITS file. The results are:

```
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      FILENAME:           RA           DEC   BEAM FWHM           DATE-OBS
                        [deg]
-----
S70_911207_093126.fits:  21:06:00.0000  -07:48:00.0000   0.75  1991-12-07T09:31:26.001000
S70_911207_093411.fits:  21:09:00.0000  -07:48:00.0000   0.75  1991-12-07T09:34:11.001000
S70_911207_093656.fits:  21:12:00.0000  -07:48:00.0000   0.75  1991-12-07T09:36:56.001000
S70_911207_093941.fits:  21:15:00.0000  -07:48:00.0000   0.75  1991-12-07T09:39:41.001000
S70_911207_094225.fits:  21:18:00.0000  -07:48:00.0000   0.75  1991-12-07T09:42:25.001000
S70_911207_094510.fits:  21:21:00.0000  -07:48:00.0000   0.75  1991-12-07T09:45:10.001000
S70_911207_094754.fits:  21:24:00.0000  -07:48:00.0000   0.75  1991-12-07T09:47:54.001000
S70_911207_095040.fits:  21:27:00.0000  -07:48:00.0000   0.75  1991-12-07T09:50:40.001000
S70_911207_095323.fits:  21:30:00.0000  -07:48:00.0000   0.75  1991-12-07T09:53:23.000999
S70_911207_095608.fits:  21:33:00.0000  -07:48:00.0000   0.75  1991-12-07T09:56:08.000999
S70_911207_095852.fits:  21:36:00.0000  -07:48:00.0000   0.75  1991-12-07T09:58:52.001000
S70_911207_100137.fits:  21:39:00.0000  -07:48:00.0000   0.75  1991-12-07T10:01:37.001000
S70_911207_100421.fits:  21:42:00.0000  -07:48:00.0000   0.75  1991-12-07T10:04:21.001000
S70_911207_100707.fits:  21:45:00.0000  -07:48:00.0000   0.75  1991-12-07T10:07:07.001000
S70_911207_100950.fits:  21:48:00.0000  -07:48:00.0000   0.75  1991-12-07T10:09:50.001000
S70_911207_101236.fits:  21:51:00.0000  -07:48:00.0000   0.75  1991-12-07T10:12:36.001000
S70_911207_101519.fits:  21:54:00.0000  -07:48:00.0000   0.75  1991-12-07T10:15:19.001000
S70_911207_101805.fits:  21:57:00.0000  -07:48:00.0000   0.75  1991-12-07T10:18:05.001000
S70_911207_102049.fits:  22:00:00.0000  -07:48:00.0000   0.75  1991-12-07T10:20:49.001000
S70_911207_102334.fits:  22:03:00.0000  -07:48:00.0000   0.75  1991-12-07T10:23:34.001000
S70_911207_102617.fits:  22:06:00.0000  -07:48:00.0000   0.75  1991-12-07T10:26:17.001000
S70_911207_102903.fits:  22:09:00.0000  -07:48:00.0000   0.75  1991-12-07T10:29:03.001000
S70_911207_103147.fits:  22:12:00.0000  -07:48:00.0000   0.75  1991-12-07T10:31:47.001000
S70_911207_103431.fits:  22:15:00.0000  -07:48:00.0000   0.75  1991-12-07T10:34:31.001000
S70_911207_103716.fits:  22:18:00.0000  -07:48:00.0000   0.75  1991-12-07T10:37:16.001000
S70_911207_104001.fits:  22:21:00.0000  -07:48:00.0000   0.75  1991-12-07T10:40:01.001000
S70_911207_104245.fits:  22:24:00.0000  -07:48:00.0000   0.75  1991-12-07T10:42:45.000999
S70_911207_104530.fits:  22:27:00.0000  -07:48:00.0000   0.75  1991-12-07T10:45:30.000999
S70_911207_104814.fits:  22:30:00.0000  -07:48:00.0000   0.75  1991-12-07T10:48:14.001000
S70_911207_105058.fits:  22:33:00.0000  -07:48:00.0000   0.75  1991-12-07T10:50:58.001000
-----
```

The summary file produced by `sc_td`, `S08103.summ`, also gives a summary, so this should be comparable directly with the `pvosummary` results.

#1	S08103	1	91/12/07	48597	09:31:27	359	359	420.062	256	0.125	0.300000	21:06:00.0	(75960.0)	-07:48:00
#1	S08103	2	91/12/07	48597	09:31:27	717	358	420.062	256	0.125	0.300000	21:09:00.0	(76140.0)	-07:48:00
#1	S08103	3	91/12/07	48597	09:31:27	1075	358	420.062	256	0.125	0.300000	21:12:00.0	(76320.0)	-07:48:00
#1	S08103	4	91/12/07	48597	09:31:27	1431	356	420.062	256	0.125	0.300000	21:15:00.0	(76500.0)	-07:48:00
#1	S08103	5	91/12/07	48597	09:31:27	1788	357	420.062	256	0.125	0.300000	21:18:00.0	(76680.0)	-07:48:00
#1	S08103	6	91/12/07	48597	09:31:27	2145	357	420.062	256	0.125	0.300000	21:21:00.0	(76860.0)	-07:48:00
#1	S08103	7	91/12/07	48597	09:31:27	2503	358	420.062	256	0.125	0.300000	21:24:00.0	(77040.0)	-07:48:00
#1	S08103	8	91/12/07	48597	09:31:27	2858	355	420.062	256	0.125	0.300000	21:27:00.0	(77220.0)	-07:48:00
#1	S08103	9	91/12/07	48597	09:31:27	3215	357	420.062	256	0.125	0.300000	21:30:00.0	(77400.0)	-07:48:00
#1	S08103	10	91/12/07	48597	09:31:27	3573	358	420.062	256	0.125	0.300000	21:33:00.0	(77580.0)	-07:48:00
#1	S08103	11	91/12/07	48597	09:31:27	3930	357	420.062	256	0.125	0.300000	21:36:00.0	(77760.0)	-07:48:00
#1	S08103	12	91/12/07	48597	09:31:27	4287	357	420.062	256	0.125	0.300000	21:39:00.0	(77940.0)	-07:48:00
#1	S08103	13	91/12/07	48597	09:31:27	4645	358	420.062	256	0.125	0.300000	21:42:00.0	(78120.0)	-07:48:00
#1	S08103	14	91/12/07	48597	09:31:27	5001	356	420.062	256	0.125	0.300000	21:45:00.0	(78300.0)	-07:48:00
#1	S08103	15	91/12/07	48597	09:31:27	5359	358	420.062	256	0.125	0.300000	21:48:00.0	(78480.0)	-07:48:00
#1	S08103	16	91/12/07	48597	09:31:27	5715	356	420.062	256	0.125	0.300000	21:51:00.0	(78660.0)	-07:48:00
#1	S08103	17	91/12/07	48597	09:31:27	6073	358	420.062	256	0.125	0.300000	21:54:00.0	(78840.0)	-07:48:00
#1	S08103	18	91/12/07	48597	09:31:27	6429	356	420.062	256	0.125	0.300000	21:57:00.0	(79020.0)	-07:48:00
#1	S08103	19	91/12/07	48597	09:31:27	6787	358	420.062	256	0.125	0.300000	22:00:00.0	(79200.0)	-07:48:00
#1	S08103	20	91/12/07	48597	09:31:27	7143	356	420.062	256	0.125	0.300000	22:03:00.0	(79380.0)	-07:48:00
#1	S08103	21	91/12/07	48597	09:31:27	7501	358	420.062	256	0.125	0.300000	22:06:00.0	(79560.0)	-07:48:00
#1	S08103	22	91/12/07	48597	09:31:27	7857	356	420.062	256	0.125	0.300000	22:09:00.0	(79740.0)	-07:48:00
#1	S08103	23	91/12/07	48597	09:31:27	8214	357	420.062	256	0.125	0.300000	22:12:00.0	(79920.0)	-07:48:00
#1	S08103	24	91/12/07	48597	09:31:27	8571	357	420.062	256	0.125	0.300000	22:15:00.0	(80100.0)	-07:48:00
#1	S08103	25	91/12/07	48597	09:31:27	8929	358	420.062	256	0.125	0.300000	22:18:00.0	(80280.0)	-07:48:00
#1	S08103	26	91/12/07	48597	09:31:27	9286	357	420.062	256	0.125	0.300000	22:21:00.0	(80460.0)	-07:48:00
#1	S08103	27	91/12/07	48597	09:31:27	9643	357	420.062	256	0.125	0.300000	22:24:00.0	(80640.0)	-07:48:00
#1	S08103	28	91/12/07	48597	09:31:27	10000	357	420.062	256	0.125	0.300000	22:27:00.0	(80820.0)	-07:48:00
#1	S08103	29	91/12/07	48597	09:31:27	10356	356	420.062	256	0.125	0.300000	22:30:00.0	(81000.0)	-07:48:00
#1	S08103	30	91/12/07	48597	09:31:27	10376	20	420.062	256	0.125	0.300000	22:33:00.0	(81180.0)	-07:48:00

Both programs produce the same number of files, which is a good start. Also, there seems to be a good correspondence between the positions and the files in terms of their order in the list (ie. the RA starts with 21:06:00 in each list and increments by 3 minutes per file).

Why were we seeing an offset in the positions and the times in the summary files earlier? One possibility might be seen if we use the `-v` option in `sc_td` to produce a summary. In this case, the data printed to screen is different to that shown above. The first file, for instance, is given an RA of 21:09:00, compared to its real RA of 21:06:00.

We believe the origin of the apparent indexing problem came from `sc_td`. When printing out the summaries, the position returned is the position at the end of the block (ie. when the telescope starts moving). But by the time the telescope is moving, the position has been updated to the next sky position (and next set of blocks), hence the mis-alignment.

From the evidence above, however, this seems to have been fixed. The summary file produced is correctly indexed, and in full agreement with the output of `pvosummary`.

In summary, we find no indexing discrepancy.

The next question is whether the data is being preserved correctly. That is, if there is a pulsar present, does its signal survive the conversion process?

We can test for the presence of a pulsar by using pdm. The file S08103_0141 should have the pulsar J2145-750 in it, based on the positions from the summary files shown above.

```
> pdm -pd 16.052 -dm 9.0 -g /xs S08103_0141.dat
```

which produces results showing the presence of the pulsar.

However, the pdm program does not work with .fits files: we get the following error message:

```
STOP .hdr file can not open statement executed
```

I also tried the pdmp program from psrchive (as this seemed to do the same sort of thing – I'm not totally familiar with the pulsar analysis software). This was able to read the FITS file, but then failed, probably due to the headers having changed (some bits of information were read correctly, but others returned NaNs...).

However, this was completely unable to read the .dat file, so no comparison would have been possible anyway.

This then remains the problem – we are unable to test the new FITS files to see if the data has been transferred correctly. George & I did test the conversion with small amounts of data earlier in the year, and I remember George was able to read data using a modified SIGPROC routine – perhaps this needs to be utilised?