

Starting Out With AIPS Tutorial

James M Anderson

This tutorial session is intended to get people familiar with the basic concepts of radio interferometry. The student will be introduced to interferometry data, visibilities, the (u,v) plane, calibration, and imaging.

Step 1 --- Figure Out What to Observe (Reduce)

I decided to try to make an image of the Sun, as the Solar KSP is a significant part of GLOW. The NRAO image archive has a nice image of the Sun at 1400 MHz located at <http://images.nrao.edu/8>



Image courtesy of NRAO/AUI

Let's try to reduce the data ourselves.

Step 2 --- Download the Data From the Archive

Conveniently, the NRAO image archive gives details about the observations used to make the image, so I downloaded the data from the NRAO data archive, making sure to select the "AIPS friendly" filename option.

This has resulted in two files on my hard drive in my current directory:

```
ls -l
total 54164
-rw-r-- 1 anderson zeall 21002240 2008-11-11 14:40 GD_1
-rw-r-- 1 anderson zeall 34392064 2008-11-11 14:41 GD_2
```

Step 3 --- Start up AIPS

aips

I have chosen to use user ID 100, at semi-random selection.

At first, most of the arcane syntax used to enter commands to AIPS will be difficult. As this is a tutorial session which intends to teach you about radio interferometry, and not how to use AIPS, we will gloss over the technical challenges of interacting with AIPS.

In AIPS you the user interact with something called POPS. You give POPS information by setting variables called ADVERBS to specific values. You can tell POPS which TASK you plan to run by setting a TASK ADVERB. If you want to check the values of ADVERBs for the current TASK, you ask for INPUTS. Because POPS will try to figure out what you mean if you only input the first few letters of an ADVERB or VERB, you can often abbreviate this to just INP. Also note that since AIPS is case-insensitive by default, you could also just type inp. If you want help on a specific topic, ask for HELP. If you want even more explanation for something, say EXPLAIN. If you don't know what it is you are trying to do, but you have some vague notion, say APROPOS SOMETHING. Note that apostrophes, and in certain locations, the lack of an apostrophe are significant.

Step 4 --- Initial look at data

FILLM

The AIPS task to read raw VLA data into AIPS is called FILLM.

```
dowait=true
task 'fillm'
default
datain = 'PWD:GD_
nfiles=0
ncount=2
vlamode='S '
doweight=10
doconcat=true
douvcomp=0
cparm(2)=16
cparm(4)=28
cparm(8)=10./60
go
```

This sets us up to read the data, sets the VLA mode to Solar, tells AIPS not to change the source if the position appears to be moving (which the Sun does), sets the shadowing limit to 28 meters, and sets the CL table interval to 10 seconds.

LISTR --- scan listing

First, let's check out which file we need.

```
pcat
```

AIPS 1: Catalog on disk 1

AIPS 1:	Cat	Usid	Mapname	Class	Seq	Pt	Last access	Stat
AIPS 1:	1	100	19810926	.C BAND.	1	UV	11-NOV-2008 18:44:06	
AIPS 1:	2	100	19810926	.L BAND.	1	UV	11-NOV-2008 18:46:44	
AIPS 1:	3	100	19810926	.C BAND.	2	UV	11-NOV-2008 18:40:21	
AIPS 1:	4	100	19810926	.L BAND.	2	UV	11-NOV-2008 18:40:21	

default listr

task 'listr'

indi 1

getn 2

optype 'scan'

docrt=132

go

AIPS 1: Got(1) disk= 1 user= 100 type=UV 19810926.L BAND.1
 vlb054 LISTR(31DEC08) 100 11-NOV-2008 18:46:44 Page 1
 File = 19810926 .L BAND. 1 Vol = 1 Userid = 100
 Freq = 1.446150006 GHz Ncor = 4 No. vis = 278465
 Scan summary listing

Scan	Source	Qual	Calcode	Sub	Timerange	FrqID
START VIS	END VIS					
1 1148-001		: 0000	C	1	0/13:53:25 - 0/13:54:35	1
1 2195						
2 SUN		: 0000		1	0/13:59:15 - 0/13:59:35	1
2196 3150						
3 1148-001		: 0000	C	1	0/14:18:05 - 0/14:19:35	1
3151 5809						
4 SUN		: 0000		1	0/14:20:25 - 0/14:24:35	1
5810 14662						
5 1148-001		: 0000	C	1	0/14:43:05 - 0/14:44:35	1
14663 17320						
6 SUN		: 0000		1	0/14:45:25 - 0/14:49:35	1
17321 25867						
7 1148-001		: 0000	C	1	0/15:07:55 - 0/15:09:25	1
25868 28503						
8 SUN		: 0000		1	0/15:10:15 - 0/15:14:25	1
28504 37058						
9 1148-001		: 0000	C	1	0/15:32:55 - 0/15:34:25	1
37059 39716						
10 SUN		: 0000		1	0/15:35:15 - 0/15:39:25	1
39717 48338						
11 1148-001		: 0000	C	1	0/15:57:55 - 0/15:59:25	1
48339 50720						
12 SUN		: 0000		1	0/16:00:15 - 0/16:04:15	1
50721 58994						
13 1148-001		: 0000	C	1	0/16:22:45 - 0/16:24:15	1
58995 61584						
14 SUN		: 0000		1	0/16:25:05 - 0/16:29:15	1
61585 70334						

15	1148-001	:	0000	C	1	0/16:47:45	-	0/16:49:15	1
70335	72949								
16	SUN	:	0000		1	0/16:50:05	-	0/16:54:15	1
72950	81664								
17	1148-001	:	0000	C	1	0/17:12:35	-	0/17:12:35	1
81665	81664								
18	1148-001	:	0000	C	1	0/17:12:45	-	0/17:14:05	1
81665	84070								
19	SUN	:	0000		1	0/17:14:55	-	0/17:19:05	1
84071	92937								
20	1148-001	:	0000	C	1	0/17:37:35	-	0/17:39:05	1
92938	95507								
21	SUN	:	0000		1	0/17:39:45	-	0/17:44:25	1
95508	105079								
22	1148-001	:	0000	C	1	0/18:02:25	-	0/18:03:55	1
105080	107535								
23	SUN	:	0000		1	0/18:04:45	-	0/18:08:55	1
107536	116401								
24	1148-001	:	0000	C	1	0/18:27:25	-	0/18:28:55	1
116402	119012								
25	SUN	:	0000		1	0/18:29:45	-	0/18:33:55	1
119013	127842								
26	1148-001	:	0000	C	1	0/18:52:35	-	0/18:53:55	1
127843	129825								
27	SUN	:	0000		1	0/18:54:45	-	0/18:59:05	1
129826	137705								
28	1148-001	:	0000	C	1	0/19:17:25	-	0/19:18:45	1
137706	139972								
29	SUN	:	0000		1	0/19:19:35	-	0/19:23:45	1
139973	148118								
30	1148-001	:	0000	C	1	0/19:42:15	-	0/19:43:45	1
148119	150467								
31	SUN	:	0000		1	0/19:44:35	-	0/19:53:05	1
150468	168022								
32	1148-001	:	0000	C	1	0/20:07:05	-	0/20:08:35	1
168023	170342								
33	SUN	:	0000		1	0/20:09:25	-	0/20:13:35	1
170343	178889								
34	1148-001	:	0000	C	1	0/20:32:05	-	0/20:33:35	1
178890	181422								
35	SUN	:	0000		1	0/20:34:25	-	0/20:38:35	1
181423	190047								
36	1148-001	:	0000	C	1	0/20:57:05	-	0/20:58:35	1
190048	192547								
37	SUN	:	0000		1	0/20:59:25	-	0/21:03:35	1
192548	201271								
38	1148-001	:	0000	C	1	0/21:21:55	-	0/21:23:25	1
201272	203709								
39	SUN	:	0000		1	0/21:24:15	-	0/21:28:25	1
203710	212708								

40 1148-001	: 0000	C	1	0/21:47:05 -	0/21:48:25	1
212709 215193						
41 SUN	: 0000		1	0/21:49:15 -	0/21:53:25	1
215194 224112						
42 1148-001	: 0000	C	1	0/22:11:45 -	0/22:13:15	1
224113 226323						
43 SUN	: 0000		1	0/22:14:05 -	0/22:18:15	1
226324 234634						
44 1148-001	: 0000	C	1	0/22:36:55 -	0/22:38:15	1
234635 236916						
45 SUN	: 0000		1	0/22:39:05 -	0/22:43:15	1
236917 245740						
46 1148-001	: 0000	C	1	0/23:01:55 -	0/23:03:15	1
245741 248122						
47 SUN	: 0000		1	0/23:04:05 -	0/23:08:05	1
248123 256112						
48 1148-001	: 0000	C	1	0/23:26:45 -	0/23:28:05	1
256113 258141						
49 SUN	: 0000		1	0/23:28:55 -	0/23:33:05	1
258142 265941						
50 1148-001	: 0000	C	1	0/23:51:45 -	0/23:53:05	1
265942 267662						
51 SUN	: 0000		1	0/23:54:05 -	0/23:58:05	1
267663 275388						
52 SUN	: 0000		1	1/00:07:25 -	1/00:07:55	1
275389 276069						
53 3C286	: 0000	B	1	1/00:21:35 -	1/00:22:55	1
276070 278465						

Source summary

Velocity type = ' ' Definition = ' '

ID Source	Qual	Calcode	RA(0.0)	Dec(0.0)	IFlux
QFlux UFlux VFlux No. vis					
1 1148-001	: 0000	C	11:48:10.1300	-00:07:13.300	0.000
0.000 0.000 0.000 59936					
2 SUN	: 0000		12:10:30.1272	-01:08:22.648	0.000
0.000 0.000 0.000 216133					
3 3C286	: 0000	B	13:28:49.6570	30:45:58.640	0.000
0.000 0.000 0.000 2396					

ID Source	Freq(GHz)	Velocity(Km/s)	Rest freq (GHz)
1 All Sources	1.4462	0.0000	0.0000

Frequency Table summary

FQID	IF#	Freq(GHz)	BW(kHz)	Ch.Sep(kHz)	Sideband
1	1	1.44615001	12500.0010	12500.0010	1

AIPS 1: Resumes

getn 4
go

AIPS 1: Got(1) disk= 1 user= 100 type=UV 19810926.L BAND.2
 vlb054 LISTR(31DEC08) 100 11-NOV-2008 18:49:17 Page 1
 File = 19810926 .L BAND. 2 Vol = 1 Userid = 100
 Freq = 1.446150006 GHz Ncor = 4 No. vis = 207072
 Scan summary listing

Scan	Source	Qual	Calcode	Sub	Timerange	FrqID
START VIS	END VIS					
1	SUN	: 0000		1	0/14:05:15 - 0/14:09:35	1
1	8935					
2	SUN	: 0000		1	0/14:30:05 - 0/14:34:35	1
8936	17885					
3	SUN	: 0000		1	0/14:55:05 - 0/14:59:25	1
17886	26458					
4	SUN	: 0000		1	0/15:19:55 - 0/15:24:25	1
26459	35408					
5	SUN	: 0000		1	0/15:44:55 - 0/15:49:25	1
35409	44108					
6	SUN	: 0000		1	0/16:09:45 - 0/16:14:15	1
44109	52834					
7	SUN	: 0000		1	0/16:34:45 - 0/16:39:15	1
52835	61669					
8	SUN	: 0000		1	0/16:59:45 - 0/17:04:05	1
61670	70226					
9	SUN	: 0000		1	0/17:24:35 - 0/17:29:05	1
70227	79180					
10	SUN	: 0000		1	0/17:50:15 - 0/17:54:05	1
79181	86877					
11	SUN	: 0000		1	0/18:14:25 - 0/18:18:55	1
86878	95785					
12	SUN	: 0000		1	0/18:39:35 - 0/18:44:05	1
95786	104689					
13	SUN	: 0000		1	0/19:04:25 - 0/19:08:45	1
104690	112638					
14	SUN	: 0000		1	0/19:29:15 - 0/19:33:45	1
112639	120854					
15	SUN	: 0000		1	0/19:54:25 - 0/19:58:45	1
120855	128861					
16	SUN	: 0000		1	0/20:19:05 - 0/20:23:35	1
128862	137749					
17	SUN	: 0000		1	0/20:44:05 - 0/20:48:35	1
137750	146600					
18	SUN	: 0000		1	0/21:08:55 - 0/21:13:25	1
146601	155488					
19	SUN	: 0000		1	0/21:33:55 - 0/21:38:25	1
155489	164306					
20	SUN	: 0000		1	0/21:58:55 - 0/22:03:25	1
164307	173005					
21	SUN	: 0000		1	0/22:23:55 - 0/22:28:15	1

```

173006      181479
   22 SUN              : 0000          1 0/22:48:55 - 0/22:53:25      1
181480      190299
   23 SUN              : 0000          1 0/23:13:45 - 0/23:18:05      1
190300      199102
   24 SUN              : 0000          1 0/23:38:45 - 0/23:43:05      1
199103      207072
   25 SUN              : 0000          1 1/00:01:15 - 1/00:01:15      1
207073      207072

```

Source summary

Velocity type = ' ' Definition = ' '

ID	Source	Qual	Calcode	RA(0.0)	Dec(0.0)	IFlux
QFlux	UFlux	VFlux	No. vis			
1	SUN	: 0000		12:10:30.1272	-01:08:22.648	0.000
0.000	0.000	0.000	207072			

ID	Source	Freq(GHz)	Velocity(Km/s)	Rest freq (GHz)
1	All Sources	1.4462	0.0000	0.0000

Frequency Table summary

FQID	IF#	Freq(GHz)	BW(kHz)	Ch.Sep(kHz)	Sideband
1	1	1.44615001	12500.0010	12500.0010	1

AIPS 1: Resumes

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