

「Visibility の表示と位相揺らぎ」

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最も S/N のよい、3C454.3 (radio loud quasar) の観測データを用いて、visibility データを複数の表示方法で表示してみる。これによって、位相揺らぎの効果が visibility へどのように現れているのかを見てみよう。一般に、位相揺らぎ(位相雑音)の大きい visibility は、(そのままベクトル量として平均すると)時間積分すればするほど、得られた visibility の振幅が低下してしまう (decorrelation という)。Re-Im 表示すると理解しやすい。

1) time vs visibility amplitude, time vs visibility phase

UVPROC2 の CRT display で表示できる。一番短い基線 (CD 基線) と一番長い基線 (EF 基線) で表示させてみよう。

2) Real - Imaginary plane 上での表示

AIPS の UVPLT で表示できる。同様に、一番短い基線と長い基線とで表示して、その振る舞いを比較してみよう。

```
>tget uvplt
>getn 35 ← 5/3 の朝に観測した、3C454.3 の visibility data
AIPS 1: Got(1) disk= 1 user= 1 type=UV D2USB-BPC.UVDATA.1
>imh
AIPS 1: Image=3C454.3 (UV) Filename=D2USB-BPC .UVDATA. 1
AIPS 1: Telescope=NRO-NMA Receiver=UWBC.U
AIPS 1: Observer=okada User #= 1
AIPS 1: Observ. date=03-MAY-2010 Map date=03-MAY-2010
AIPS 1: # visibilities 1575 Sort order TB
AIPS 1: Rand axes: UU-L VV-L WW-L BASELINE TIME1 HA
AIPS 1: -----
AIPS 1: Type Pixels Coord value at Pixel Coord incr Rotat
AIPS 1: COMPLEX 3 1.0000000e+00 1.00 1.0000000e+00 0.00
AIPS 1: STOKES 1 -1.0000000e+00 1.00 -1.0000000e+00 0.00
AIPS 1: FREQ 256 1.1501520e+11 1.00 2.0000000e+06 0.00
AIPS 1: RA 1 22 51 29.521 1.00 3600.000 0.00
AIPS 1: DEC 1 15 52 54.310 1.00 3600.000 0.00
AIPS 1: -----
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AIPS 1: Coordinate equinox 1950.00
AIPS 1: Maximum version number of extension files of type HI is 1
AIPS 1: Maximum version number of extension files of type PL is 1
>bchan 134; echan 134 ← どこか1つの周波数チャンネルのみ表示。ここでは134ch
>ante 3 4 ← アンテナ#3 = C号機、#4 = D号機。
>base 3 4 ← antennaとbaselineの組み合わせで、C-D基線のみを表示を指定
>bparm 9,10,1,-0.002,0.002,-0.002,0.002 ← X軸はRe, Y軸はIm, ±2mJyのグラフに
>inp
AIPS 1: UVPLT      Plots data from a u,v data base: multi-channel version
AIPS 1: Adverbs      Values      Comments
AIPS 1: -----
AIPS 1: USERID      0          Data base owner number
AIPS 1: INNAME      'D2USB-BPC '   Input UV file name (name)
AIPS 1: INCLASS     'UVDATA'      Input UV file name (class)
AIPS 1: INSEQ       1          Input UV file name (seq. #)
AIPS 1: INDISK      0          Input UV file disk unit #
AIPS 1: SOURCES     *all ' '      Sources to plot, ' '=>all.
AIPS 1: QUAL        -1         Qualifier -1=>all
AIPS 1: CALCODE     ' '        Calibrator code ' '=>all
AIPS 1: STOKES      ' '        Stokes type to select.
AIPS 1: SELBAND     -1         Bandwidth to select (kHz)
AIPS 1: SELFREQ     -1         Frequency to select (MHz)
AIPS 1: FREQID      -1         Freq. ID to select.
AIPS 1: TIMERANG    *all 0     Time range to select
AIPS 1: ANTENNAS    3          4          Antennas to plot
AIPS 1:              *rest 0
AIPS 1: BASELINE    3          4          Baselines with ANTENNAS
AIPS 1:              *rest 0
AIPS 1: UVRANGE     0          0          UV range in kilolambda.
AIPS 1: SUBARRAY    0          Subarray, 0 => all
AIPS 1: BCHAN       134         1st spectral channel #
AIPS 1: ECHAN       134         Last spectral channel #
AIPS 1: CHINC       1          Increment in channel #
AIPS 1: BIF         0          Low IF number to plot
AIPS 1: EIF         0          Highest IF number to plot
AIPS 1: DOCALIB     -1         If >0 calibrate data

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AIPS 1:	GAINUSE	0		CAL (CL or SN) table to apply
AIPS 1:	DOPOL	-1		If >0 correct polarization.
AIPS 1:	BLVER	-1		BL table to apply.
AIPS 1:	FLAGVER	0		Flag table version
AIPS 1:	DOBAND	-1		If >0 apply bandpass cal.
AIPS 1:				Method used depends on value
AIPS 1:				of DOBAND (see HELP file).
AIPS 1:	BPVER	-1		Bandpass table version
AIPS 1:	SMOOTH	*all	0	Smoothing function. See
AIPS 1:				HELP SMOOTH for details.
AIPS 1:	XINC	0		Plot every XINC'th visibility
AIPS 1:				0 => 1.
AIPS 1:	BPARM	9	10	Control parameters
AIPS 1:		1	-0.002	1 : X-axis type 0=>UV dist
AIPS 1:		0.002	-0.002	2 : Y-axis type 0=>Ampl
AIPS 1:		0.002	*rest 0	1=> amplitude (Jy)
AIPS 1:				2=> phase (degrees)
AIPS 1:				3=> uv dist. (klambda)
AIPS 1:				4=> uv p.a. (deg N->E)
AIPS 1:				5=> time (IAT days)
AIPS 1:				6=> u (klambda)
AIPS 1:				7=> v (klambda)
AIPS 1:				8=> w (klambda)
AIPS 1:				9=> Re(Vis) (Jy)
AIPS 1:				10=> Im(Vis) Jy)
AIPS 1:				11=> time (IAT hours)
AIPS 1:				12=> log(ampl)
AIPS 1:				3 : > 0.0 => fixed scale
AIPS 1:				< 0.0 => fixed range
AIPS 1:				4 : Xmin (fixed scale)
AIPS 1:				5 : Xmax (fixed scale)
AIPS 1:				6 : Ymin (fixed scale)
AIPS 1:				7 : Ymax (fixed scale)
AIPS 1:				8 : Number of bins in plot.
AIPS 1:				9 : > 0 => list bin values.
AIPS 1:				10: > 0 => plot auto-corr too
AIPS 1:				BPARM=6,7,2,0 generates

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AIPS 1:                                square UV coverage plots
AIPS 1: FACTOR          0                Scale dots by FACTOR
AIPS 1: LTYPE          3                Type of labeling: 1 border,
AIPS 1:                                2 no ticks, 3 - 6 standard,
AIPS 1:                                7 - 10 only tick labels
AIPS 1:                                <0 -> no date/time
AIPS 1: BADDISK      *all 0            Disk to avoid for scratch.
AIPS 1: DOTV         -1                > 0 Do plot on the TV, else
AIPS 1:                                make a plot file
AIPS 1: GRCHAN       0                Graphics channel 0 => 1.

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>

>go uvplt

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UVPLT1: Task UVPLT (release of 15APR99) begins
UVPLT1: FNDPOL: Stokes I computed assuming V=0
UVPLT1: GFINIS: number records used      9
UVPLT1: PLTUV:      95 Points plotted
UVPLT1: PLTUV: Plot file version  2  created.
UVPLT1: Appears to have ended successfully
UVPLT1: mpu5m      15APR99 NEW: Cpu=      0.0 Real=      0
AIPS 1: Resumes

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>go tpl

AIPS 1: TEXT FOR TPL UNAVAILABLE

>go tkpl

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TKPL 1: Task TKPL (release of 15APR99) begins
AIPS 1: Resumes
>TKPL 1: Appears to have ended successfully
TKPL 1: mpu5m      15APR99 NEW: Cpu=      0.0 Real=      2

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inp lwpl

AIPS 1: LWPLA: Task to send a plot file to a PostScript printer

AIPS 1: Adverbs Values Comments

AIPS 1: -----

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AIPS 1: USERID          0                User ID. 0 => current user
AIPS 1:                                32000 => all users
AIPS 1: INNAME          'D2USB-BPC  '    Image name (name)
AIPS 1: INCLASS        'UVDATA'         Image name (class)
AIPS 1: INSEQ           1                Image name (seq. #)
AIPS 1: INDISK          0                Disk drive #

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AIPS 1: PLVER      0          Version # of PL file. 0=>last
AIPS 1: ASPMM      0          Arc sec. per mm. 0=self scale
AIPS 1: LPEN       2          Pen width (dots).
AIPS 1: FUNCTYPE   ' '       'NE','LG','NG' else linear
AIPS 1: DPARM      *all 0    (1,2) Clip recorded greys
AIPS 1:           before FUNCTYPE (0 to 1)
AIPS 1:           (3,4) After FUNCTYPE scale
AIPS 1:           by g*DPARM(3) + DPARM(4)
AIPS 1:           (5) Page orientation
AIPS 1:           0: fill page
AIPS 1:           1: portrait  2: landscape
AIPS 1:           (6) Paper type, for centering
AIPS 1:           0: quarto,    1: legal,
AIPS 1:           2: 4x5 in Slide, 3: A3,
AIPS 1:           4: A4,      5: 35 mm Slide
AIPS 1:           6: 11 x 17
AIPS 1:           1000*X + Y -> XxY inches
AIPS 1:           (7) Font type, default
AIPS 1:           Helvetica-Bold (see help)
AIPS 1:           (8) Font size (in points,
AIPS 1:           default 13).
AIPS 1:           (9) 0.0 -> black lines,
AIPS 1:           0.5 -> grey,
AIPS 1:           1.0 -> white
AIPS 1: OUTFILE    ' '       ' ' => print/delete
AIPS 1:           otherwise write named file.
AIPS 1: COPIES     1          Number of copies if going
AIPS 1:           directly to a printer
>go lwpl
LWPLA1: Task LWPLA (release of 15APR99) begins
LWPLA1: No clipping or scaling applied to grey scale pixels
LWPLA1: ZLWIO: plotter file = /tmp/ZLWIO.a08668
LWPLA1: Using 0.00000e+00 unit per mm
LWPLA1: Using 0.00000e+00 arcsec per mm
AIPS 1: Resumes
>LWPLA1: request id is prmc2-3854 (standard input)

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LWPLA1: a child process will delete /tmp/ZLWIO.a08668 in 300 seconds
LWPLA1: Appears to have ended successfully
LWPLA1: mpu5m      15APR99 NEW: Cpu=      0.0 Real=      2
ante 5 6
>base 5 6
>go uvplt
UVPLT1: Task UVPLT (release of 15APR99) begins
UVPLT1: FNDPOL: Stokes I computed assuming V=0
UVPLT1: GFINIS: number records used      9
UVPLT1: PLTUV:      95 Points plotted
UVPLT1: PLTUV: Plot file version  3  created.
UVPLT1: Appears to have ended successfully
UVPLT1: mpu5m      15APR99 NEW: Cpu=      0.0 Real=      1
AIPS 1: Resumes
>go tkpl
TKPL 1: Task TKPL (release of 15APR99) begins
AIPS 1: Resumes
>TKPL 1: Appears to have ended successfully
TKPL 1: mpu5m      15APR99 NEW: Cpu=      0.0 Real=      2
go lwpl
LWPLA1: Task LWPLA (release of 15APR99) begins
LWPLA1: No clipping or scaling applied to grey scale pixels
LWPLA1: ZLWIO: plotter file = /tmp/ZLWIO.a08692
LWPLA1: Using 0.00000e+00 unit per mm
LWPLA1: Using 0.00000e+00 arcsec per mm
AIPS 1: Resumes
>LWPLA1: request id is prmc2-3855 (standard input)
LWPLA1: a child process will delete /tmp/ZLWIO.a08692 in 300 seconds
LWPLA1: Appears to have ended successfully
LWPLA1: mpu5m      15APR99 NEW: Cpu=      0.0 Real=      1

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以上