S-Lang Scripts in CIAO

V&V plotting

Nancy Adams-Wolk, January 31, 2003

S-lang and V&V

- Refer to Mike Noble's talk on 1/27/03 on why we chose S-Lang in CIAO.
- V&V (Verification and Validation): Reviews the spacecraft state and compares to the planned state and determines if the observation has valid data (pointing accuracy, image reconstruction, items that affect GTI).
- Easiest way to detect a problem is to visualize it. Therefore, plotting data is a large part of V&V.
- Current V&V is run after SDP. We are writing a V&V system that can be run as part of SDP and reviewed later.
- Current V&V uses IDL plotting. We are replacing with S-lang and ChIPS.

What CIAO libraries can we use in S-Lang?

1. Chips: Plotting library
2. Paramio: Parameter file library
3. Stack: File stack library
4. Varmm: Interface to the DM
5. Group: (Future use) DM group library
6. Region: DM region library

What commands of ChIPS are available?

```
chips> apropos("chips")
Found 30 matches in Global namespace:
chips_clear                chips_get_yscale    chips_color_name
chips_get_xscale           chips_State         chips_get_zscale
chips_set_pane             chips_set_yscale    chips_line
chips_get_pane             chips_get_zrange    chips_split
chips_get_xrange           chips_pickpoints    chips_set_zrange
chips_set_drawing_area     chips               chips_get_yrange
chips_get_drawing_area     _chips_version      chips_get_zscale
chips_set_xscale           chips_label         chips_color_value
chips_redraw               chips_auto_redraw   chips_set_yrange
_chips_version_string      chips_set_xrange    chips_eval
```

To access functions not available yet: `chips_eval`

What Types of Plots?

1. Strip Plots: Items plotted against a dependent variable. Example: RA vs Time.
2. Scatter Plots: Two independent variables plotted against each other. Example: RA vs Dec.
3. Histogram Plots: Plot pre-binned data in a histogram mode. Example: PHA vs Event in PHA bin.

Examples: Strip Plots

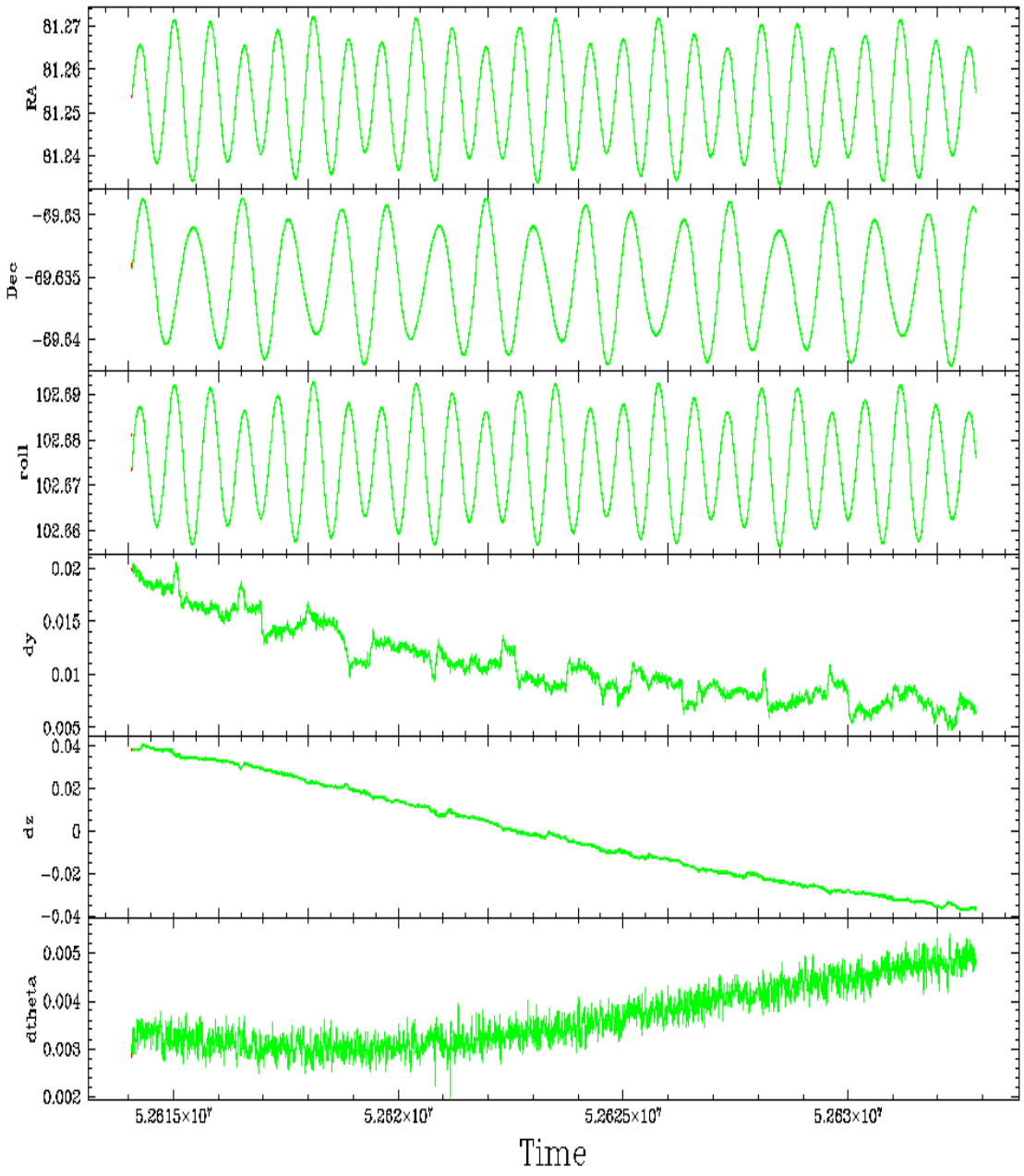
- Strip plots can be 1 to many items plotted.
- Need to determine good and bad data. S-lang math is used here.
- Use chips calls to set axis scales and other configurations.

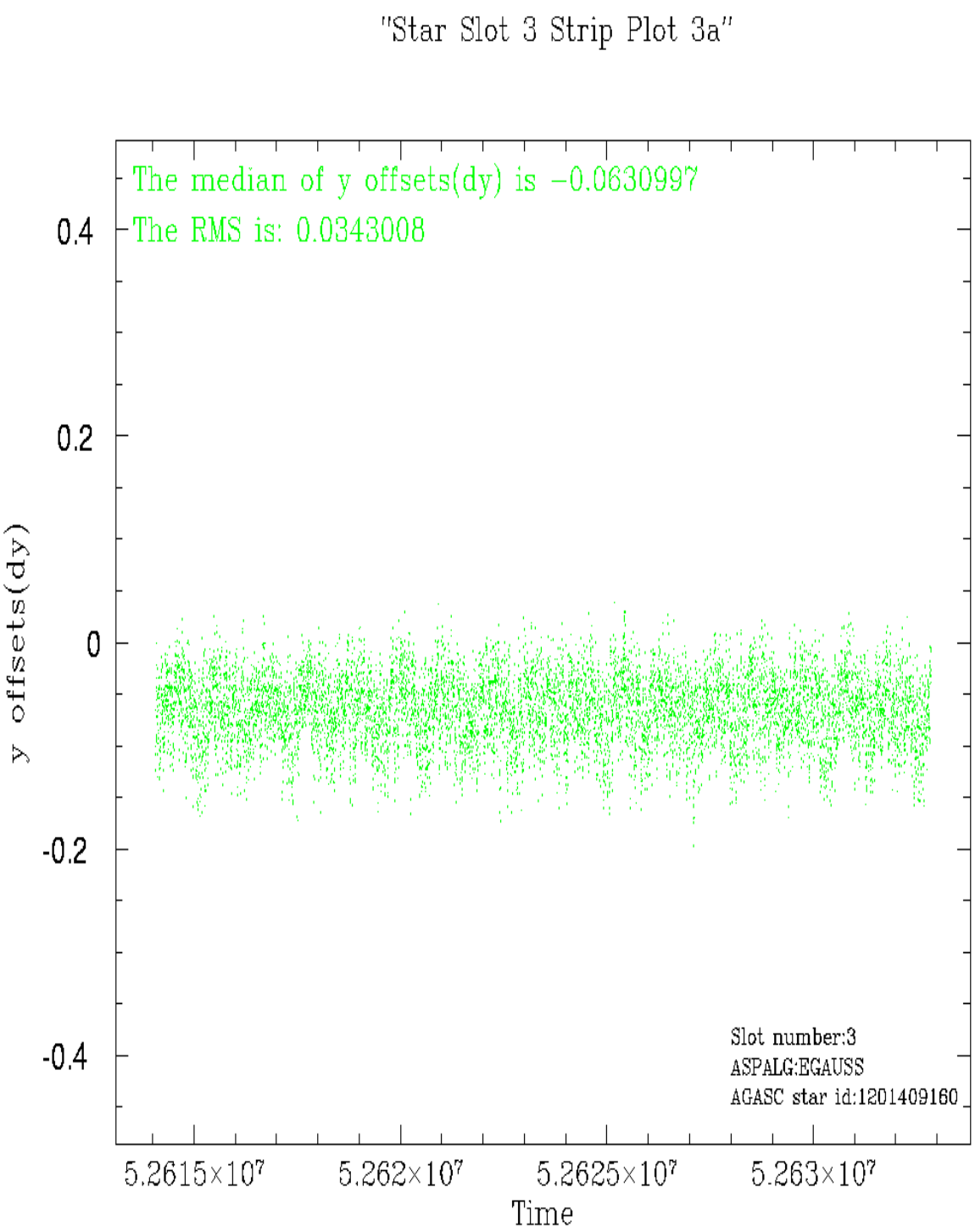
Examples: Strip Plots...s-lang code fragment

```
() = chips_eval ("batch on");
() = chips_split (1, counter);
() = chips_auto_redraw (0);
for (i = 0; i < counter; i++) {
     chips.symbolcolor = good_color;
     colsy[i,*] = get_struct_field (filestruct, cols_name[i]);
     () = chips_set_pane (i + 1);
     variable limits = vv_determine_limits(xlimits, ylimits[i,*], colx,
                                           colsy[i,*]);
     () = chips_eval ("limits x "+string(limits[0])+" "+string(limits[1]));
     () = chips_eval ("limits y "+string(limits[2])+" "+string (limits[3]));
     () = curve (colx, colsy[i,*]);
     () = chips_eval ("ylabel  " + "\'" + (labely[i])+ "\'");


} %end for all y data
 () = chips_eval ("xlabel " + "\'" + (labelx) + "\'");
() = chips_eval ("title " + "\'" + (title) +"\'" );
() = chips_redraw (1);
() = chips_eval ("print postfile " + outfile);
return ret_val;
```

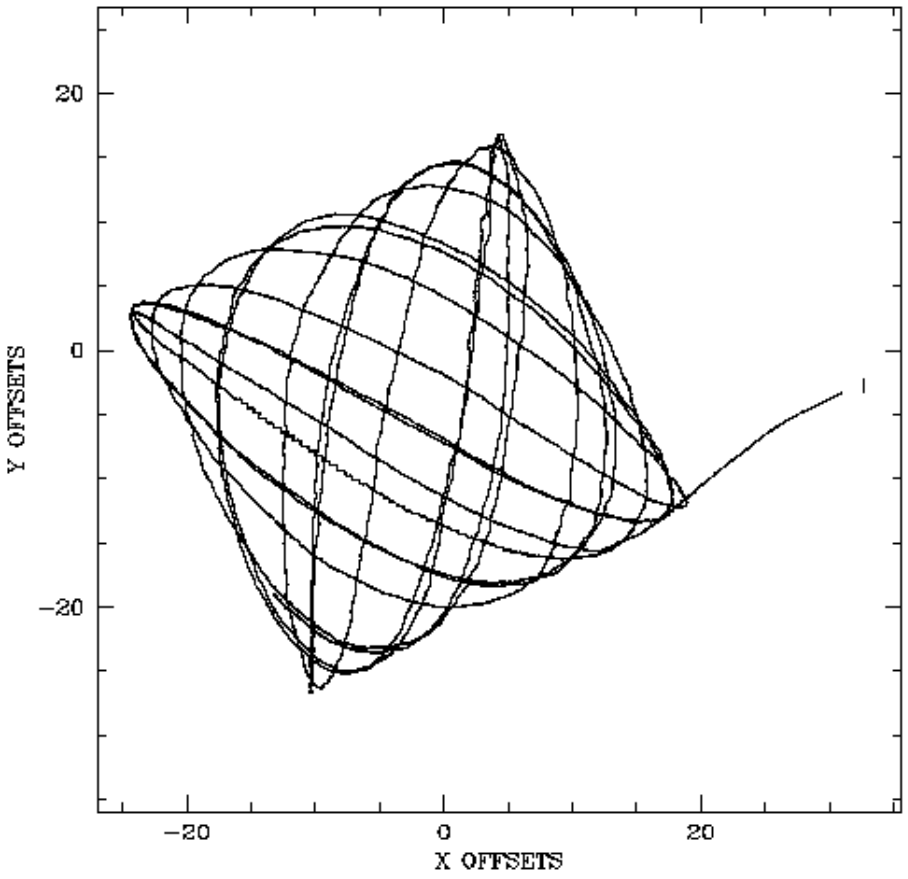
Title for Aspect Strip Plots



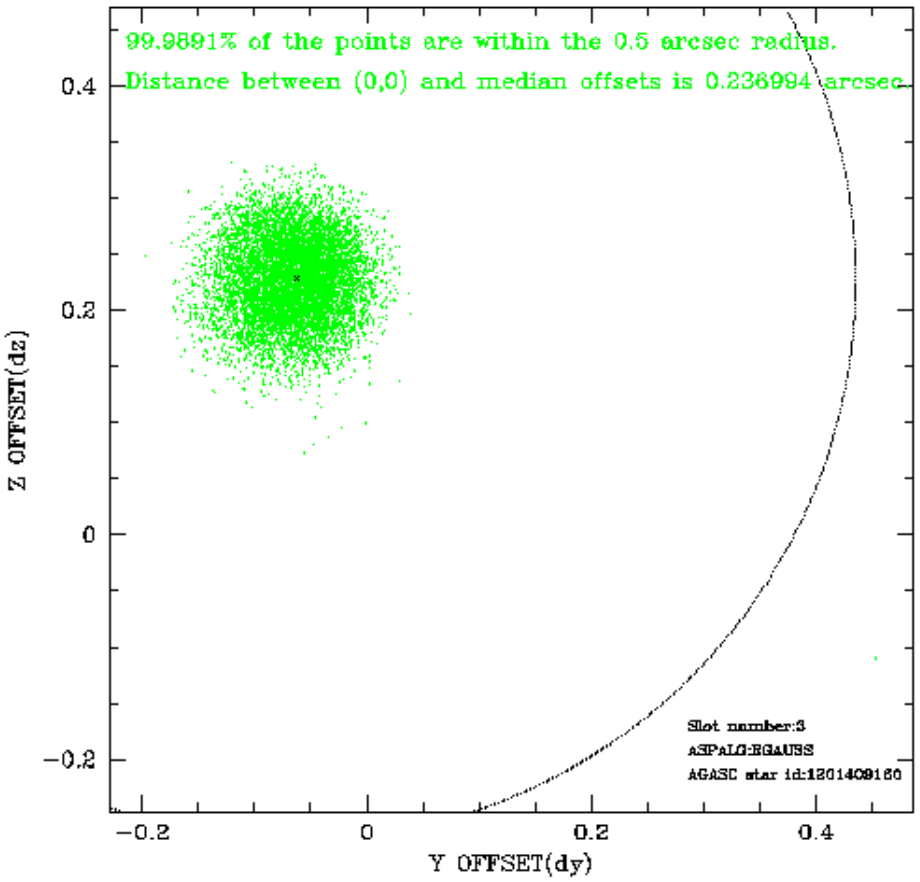

"Star Slot 3 Strip Plot 3a"
The median of y offsets(dy) is −0.0630997
The RMS is: 0.0343008
0.4
0.2
0
-0.2
-0.4
y offsets(dy)
Slot number:3
ASPALG:EGAUSS
AGASC star id:1201409160
5.2615×10^7
5.262×10^7
5.2625×10^7
5.263×10^7
Time

Examples: Scatter Plots

- Scatter plots are two items plotted against each other.
- Again use S-lang code to determine good and bad data.
- Need to handle different types of data plotting.


20
0
−20
Y OFFSETS
−20
0
20
X OFFSETS

Star Slot #3: dy vs dz



Examples: Histogram Plots

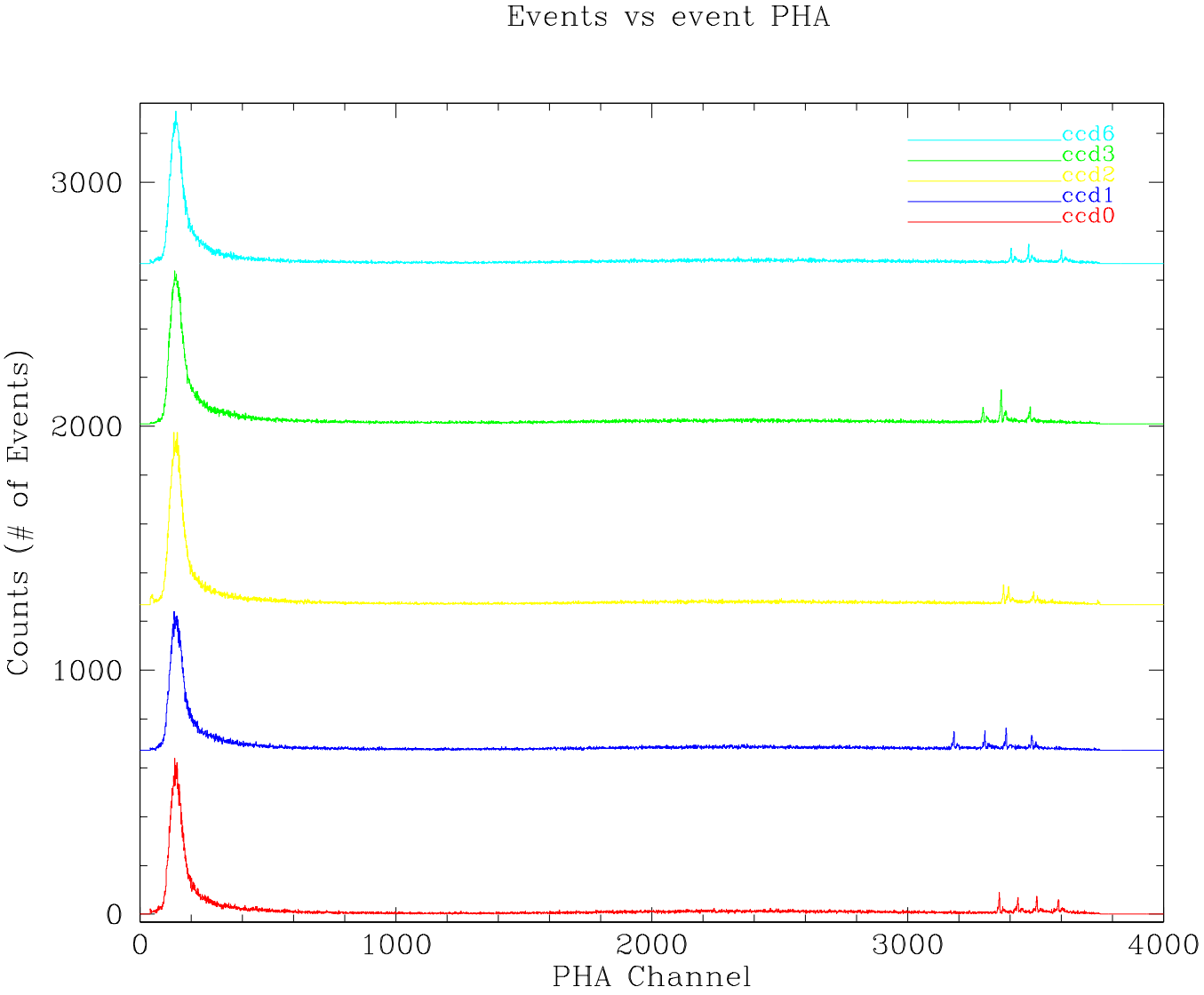
- Multiple columns plotted together
- Brings out the question of where to bin the data!

Examples: Histogram Plots...s-lang code fragment

```
() = chips_eval ("batch on");
() = chips_auto_redraw (0);
chips.curvestyle=_chips->step;
() = chips_eval ("limits x "+string(xmin)+" "+string(xmax));
() = chips_eval ("limits y auto auto");

for (i = 0; i < array_size; i++){
    color = chips_color_value (color_array[i]);
    chips.curvecolor = color;
    colx = get_struct_field (filestruct, xcol_name[i]);
    coly = get_struct_field (filestruct, ycol_name[i]);
    () = curve (colx, coly + offset);
    (range,offset) = chips_get_yrange();
    }
 () = chips_eval ("ylabel " + "\'" + (ylabel[0]) + "\'");
 () = chips_eval ("xlabel " + "\'" + (xlabel[0]) + "\'");
 () = chips_eval ("title " + "\'" + (title[0]) +"\'" );

 vv_add_hist_key(colx, coly,key_label,color_array);
 () = chips_redraw (1);
 () = chips_eval ("print postfile " + outfile);
```


Events vs event PHA
ccd6
ccd3
ccd2
ccd1
ccd0
Counts (# of Events)
0
1000
2000
3000
0
1000
2000
3000
4000
PHA Channel