



# An introduction to a GTL Macro

Kevin CHEN

Boehringer Ingelheim (China) Investment Co., Ltd



# Agenda

- Introduction of GTL macro
- Graph models covered by GTL macro
- Demo for Longitudinal plot
- Compare with ODS Graphics Designer
- Summary for GTL macro



# Introduction

GTL is a powerful tool from SAS graphics and with flexible syntax to create complex and high quality graphics. How to initiate GTL programming quickly and efficiently? A GTL macro can help you to make GTL graph quickly and also can get GTL code directly from this macro.

- Match the basic requirement of graph model
- %GTLsetup
- Visualized window
- No manual book / no need maintenance
- Create GTL graph directly
- Get GTL code in output window



# Graph Models

Scatter plot

Series Plot

Step Plot

Histogram

High Low Plot

Bar Chart

Line Chart

Survival Plot

Box Plot

Loess Plot

Waterfall Plot

Regression Plot

Swimmer Plot

Longitudinal Plot





# Demo for Longitudinal Plot

# Longitudinal Plot – RDS

Analysis Value	Analysis Relative Day	PD	SD	PCR	Frequency	AVALC
0.0	0	0.0	.	.	10	PD (n=10)
20.2	35	20.2	.	.	10	PD (n=10)
0.0	0	.	0.0	.	22	SD (n=22)
-7.1	29	.	-7.1	.	22	SD (n=22)
0.0	0	.	0.0	.	22	SD (n=22)
6.8	43	.	6.8	.	22	SD (n=22)
13.6	64	.	13.6	.	22	SD (n=22)
0.0	0	0.0	.	.	10	PD (n=10)
13.8	43	13.8	.	.	10	PD (n=10)
0.0	0	.	0.0	.	22	SD (n=22)
0.0	42	.	0.0	.	22	SD (n=22)
24.4	63	.	24.4	.	22	SD (n=22)
0.0	0	0.0	.	.	10	PD (n=10)
22.1	42	22.1	.	.	10	PD (n=10)
0.0	0	.	0.0	.	22	SD (n=22)
3.9	37	.	3.9	.	22	SD (n=22)
7.8	64	.	7.8	.	22	SD (n=22)
0.0	0	0.0	.	.	10	PD (n=10)
19.5	26	19.5	.	.	10	PD (n=10)
0.0	0	0.0	.	.	10	PD (n=10)
7.1	42	7.1	.	.	10	PD (n=10)
0.0	0	.	0.0	.	22	SD (n=22)
1.5	41	.	1.5	.	22	SD (n=22)
-3.5	85	.	-3.5	.	22	SD (n=22)
-6.8	120	.	-6.8	.	22	SD (n=22)
-8.2	183	.	-8.2	.	22	SD (n=22)
0.6	253	.	0.6	.	22	SD (n=22)
-15.3	315	.	-15.3	.	22	SD (n=22)
0.0	0	0.0	.	.	10	PD (n=10)
6.5	39	6.5	.	.	10	PD (n=10)
0.0	0	0.0	.	.	10	PD (n=10)
17.7	23	17.7	.	.	10	PD (n=10)
0.0	0	0.0	.	.	10	PD (n=10)
21.5	22	21.5	.	.	10	PD (n=10)
0.0	0	0.0	.	.	10	PD (n=10)
20.4	28	20.4	.	.	10	PD (n=10)
0.0	0	.	0.0	.	22	SD (n=22)

# Longitudinal Plot – Window 1

Command ==>

Select Which graph model need to be set, please tick x

- Scatter Plot
- Series Plot
- Step Plot
- High Low Plot
- Bar Chart
- Line Chart
- Histogram
- Box Plot
- Regression Plot
- Loess Plot
- Waterfall plot
- Longitudinal Plot
- Survival Plot
- Swimmer plot

\*\*\* After entering choice, press [ENTER]

# Longitudinal Plot – Window 2

Command ==>

Please fill out and update graph information below:

BI style template*:	<u>BI A9</u>
Where do you save your graph?***:	<u>'V:\SAS\Clinrep\1200 0066\pgm\pop window'</u>
Graph file name:	<u>'GTL'</u>
Image quality (dpi):	<u>200</u>
Image height (inch):	<u>5.2</u>
Image width (inch):	<u>9.5</u>
Color list for group data:	<u>blue green purple grey yellow orange red</u>

\* BI styles are in form - BI\_xyy, where x= A (Arial), C (Courier), T(Times New Roman), y=8 or 9 or 10 or 11.

\*\* Leave blank if no permanent saving place.

\*\*\* After entering choice, press [ENTER]

# Longitudinal Plot – Window 3

Command ==>

Please fill out and update information below for Longitudinal Plot

Here is some more options:

* Input Dataset, please add libname, eg: ads.ads1: (required)	<u>longti2</u>
*** Title and Footnote information ***	
* Graph Title 1:	
* Title Name, please include ' ', eg: 'scatter plot': (required)	<u>'Longitudinal Plot'</u>
* Title Location (left, center or right): (required)	<u>center</u>
* Title Size, eg: 12pt: (required)	<u>12pt</u>
* Graph Footnote 1:	
* Footnote, please include ' ', eg: 'scatter plot': (required)	<u>'Source data: longti'</u>
* Footnote Location (left, center or right): (required)	<u>left</u>
* Footnote Size, eg: 12pt: (required)	<u>10pt</u>
* Need additional title or footnote? (Y/N): (required)	<u>Y</u>

\*\*\* right column can't be leaved as blank and it should be populated with N or required value.  
\*\*\* already set up some by default values in the right column and they can be updated.  
\*\*\* N: Statement is not defined here or stand for 'no'.  
\*\*\* required: The right column must be populated with required value.  
\*\*\* optional: The right column can be leaved as N if statement is not defined here.

# Longitudinal Plot – Window 4

Command ==>

**Please fill out and update information below for Longitudinal Plot**

Here is some more options - continued:

\*\*\* Title and Footnote information - extended window \*\*\*

\* Graph Title 2:

* Title Name, please include ' ', eg: 'scatter plot': (optional)	N
* Title Location (left, center or right): (optional)	N
* Title Size, eg: 12pt: (optional)	N

\* Graph Title 3:

* Title Name, please include ' ', eg: 'scatter plot': (optional)	N
* Title Location (left, center or right): (optional)	N
* Title Size, eg: 12pt: (optional)	N

\* Graph Footnote 2:

* Footnote, please include ' ', eg: 'scatter plot': (optional)	N
* Footnote Location (left, center or right): (optional)	N
* Footnote Size, eg: 12pt: (optional)	N

\* Graph Footnote 3:

* Footnote, please include ' ', eg: 'scatter plot': (optional)	N
* Footnote Location (left, center or right): (optional)	N
* Footnote Size, eg: 12pt: (optional)	N

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# Longitudinal Plot – Window 5

Command ==>

Please fill out and update information below for Longitudinal Plot

Here is some more options - continued:

\*\*\* Plot statement information \*\*\*

\* Plot Statement - Scatter plot:

\* Variable for X-axis: (required)  
\* Variable for Y-axis: (required)  
\* Lower limit value: (optional)  
\* Upper limit value: (optional)  
\* Group Variable: (optional)  
\* Graph Symbol (eg: plus, star, square): (optional)  
\* Graph color (eg: red, blue, yellow): (optional)

ady \_\_\_\_\_  
aval \_\_\_\_\_  
N \_\_\_\_\_  
N \_\_\_\_\_  
avalc \_\_\_\_\_  
N \_\_\_\_\_  
N \_\_\_\_\_

\* Plot Statement - Series plot 1:

\* Variable for X-axis: (required)  
\* Variable for Y-axis: (required)  
\* Group Variable: (optional)  
\* Curve label variable: (optional)  
\* Curve color: (optional)

ady \_\_\_\_\_  
cr \_\_\_\_\_  
usubjid \_\_\_\_\_  
N \_\_\_\_\_  
red \_\_\_\_\_

\* Plot Statement - Series plot 2:

\* Variable for X-axis: (required)  
\* Variable for Y-axis: (required)  
\* Group Variable: (optional)  
\* Curve label variable: (optional)  
\* Curve color: (optional)

ady \_\_\_\_\_  
pr \_\_\_\_\_  
usubjid \_\_\_\_\_  
N \_\_\_\_\_  
blue \_\_\_\_\_

\* Plot Statement - Series plot 3:

\* Variable for X-axis: (required)  
\* Variable for Y-axis: (required)  
\* Group Variable: (optional)  
\* Curve label variable: (optional)  
\* Curve color: (optional)

ady \_\_\_\_\_  
sd \_\_\_\_\_  
usubjid \_\_\_\_\_  
N \_\_\_\_\_  
purple \_\_\_\_\_

\* Plot Statement - Series plot 4:

\* Variable for X-axis: (required)  
\* Variable for Y-axis: (required)  
\* Group Variable: (optional)  
\* Curve label variable: (optional)  
\* Curve color: (optional)

ady \_\_\_\_\_  
pd \_\_\_\_\_  
usubjid \_\_\_\_\_  
N \_\_\_\_\_  
green \_\_\_\_\_

\* Need more Series plots? (Y/N): (required)

N \_\_\_\_\_

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# Longitudinal Plot – Window 6

Command ==>

Please fill out and update information below for Longitudinal Plot

Here is some more options - continued:

\*\*\* Plot statement information - extended window \*\*\*

\* Plot Statement - Series plot 5:

\* Variable for X-axis: (required)

N \_\_\_\_\_

\* Variable for Y-axis: (required)

N \_\_\_\_\_

\* Group Variable: (optional)

N \_\_\_\_\_

\* Curve label variable: (optional)

N \_\_\_\_\_

\* Curve color: (optional)

N \_\_\_\_\_

\* Plot Statement - Series plot 6:

\* Variable for X-axis: (required)

N \_\_\_\_\_

\* Variable for Y-axis: (required)

N \_\_\_\_\_

\* Group Variable: (optional)

N \_\_\_\_\_

\* Curve label variable: (optional)

N \_\_\_\_\_

\* Curve color: (optional)

N \_\_\_\_\_

\* Plot Statement - Series plot 7:

\* Variable for X-axis: (required)

N \_\_\_\_\_

\* Variable for Y-axis: (required)

N \_\_\_\_\_

\* Group Variable: (optional)

N \_\_\_\_\_

\* Curve label variable: (optional)

N \_\_\_\_\_

\* Curve color: (optional)

N \_\_\_\_\_

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# Longitudinal Plot – Window 7

Command ==>

Please fill out and update information below for Longitudinal Plot

Here is some more options - continued:

\*\*\* Axes and legend information \*\*\*

\* Linear Axes:

* X Axis Display (line, label, ticks and tick values): (required)	<u>ticks tickvalues label</u>
* X Axis Label, please include '': (required)	<u>'Time on Study (Days)'</u>
* X Axis Tickvaluelist, if contains negative value, * please include %str(), eg: %str(-40 -20 -10): (optional)	<u>N</u>
* Y Axis Display (line, label, ticks and tick values): (required)	<u>ticks tickvalues label</u>
* Y Axis Label, please include '': (required)	<u>'Change in Sum of Longitudinal Plot'</u>
* Y Axis Tickvaluelist, if contains negative value, * please include %str(), eg: %str(-40 -20 -10): (optional)	<u>-40 -20 0 20 40 60</u>

\* Discrete Legend - Scatter plot:

* Legend Title, please include '': (required)	<u>'Tumor Response'</u>
* Legend Location (inside or outside): (required)	<u>inside</u>
* Legend Horizontal Location (left, center or right): (required)	<u>left</u>
* Legend Vertical Location (top, center or bottom): (required)	<u>top</u>
* Legend Size, eg: 7: (required)	<u>7</u>
* Legend columns, eg: 1: (optional)	<u>1</u>
* Legend rows, eg: 1: (optional)	<u>N</u>

\* Discrete Legend - Series plot:

* Legend Title, please include '': (required)	<u>N</u>
* Legend Location (inside or outside): (required)	<u>outside</u>
* Legend Horizontal Location (left, center or right): (required)	<u>right</u>
* Legend Vertical Location (top, center or bottom): (required)	<u>bottom</u>
* Legend Size, eg: 7: (required)	<u>7</u>
* Legend columns, eg: 1: (optional)	<u>1</u>
* Legend rows, eg: 1: (optional)	<u>N</u>

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# Longitudinal Plot – Window 8

Command ==>

Please fill out and update information below for Longitudinal Plot

Here is some more options - continued:

\*\*\* Reference Line and drop line information \*\*\*

\* Reference Line:

* Add Reference Line? (Y/N): (required)	Y
* Y Value - Reference Line: (optional)	30
* Label - Reference Line, please include '': (optional)	'Average Tumor response change'
* Location (inside or outside) - Reference Line: (optional)	inside

\* Drop Line:

* Add Drop Line to X Axis? (Y/N): (required)	N
* X value - Drop Line to X Axis: (optional)	58
* Y value - Drop Line to X Axis: (optional)	90
* Label - Drop Line to X Axis, please include '': (optional)	N
* Add Drop Line to Y Axis? (Y/N): (required)	N
* X Value - Drop Line to Y Axis: (optional)	58
* Y Value - Drop Line to Y Axis: (optional)	90
* Label - Drop Line to Y Axis, please include '': (optional)	N

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# Longitudinal Plot – Window 9

Command ==>

Please fill out and update information below for Longitudinal Plot

Here is some more options - continued:

\*\*\* Add text annotation - Entry Statement \*\*\*

* Want to add mutiple entry in the same location (Y/N)?	Y
* Mutiple entry location (ex: topleft, topright)	topright
* Mutiple entry Border, ('true' or 'flase')	true
* Entry Statement 1:	
* Entry Text, please include '': (required)	'Created by Kevin'
* Entry Horizontal Location (left, center or right): (required)	right
* Entry Vertical Location (top, center or bottom): (required)	top
* Entry Text Size, eg: 7: (required)	7
* Entry Text rotation (0, 90, 180 and 270): (required)	0
* Entry Border, ('true' or 'flase'): (required)	false
* Entry Borderline color, please include '': (optional)	black
* Entry Statement 2:	
* Entry Text, please include '': (optional)	'BDS'
* Entry Horizontal Location (left, center or right): (optional)	right
* Entry Vertical Location (top, center or bottom): (optional)	top
* Entry Text Size, eg: 7: (optional)	7
* Entry Text rotation (0, 90, 180 and 270): (optional)	0
* Entry Border, ('true' or 'flase'): (optional)	false
* Entry Borderline color, please include '': (optional)	black
* Entry Statement 3:	
* Entry Text, please include '': (optional)	'BI'
* Entry Horizontal Location (left, center or right): (optional)	right
* Entry Vertical Location (top, center or bottom): (optional)	top
* Entry Text Size, eg: 7: (optional)	7
* Entry Text rotation (0, 90, 180 and 270): (optional)	0
* Entry Border, ('true' or 'flase'): (optional)	false
* Entry Borderline color, please include '': (optional)	black
* Add annotation dataset (Y/N)?: (required)	Y

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# Longitudinal Plot – Window 10

Command ==>

**Please fill out and update information below for Longitudinal Plot**

Here is some more options - continued:

\*\*\* Add text annotation - Annotated dataset \*\*\*

\* Annotated Dataset - Add text to the graph (No missing for right column):

* Function, please include '': (required)	'text'
* Text Color, please include '': (required)	'red'
* Text Width: (required)	500
* Text Width Unit, please include '': (required)	'pixel'
* Anchor Location, 'left', 'right', 'center', 'bottomleft', 'bottomright', 'bottomcenter: (required)	'right'
* Location - X axis value: (required)	900
* Location - Y axis value: (required)	15
* Text content, please include '': (required)	'Created by Kevin'
* Draw Space, please include '': (required)	'graphpixel'
* Border, ('true' or 'false'): (required)	'true'
* Borderline color, please include '': (optional)	'blue'
* Borderline pattern, please include '': (optional)	'dash'

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# Longitudinal Plot – Window 1 1

Command ==>

Please fill out and update information below for Longitudinal Plot

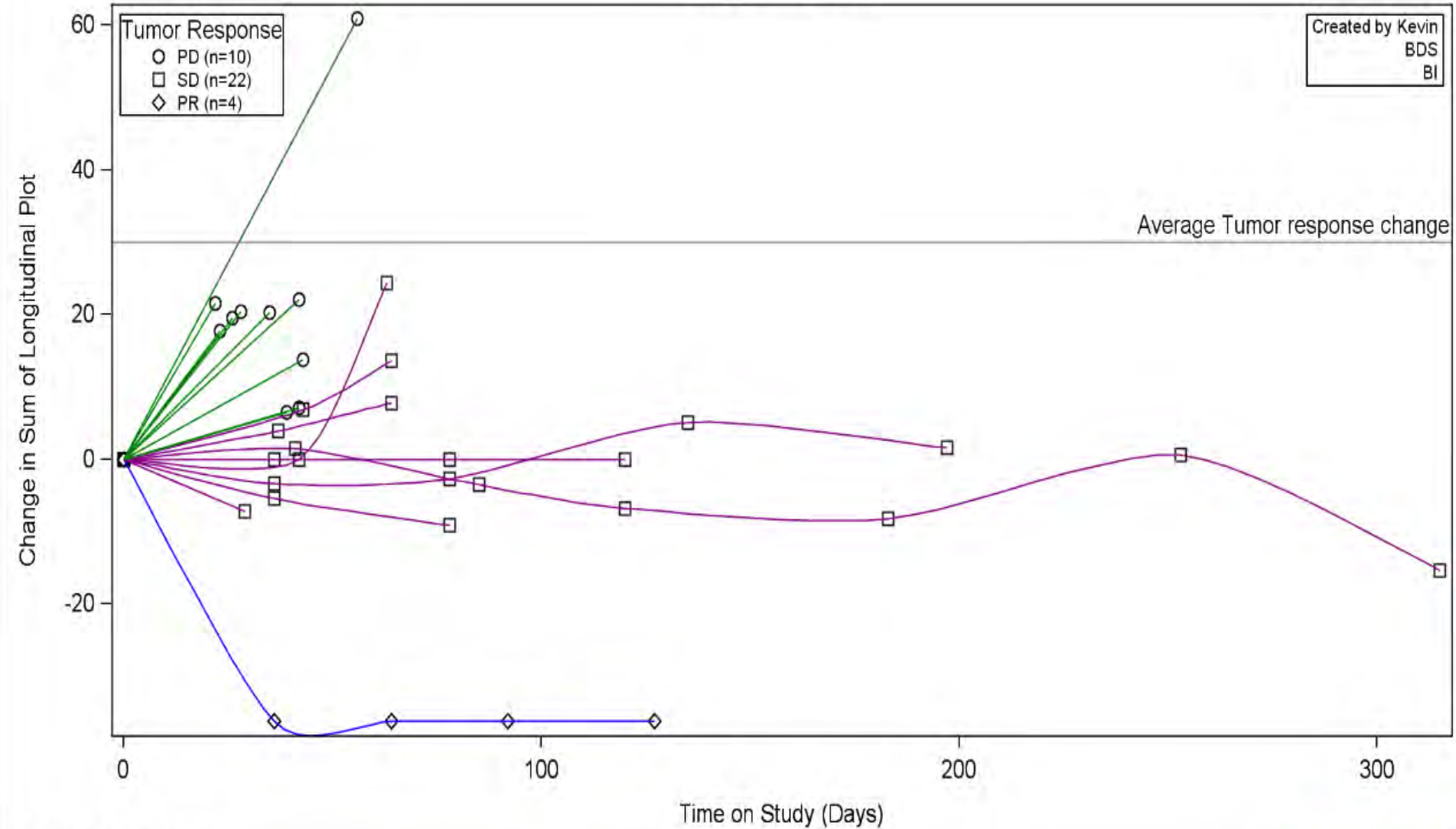
Here is some more options - continued:

\* Need GTL Code (Y/N): (required) Y

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# Longitudinal Plot – Graph Output

Longitudinal Plot





# Longitudinal Plot – GTL Code 1

## GTL code - Longitudinal Plot

```
%let outputno=1;

ods listing style=BI_A9 image_dpi=200 gpath='V:\SAS\Clinrep\1200_0066\pgm\pop window';
ods graphics on / reset=all imagename='GTL' imagefmt=png height=5.2 in width=9.5 in;

proc template;
  define statgraph temp;
    begingraph / datacolors=(blue green purple grey yellow orange red);
      entrytitle textattrs=(size=12pt)
        halign=center
        'Longitudinal Plot';
      layout overlay / xaxisopts=(display=(ticks tickvalues label)
        label='Time on Study (Days)'
        labelposition=datacenter)
        yaxisopts=(display=(ticks tickvalues label)
        label='Change in Sum of Longitudinal Plot'
        labelposition=datacenter
        linearopts=(tickvaluelist=(-40 -20 0 20 40 60)))
        ;
      layout gridded / border=true autoalign=(topright)
        rows=3
        ;
      entry halign=right 'Created by Kevin' / valign=top
        textattrs=(color=black size=7)
        rotate=0 border=false;
      entry halign=right 'BDS' / valign=top
        textattrs=(color=black size=7)
        rotate=0 border=false;
      entry halign=right 'BI' / valign=top
        textattrs=(color=black size=7)
        rotate=0 border=false;
    endlayout;
    scatterplot x=ady y=aval / group=avalc name='scatter'
      ;
    seriesplot x=ady y=cr / name='series1' group=usubjid
      smoothconnect=true lineattrs=(thickness=1 pattern=solid color=red);
    seriesplot x=ady y=pr / name='series2' group=usubjid
      smoothconnect=true lineattrs=(thickness=1 pattern=solid color=blue);
    seriesplot x=ady y=sd / name='series3' group=usubjid
      smoothconnect=true lineattrs=(thickness=1 pattern=solid color=purple);
    seriesplot x=ady y=pd / name='series4' group=usubjid
      smoothconnect=true lineattrs=(thickness=1 pattern=solid color=green);
    referenceline y=30 / curvelabel='Average Tumor response change' curvelabellocation=inside;
    discretelegend 'scatter' / location=inside halign=left valign=top
      valueattrs=(size=7) title='Tumor Response'
      across=1
      ;
    endlayout;
  annotate;
  entryfootnote textattrs=(size=10pt)
    halign=left
```

# Longitudinal Plot – GTL Code2

GTL code - Longitudinal Plot

---

```
                                'Source data: longti';
endgraph;
end;
run;

data anno;
  length function $9. label $60.;
  function='text';
  drawspace='graphpixel';
  x1=900;
  y1=15;
  width=500;
  widthunit='pixel';
  anchor='right';
  label='Created by Kevin';
  textcolor='red';
  border='true';
  linecolor='blue';
  linepattern='dash';
  output;
run;

proc sgrender data=longti2 template=temp sganno=anno;
run;

ods graphics off;
```



Compare with ODS Graphics Designer

	GTL Training Macro	ODS graphic designer
Match the basic requirement of graph model	Yes but contains BI specific graph model, like Swimmer plot	Yes
Easy to use	Easy ( include macro in program)	Not easy ( need to open it in the SAS -> Tool and can not apply in the SAS program directly)
Visualized window	Yes	Yes
Manual book	No	No
Get graph directly	Yes	No
Get GTL code	Yes	Yes



# Summary for GTL Macro

- Can get all the parameter information in the visualized window
- Simple graph – Get the GTL code and graph directly
- Complex graph – Get the main part of GTL code and draft graph
- It is a good training tool for entry level programmer and also is good graphing macro for experienced programmer and statistician

Name: Kevin CHEN

Organization: Boehringer Ingelheim (China) Investment Co., Ltd

Address:

29/F, Park Place

1601 Nanjing Road ( West)

Shanghai 200040, P.R. China

City: Shanghai

E-mail: [kevin.chen@boehringer-ingelheim.com](mailto:kevin.chen@boehringer-ingelheim.com)