Subject: Plotting lookback time (in Gyrs) and redshift on two x axis in IDL
Posted by johndraper1993 on Wed, 03 Dec 2014 11:47:17 GMT

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Hey, I recently came across this forum which discusses the difficulties in plotting two different x axis on the same plot.

 https://groups.google.com/forum/#!topic/comp.lang.idl-pvwave /_ooU4X875i0

One contributer wrote

"IDL> plot,indgen(10),YRANGE=[1,12],YTITLE='first linear
axis',YSTYLE=9,POSITION=[.1,.1,.9,.9],CHARSIZE=2
IDL>
 axis,YSTYLE=1,YAXIS=1,YTICKFORMAT='conv_axis',CHARSIZE=2,YTI TLE='second
non-linear axis'

where 'conv_axis' is the name of the function which does the
conversion (e.g.):

```
function conv_axis,axis,index,value
  return,string(FORMAT='(F0.1)',value^1.5*exp(-value^2/100))
end"
```

I tried to use what this user wrote in my code:

```
window,0
plot,res,rho*5000,/Ylog,XTITLE='Time (Gyr)',YTITLE='Log(dp/dt) (Solar Mass Mpc^-3 yr^-1)',
XRange=[12,0]  ;plot z against phi
axis, XAXIS=1,XTICKFORMAT=z,XTITLE='redshift'
```

Note: res is the time in gigayears given here:
 res=9.777505969(2./3/h/sqrt(1.omega_m))*asin(sqrt((1.omega_m)/omega_m)/(1.+z)^(3./2))
;turns z into Giga years

I was unsure what function to set equal to XTICKFORMAT, do i need to create a function to convert Gigayears into redshift?

Please say if you would like to see any more of the code, as it is quite long i left most of it out.

Thanks in advance, John

Subject: Re: Plotting lookback time (in Gyrs) and redshift on two x axis in IDL
Posted by rryan%stsci.edu on Wed, 03 Dec 2014 20:12:53 GMT

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I don't know... But I found it to be a lot more obvious what's going on if you just do what Fanning

teaches us:

http://www.idlcoyote.com/tips/another_yaxis.html
http://www.idlcoyote.com/tips/irregular_tick_spacing.html

note, for the second one, you can use the xtickv keyword and just set it equal to whatever array you want.

Russell

On Wednesday, December 3, 2014 6:47:19 AM UTC-5, johndra...@gmail.com wrote:
> Hey, I recently came across this forum which discusses the difficulties in plotting two different x axis on the same plot.
>
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>
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> where 'conv_axis' is the name of the function which does the
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> Note: res is the time in gigayears given here:
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>
> I was unsure what function to set equal to XTICKFORMAT, do i need to create a function to convert Gigayears into redshift?
>
> Please say if you would like to see any more of the code, as it is quite long i left most of it out.

>
> Thanks in advance, John

Subject: Re: Plotting lookback time (in Gyrs) and redshift on two x axis in IDL
Posted by johndraper1993 on Wed, 03 Dec 2014 21:56:51 GMT
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I understand that i can make one axis logarithmic in scale but i don't think this helps me as redshift isn't logarithmic with respect to lookback time (res).

I have worked out what redshift is with respect to lookback time in Gyrs:

 z=(sqrt((1.-omega_m)/omega_m)/sin(res*3*h*sqrt((1.-omega_m)/ (2*9.777505969))))

Do you know if there is there anyway i can set the top axis to have this scaling within some set of values?

please say if i haven't made it clear

Thanks, John

Subject: Re: Plotting lookback time (in Gyrs) and redshift on two x axis in IDL
Posted by rryan%stsci.edu on Thu, 04 Dec 2014 20:40:09 GMT
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On Wednesday, December 3, 2014 4:56:59 PM UTC-5, johndra...@gmail.com wrote> I understand that i can make one axis logarithmic in scale but i don't think this helps me as redshift isn't logarithmic with respect to lookback time (res).
>
> I have worked out what redshift is with respect to lookback time in Gyrs:
>
> z=(sqrt((1.-omega_m)/omega_m)/sin(res*3*h*sqrt((1.-omega_m)/ (2*9.777505969))))
>
> Do you know if there is there anyway i can set the top axis to have this scaling within some set of values?
>
> please say if i haven't made it clear
>
> Thanks, John

The functional form you choose is irrelevant.

(1) Pick some redshifts for which you want the lookback time.
(2) compute the lookback time. You keep giving that equation, and I think that's wrong. Where is Omega_lambda? where is time?   Look at galage() in the astrolib. that is what you want.

---

(3) now use the z values posited above with xtickv, xtickname, and axis to put the plot where you want.

xr=[0,10]
yr=[0,1]

z=[1,2,3,4] ;redshifts to compute LB time for...

;Univ age at some redshift:
 t=galage(z,1000.,h0=69.6,omega=0.286,lambda=0.714,/sil)/1.0e 9

;Univ age at today
 t0=galage(0.,1000.,h0=69.6,omega=0.286,lambda=0.714,/sil)/1. 0e9

;LB time is difference...
lb=t0-t

;draw the plot
plot,[0],[0],xr=xr,xst=9,yr=yr,yst=1 ;set xst=9 to leave the top axis empty

;more plotting here

;draw the top axis
 axis,xaxis=1,xr=xr,xst=1,xtickv=z,xtickname=string(lb,f='(F4 .1)'),$
    xticks=n_elements(z)-1