

**On the variation  
of the  
energy scale 25**

**SPARC catalogue  
rotation curves:  
UGC galaxies**

Fri 19th Jul 2024  
(Previously: Wed 30th Jan 2019)  
[www.varensca.com](http://www.varensca.com)

## Summary

This paper presents plots of the rotation curves for 73 UGC galaxies taken from the SPARC catalogue (Lelli et al, 2016). These are in addition to the 64 galaxies covered in paper JoKe23 (2019). The fitted rotation curves are based on the ideas and analysis presented in JoKe22 (2019).

# 1 Table SPARC galaxies

## 1.1 Table of SPARC galaxies included here.

**Mass** mass of galaxy in solar masses  
**xi slope** slope of  $\xi$ -function in bottom left panels  
**M-to-L** mass-to-light ratio  
**DM** dark matter ratio

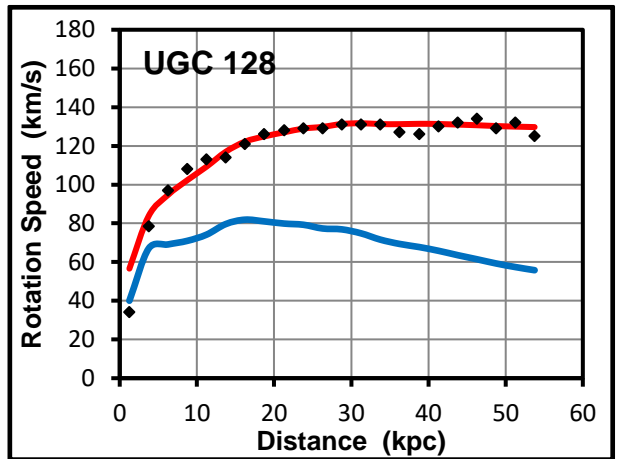
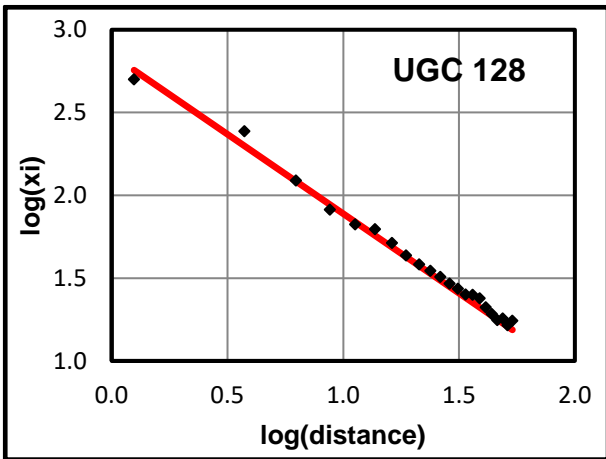
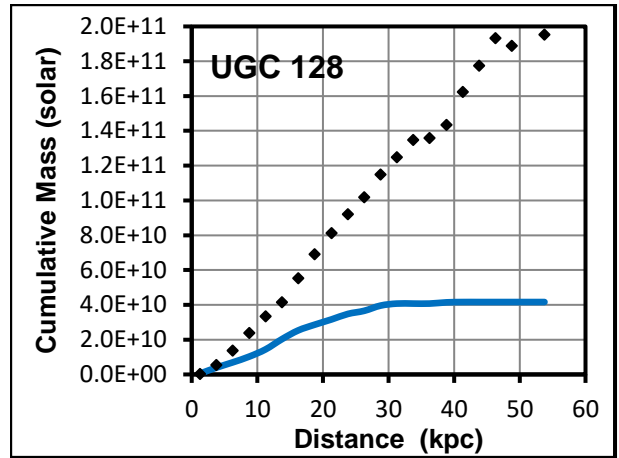
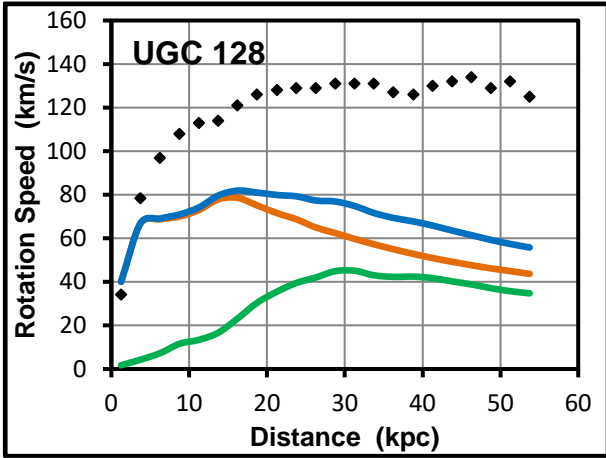
Galaxy	Mass	xi slope	M-to-L	DM
UGC00128	4.16E+10	-0.96	1.85	3.7
UGC00191+	5.36E+09	-1.07	1.15	2.0
UGC00634+	9.60E+09	-1.38	1.22	4.0
UGC00731-	7.13E+09	-0.80	9.30	0.9
UGC00891+	1.13E+09	-1.78	0.79	5.2
UGC01230-	3.12E+10	-0.80	2.00	1.9
UGC01281+	8.72E+08	-2.00	1.00	3.3
UGC02023+	7.10E+08	-2.13	0.32	3.3
UGC02259-	6.39E+09	-0.72	2.41	1.4
UGC02487+	3.63E+11	-0.71	0.62	4.7
UGC02885+	2.99E+11	-0.92	0.37	4.1
UGC02916-	2.19E+11	-0.04	2.00	0.3
UGC02953+	1.35E+11	-0.67	0.45	7.0
UGC03205-	5.85E+10	-0.78	0.22	6.7
UGC03546+	3.06E+10	-0.76	0.20	7.3
UGC03580+	1.04E+10	-1.14	0.20	8.3
UGC04278-	4.03E+09	-1.13	0.95	2.3
UGC04325-	6.49E+09	-0.70	2.00	0.7
UGC04499+	3.28E+09	-1.30	0.62	2.2
UGC05005+	1.33E+10	-1.43	0.72	3.9
UGC05253-	7.76E+10	-0.72	0.24	6.6
UGC05414+	1.25E+09	-1.46	0.65	1.9
UGC05716+	3.18E+09	-1.19	1.55	4.0
UGC05721-	1.55E+09	-1.02	1.11	5.4
UGC05750+	1.20E+10	-1.11	1.27	1.8
UGC05764-	8.94E+08	-1.21	5.42	1.3
UGC05829+	3.40E+09	-1.19	2.24	1.2
UGC05918	1.36E+09	-0.63	3.70	0.5
UGC05986+	6.74E+09	-1.06	0.95	2.7
UGC05999+	1.20E+10	-1.49	0.87	2.1
UGC06399+	4.84E+09	-1.24	1.20	1.9
UGC06446+	4.61E+09	-1.01	1.81	2.3
UGC06614-	8.31E+10	-1.01	0.20	6.5

Galaxy	Mass	xi slope	M-to-L	DM
UGC06628-	3.20E+09	-0.03	0.63	0.0
UGC06667-	9.51E+09	-1.30	8.00	0.4
UGC06786+	3.42E+10	-0.89	0.33	9.3
UGC06787+	3.50E+10	-0.99	0.21	15.1
UGC06818+	1.14E+09	-2.06	0.22	6.9
UGC06917+	9.13E+09	-1.20	0.66	2.3
UGC06923+	2.14E+09	-1.46	0.31	2.7
UGC06930+	1.52E+10	-0.97	0.81	2.0
UGC06983+	1.07E+10	-1.04	0.83	3.0
UGC07089+	4.00E+09	-1.33	0.57	2.3
UGC07125+	8.02E+09	-0.93	0.63	1.3
UGC07151+	3.45E+09	-0.94	0.83	1.2
UGC07261+	3.48E+09	-0.86	1.10	1.6
UGC07323+	3.77E+09	-1.40	0.53	1.6
UGC07399+	2.83E+09	-1.29	1.38	4.7
UGC07524-	6.47E+09	-1.22	1.00	1.6
UGC07559+	2.31E+08	-1.54	0.51	1.6
UGC07577+	5.15E+07	-1.40	0.34	1.4
UGC07603+	5.95E+08	-1.38	0.75	5.6
UGC07608-	1.23E+09	-1.80	2.00	3.3
UGC07690-	1.04E+09	-0.78	0.60	1.9
UGC07866+	2.47E+08	-1.15	0.94	1.4
UGC08266+	3.94E+09	-0.96	1.88	2.4
UGC08490+	2.34E+09	-0.94	1.10	5.1
UGC08550+	9.99E+08	-1.12	1.30	3.1
UGC08699-	2.02E+10	-0.80	0.21	8.9
UGC08837+	8.46E+08	-1.82	0.51	1.7
UGC09037+	4.53E+10	-1.00	0.24	2.3
UGC09133+	1.43E+11	-0.70	0.21	8.3
UGC09992+	6.66E+08	-0.49	0.88	0.6
UGC10310+	5.27E+09	-0.77	1.57	0.8
UGC11455+	2.11E+11	-0.76	0.41	2.3
UGC11557-	6.42E+09	-1.18	0.24	1.7
UGC11820+	6.15E+09	-1.28	1.45	3.3
UGC11914-	4.16E+10	-0.77	0.20	4.1
UGC12506-	3.08E+11	-0.48	1.45	0.9
UGC12632+	5.81E+09	-0.96	1.90	1.3
UGC12732+	9.44E+09	-1.19	1.45	2.6
UGCA442+	8.23E+08	-1.74	2.00	4.7
UGCA444	1.93E+08	-1.48	3.85	3.6

## 2 Plots of SPARC galaxies

- 2.1 The following pages show the results of applying the analysis of JoKe22 (2019) to the UGC galaxies presented in the SPARC catalogue (Lelli et al, 2016).
- 2.2 The top left panels shows the SPARC data. The black diamonds are the observations of the rotation curve. The purple curve is the contribution to the velocity from the central bulge (if one exists); the orange curve from the disk of stars; the green curve from the gas. The blue curve is the expected velocity given by aggregating the components using equation (8).
- 2.3 The top right panel shows the cumulative mass distribution corresponding to the velocities in the top left panel. The values are found by solving the numerical form of equation (5). The black diamonds give the observed total mass corresponding to the black diamonds in the top left panel. The blue line gives the normal matter mass corresponding to the blue line in the top left panel. This diagram shows whether the observed or expected masses are levelling off or are still increasing at the outer edge of the galaxy. The observed mass usually shows a continuing increase; the expected mass usually shows convergence. If the observed mass is interpreted as the expected mass plus the dark matter mass then we can define the dark matter ratio as
- $$\text{Ratio}(\text{dark matter}) = \frac{M(\text{dark matter})}{M(\text{observed})} = \frac{M(\text{observed}) - M(\text{expected})}{M(\text{observed})} \quad (11)$$
- 2.4 The bottom left panel shows, in logarithmic form, the  $\xi$ -function as a function of distance, as derived by solving equation (4). In practice  $\xi(r)$  is found by solving equations (9) and (10). The black diamonds correspond to the observed velocities shown in the top left panel. All galaxies show an approximate linear relation. The red line is a straight line that approximates to the observed data. It turns out that it is only the slope of the red line that is important and not is position.
- 2.5 The bottom right panel shows the rotation curve again. The black diamonds are the same observed velocities as in the top left panel. Similarly the blue line is the same expected velocities as in the top left panel. The red line is the fitted rotation curve derived by applying the red line from the bottom left panel for  $\xi(x)$  to the blue line from the top right panel for the mass  $dM(x)$ . The fitted velocity is calculated by applying the  $\xi(x)$  and  $dM(x)$  to equation (4).

### UGC 128

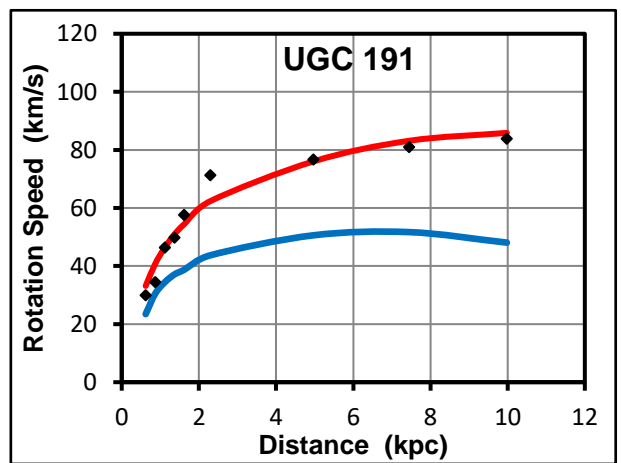
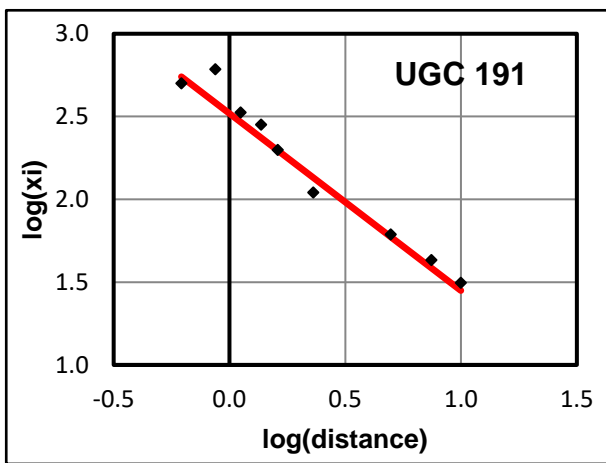
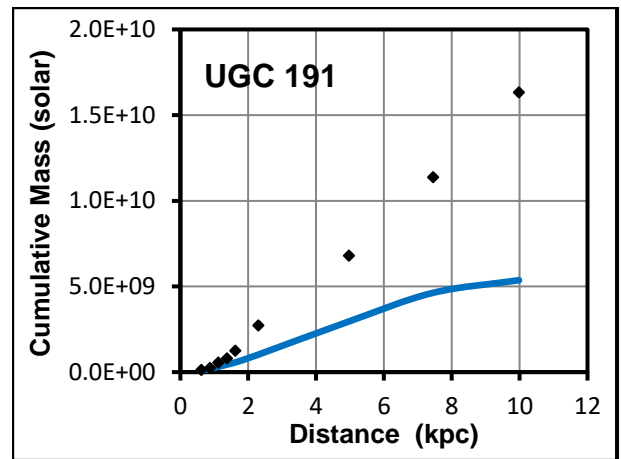
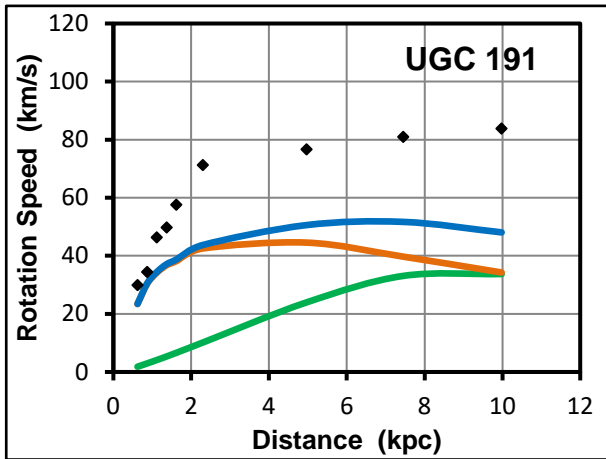


Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.85
$\xi, \text{slope}$	-0.96
DM factor	3.7
Fit quality	good

### UGC 191



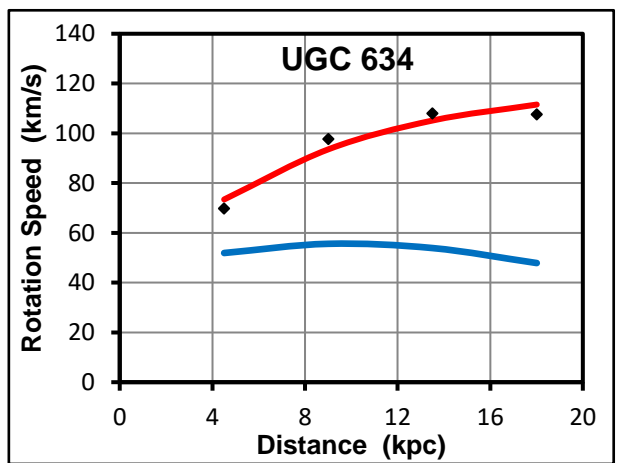
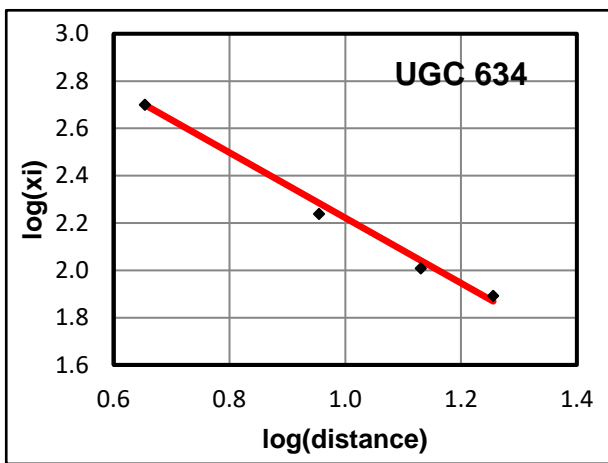
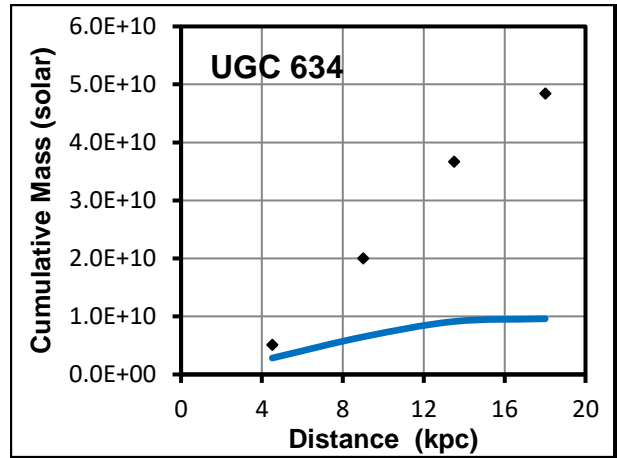
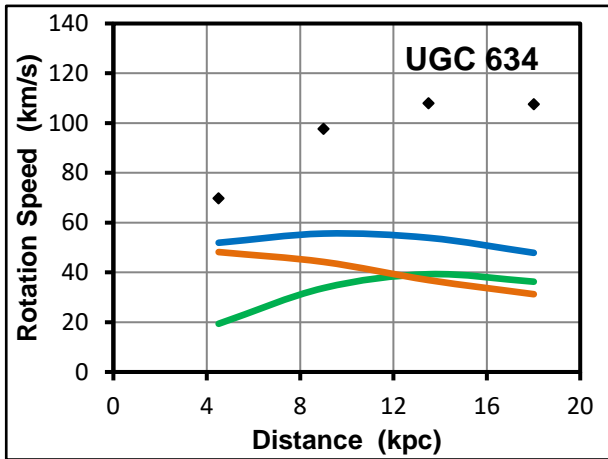
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y$ , M-to-L	1.15
$\xi$ , slope	-1.07
DM factor	2.0
Fit quality	OK

Comments:

### UGC 634



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

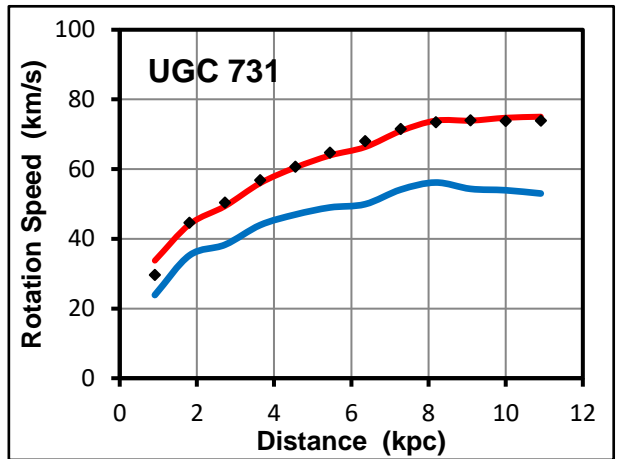
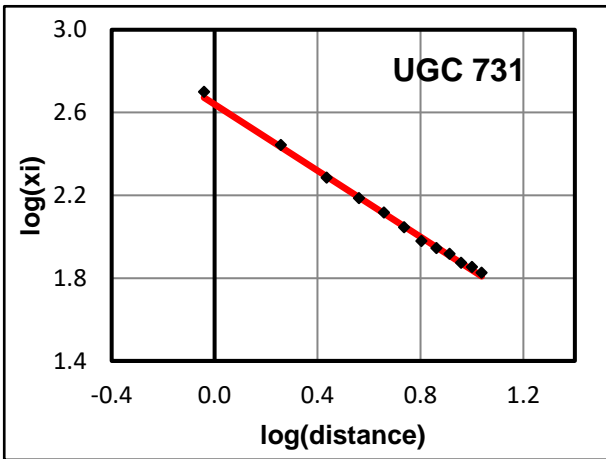
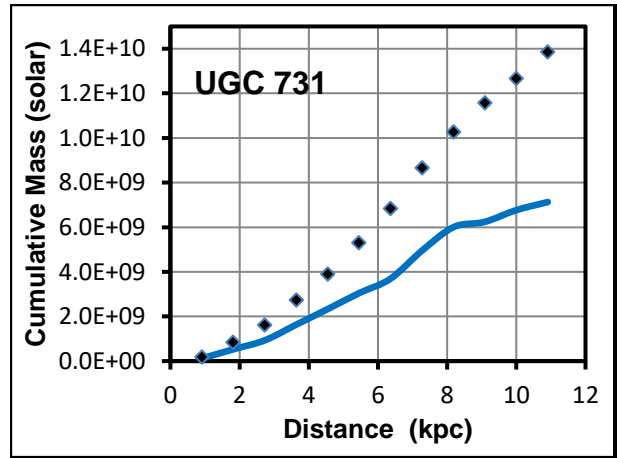
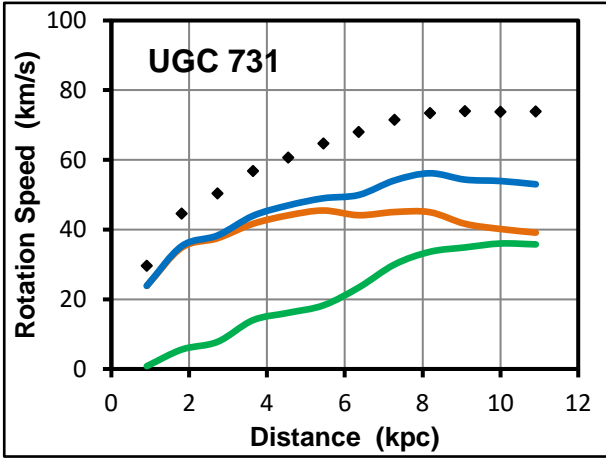
Fit parameters

$Y$ , M-to-L	1.22
$\xi$ , slope	-1.38
DM factor	4.0
Fit quality	OK

Comments:  
 Only 4 data points



### UGC 731



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

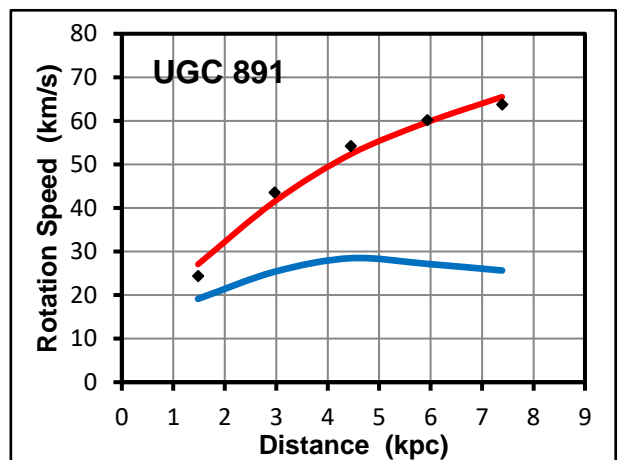
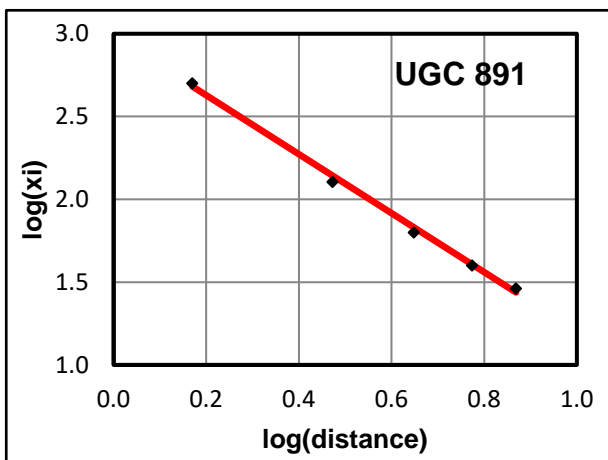
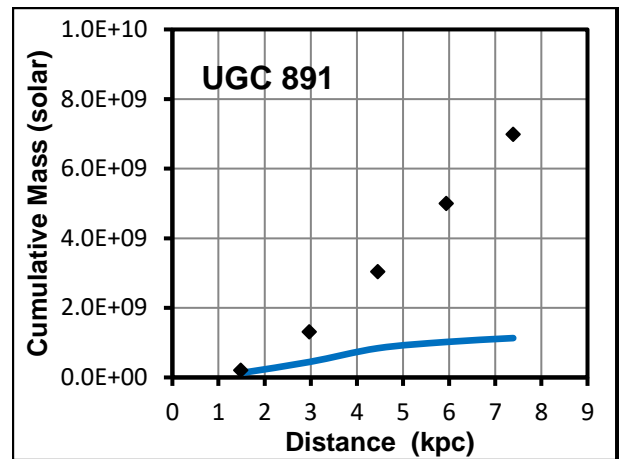
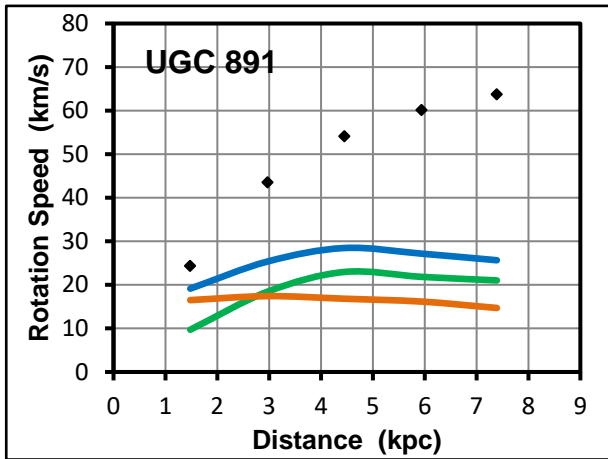
Fit parameters

$Y$ , M-to-L	9.30
$\xi$ , slope	-0.80
DM factor	0.9
Fit quality	Ouch!

Comments:

M-to-L ratio has to be the unphysically high value of 9.30! This suggests that the data for the stellar disk is wrong by a factor of 10.

### UGC 891



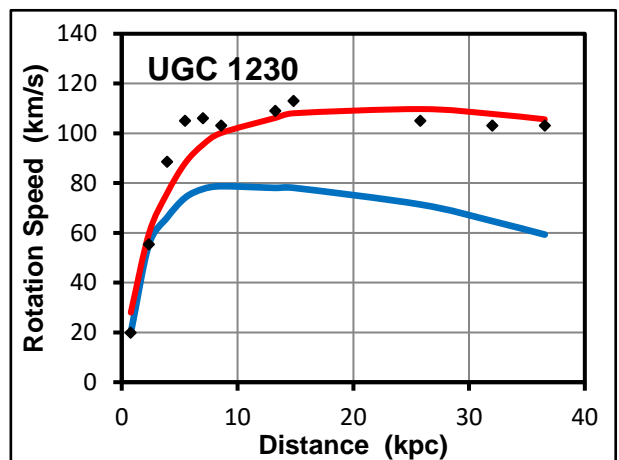
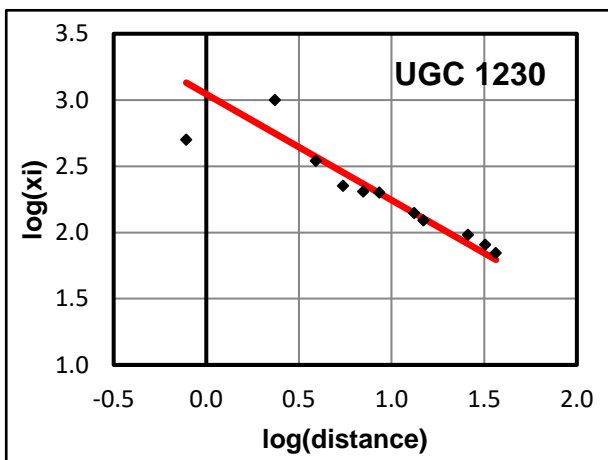
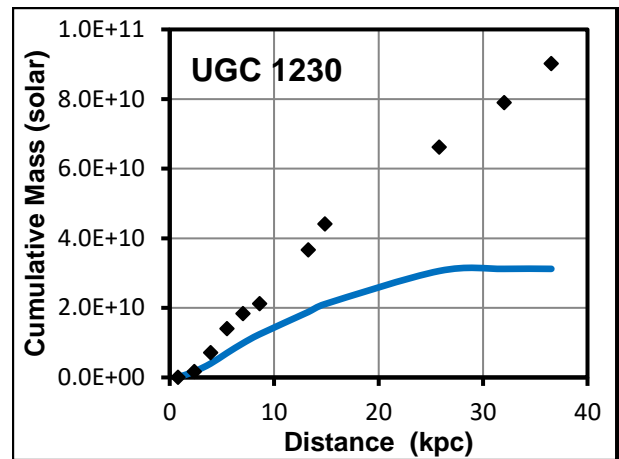
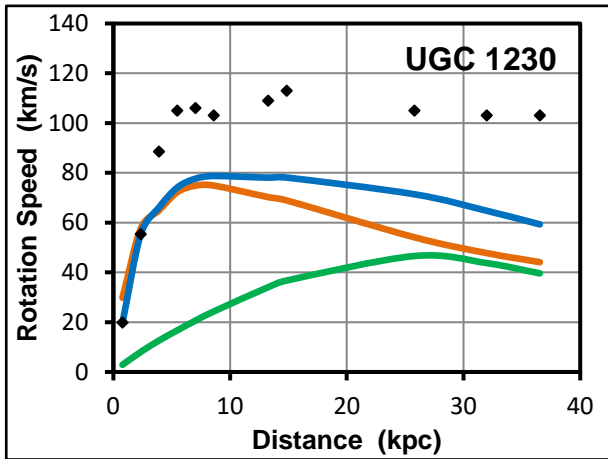
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.79
$\xi, \text{slope}$	-1.78
DM factor	5.2
Fit quality	OK

Comments:  
 Only 5 data points. Galaxy is gas dominated in the outer regions.

### UGC 1230



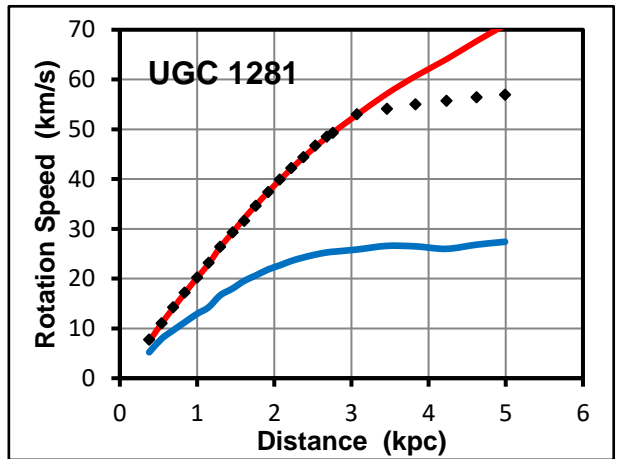
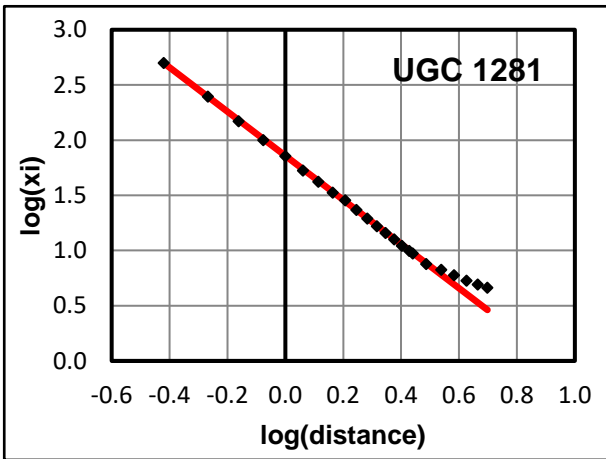
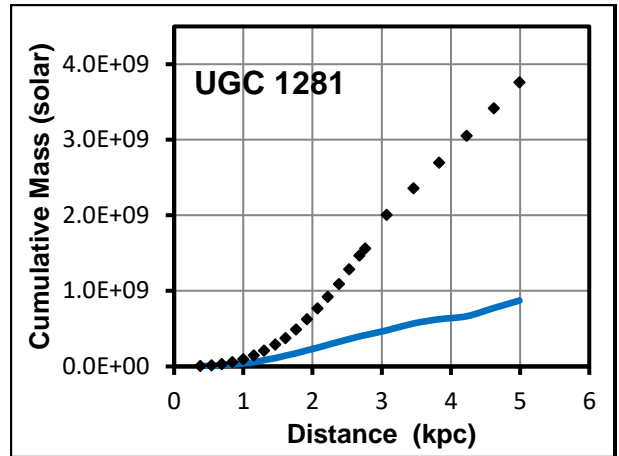
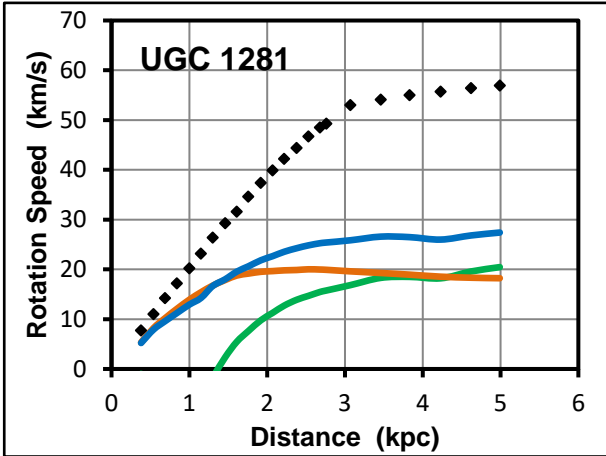
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y$ , M-to-L	2.00
$\xi$ , slope	-0.80
DM factor	1.9
Fit quality	poor

Comments:  
 Manual fit. Requires a high M-to-L ratio.

### UGC 1281



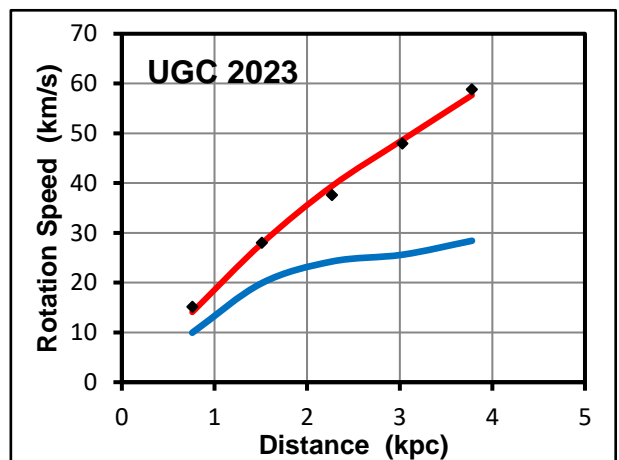
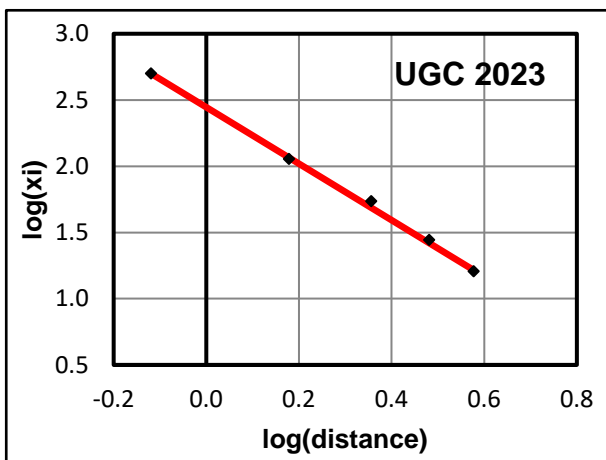
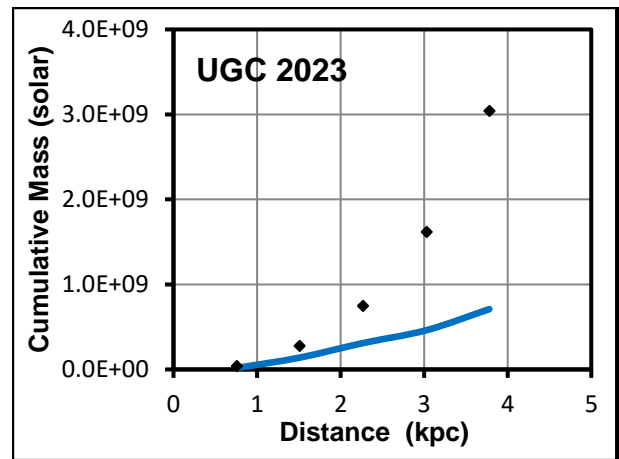
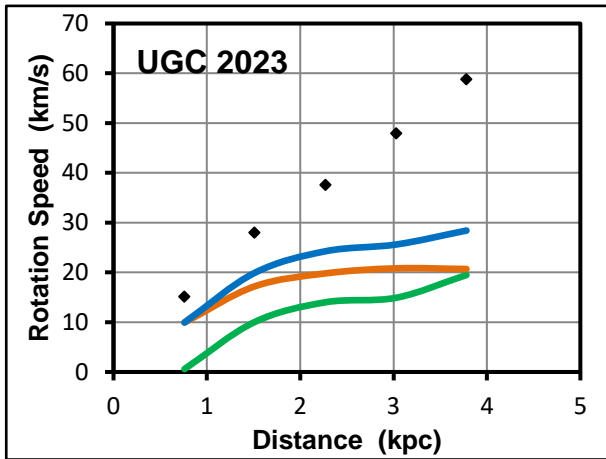
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Y, M-to-L	1.00
$\xi$ , slope	-2.00
DM factor	3.3
Fit quality	OK

Comments:  
 Manual fit. Fit ignores innermost 2 points (not shown) and outermost 5 points where  $\xi$ -function begins to converge.

### UGC 2023



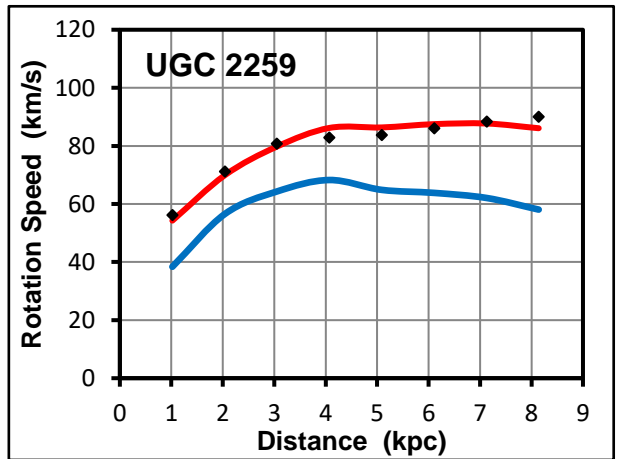
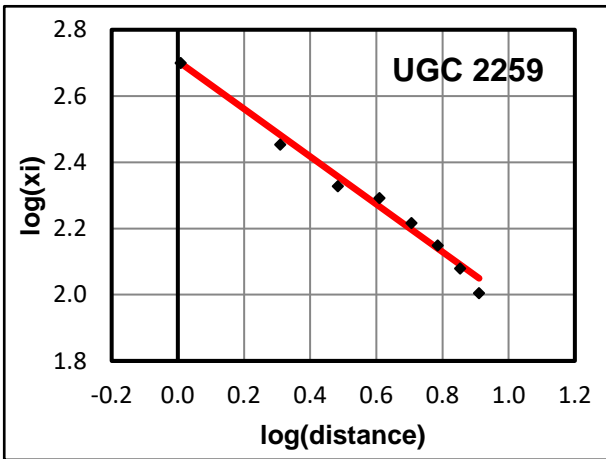
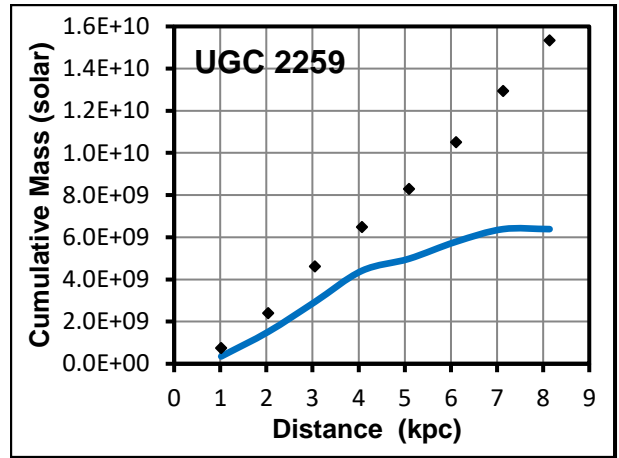
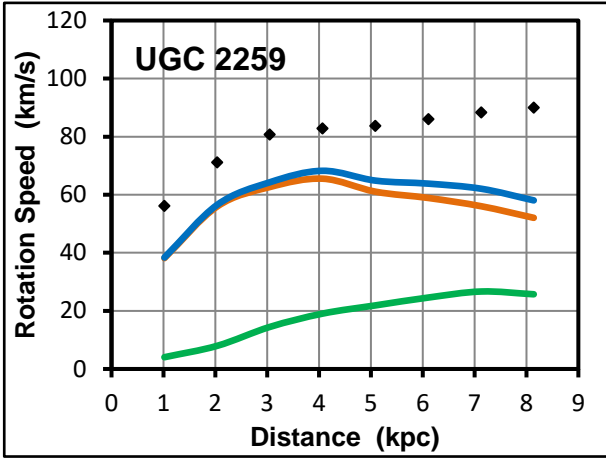
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.32
$\xi, \text{slope}$	-2.13
DM factor	3.3
Fit quality	OK

Comments:  
 Only 5 data points. Mass still increasing due to gas.

### UGC 2259



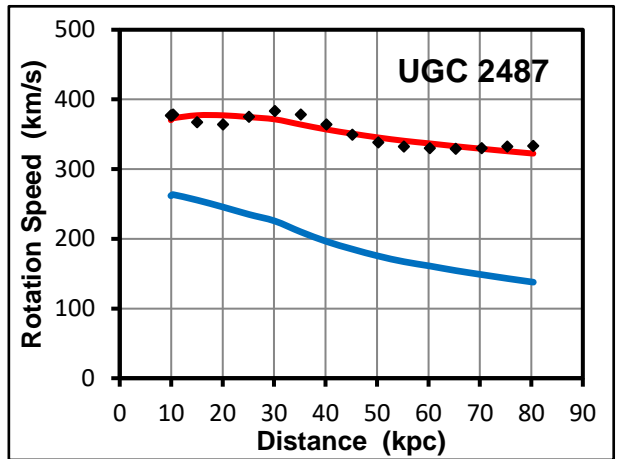
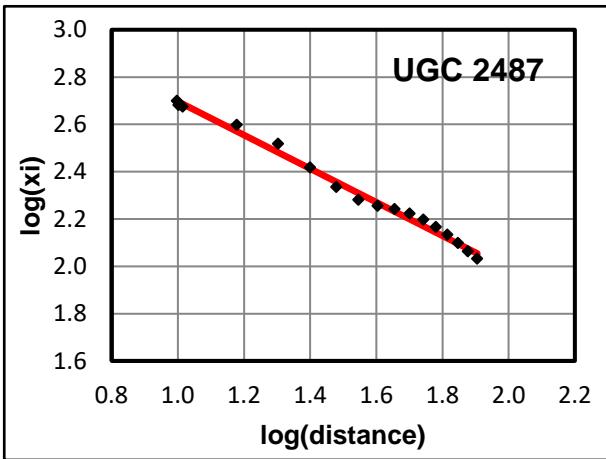
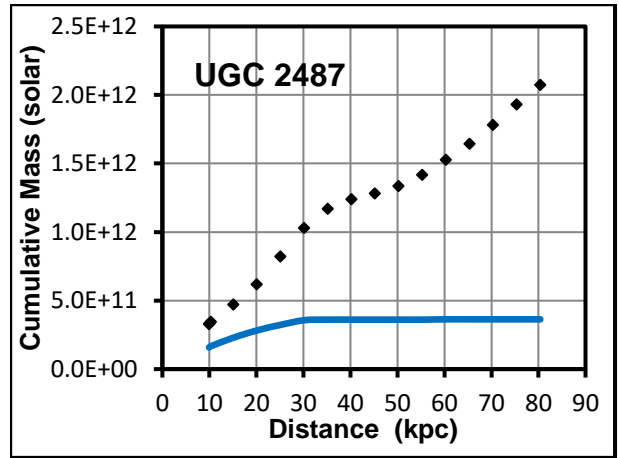
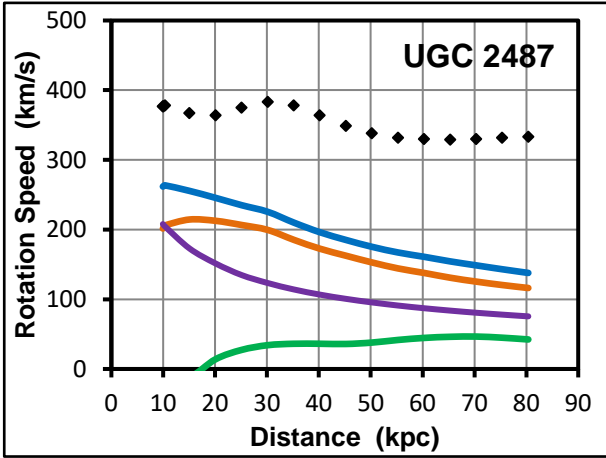
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	2.41
$\xi, \text{slope}$	-0.72
DM factor	1.4
Fit quality	poor

Comments:  
 Very high M-to-L ratio, 2.41.

### UGC 2487



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

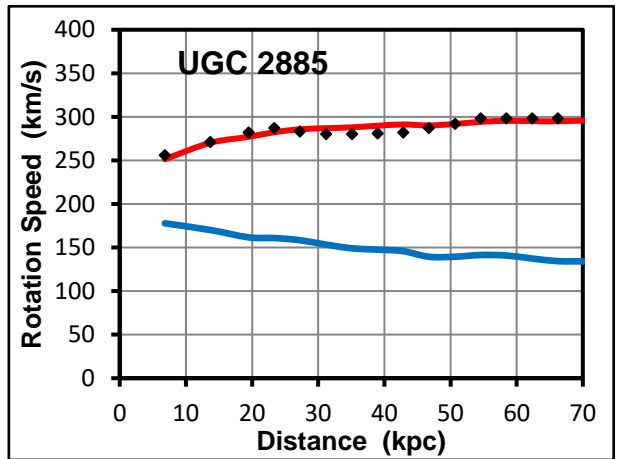
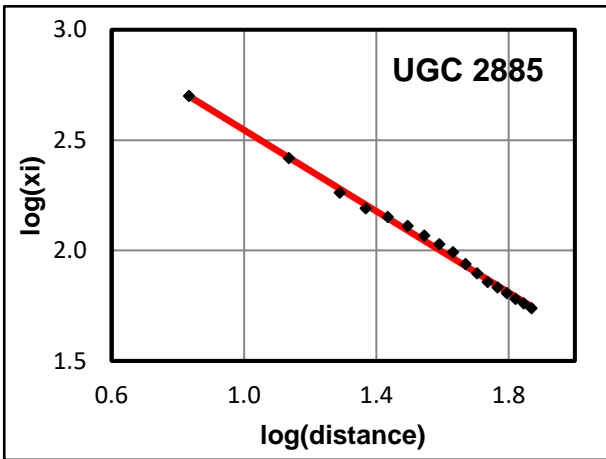
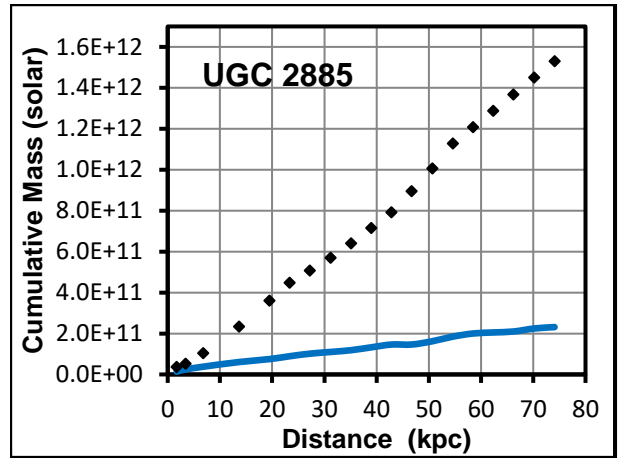
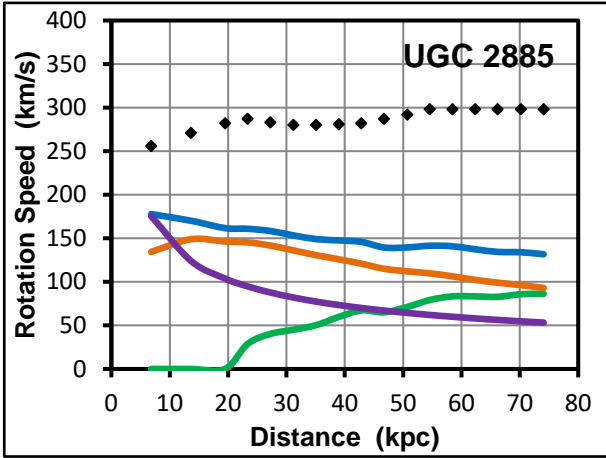
Fit parameters

Bulge, M-to-L	0.65
Disk, M-to-L	0.62
$\xi$ , slope	-0.71
DM factor	4.7
Fit quality	OK

Comments:

Galaxy has a bulge. 44% of mass inside 1st data point. Mass converged by 30kpc.

### UGC 2885



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

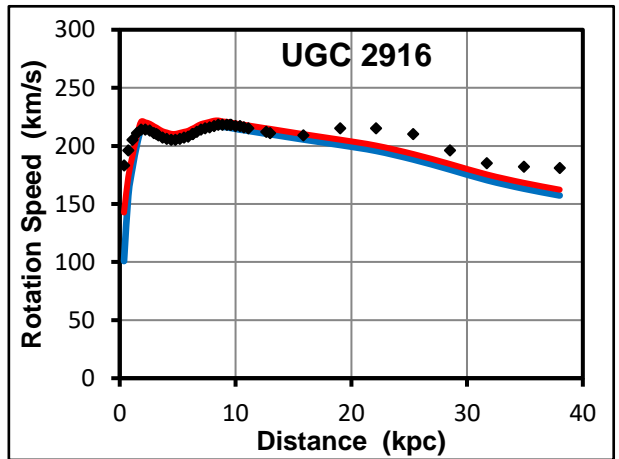
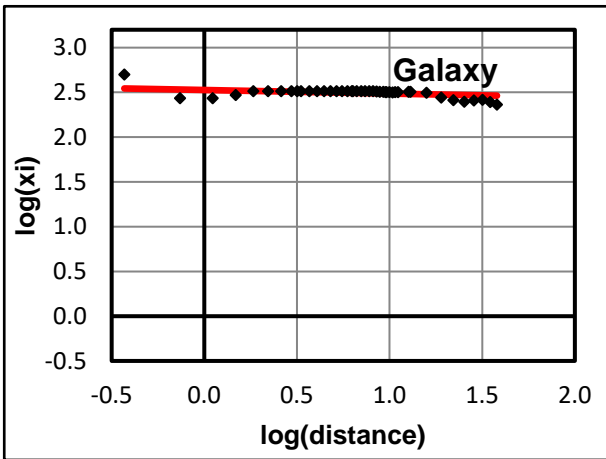
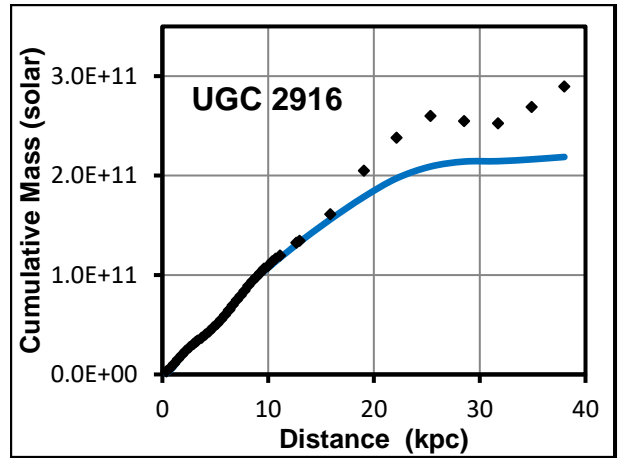
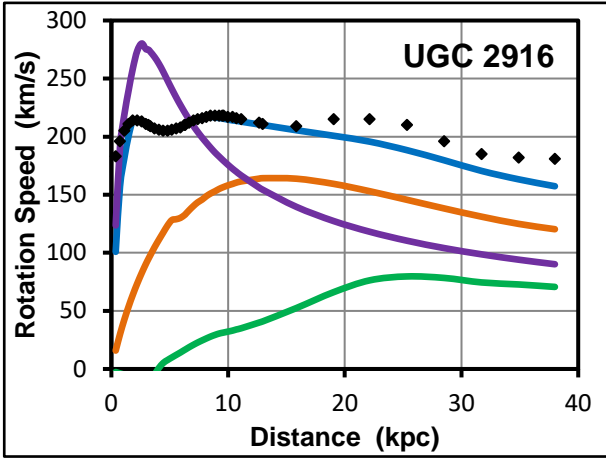
Fit parameters

Bulge, M-to-L	0.46	0.44
Y, M-to-L	0.20	0.37
$\xi$ , slope	-0.89	-0.92
DM factor	5.6	4.1
Fit quality	poor	OK

Comments:  
 Galaxy has a bulge.  
 "OK" fit (shown): Ignore innermost 2 points, <6kpc.



### UGC 2916



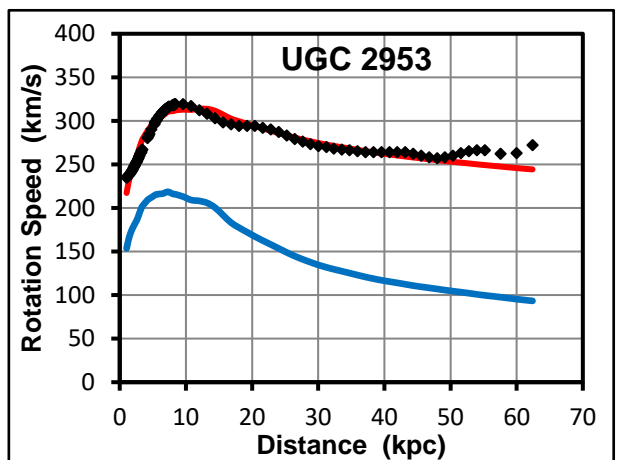
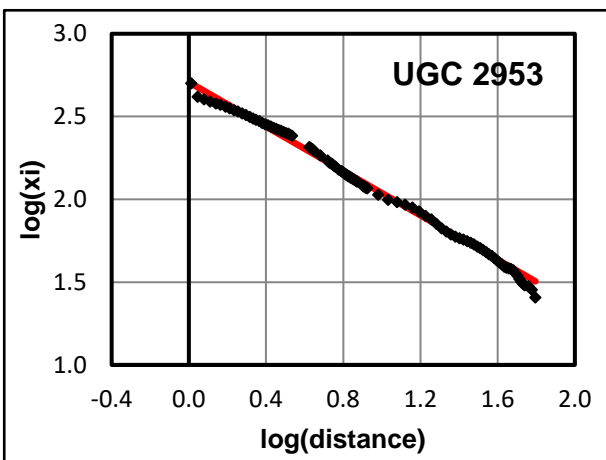
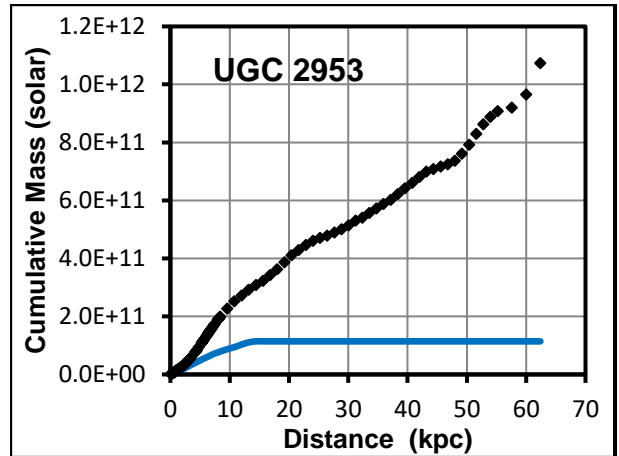
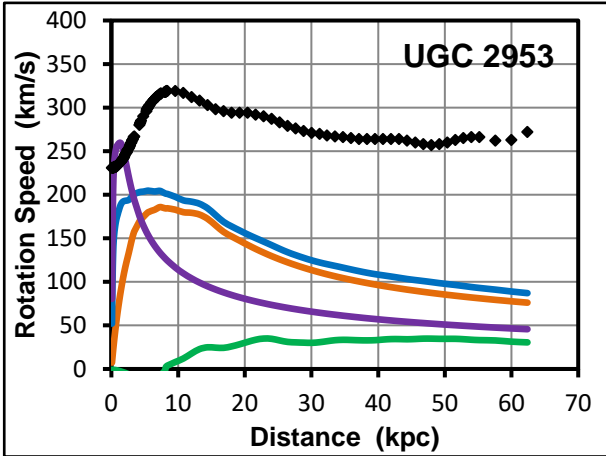
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Bulge, M-to-L	0.65
Disk, M-to-L	2.00
$\xi$ , slope	-0.04
DM factor	0.3
Fit quality	poor

Comments:  
 High disk M-to-L ratio, 2.00. Fit OK up to 15kpc; bad in outer regions.

### UGC 2953



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

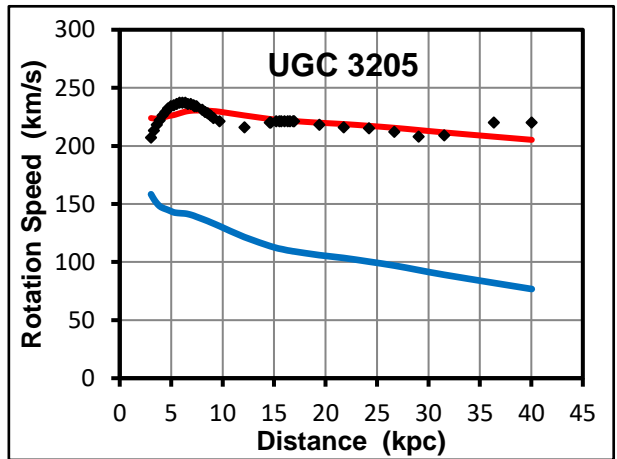
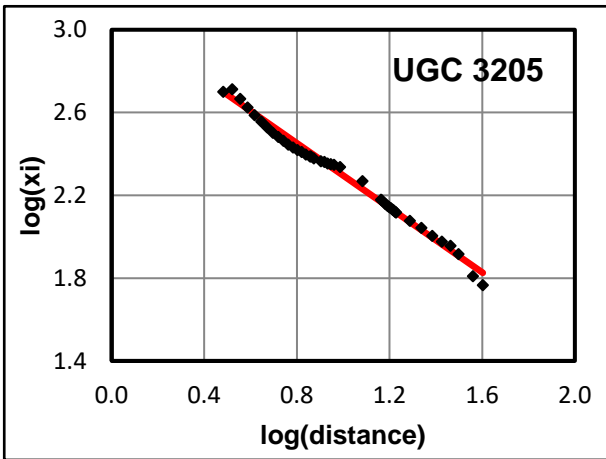
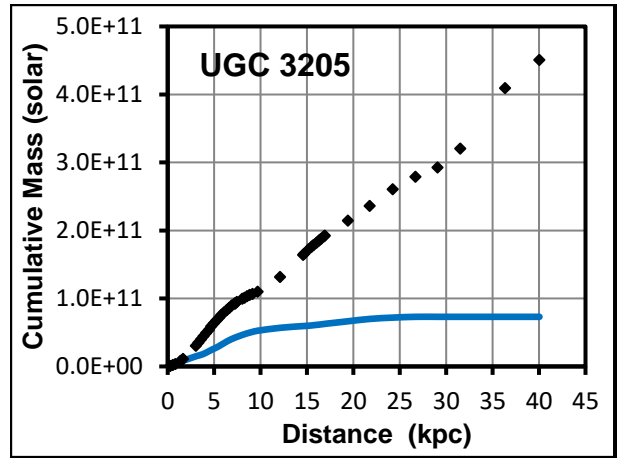
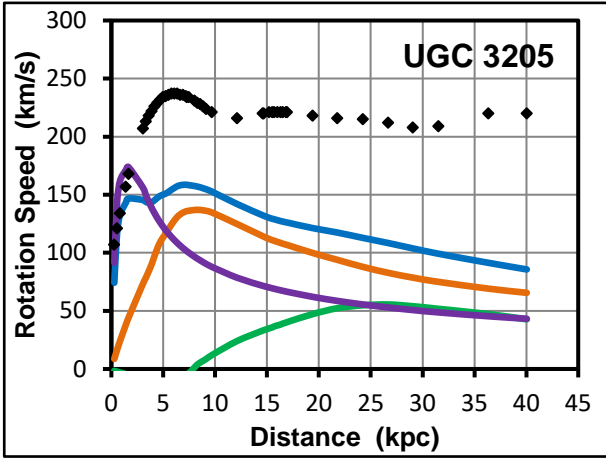
Bulge, M-to-L	0.41	0.26
Disk, M-to-L	0.36	0.45
$\xi$ , slope	-0.71	-0.67
DM factor	8.4	7.0
Fit quality	poor	OK

Comments:

Galaxy has a bulge. Mass converges by 14kpc.

"OK" fit (shown): ignore innermost points, <1kpc, and ignore outer 6 points, >52kpc. Low bulge M-to-L ratio, 0.26.

### UGC 3205



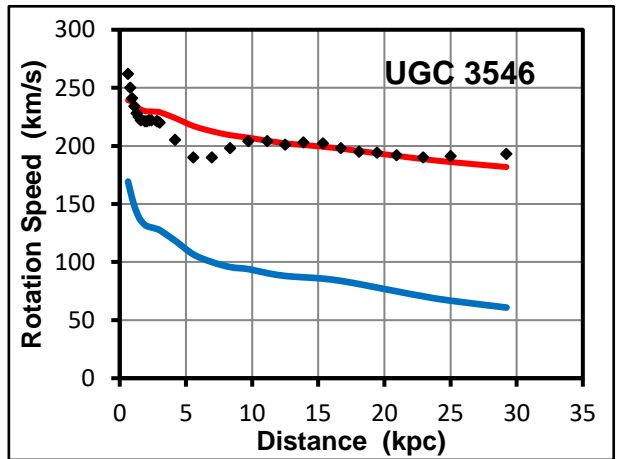
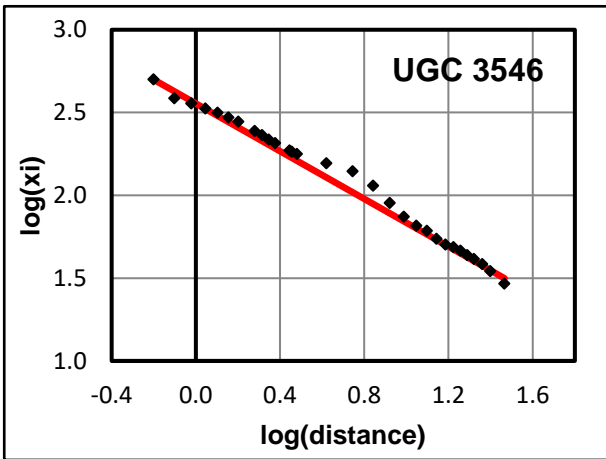
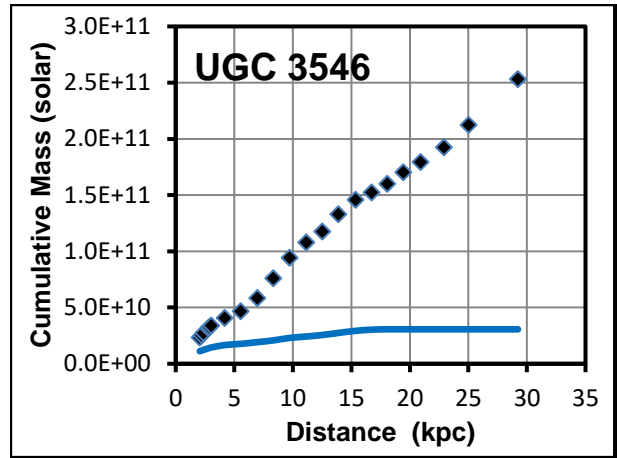
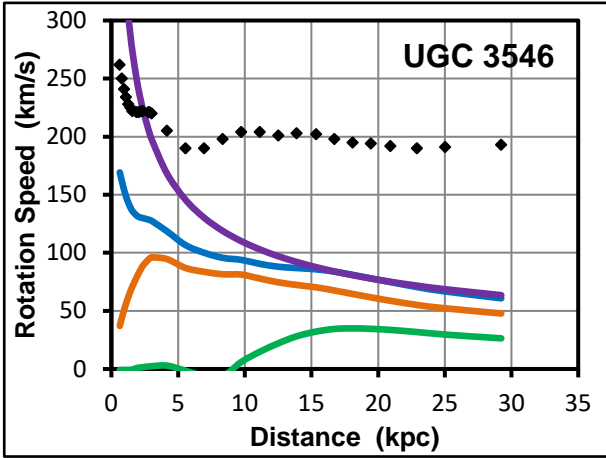
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Bulge, M-to-L	0.65	0.91
Disk, M-to-L	0.40	0.22
$\xi$ , slope	-0.75	-0.78
DM factor	5.2	6.7
Fit quality	more poor	less poor

Comments:  
 Galaxy has a bulge. Galaxy mass converged by 25kpc.  
 "less poor" fit (shown) ignore innermost 5 data points, <3kpc.

### UGC 3546



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Bulge, M-to-L	0.18	0.29
Disk, M-to-L	0.20	0.20
$\xi$ , slope	-0.72	-0.76
DM factor	8.2	7.3
Fit quality	poor	OK

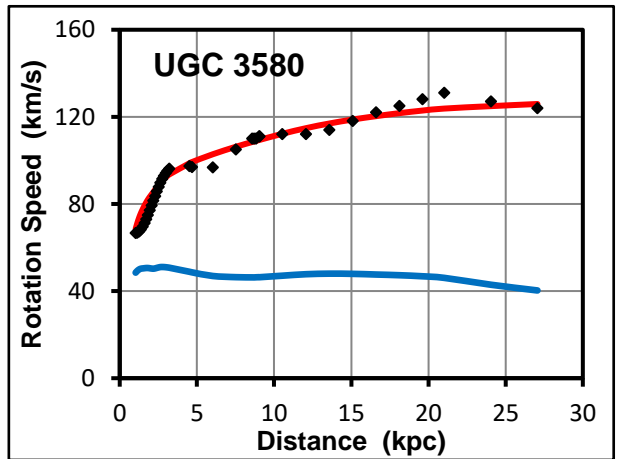
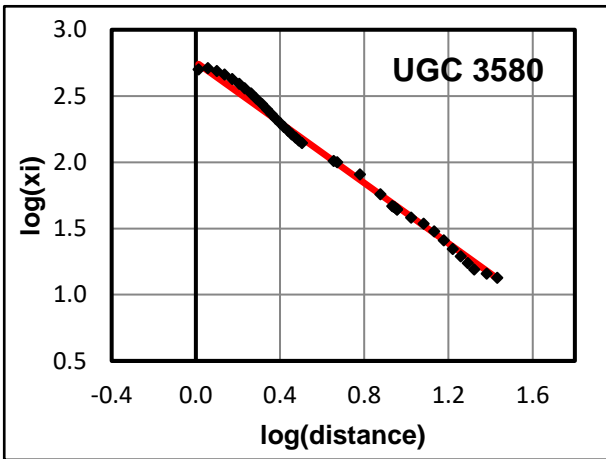
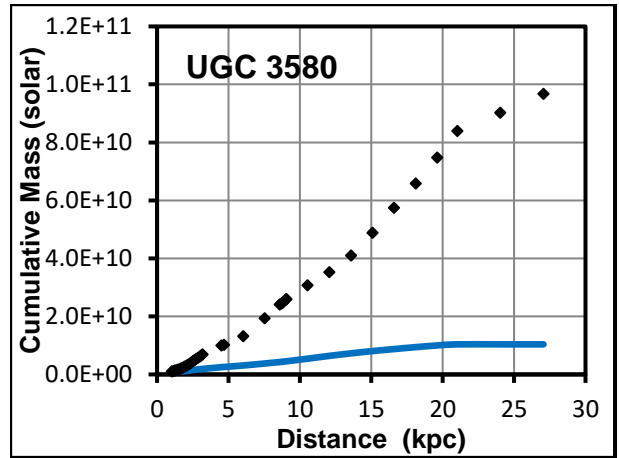
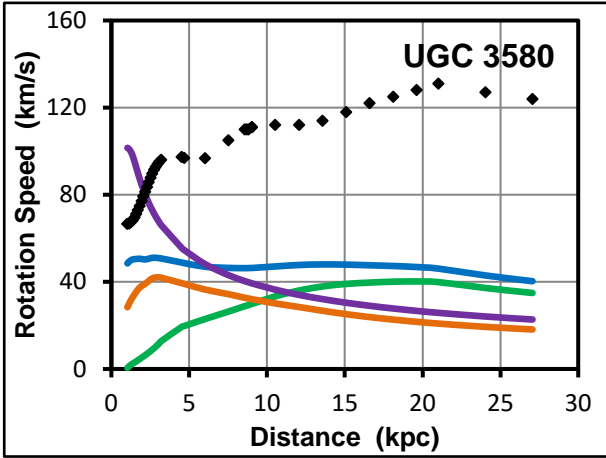
Comments:

Galaxy has a bulge. Mass converged by 17kpc.

"poor" fit (shown above): Very low bulge M-to-L ratio, and very low disk M-to-L ratio.

"OK" fit (not shown): Acceptable fit; still a depression from 3kpc to 10kpc.

### UGC 3580



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

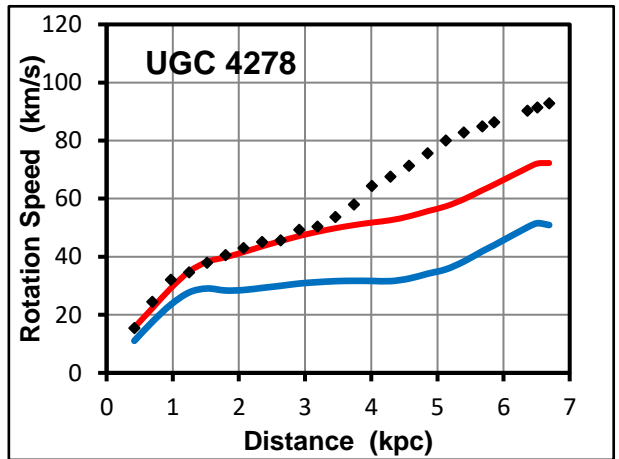
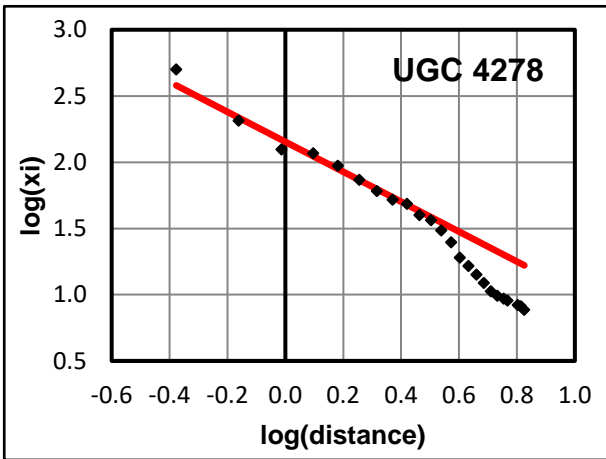
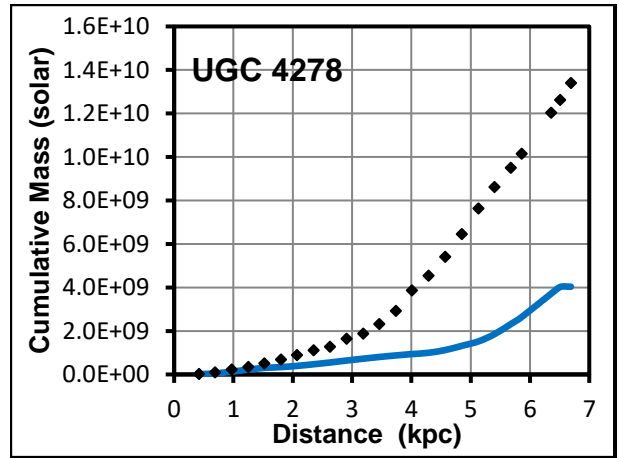
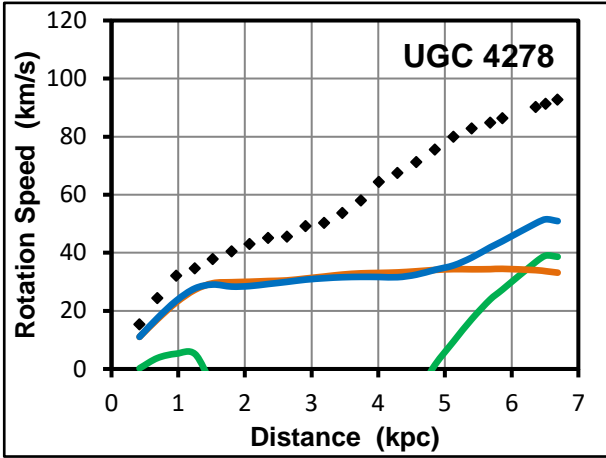
Fit parameters

Bulge, M-to-L	0.15
Disk, M-to-L	0.20
$\xi$ , slope	-1.14
DM factor	8.3
Fit quality	OK

Comments:

Galaxy has a bulge. Inner 8 data points ignored (<1.0kpc) to get an acceptable fit. Very low M-to-L ratios for bulge and disk.

### UGC 4278



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

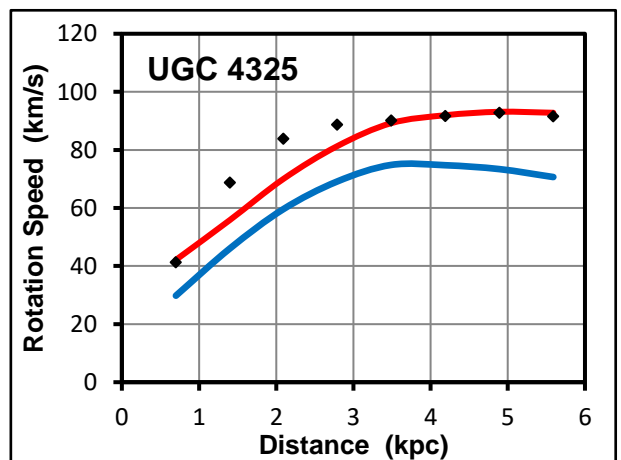
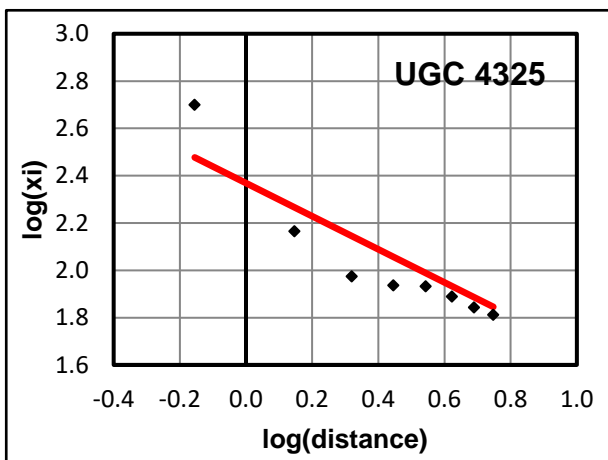
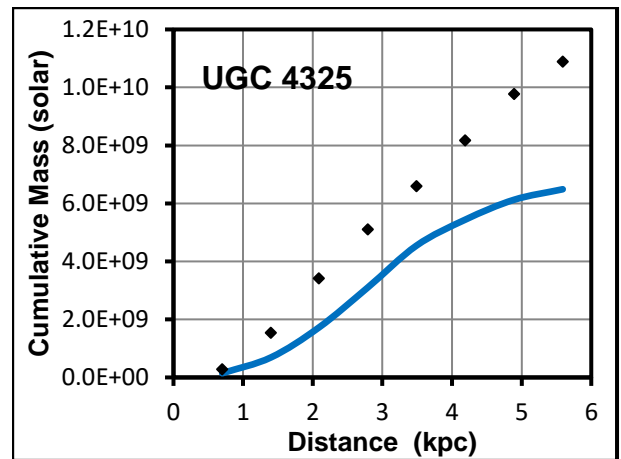
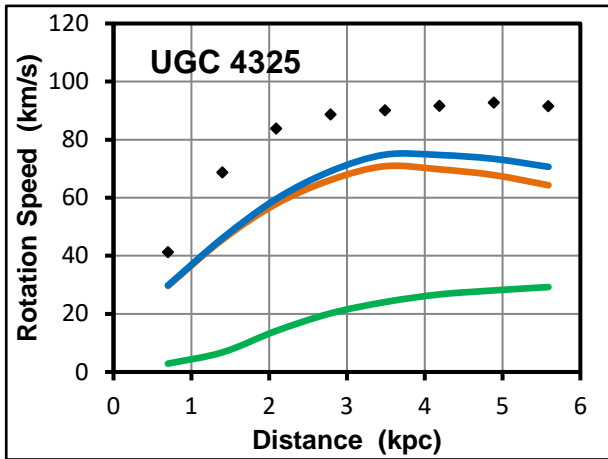
Fit parameters

$Y, M\text{-to-L}$	0.95
$\xi, \text{slope}$	-1.13
DM factor	2.3
Fit quality	problematic

Comments:

Fit made using only the inner half of the data points, <3.5kpc. The rise in the curve caused by the gas is clearly problematic.

### UGC 4325



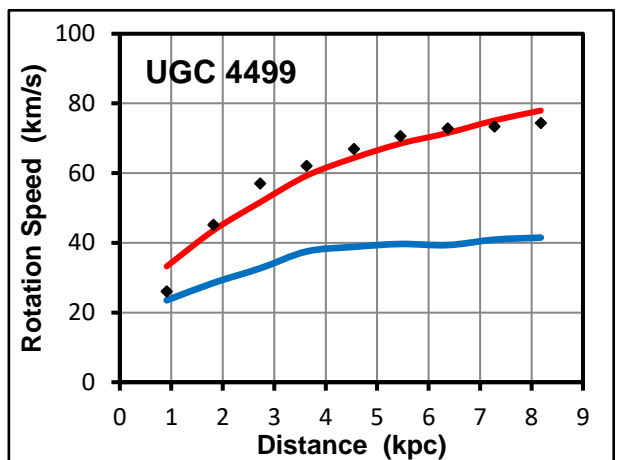
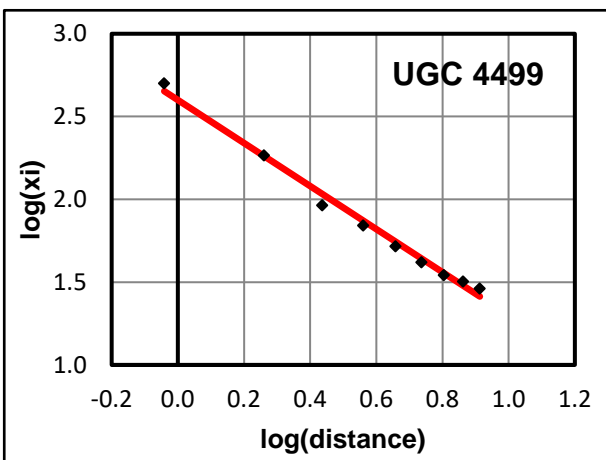
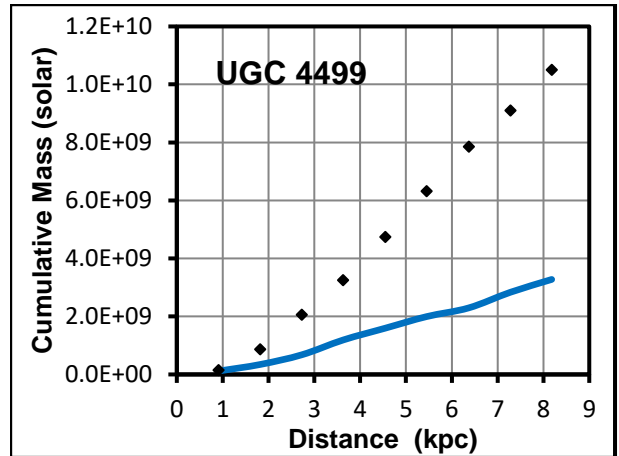
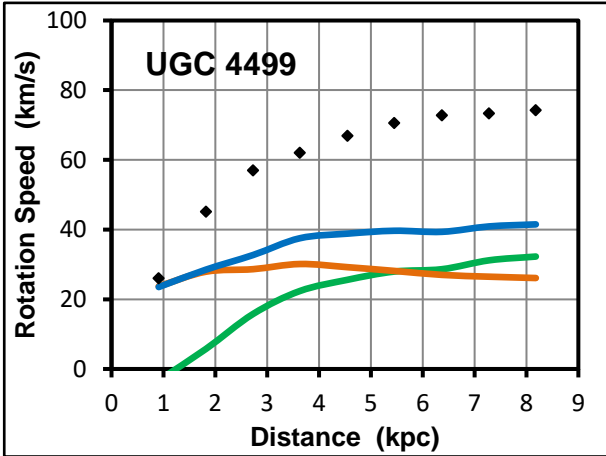
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	2.00
$\xi, \text{slope}$	-0.70
DM factor	0.7
Fit quality	poor

Comments:

### UGC 4499



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

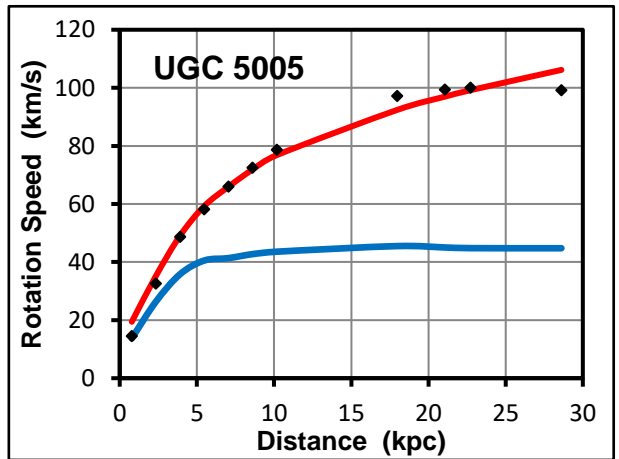
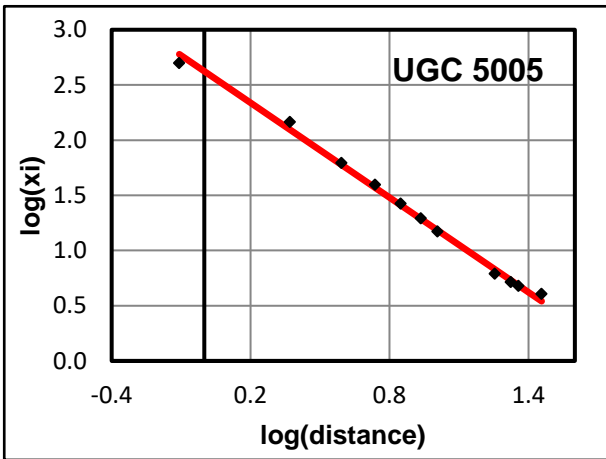
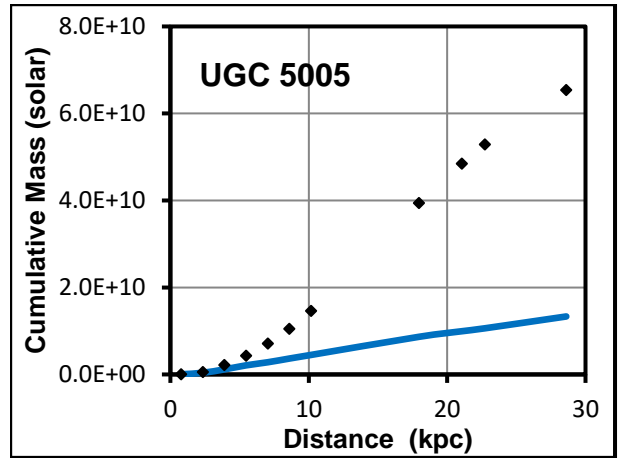
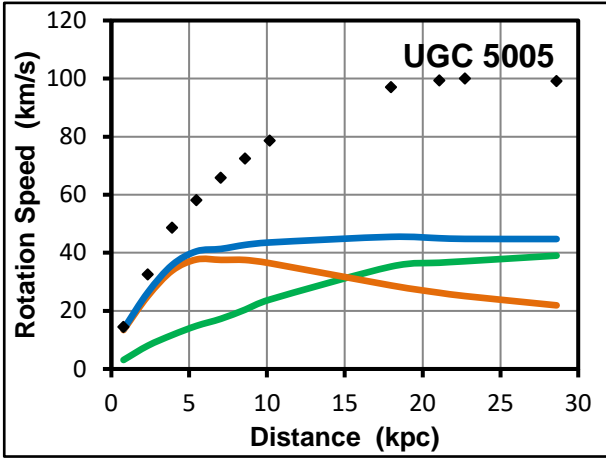
Fit parameters

$Y$ , M-to-L	0.62
$\xi$ , slope	-1.30
DM factor	2.2
Fit quality	OK

Comments:



### UGC 5005



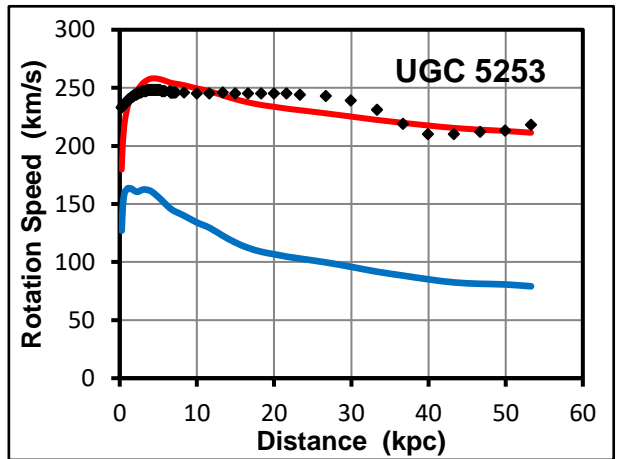
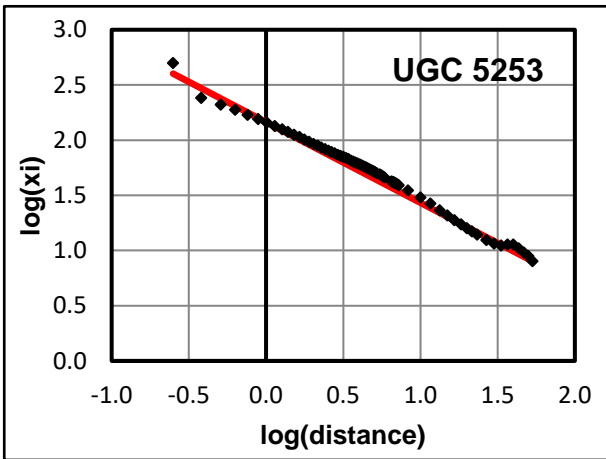
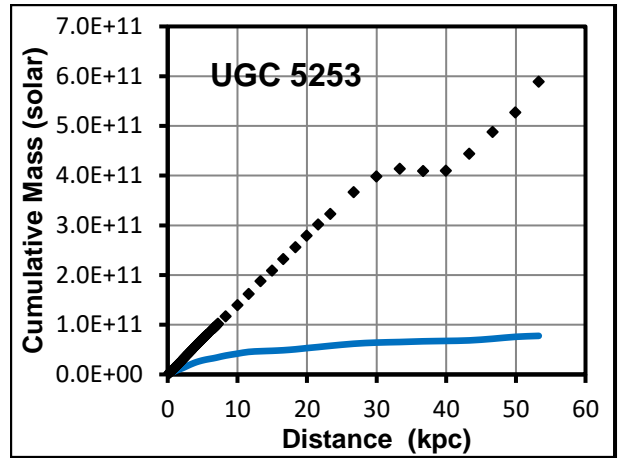
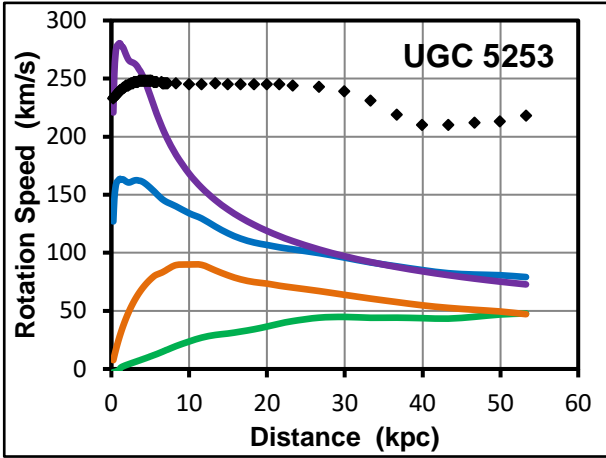
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.72
$\xi, \text{slope}$	-1.43
DM factor	3.9
Fit quality	good

Comments:

### UGC 5253



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

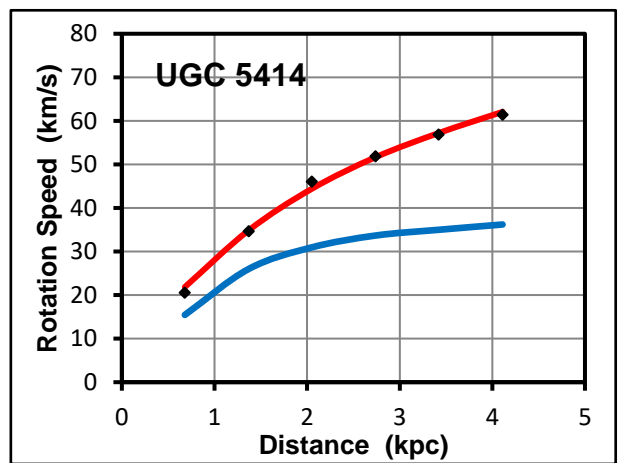
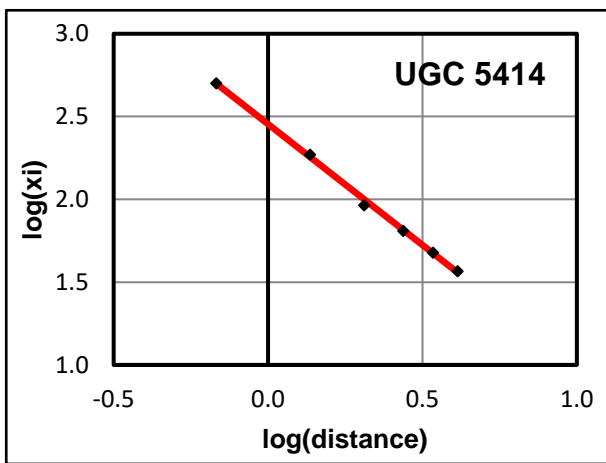
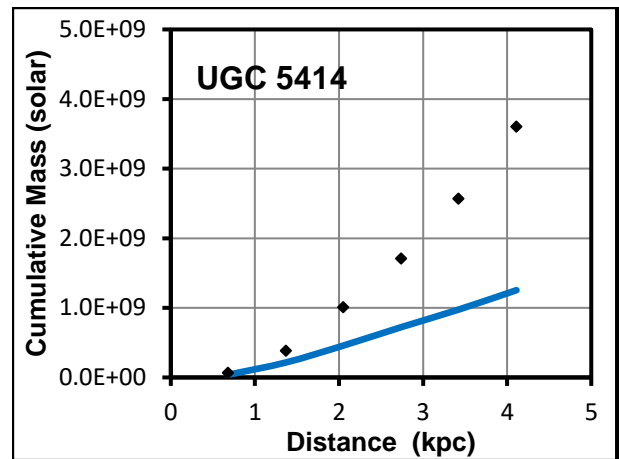
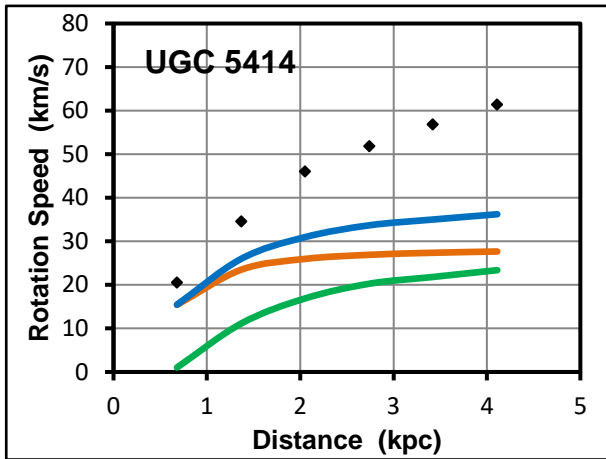
Fit parameters

Bulge, M-to-L	0.33
Disk, M-to-L	0.24
$\xi$ , slope	-0.72
DM factor	6.6
Fit quality	poor

Comments

Galaxy has a bulge.

### UGC 5414



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

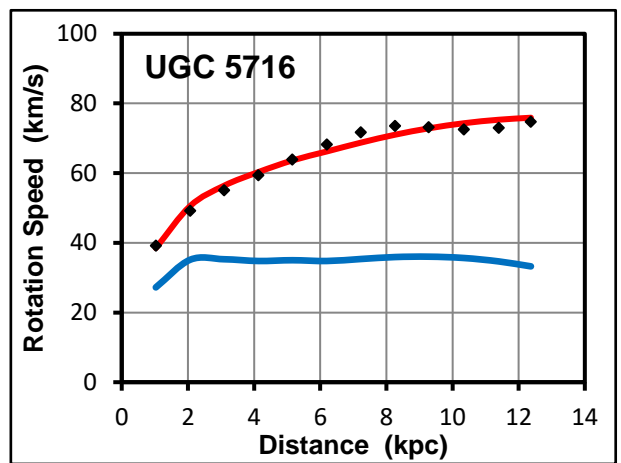
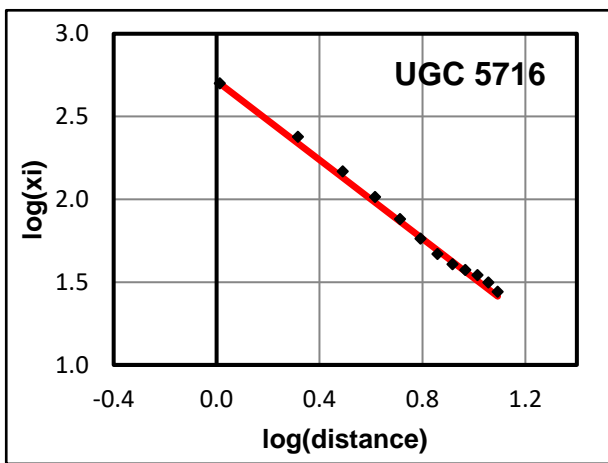
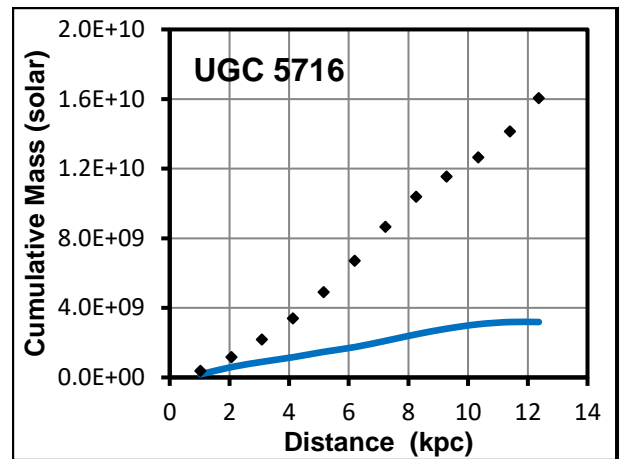
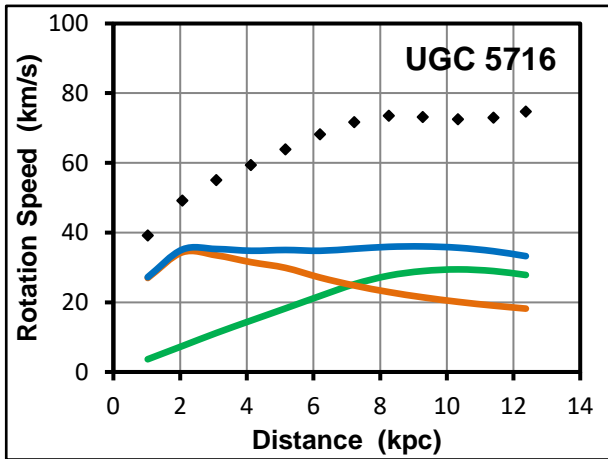
Fit parameters

$Y, M\text{-to-L}$	0.65
$\xi, \text{slope}$	-1.46
DM factor	1.9
Fit quality	good

Comments

Only 6 data points. Mass has not converged.

### UGC 5716



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

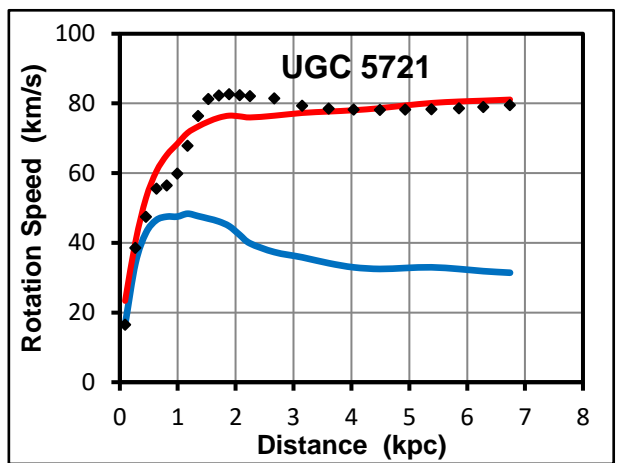
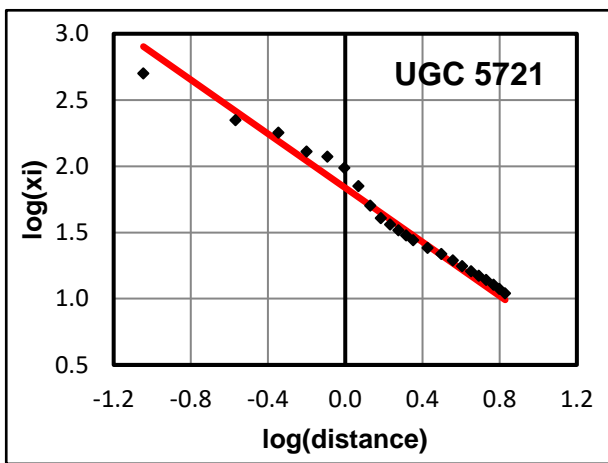
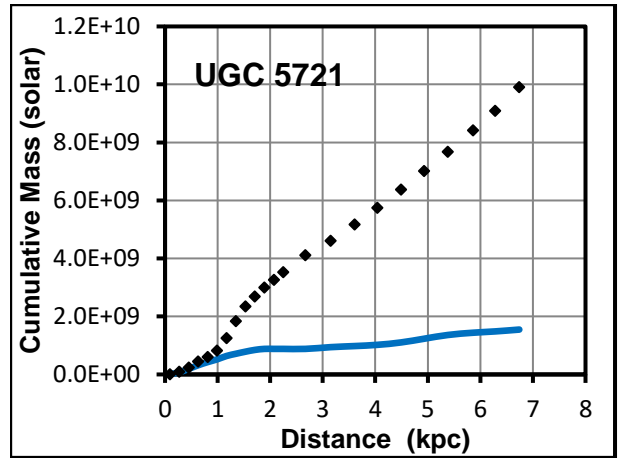
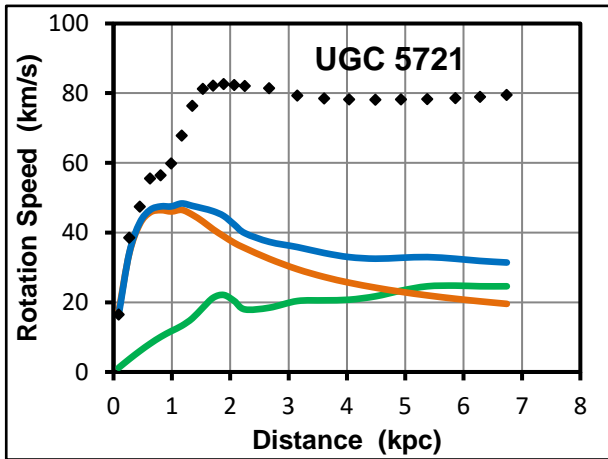
Fit parameters

$Y$ , M-to-L	1.55
$\xi$ , slope	-1.19
DM factor	4.0
Fit quality	good

Comments

High M-to-L ratio, 1.55.

### UGC 5721

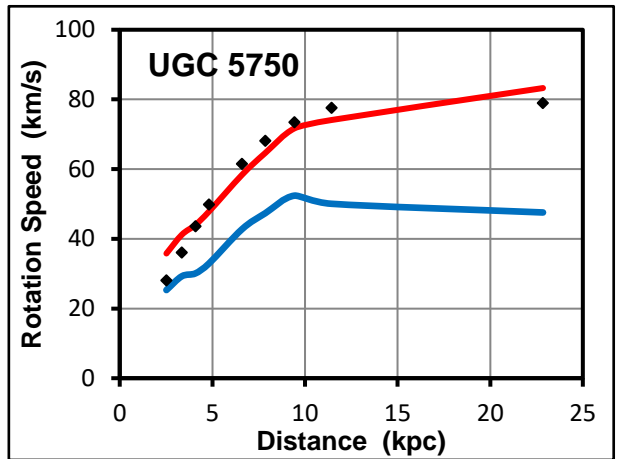
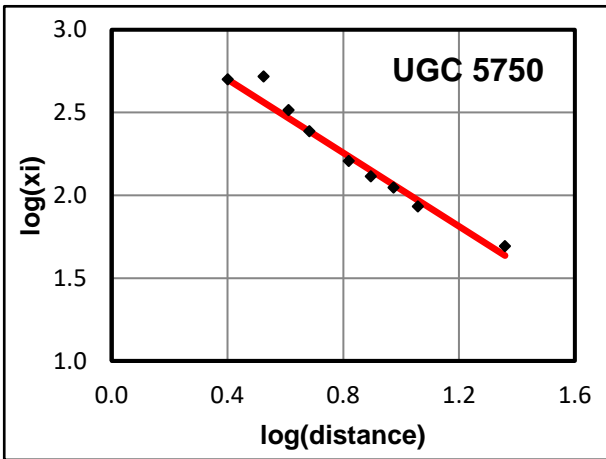
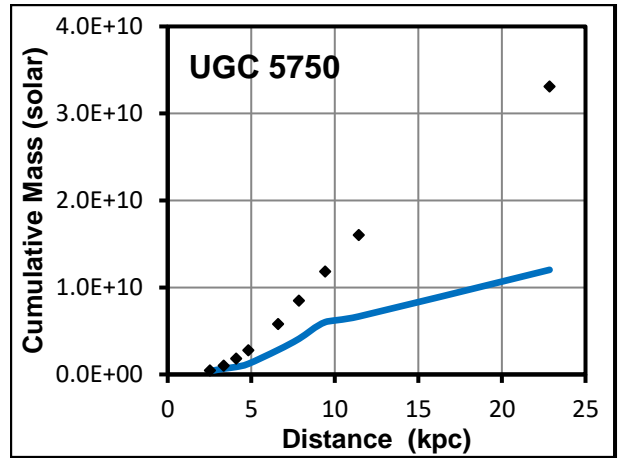
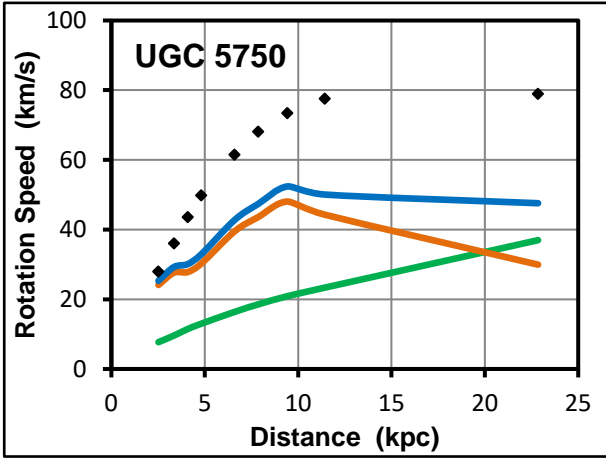


Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.11
$\xi, \text{slope}$	-1.02
DM factor	5.4
Fit quality	poor

### UGC 5750



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

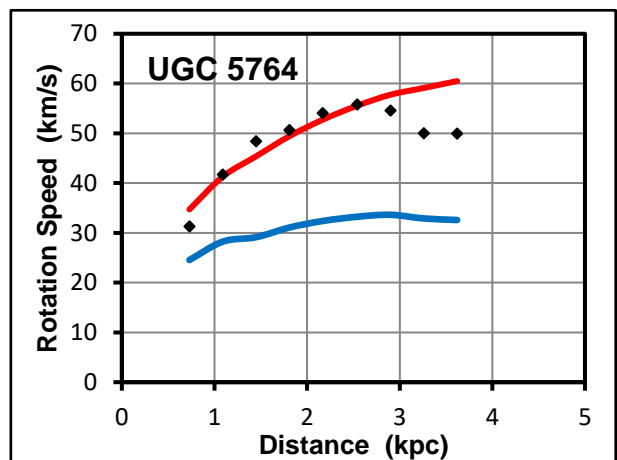
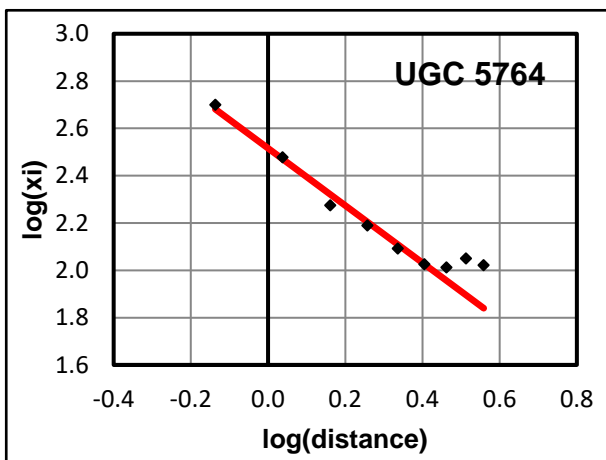
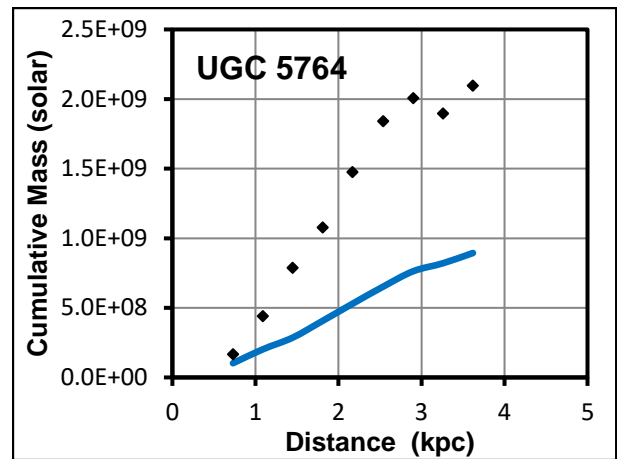
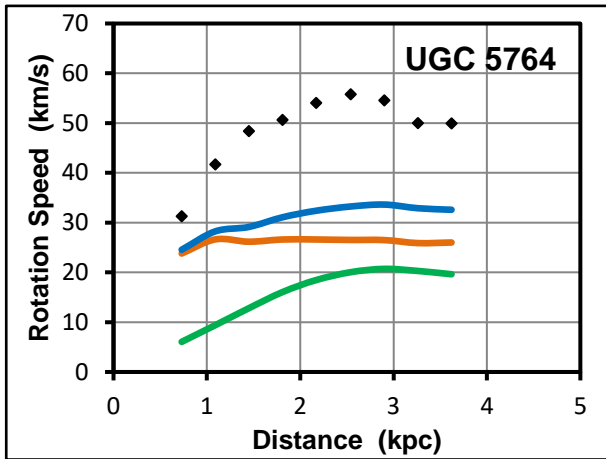
Fit parameters

$Y, M\text{-to-L}$	1.27
$\xi, \text{slope}$	-1.11
DM factor	1.8
Fit quality	OK, just

Comments

Fit made after ignoring first 2 data point, <2.5kpc.

### UGC 5764



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

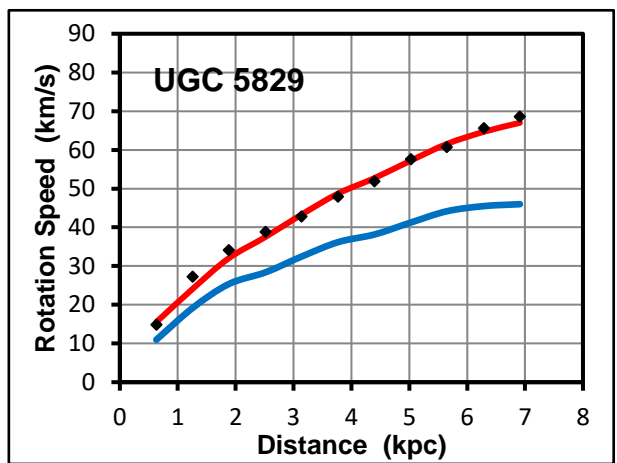
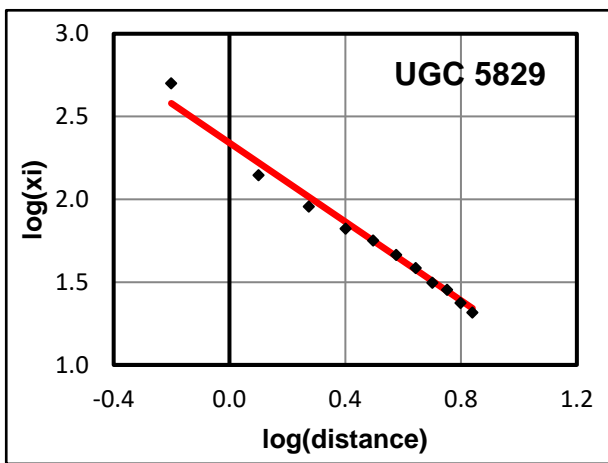
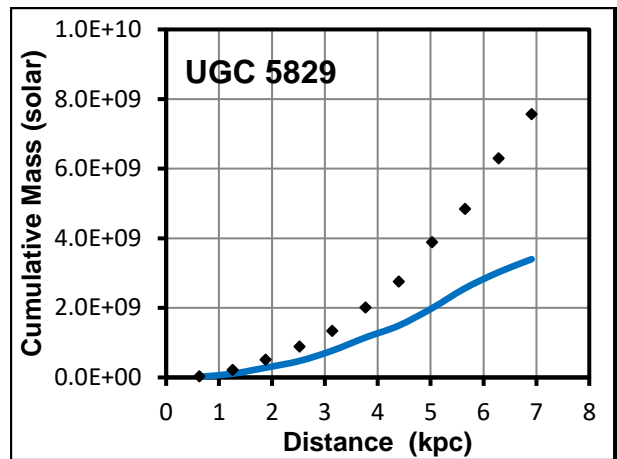
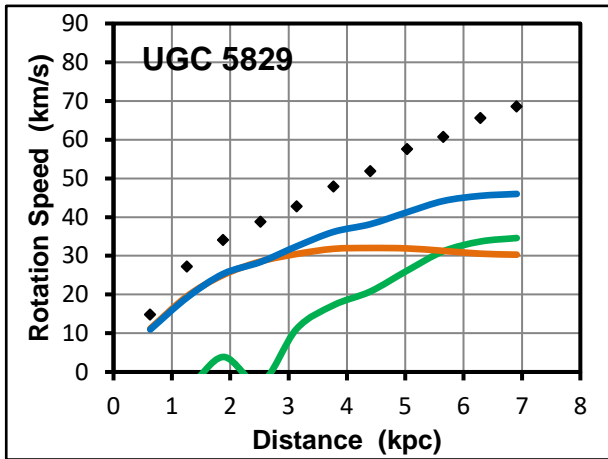
Fit parameters

$Y$ , M-to-L	5.42
$\xi$ , slope	-1.21
DM factor	1.3
Fit quality	bad

Comments

Bad fit. Fit only possible by omitting 1st (not shown) and outer 2 data points. Unphysically(?) high M-to-L ratio, 5.42.

### UGC 5829



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

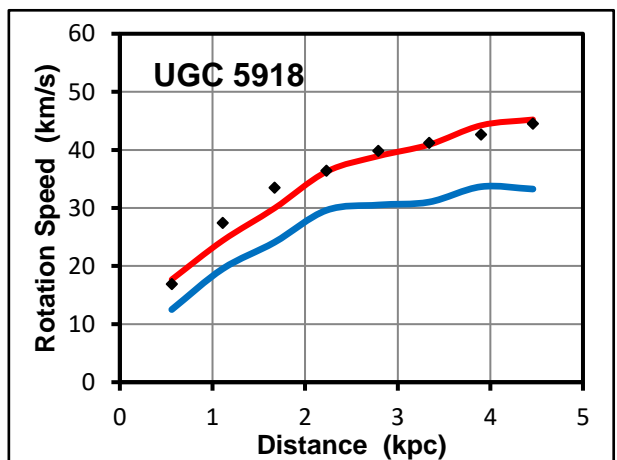
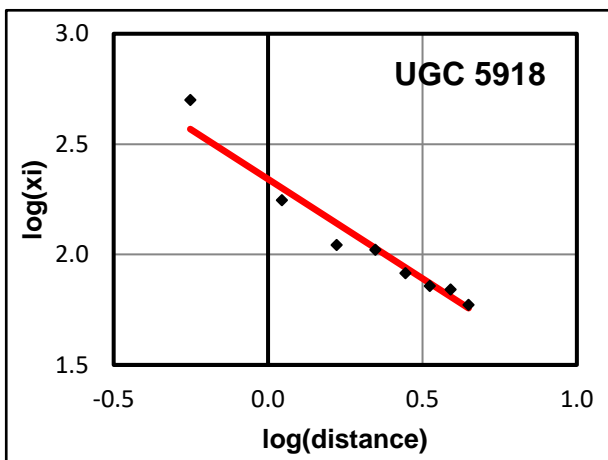
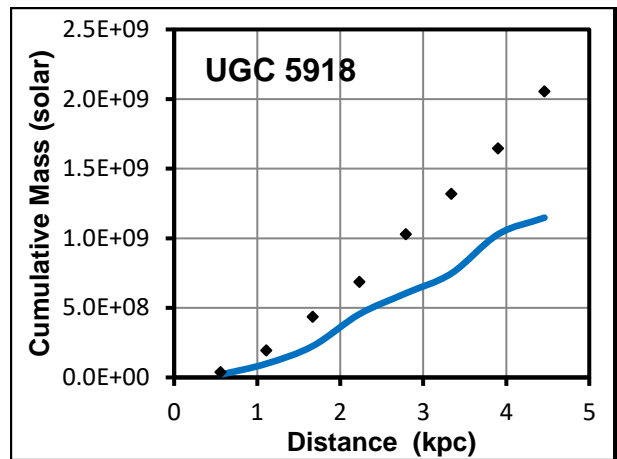
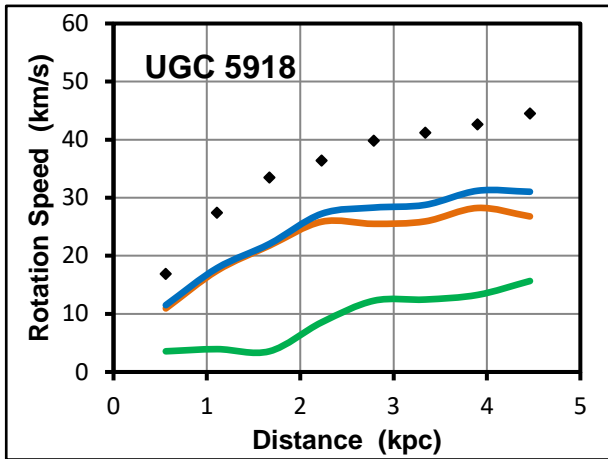
Y, M-to-L	2.24
$\xi$ , slope	-1.19
DM factor	1.2
Fit quality	good

Comments

High M-to-L ratio, 2.24.



### UGC 5918



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

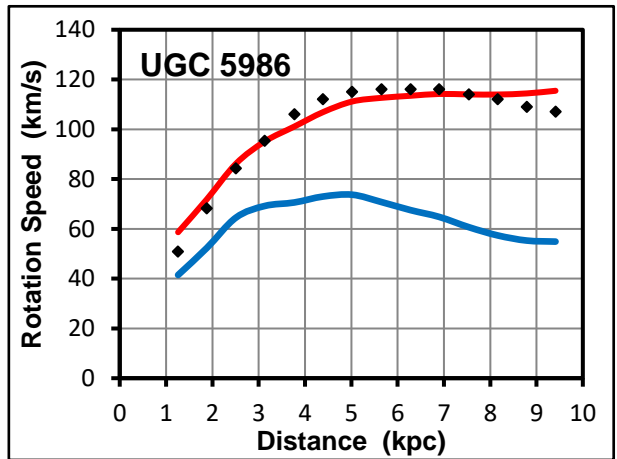
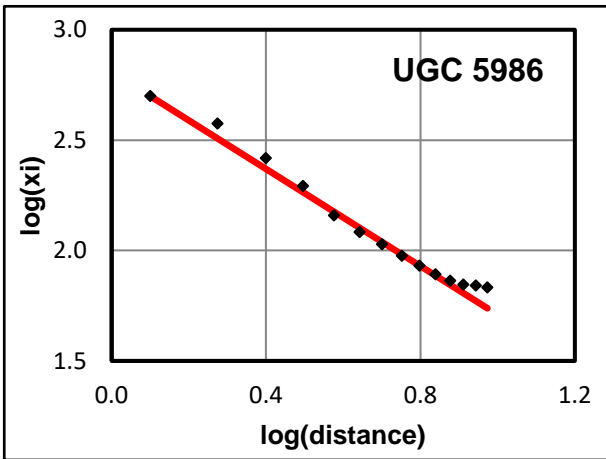
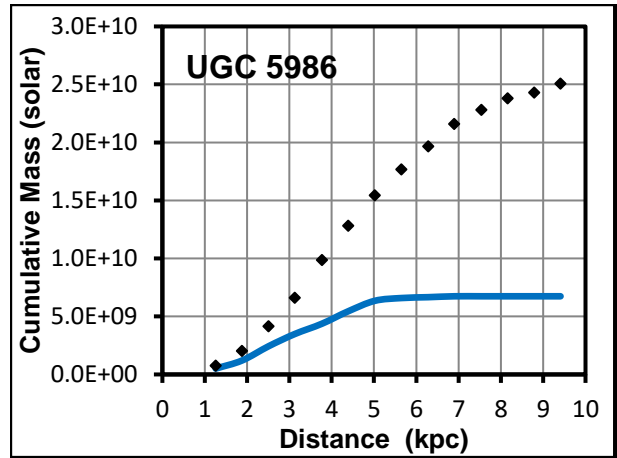
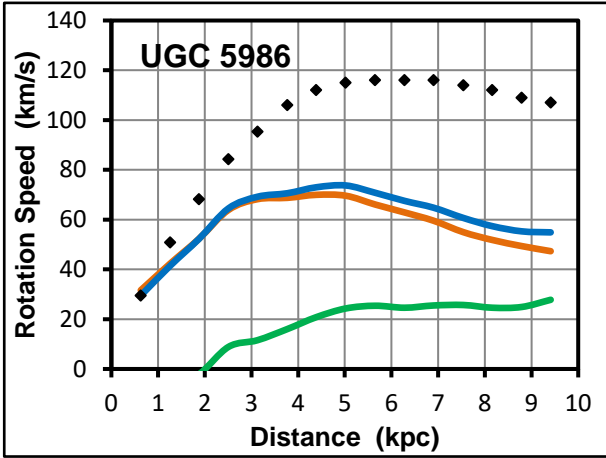
Fit parameters

$Y$ , M-to-L	2.50	3.00	3.70
$\xi$ , slope	-1.10	-0.90	-0.63
DM factor	1.1	0.8	0.5
Fit quality	OK	better	best

Comments

We can get acceptable fits by varying the M-to-L ratio against the  $\xi$ -slope. Shown is the "better" fit, with  $\xi$ -slope -0.90. Very high M-to-L ratio, 3.00.

### UGC 5986



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

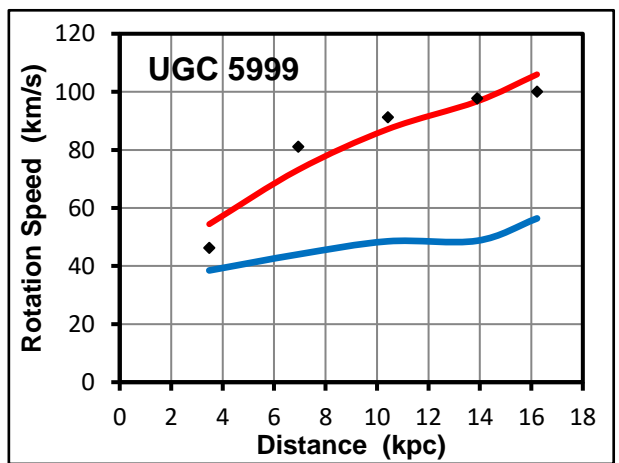
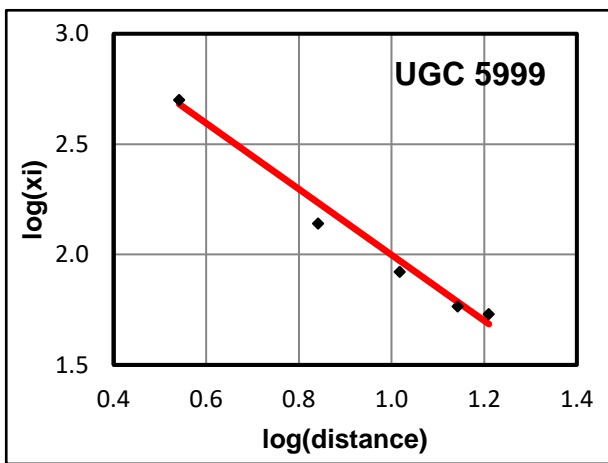
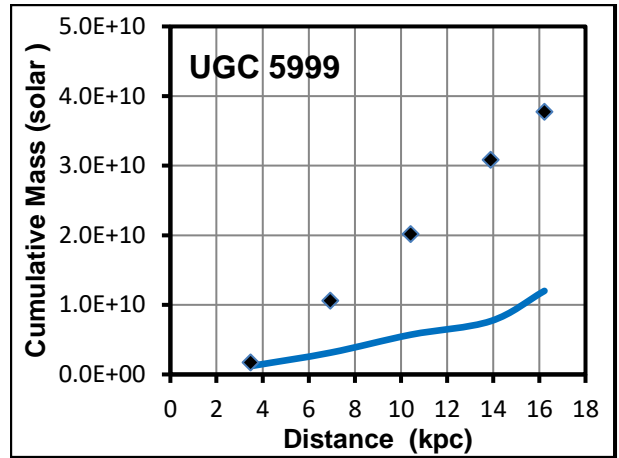
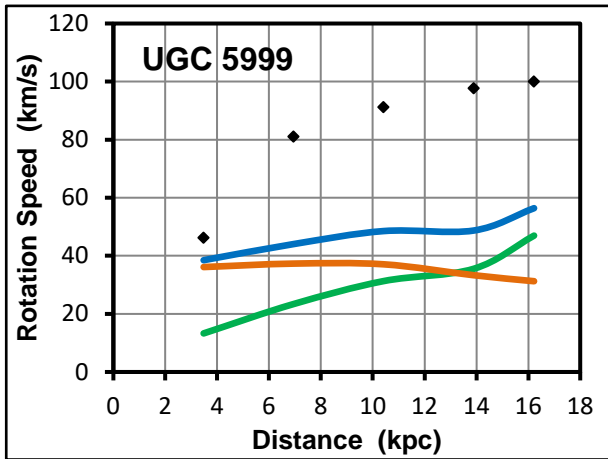
Fit parameters

$Y, M\text{-to-L}$	0.95
$\xi, \text{slope}$	-1.06
DM factor	2.7
Fit quality	OK

Comments

Fit ignores 1st data point. We could obtain a better fit by ignoring outer 2 data points where  $\xi$ -function is levelling off. Mass has converged by 6kpc.

### UGC 5999



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

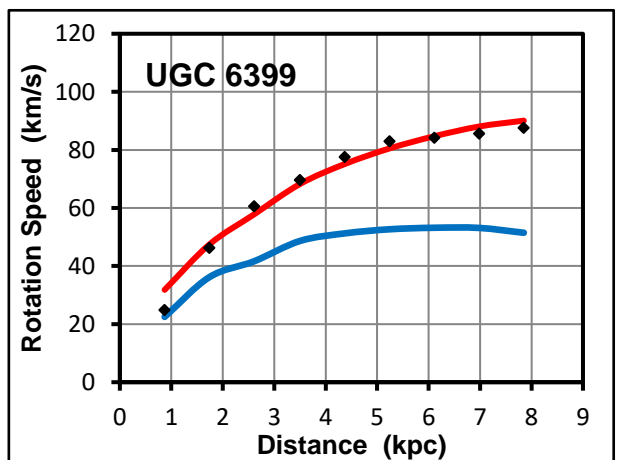
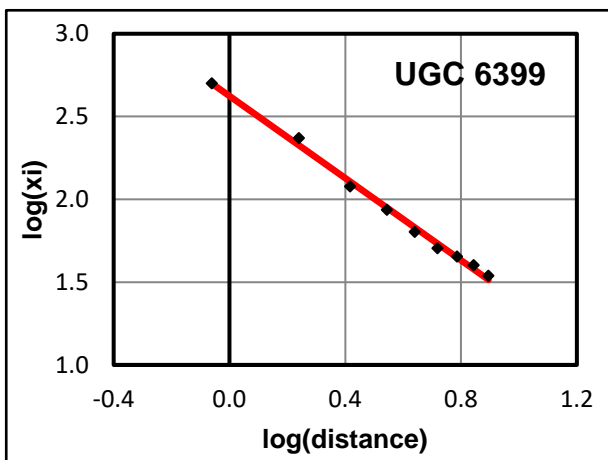
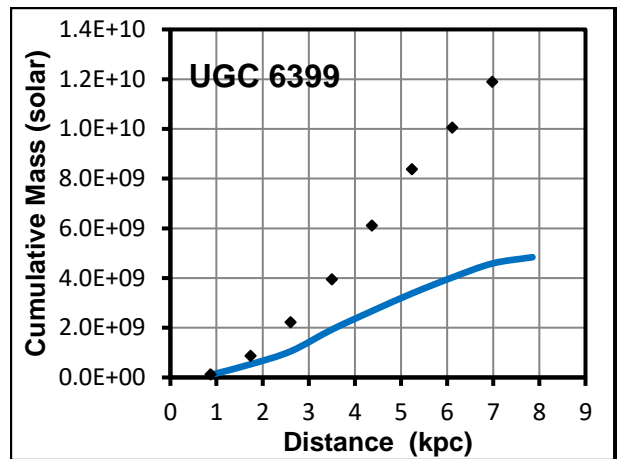
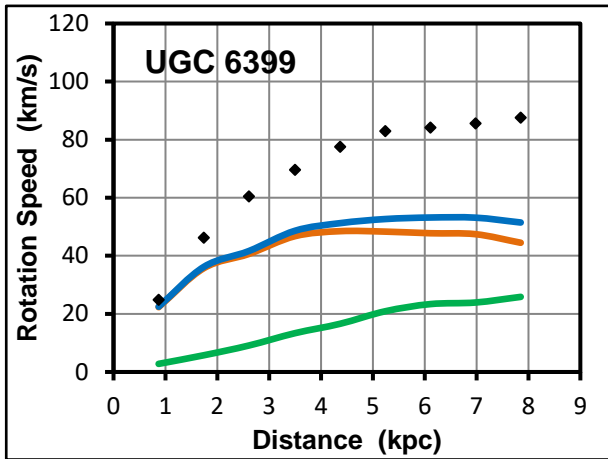
Fit parameters

$Y$ , M-to-L	0.87
$\xi$ , slope	-1.49
DM factor	2.1
Fit quality	OK, just

Comments

Only 5 data points.

### UGC 6399

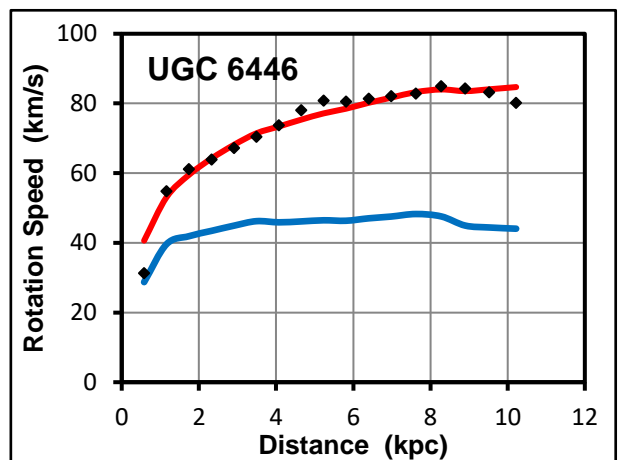
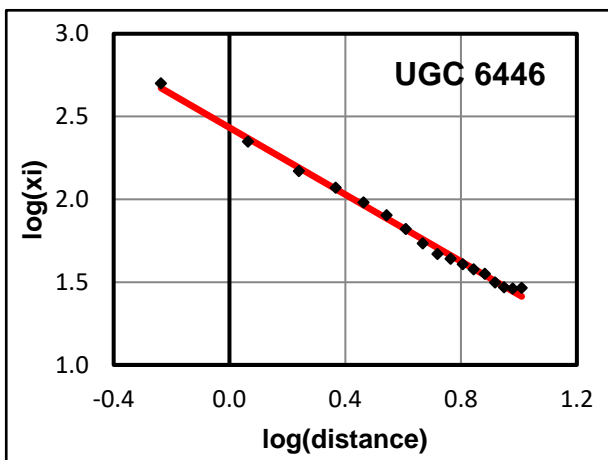
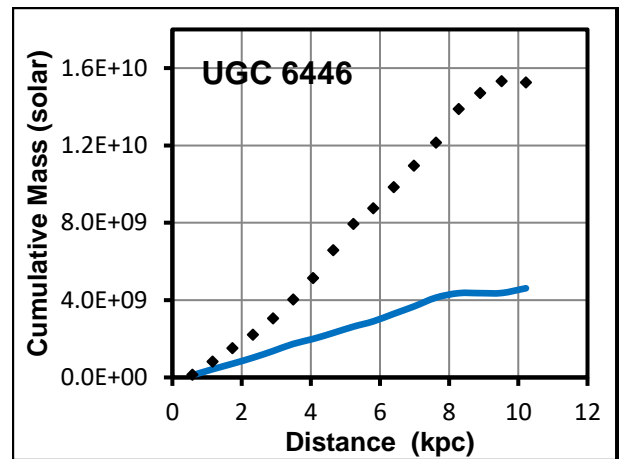
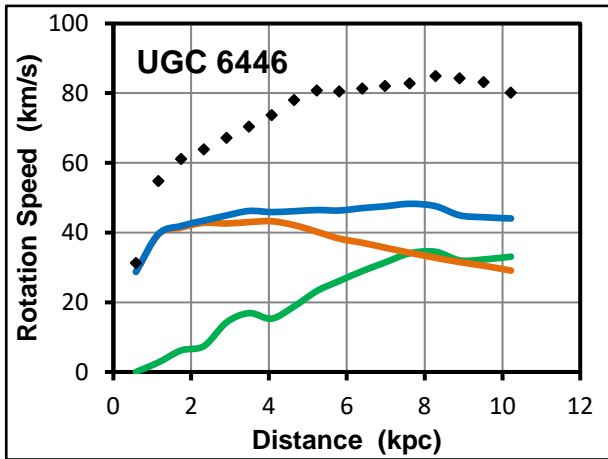


Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.20
$\xi, \text{slope}$	-1.24
DM factor	1.9
Fit quality	good

### UGC 6446

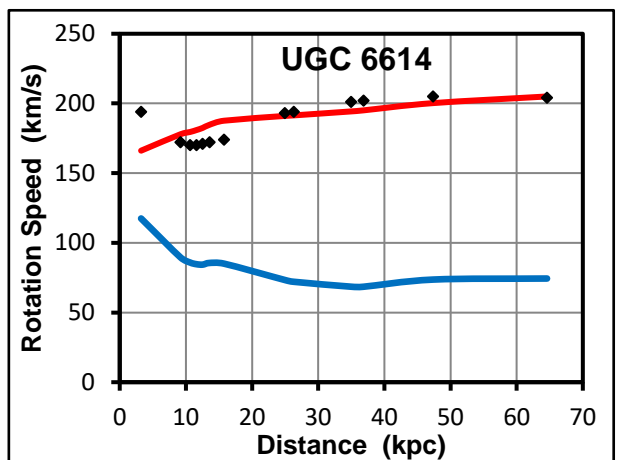
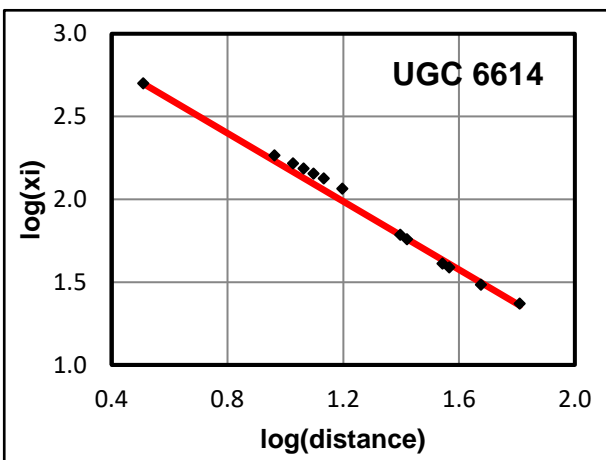
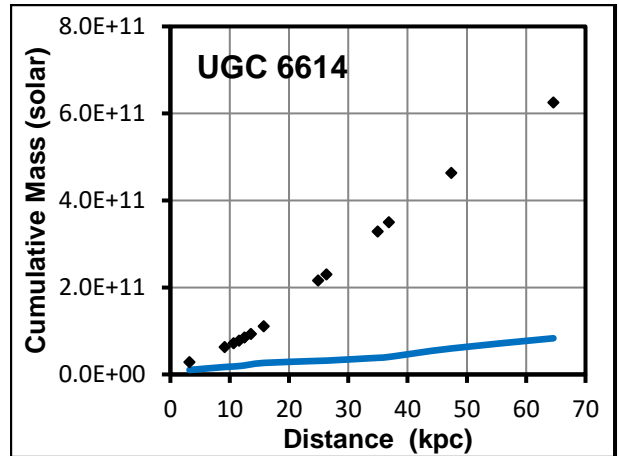
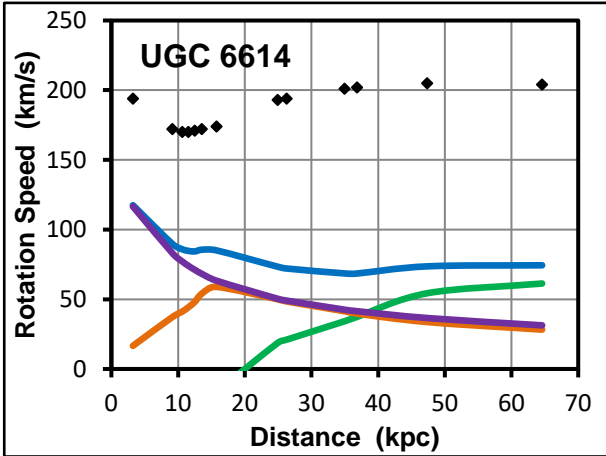


Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y$ , M-to-L	1.81
$\xi$ , slope	-1.01
DM factor	2.3
Fit quality	good

### UGC 6614



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

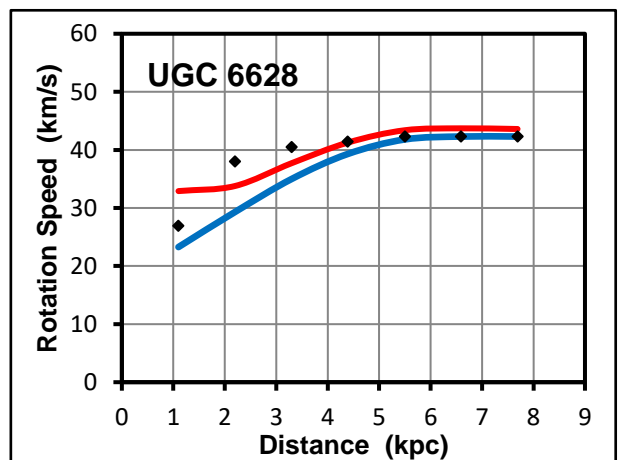
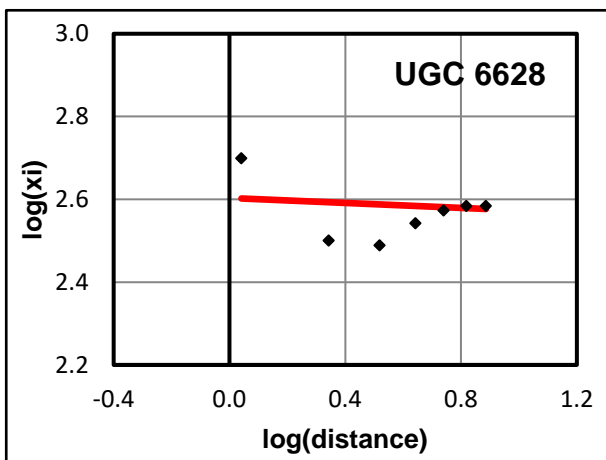
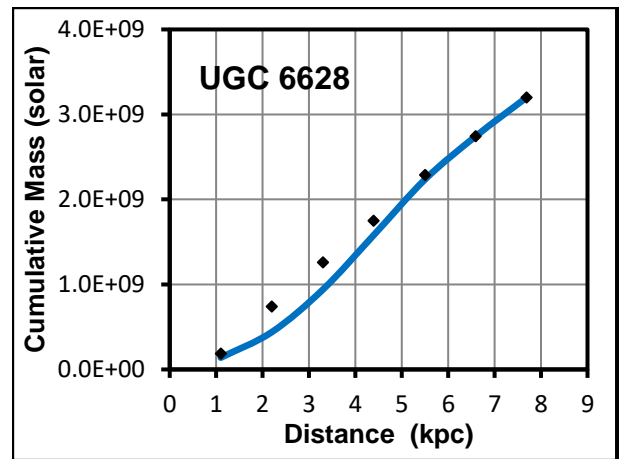
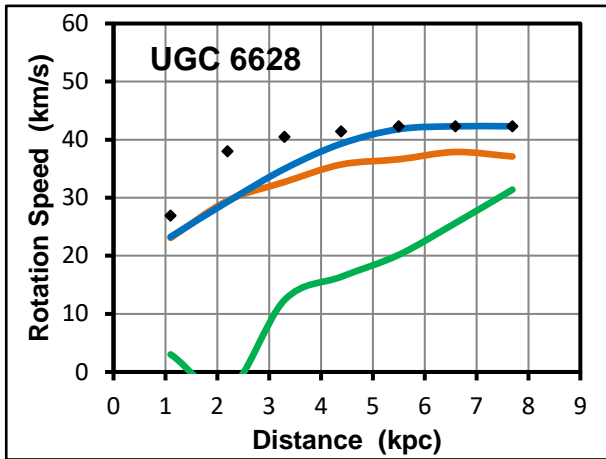
Fit parameters

Bulge, M-to-L	0.22
Disk, M-to-L	0.20
$\xi$ , slope	-1.01
DM factor	6.5
Fit quality	poor

Comments

Galaxy has a bulge. Low values for both M-to-L ratios.

### UGC 6628



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

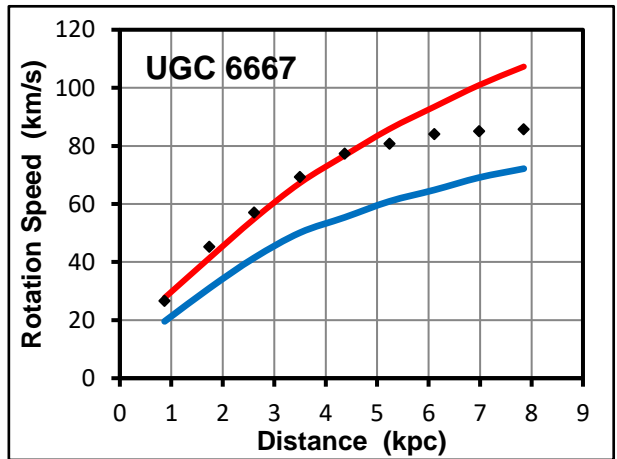
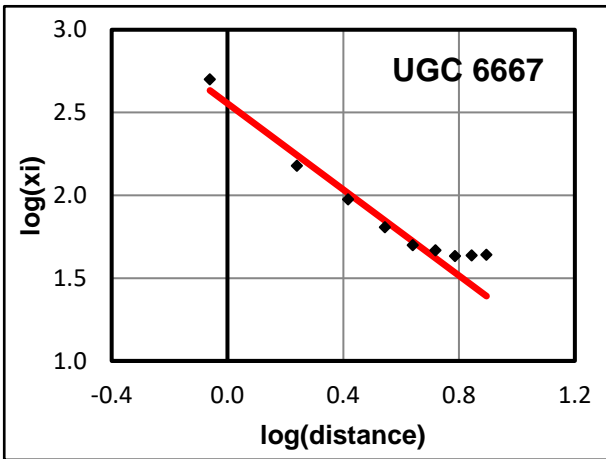
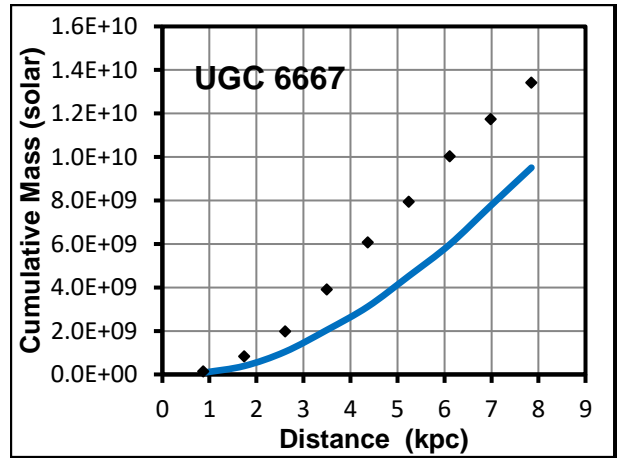
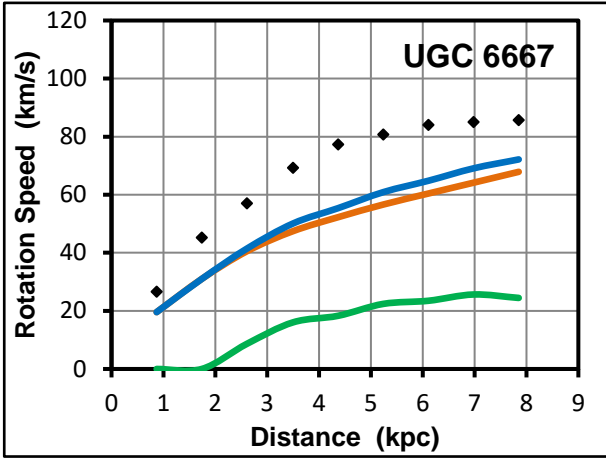
Fit parameters

$Y, M\text{-to-L}$	0.63
$\xi, \text{slope}$	-0.03
DM factor	0.0
Fit quality	bad

Comments

No acceptable fit possible. Original data has large error bars. So should probably exclude anyway.

### UGC 6667



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

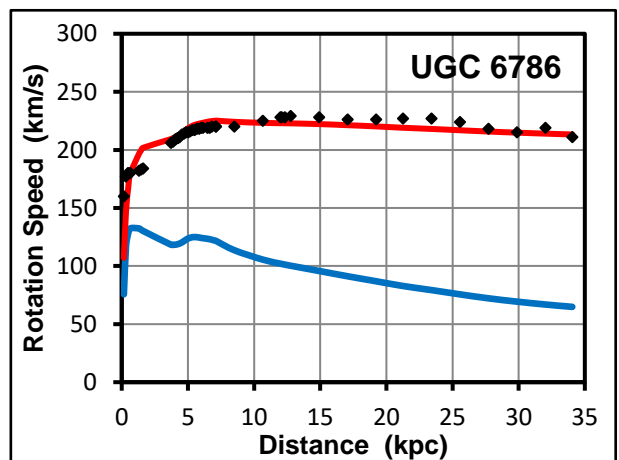
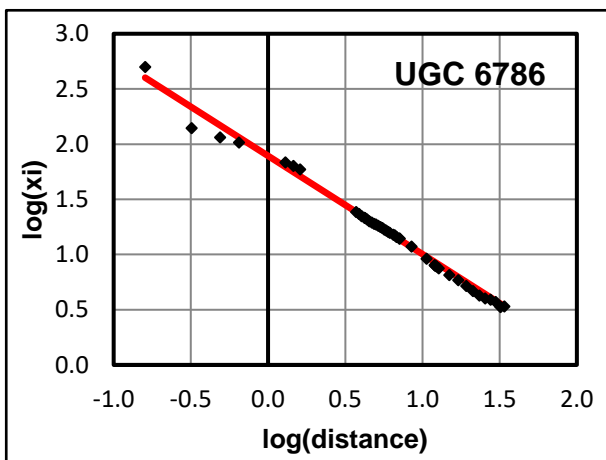
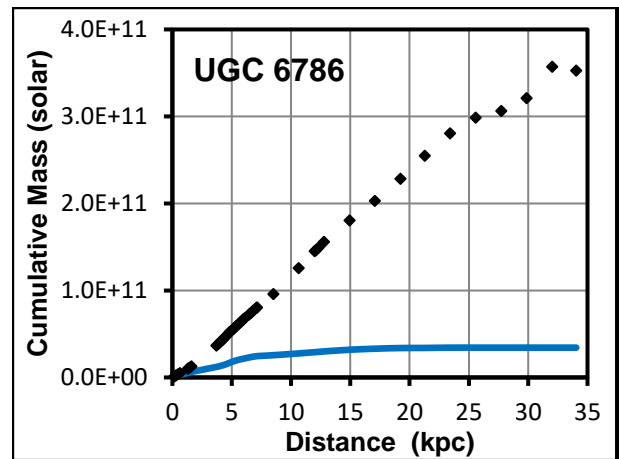
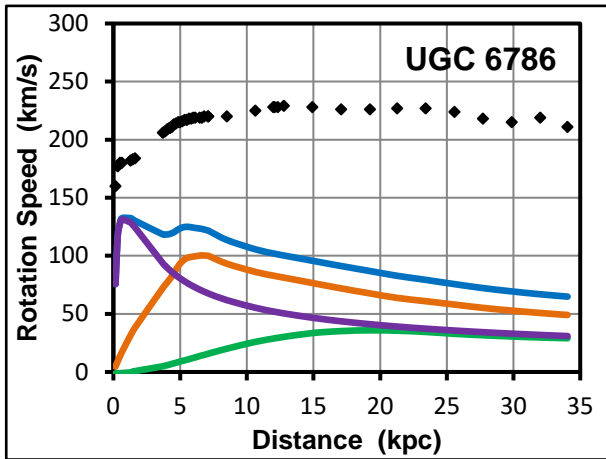
Y, M-to-L	4.00	6.00	8.00
$\xi$ , slope	-2.00	-1.70	-1.30
DM factor	1.5	0.8	0.4
Fit quality	poor	better	best bad

Comments

Fits ignore outermost 3 points. Fits only possible with unphysically high M-to-L ratios. No acceptable fit possible. Plots are for "-1.30" fit.



### UGC 6786



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

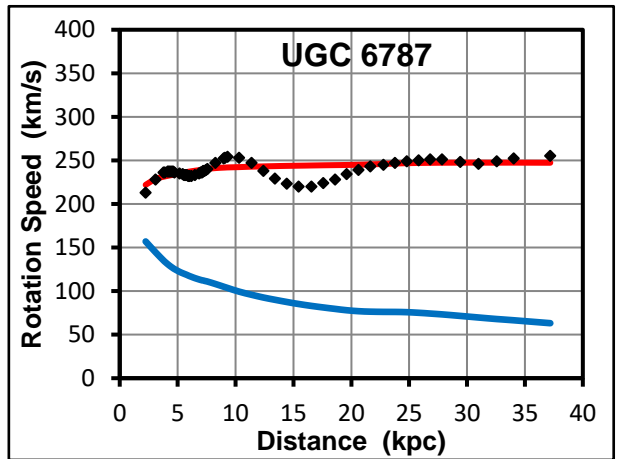
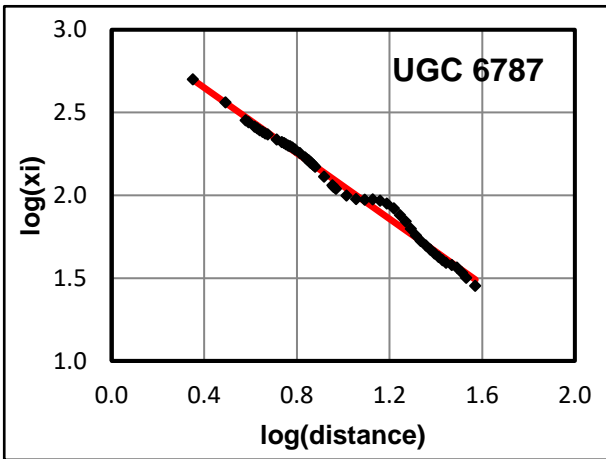
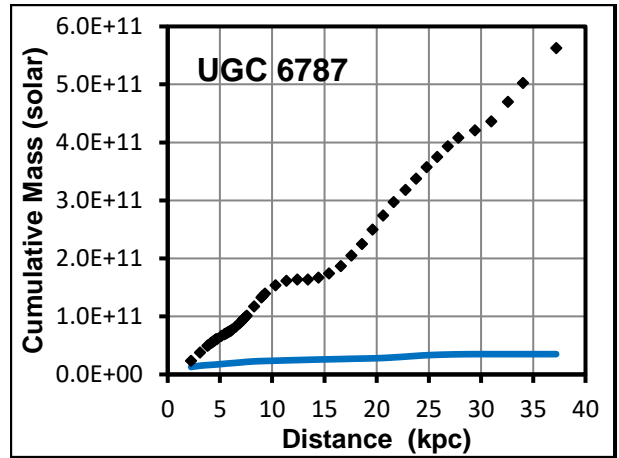
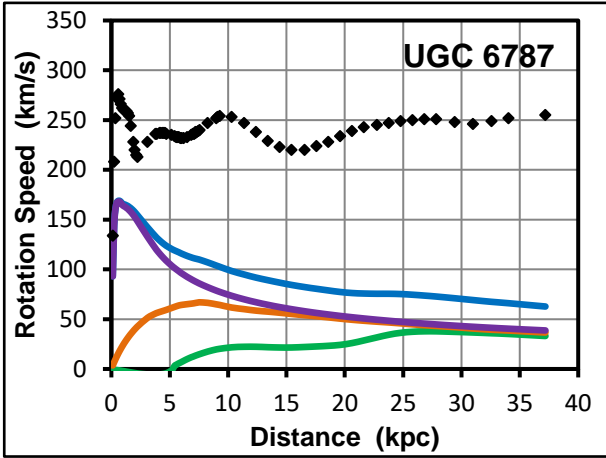
Fit parameters

Bulge, M-to-L	0.40
Disk, M-to-L	0.33
$\xi$ , slope	-0.89
DM factor	9.3
Fit quality	good

Comments

Galaxy has a bulge. Mass has converged by 23kpc.

### UGC 6787



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

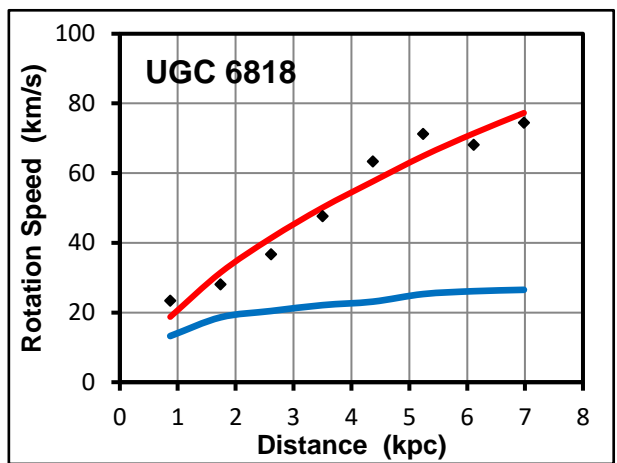
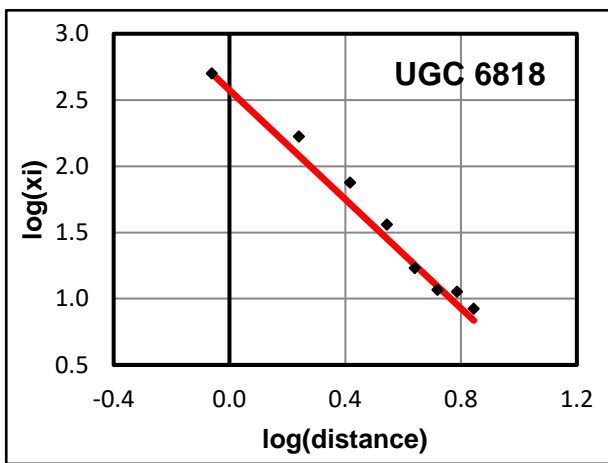
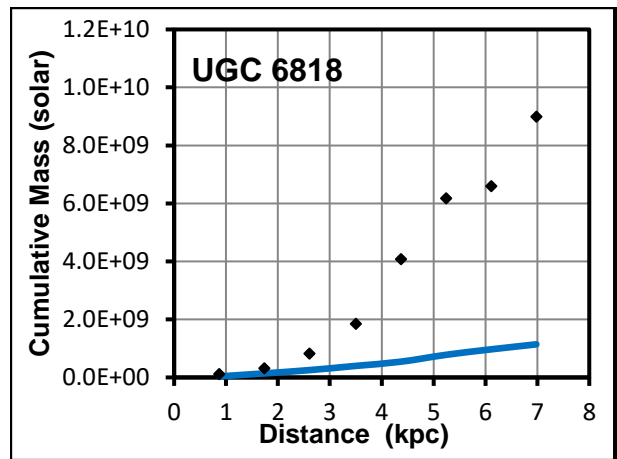
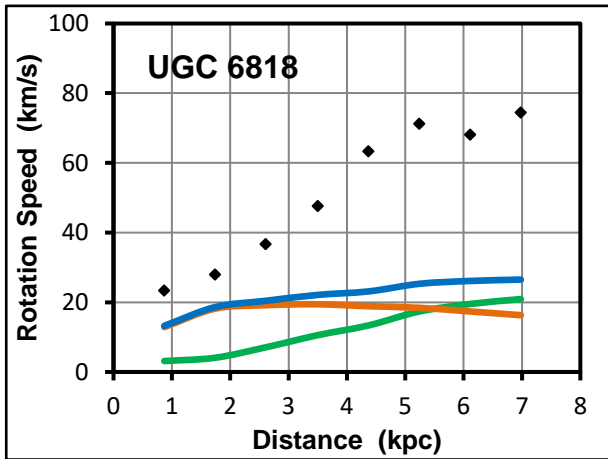
Fit parameters

Bulge, M-to-L	0.28
Disk, M-to-L	0.21
$\xi$ , slope	-0.99
DM factor	15.1
Fit quality	bumpy

Comments

Galaxy has a bulge. Fit only works by omitting points inside 2.2kpc. Fit does not match depression around 16kpc.

### UGC 6818



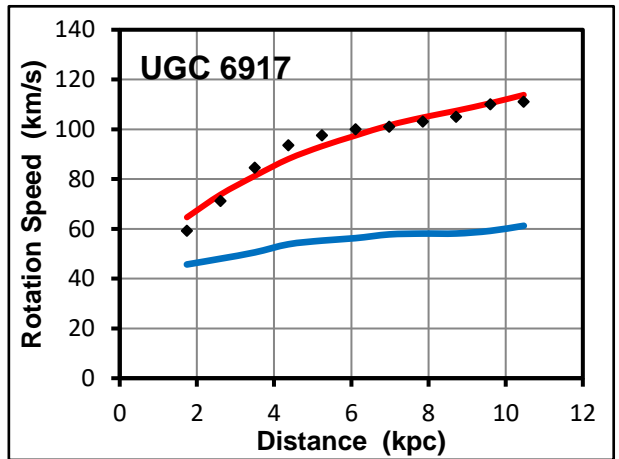
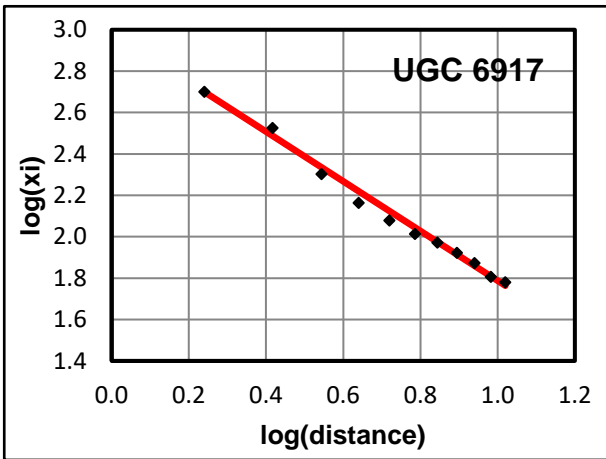
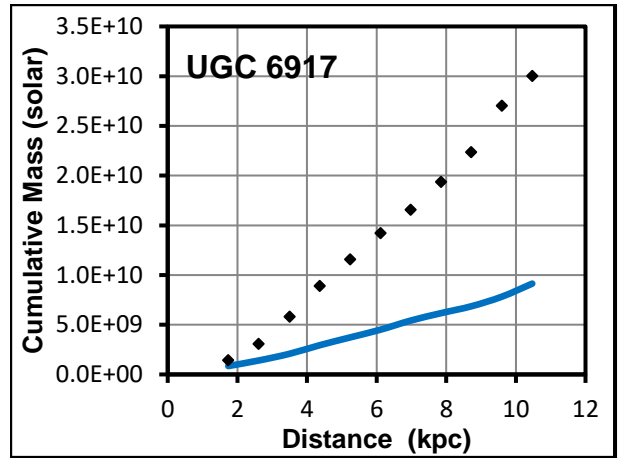
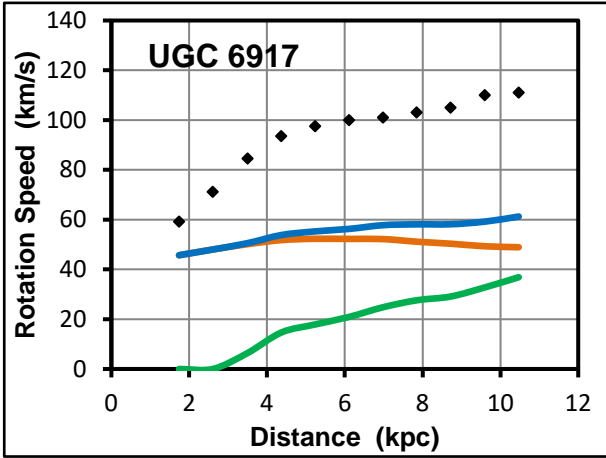
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Y, M-to-L	0.22
$\xi$ , slope	-2.06
DM factor	6.9
Fit quality	OK

Comments

### UGC 6917



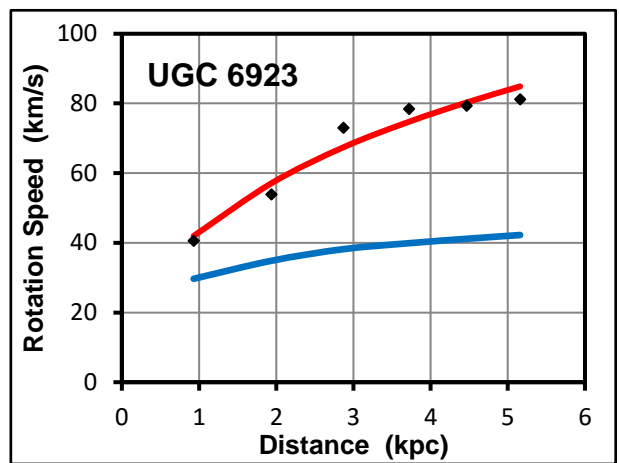
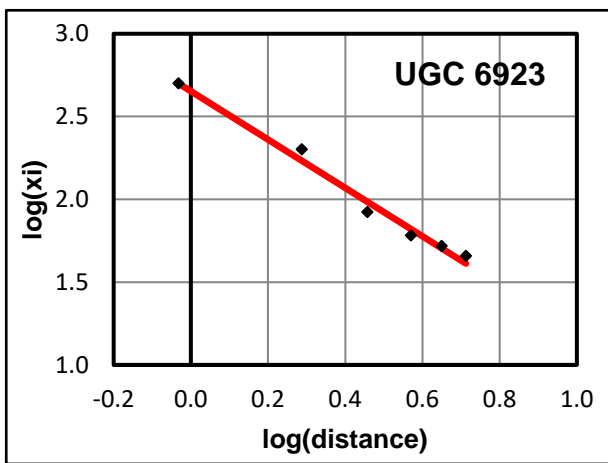
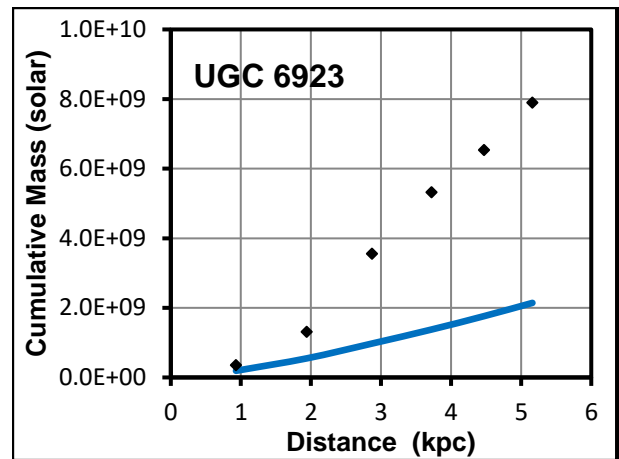
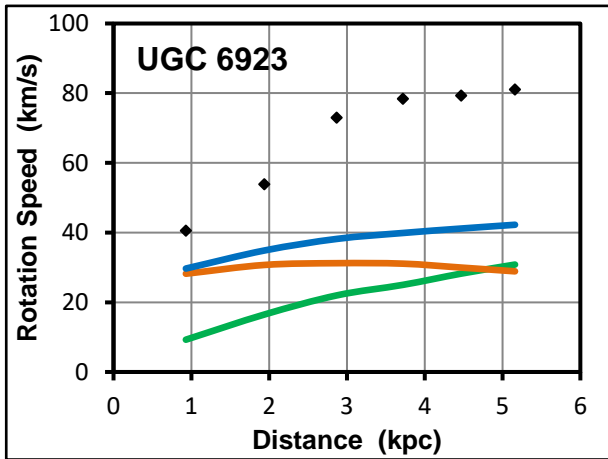
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.66
$\xi, \text{slope}$	-1.20
DM factor	2.3
Fit quality	OK

Comments

### UGC 6923



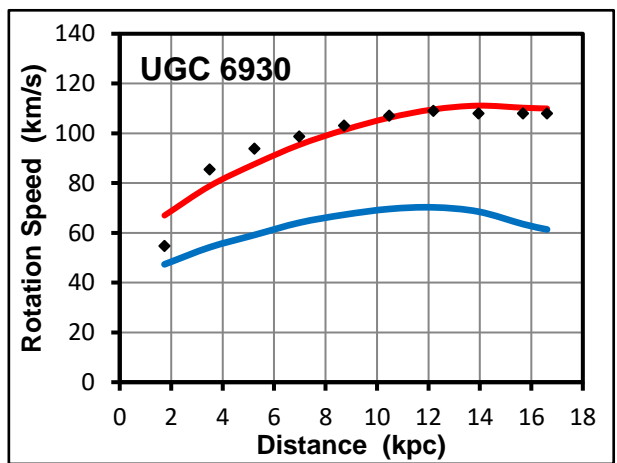
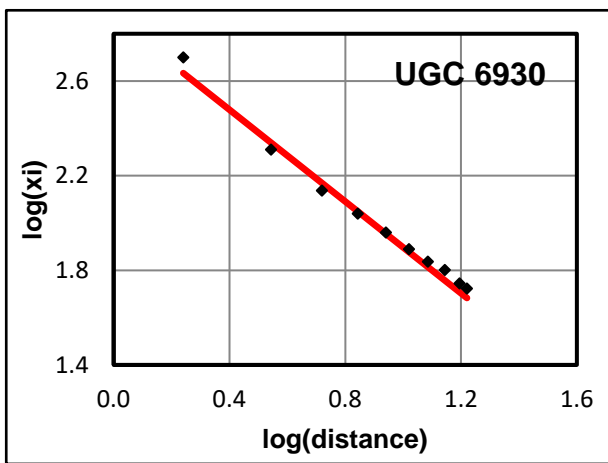
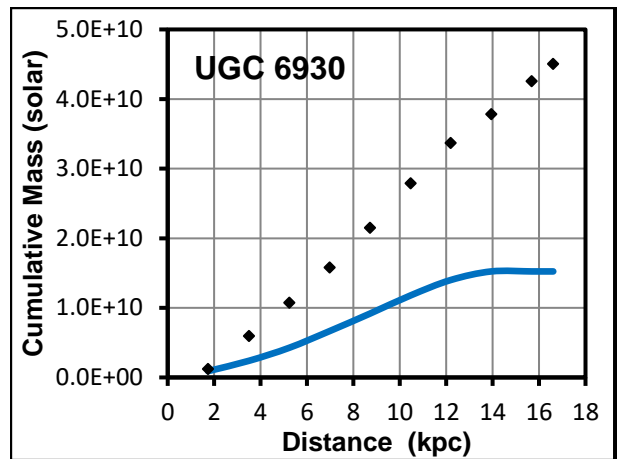
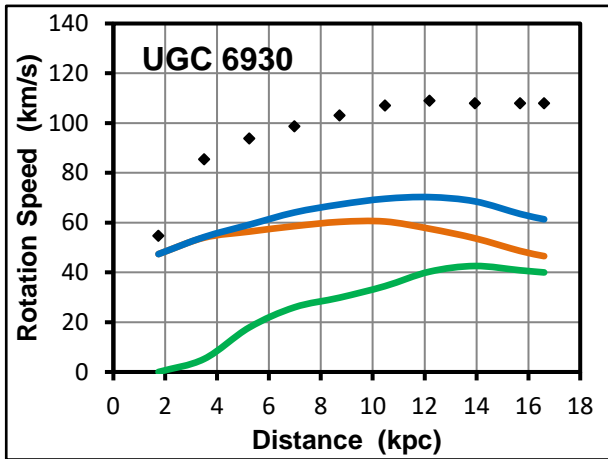
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.31
$\xi, \text{slope}$	-1.46
DM factor	2.7
Fit quality	OK

Comments

### UGC 6930



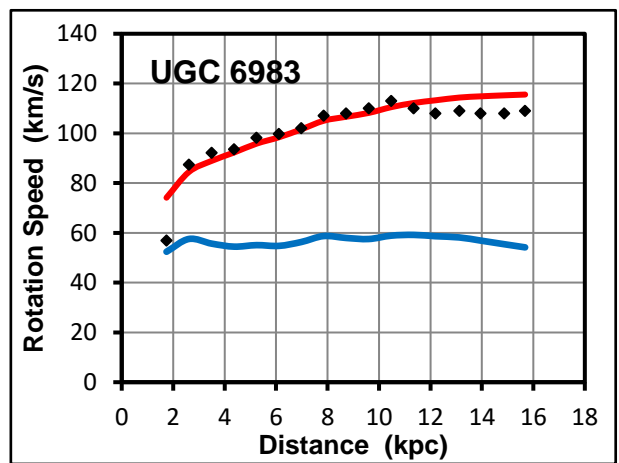
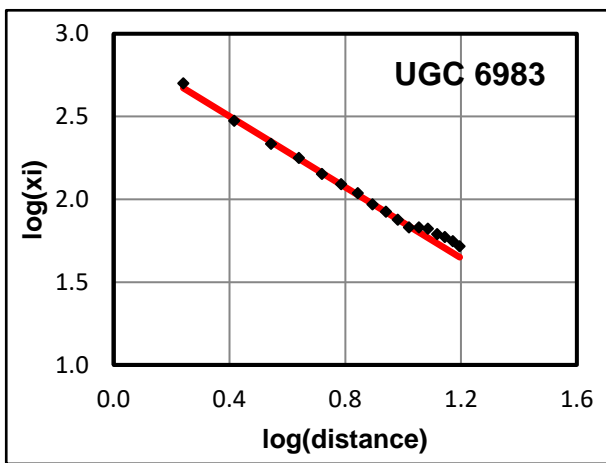
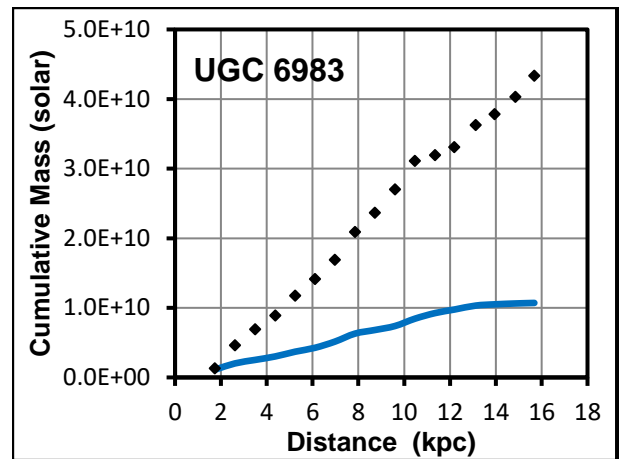
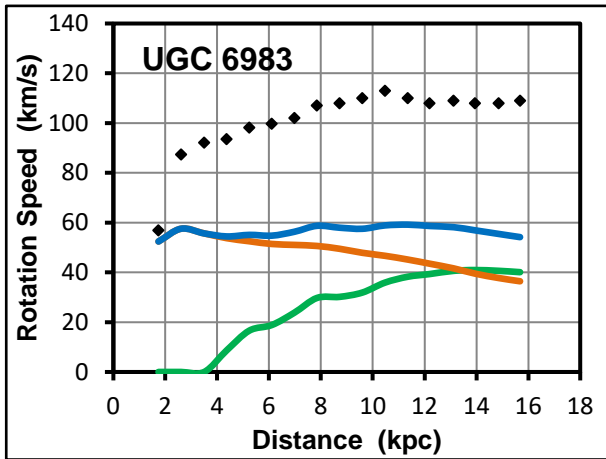
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.81
$\xi, \text{slope}$	-0.97
DM factor	2.0
Fit quality	OK

Comments

### UGC 6983



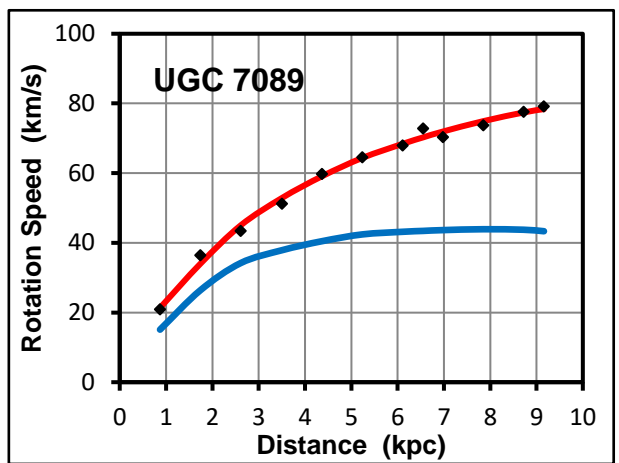
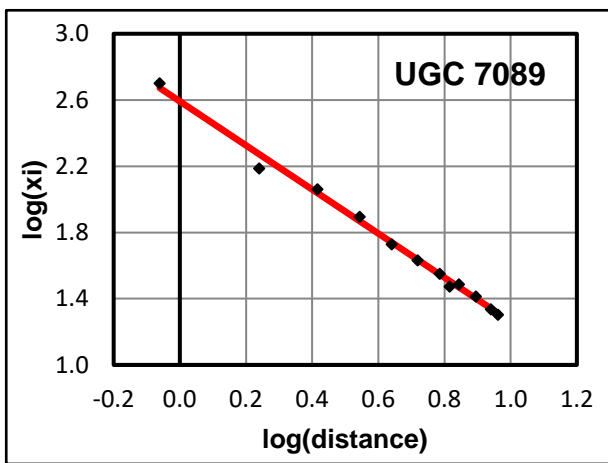
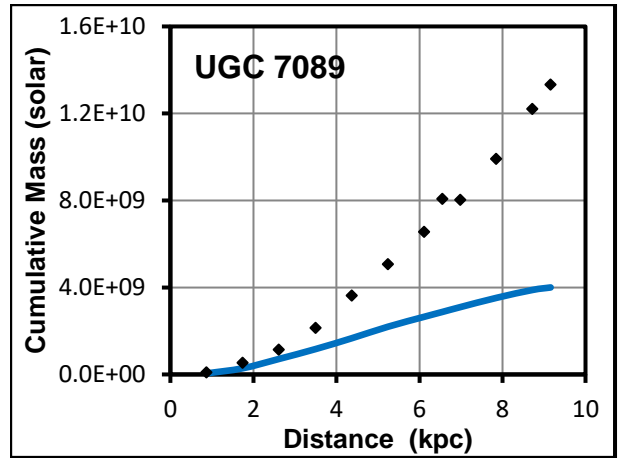
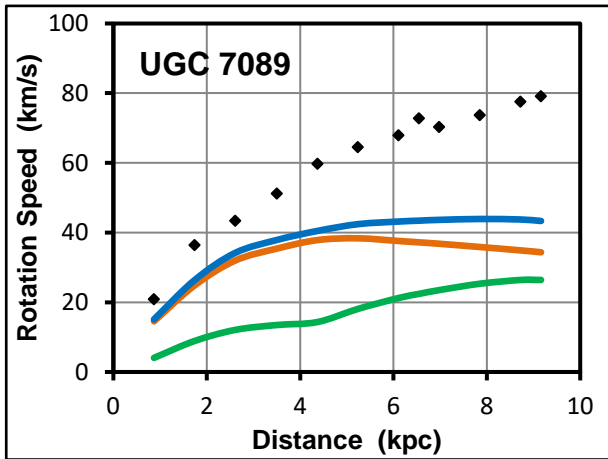
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y$ , M-to-L	0.83
$\xi$ , slope	-1.04
DM factor	3.0
Fit quality	OK

Comments

### UGC 7089



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

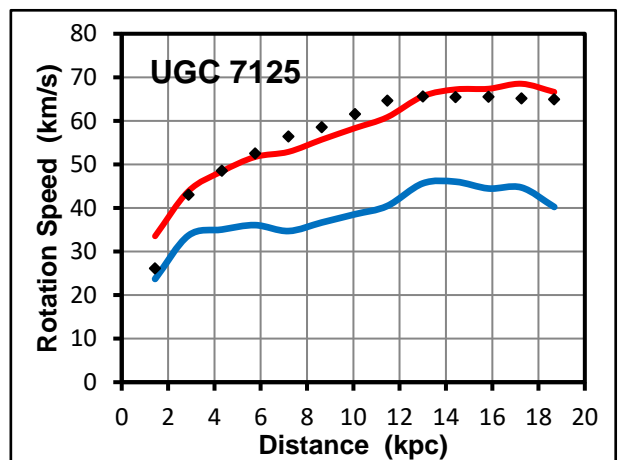
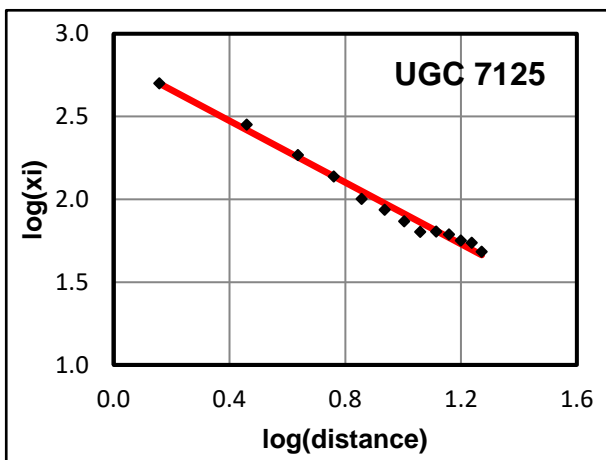
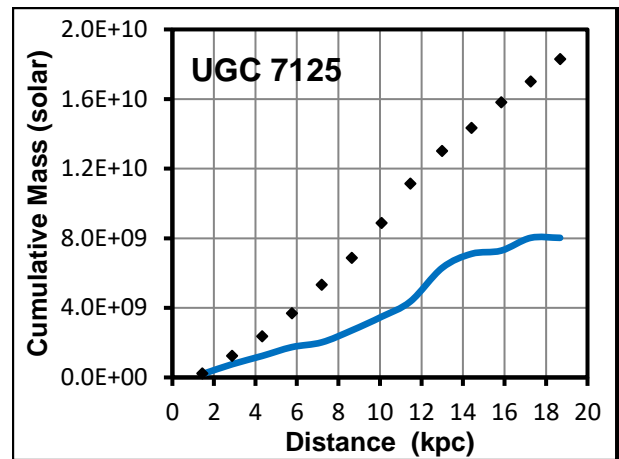
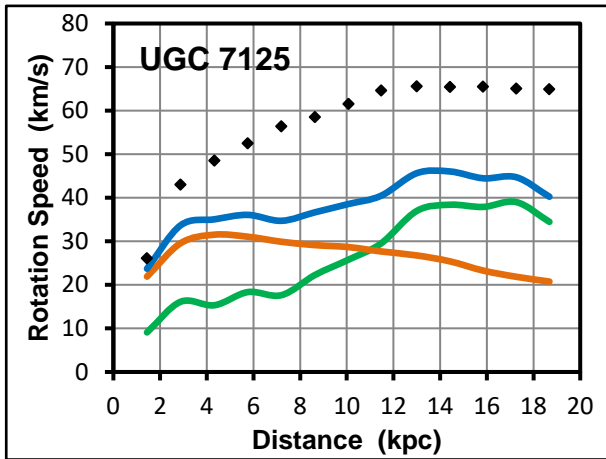
Fit parameters

$Y$ , M-to-L	0.57
$\xi$ , slope	-1.33
DM factor	2.3
Fit quality	good

Comments



### UGC 7125



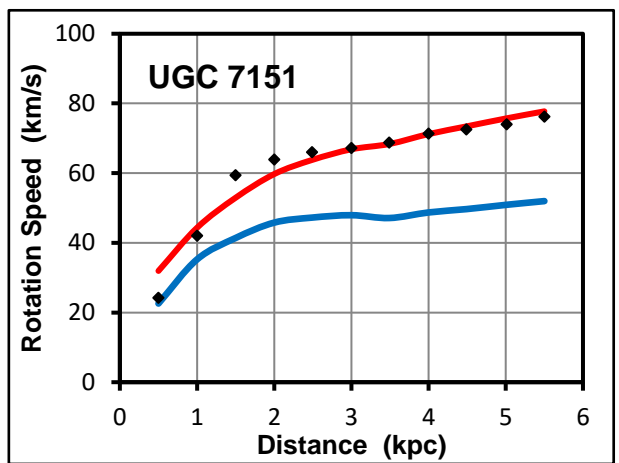
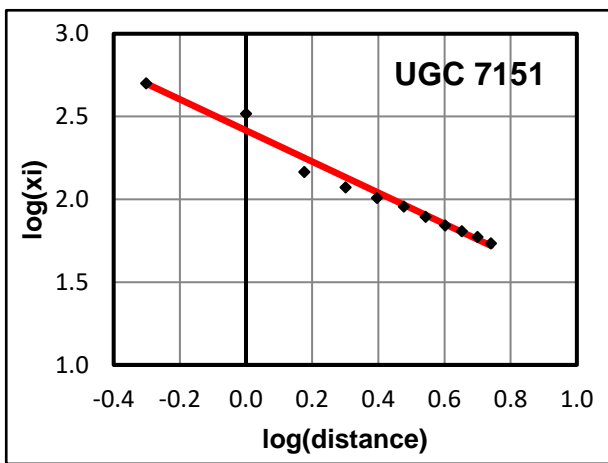
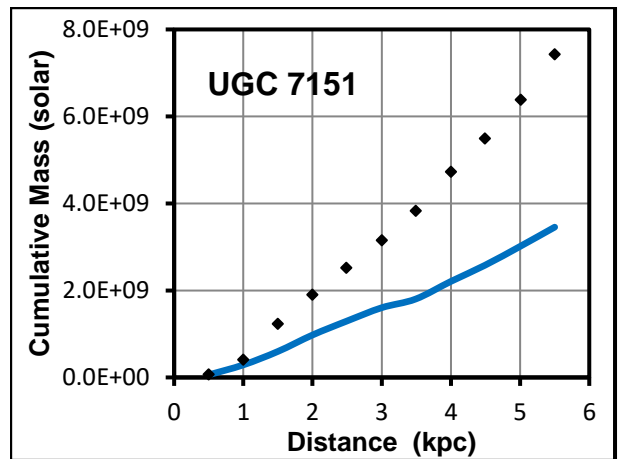
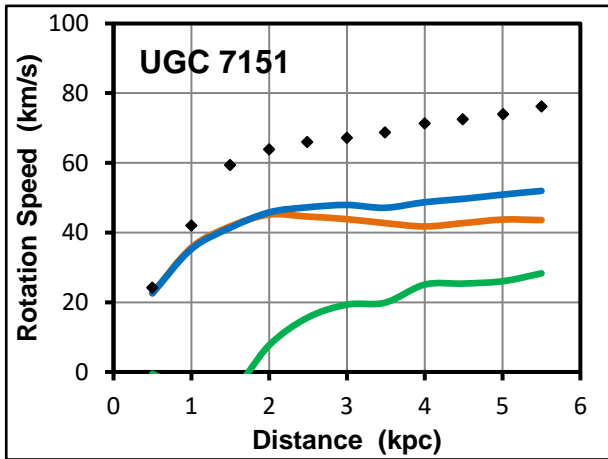
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.63
$\xi, \text{slope}$	-0.93
DM factor	1.3
Fit quality	OK
	bumpy

Comments

### UGC 7151



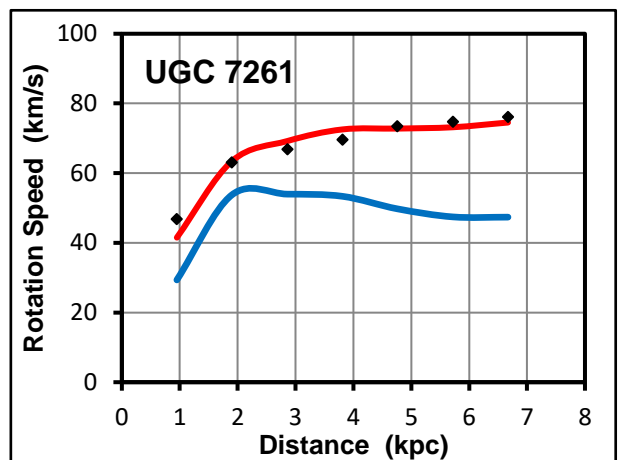
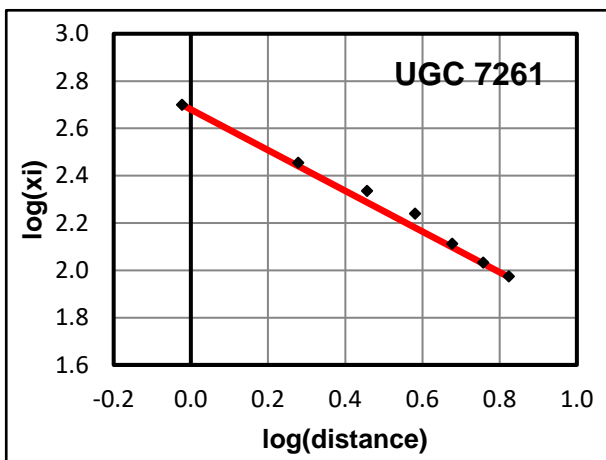
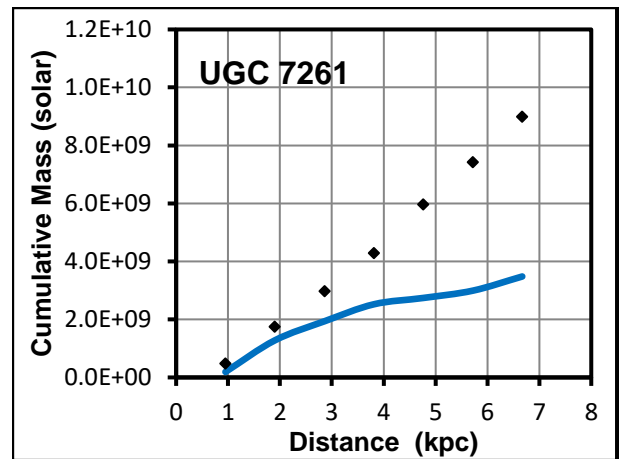
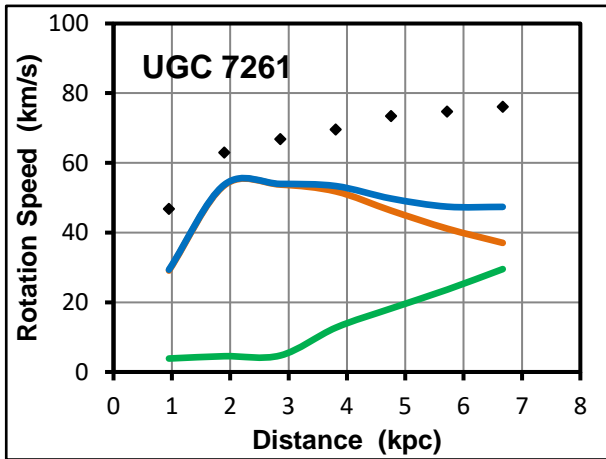
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.83
$\xi, \text{slope}$	-0.94
DM factor	1.2
Fit quality	good

Comments

### UGC 7261



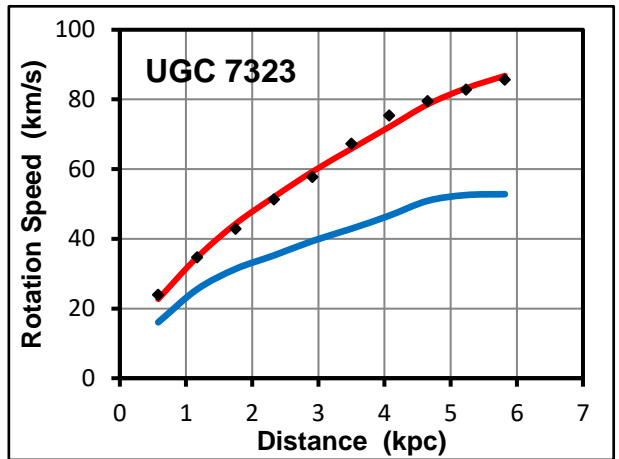
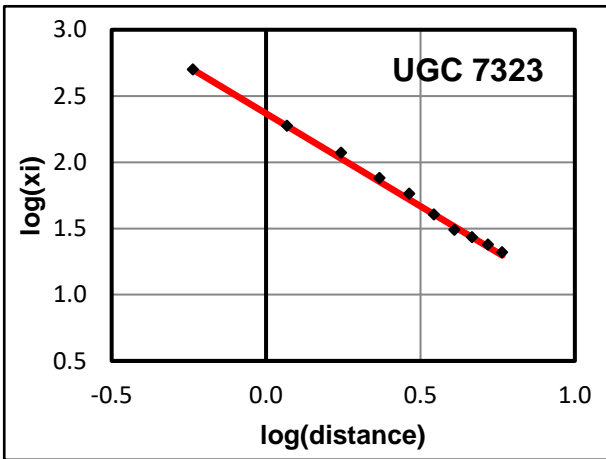
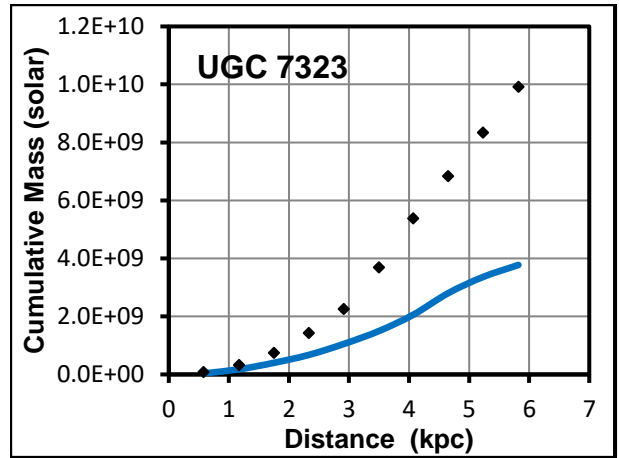
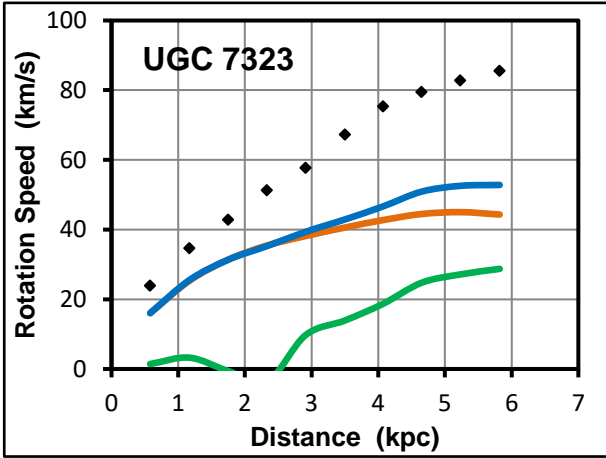
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.10
$\xi, \text{slope}$	-0.86
DM factor	1.6
Fit quality	good

Comments

### UGC 7323



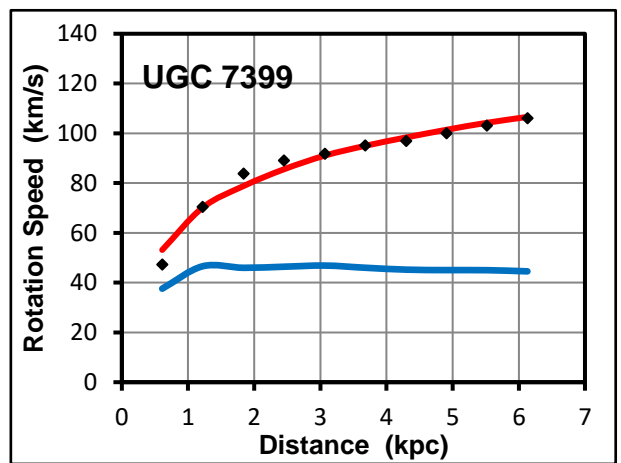
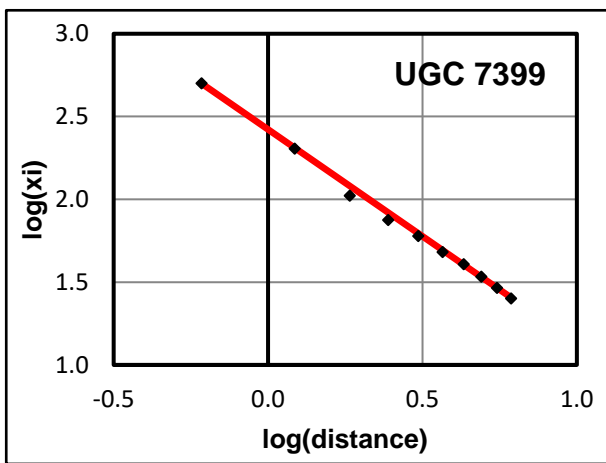
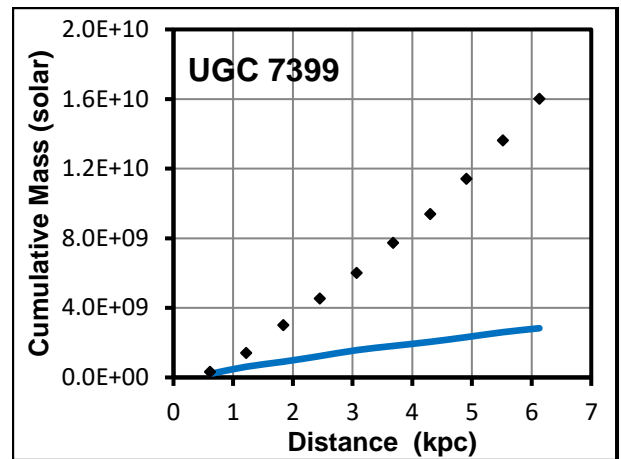
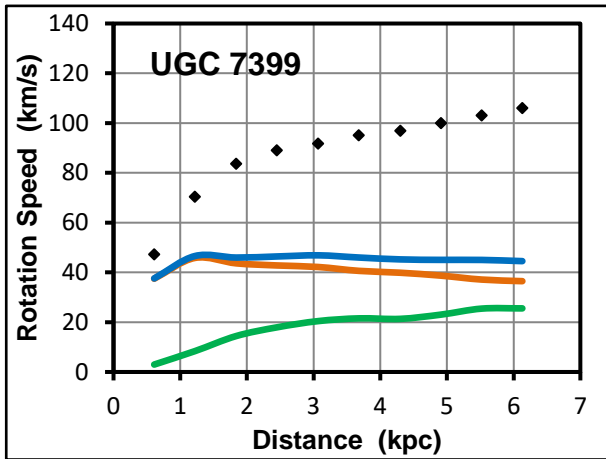
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Y, M-to-L	0.53
$\xi$ , slope	-1.40
DM factor	1.6
Fit quality	good

Comments

### UGC 7399



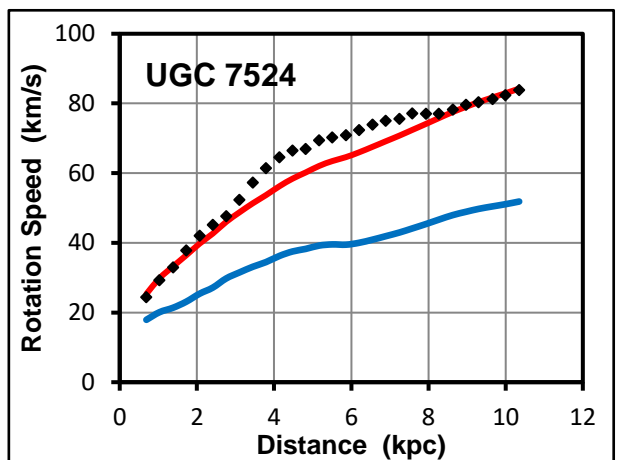
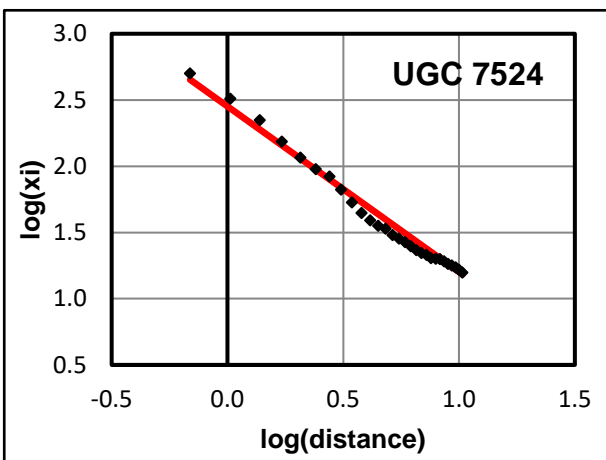
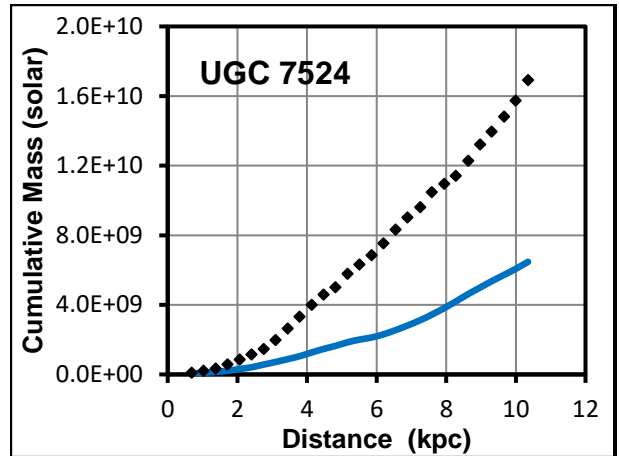
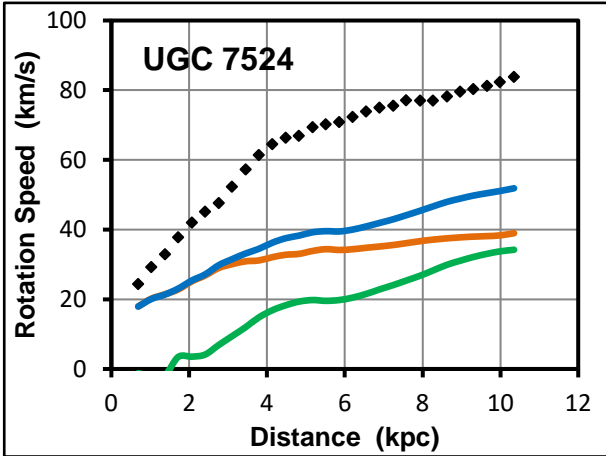
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y$ , M-to-L	1.38
$\xi$ , slope	-1.29
DM factor	4.7
Fit quality	good

Comments

### UGC 7524



Top left: rotation curve from SPARC data

Top right: cumulative mass

Bottom left:  $\xi$ -function

Bottom right: fitted rotation curve

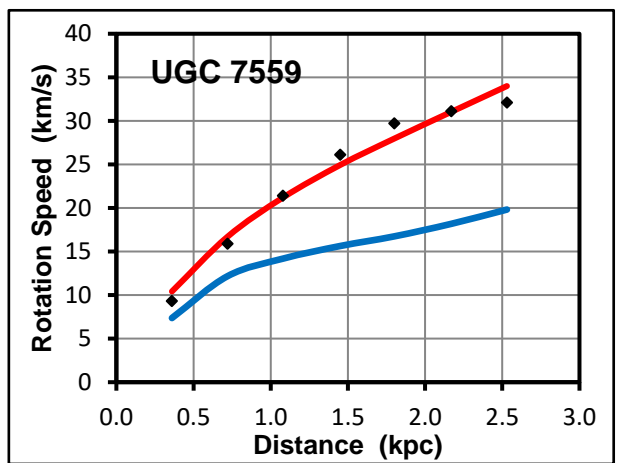
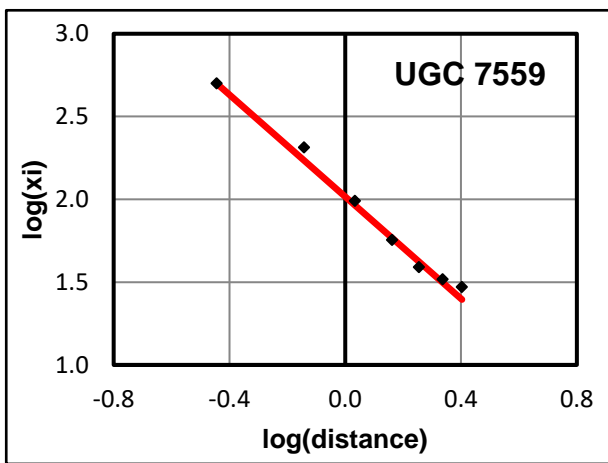
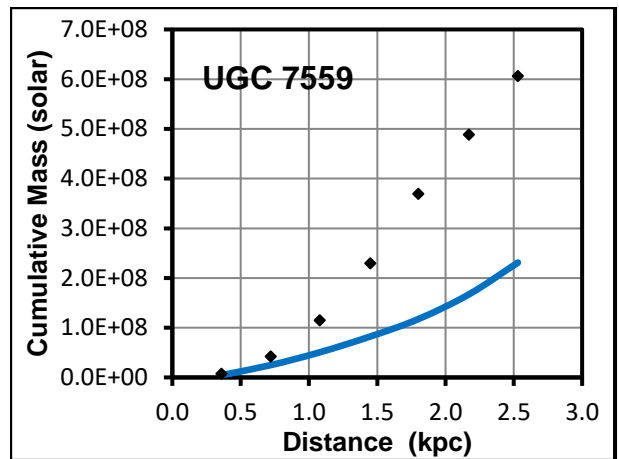
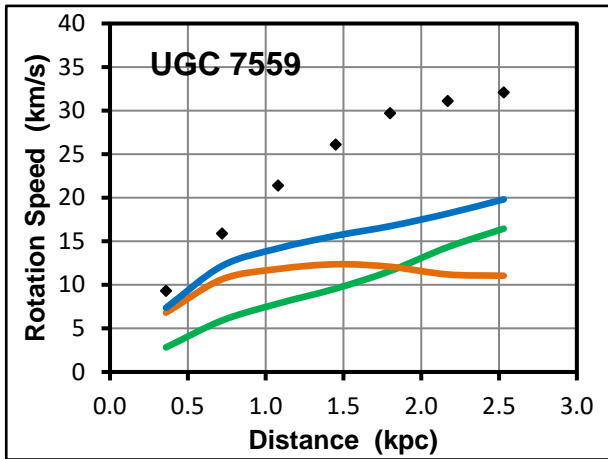
Fit parameters

$Y, M\text{-to-L}$	1.00
$\xi, \text{slope}$	-1.22
DM factor	1.6
Fit quality	poor

Comments

Manual fit, because of bump in curve from 3kpc to 8kpc.

### UGC 7559



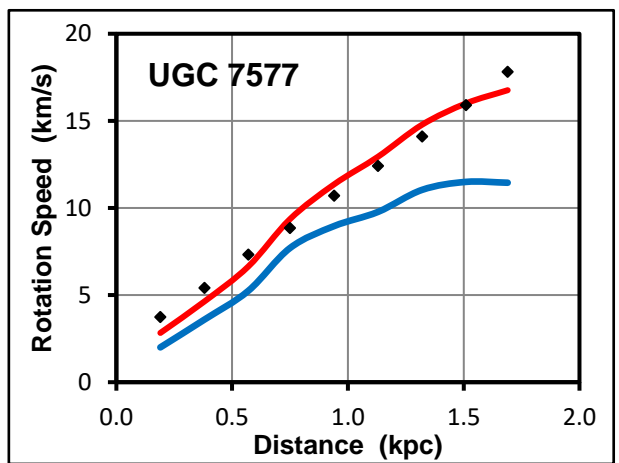
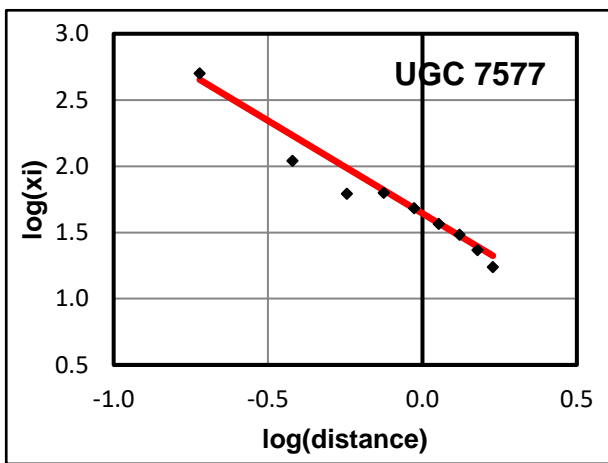
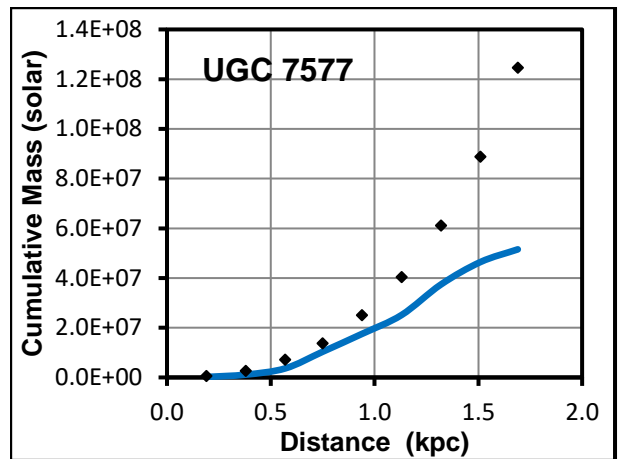
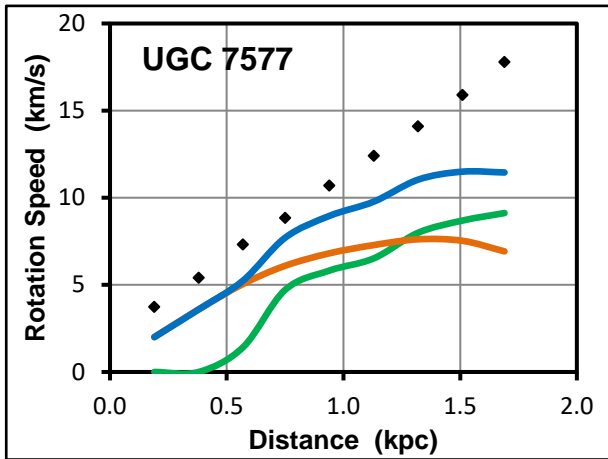
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.51
$\xi, \text{slope}$	-1.54
DM factor	1.6
Fit quality	OK

Comments

### UGC 7577



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

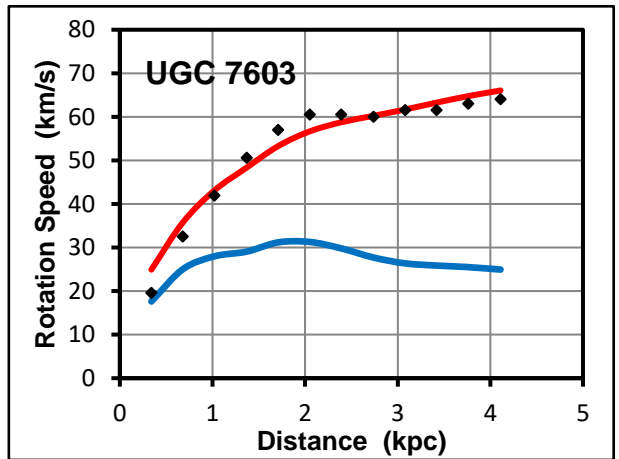
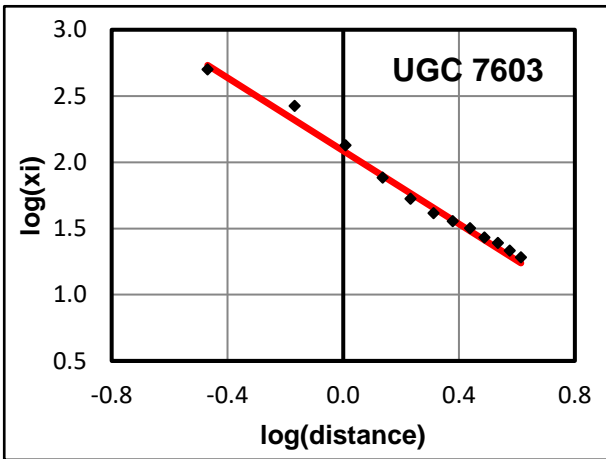
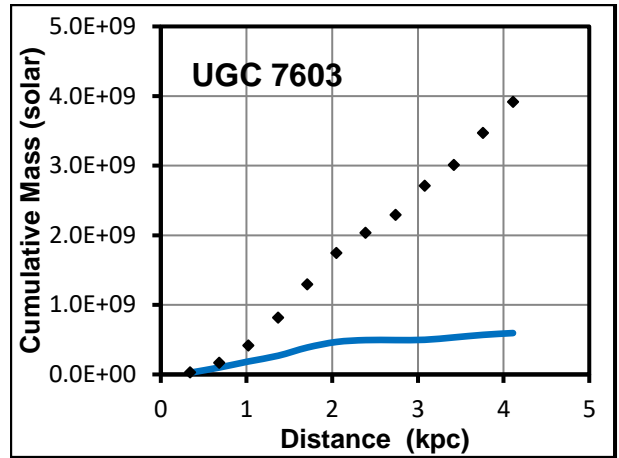
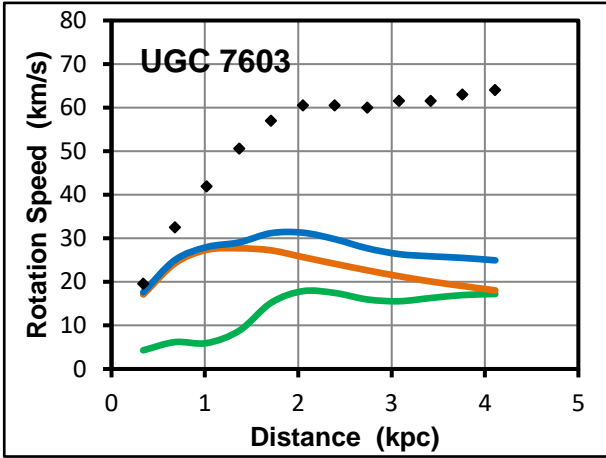
Fit parameters

$Y, M\text{-to-L}$	0.34
$\xi, \text{slope}$	-1.40
DM factor	1.4
Fit quality	OK

Comments



### UGC 7603



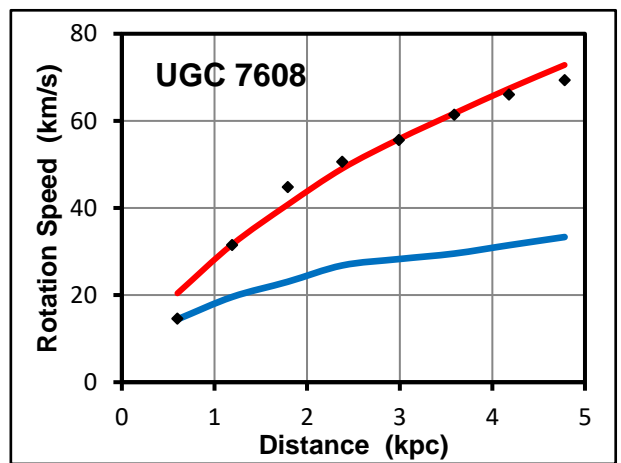
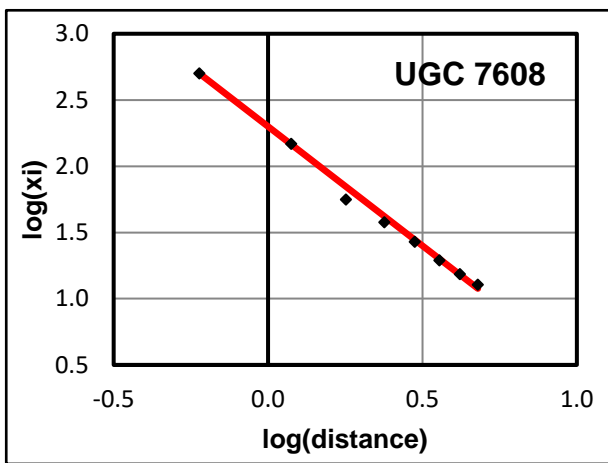
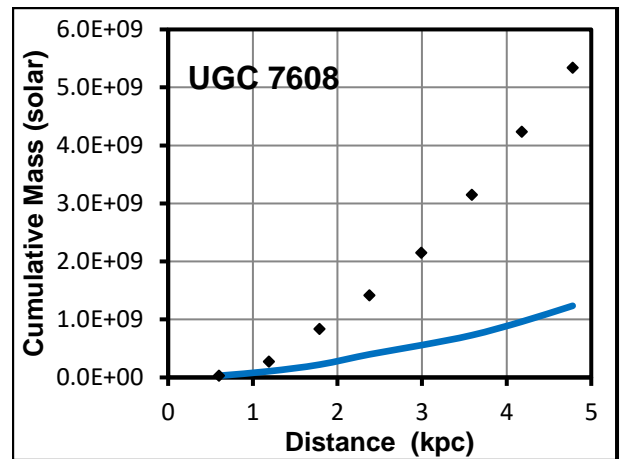
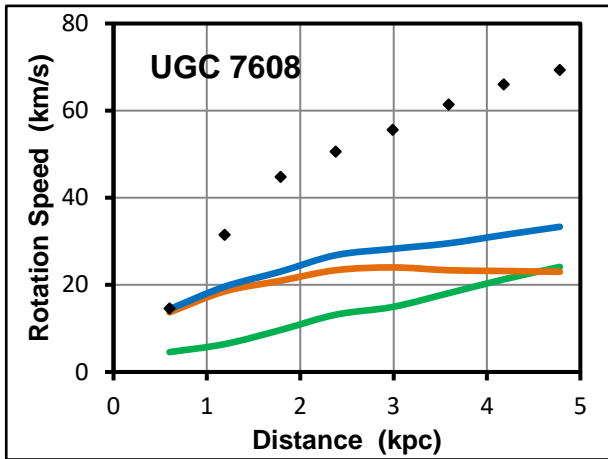
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.75
$\xi, \text{slope}$	-1.38
DM factor	5.6
Fit quality	OK

Comments

### UGC 7608



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

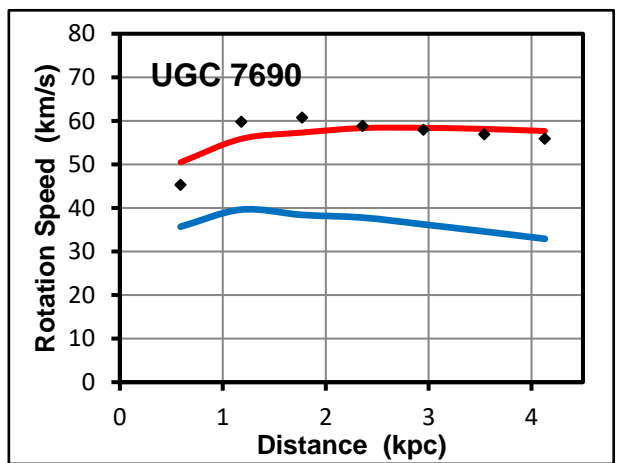
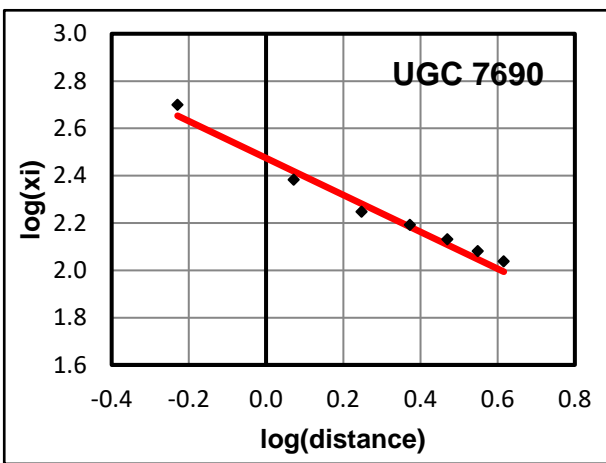
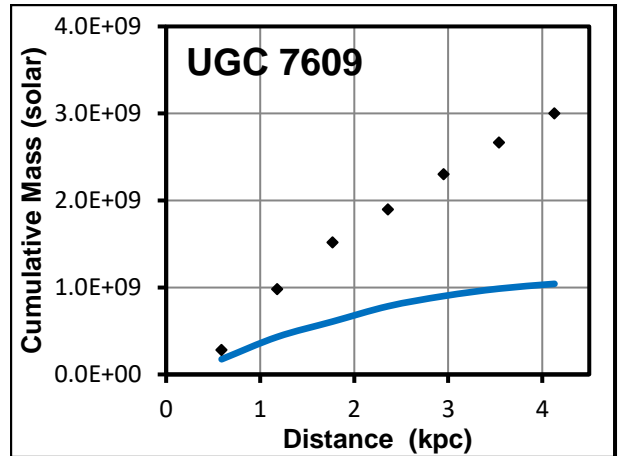
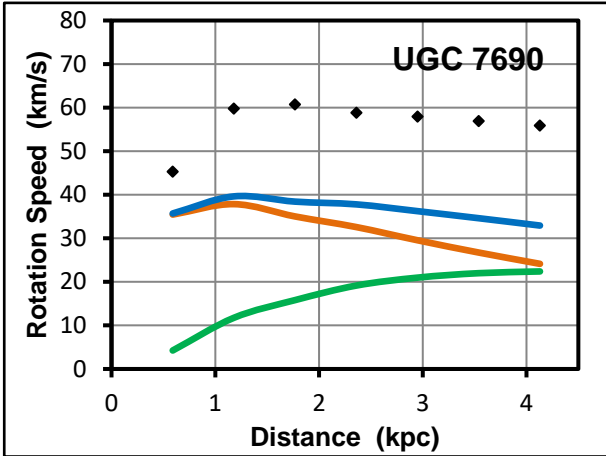
Fit parameters

$Y, M\text{-to-L}$	2.00
$\xi, \text{slope}$	-1.80
DM factor	3.3
Fit quality	poor

Comments

Fit poorly defined - can trade off M-to-L against  $\xi$ -slope.

### UGC 7690



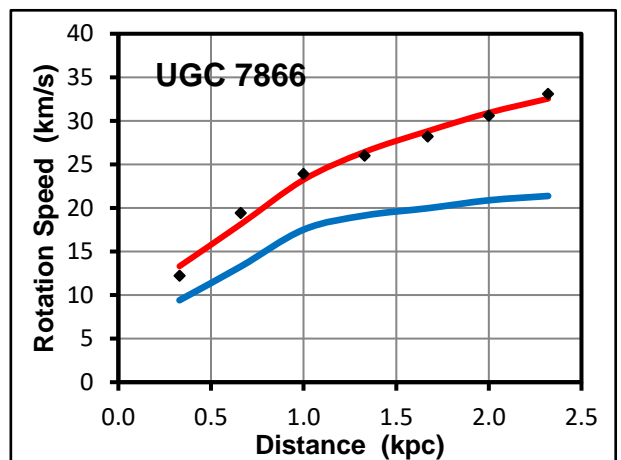
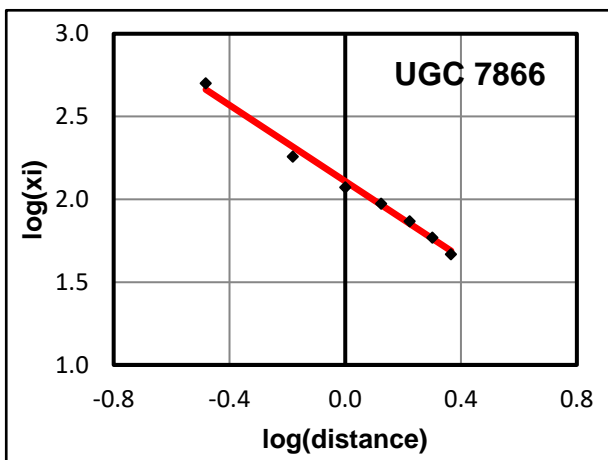
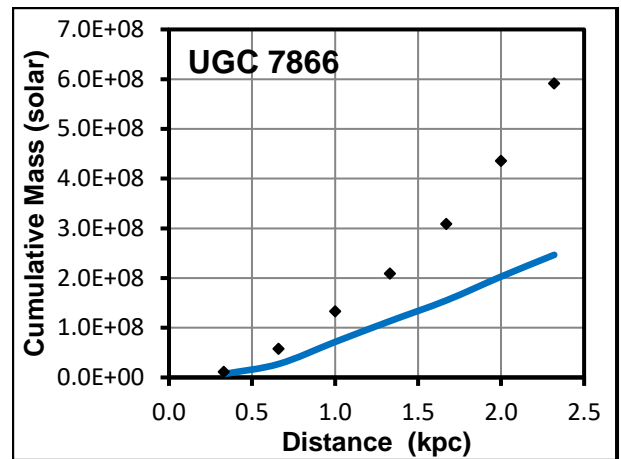
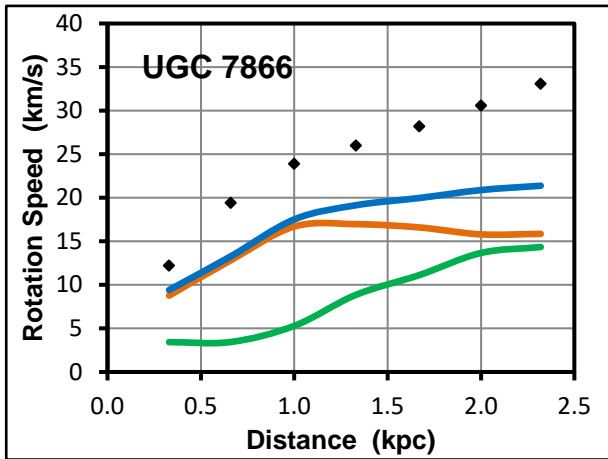
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.60
$\xi, \text{slope}$	-0.78
DM factor	1.9
Fit quality	poor

Comments

### UGC 7866



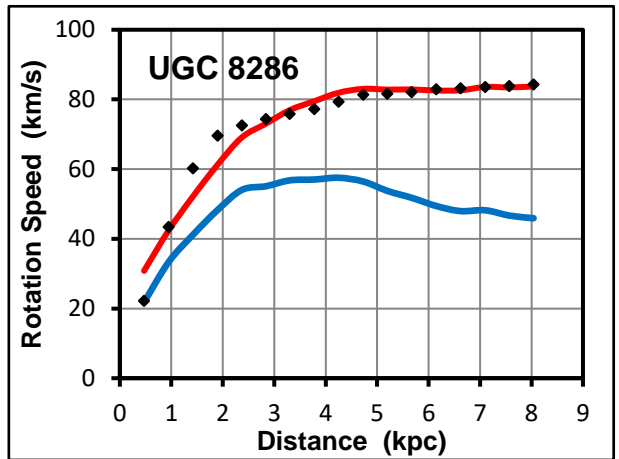
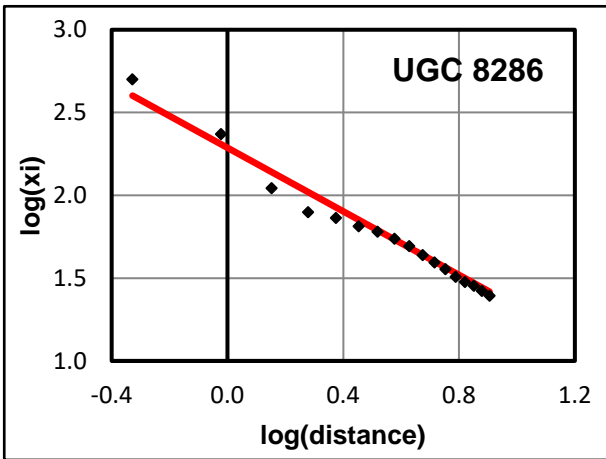
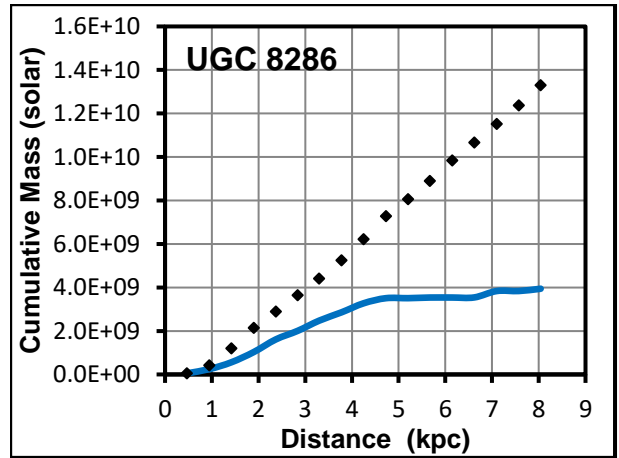
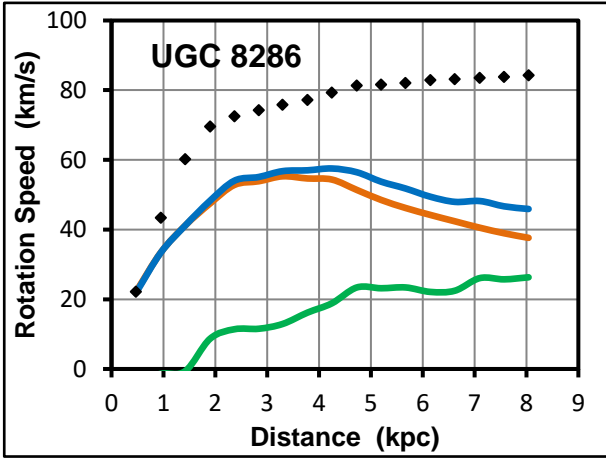
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.94
$\xi, \text{slope}$	-1.15
DM factor	1.4
Fit quality	good

Comments

### UGC 8286



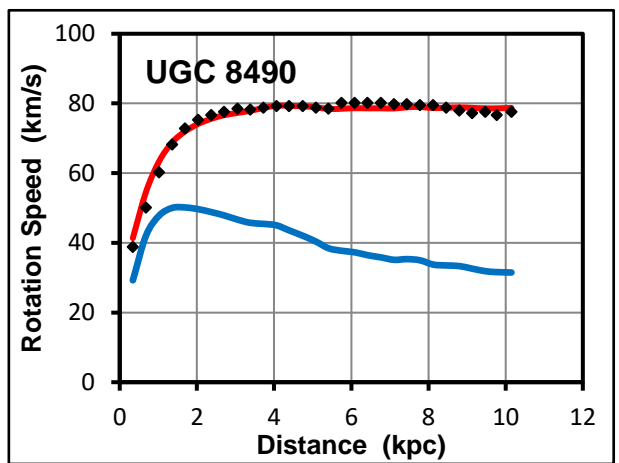
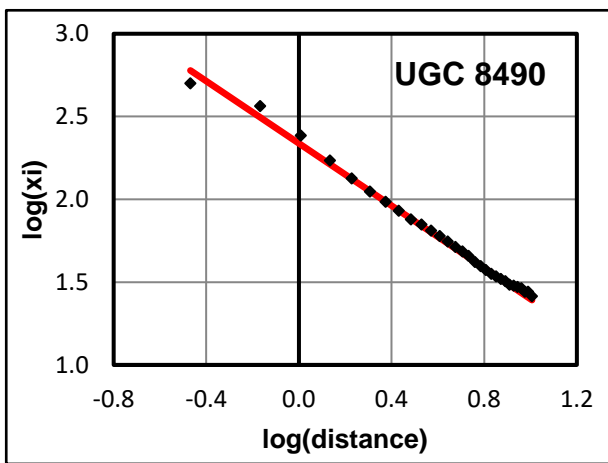
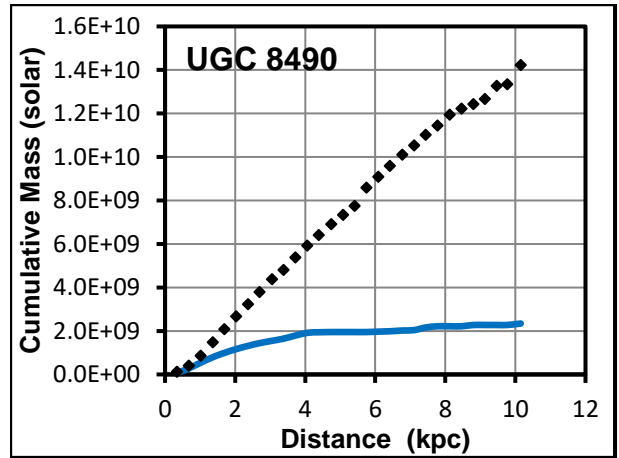
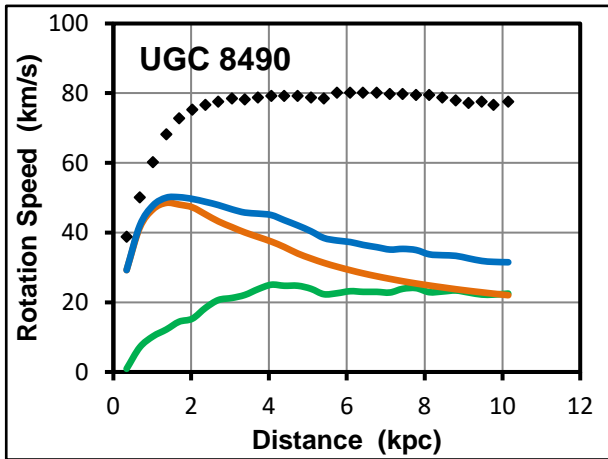
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.88
$\xi, \text{slope}$	-0.96
DM factor	2.4
Fit quality	OK

Comments

### UGC 8490



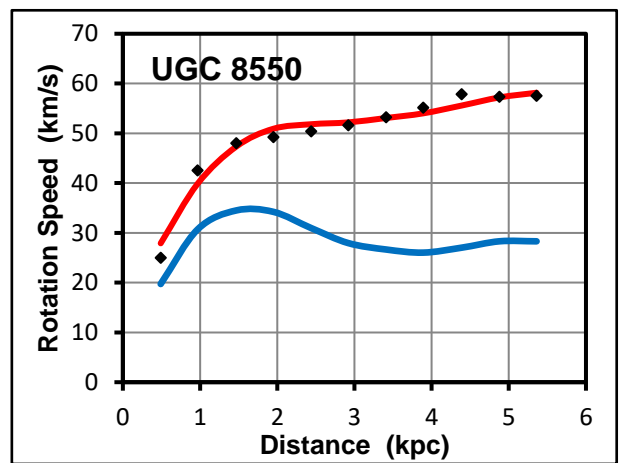
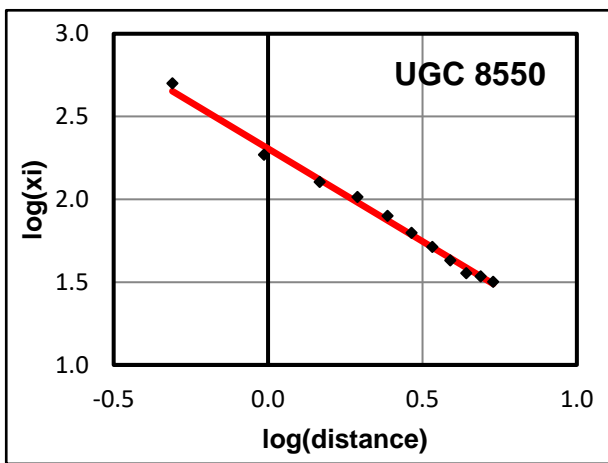
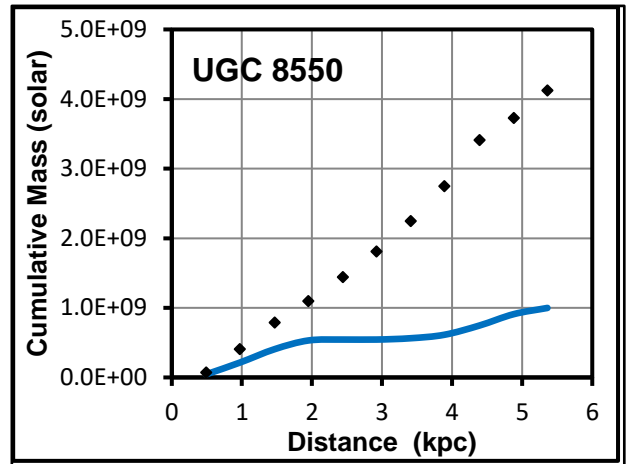
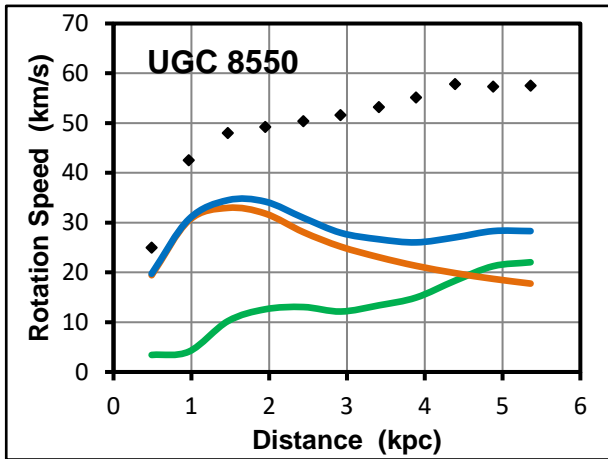
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.10
$\xi, \text{slope}$	-0.94
DM factor	5.1
Fit quality	good

Comments

### UGC 8550



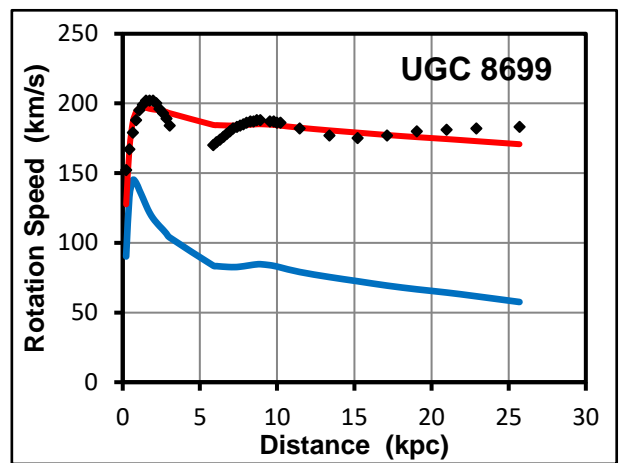
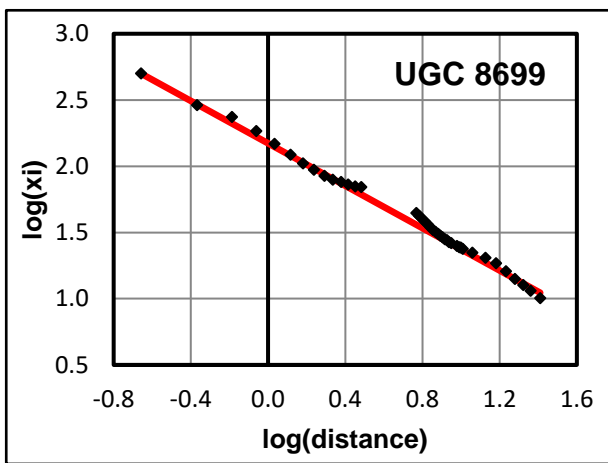
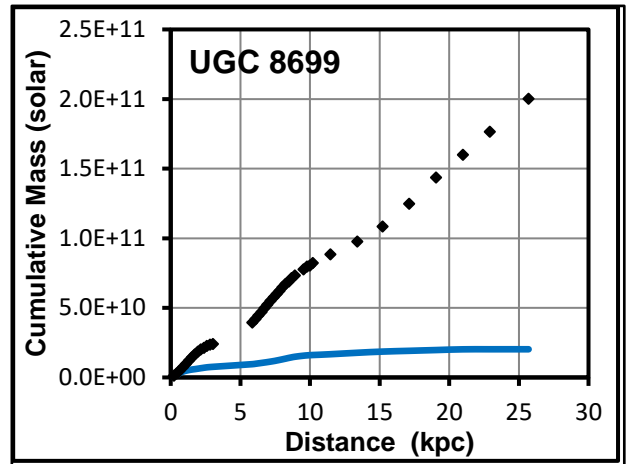
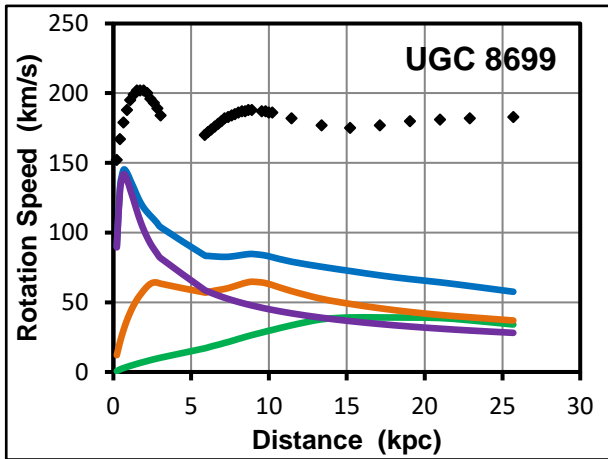
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y$ , M-to-L	1.30
$\xi$ , slope	-1.12
DM factor	3.1
Fit quality	good

Comments

### UGC 8699



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

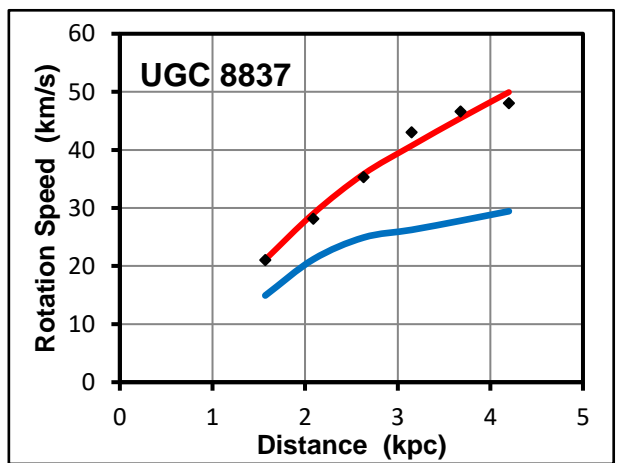
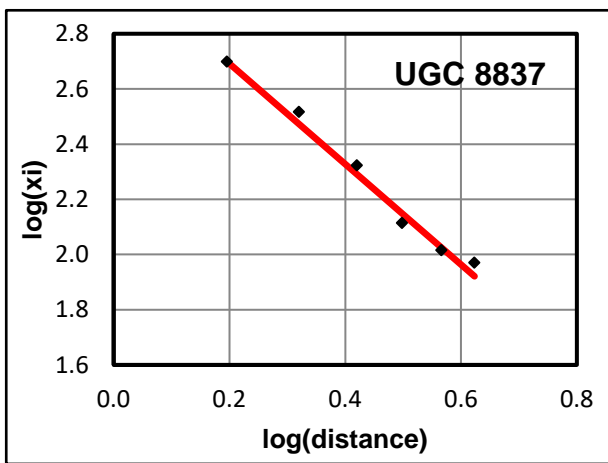
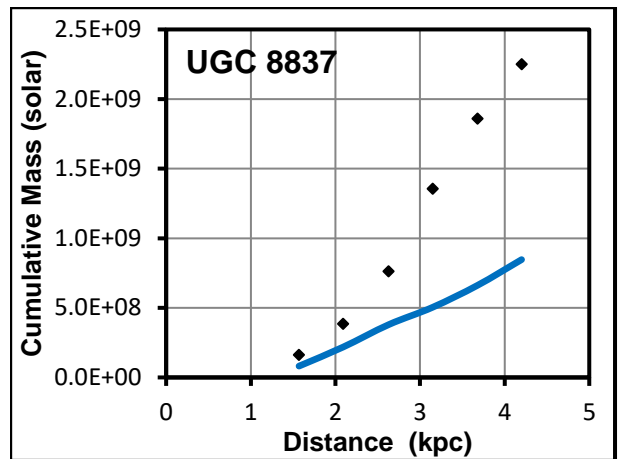
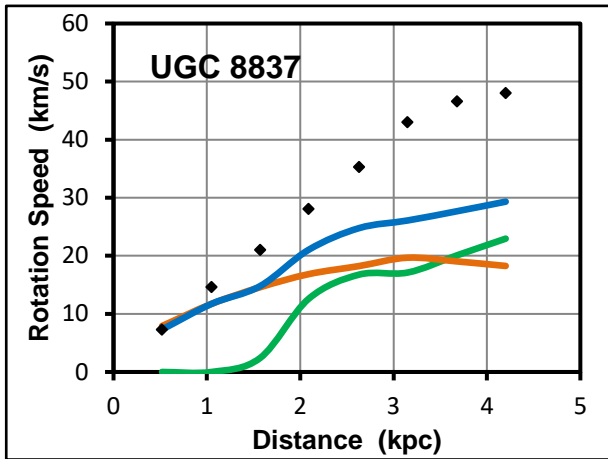
Fit parameters

Bulge, M-to-L	0.32
Disk, M-to-L	0.21
$\xi$ , slope	-0.80
DM factor	8.9
Fit quality	poor

Comments



### UGC 8837



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

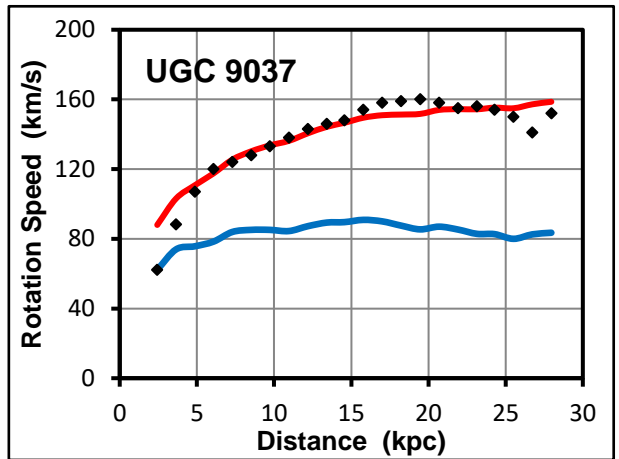
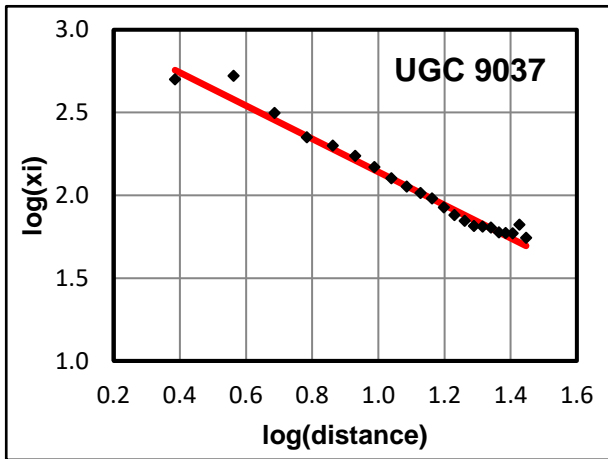
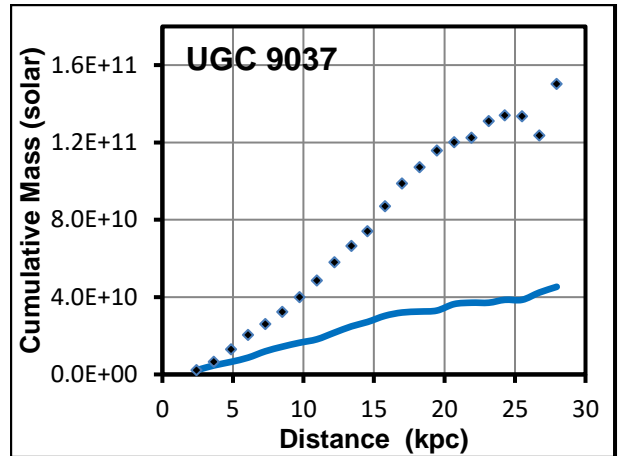
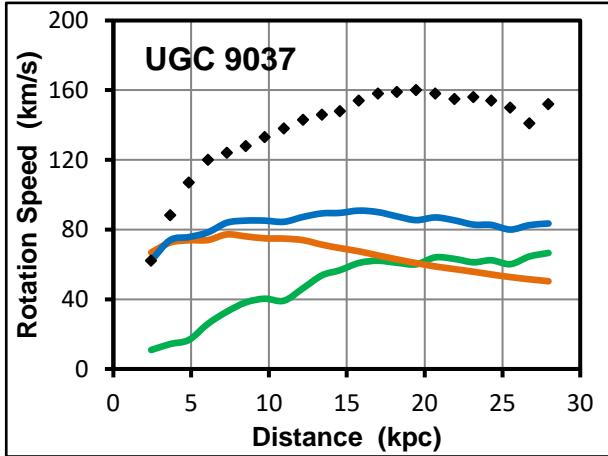
Fit parameters

$Y, M\text{-to-L}$	0.51
$\xi, \text{slope}$	-1,82
DM factor	1.7
Fit quality	OK

Comments

Fit ignores innermost 2 data points.

### UGC 9037



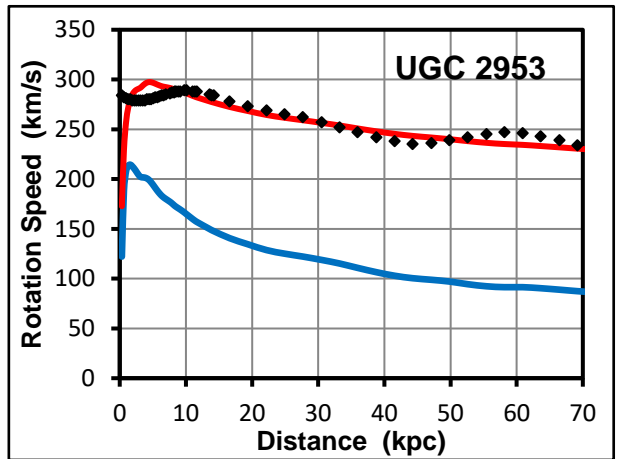
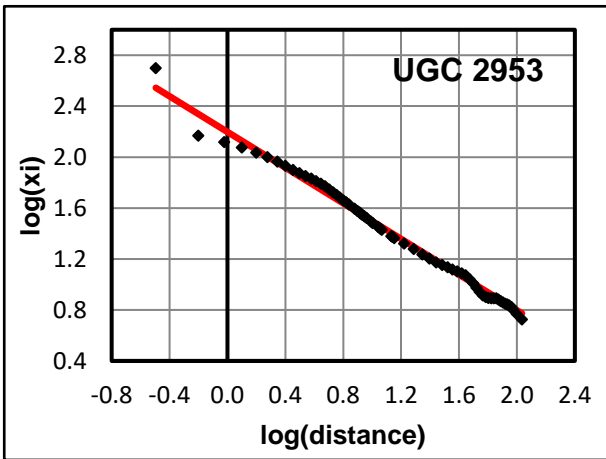
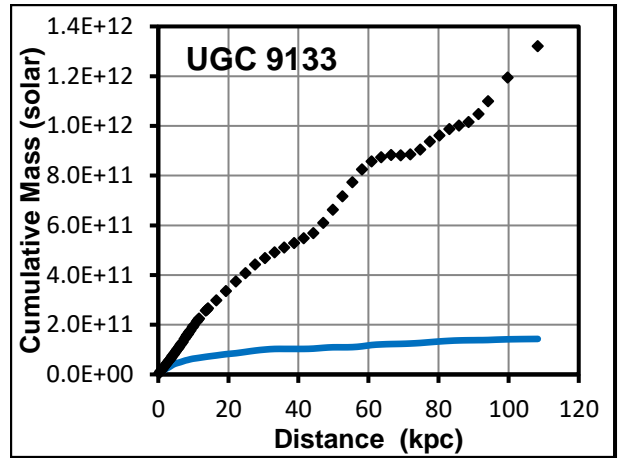
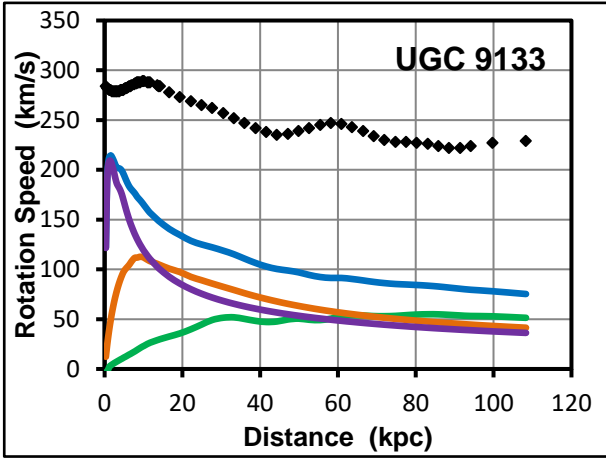
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.24
$\xi, \text{slope}$	-1.00
DM factor	2.3
Fit quality	OK

Comments

### UGC 9133



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

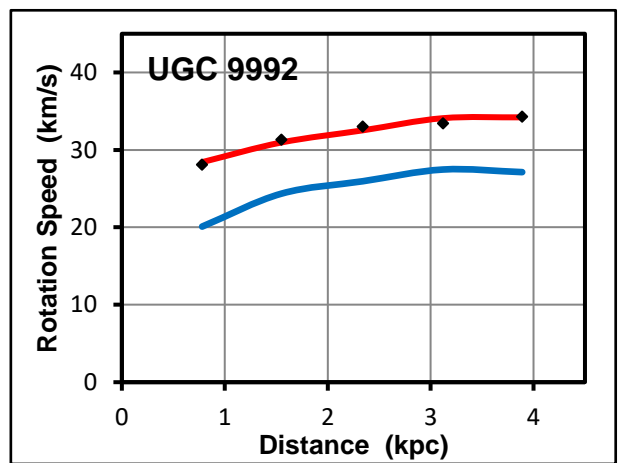
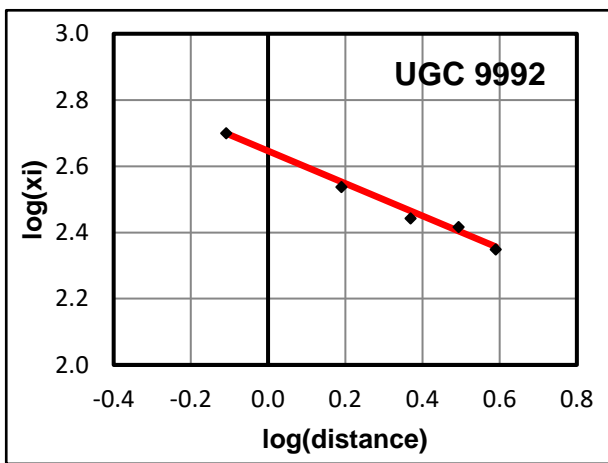
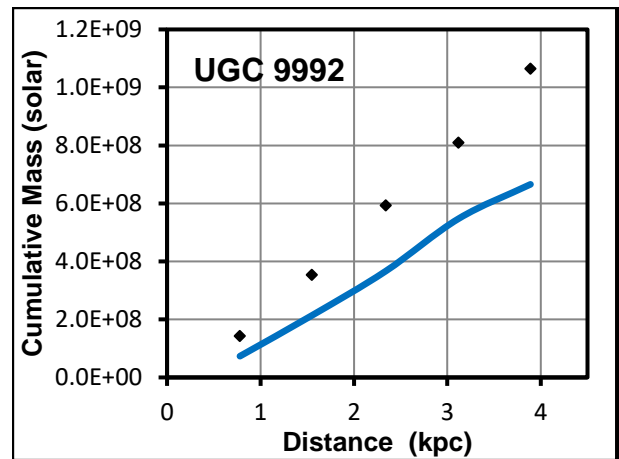
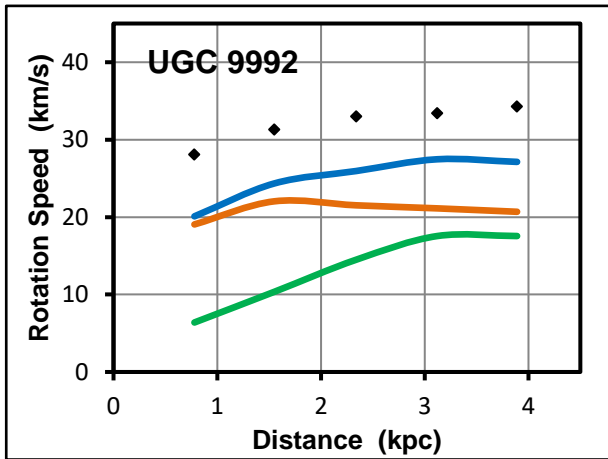
Fit parameters

Bulge, M-to-L	0.41
Disk, M-to-L	0.21
$\xi$ , slope	-0.70
DM factor	8.3
Fit quality	OK

Comments

Galaxy has a bulge. Not a good fit to the innermost regions.

### UGC 9992



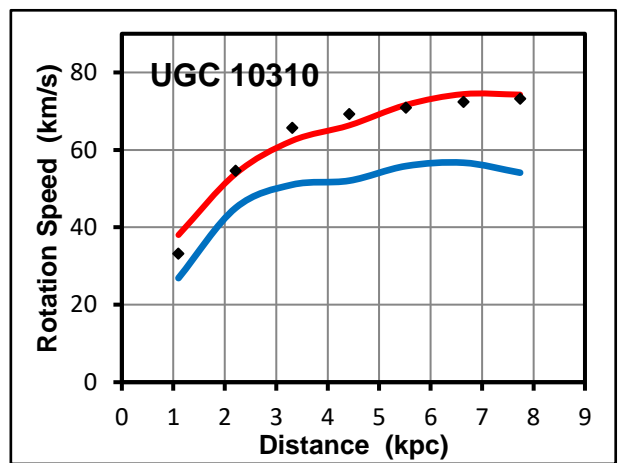
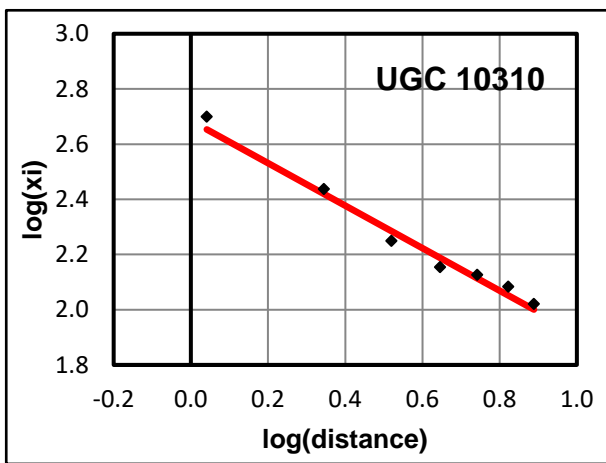
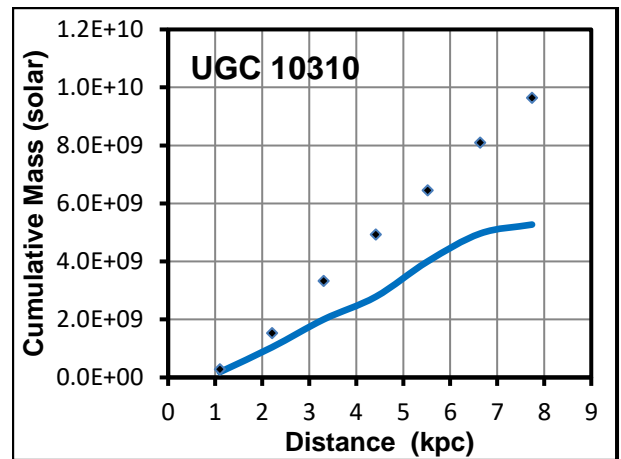
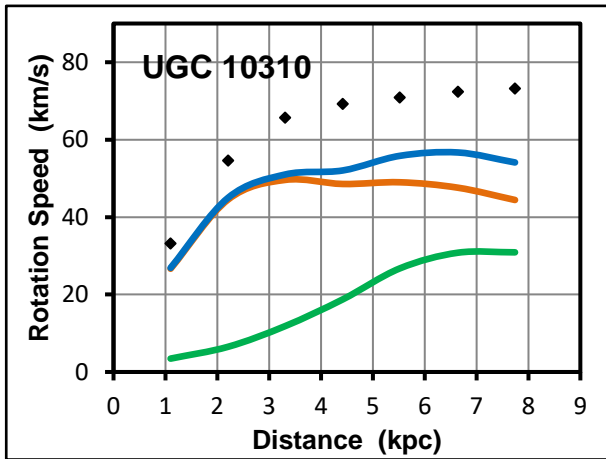
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.88
$\xi, \text{slope}$	-0.49
DM factor	0.6
Fit quality	good

Comments  
 Only 5 data points.

### UGC 10310



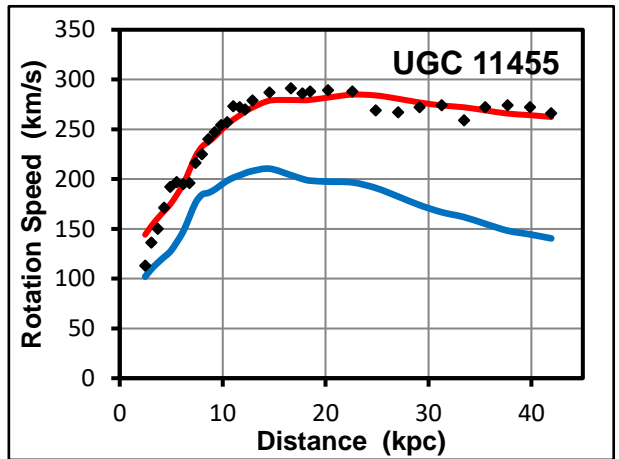
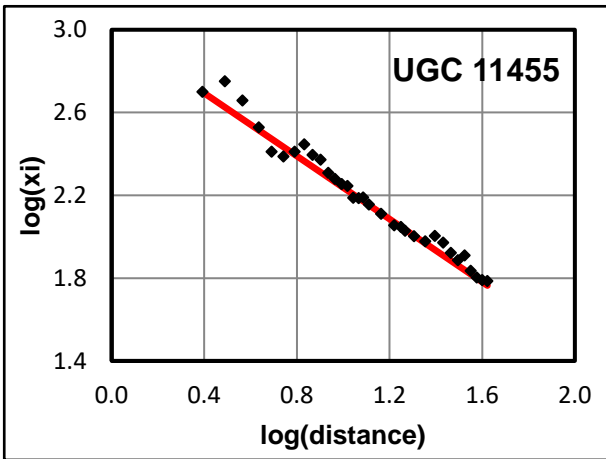
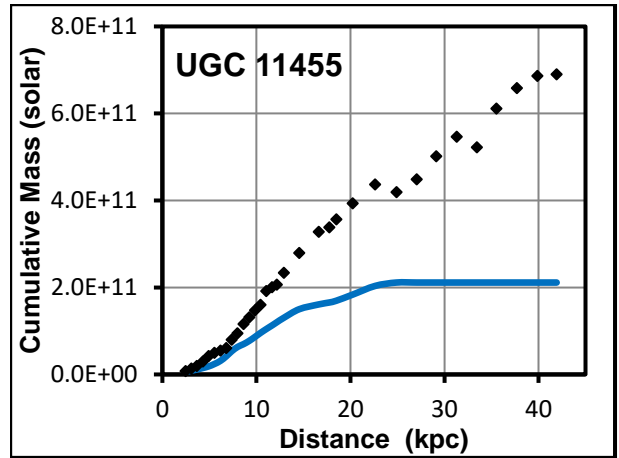
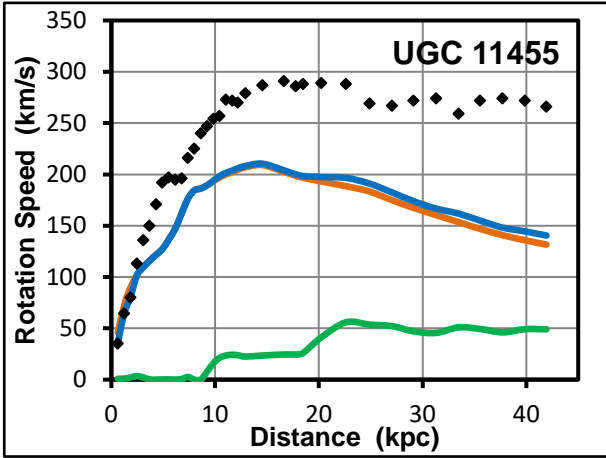
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.57
$\xi, \text{slope}$	-0.77
DM factor	0.8
Fit quality	OK

Comments

### UGC 11455



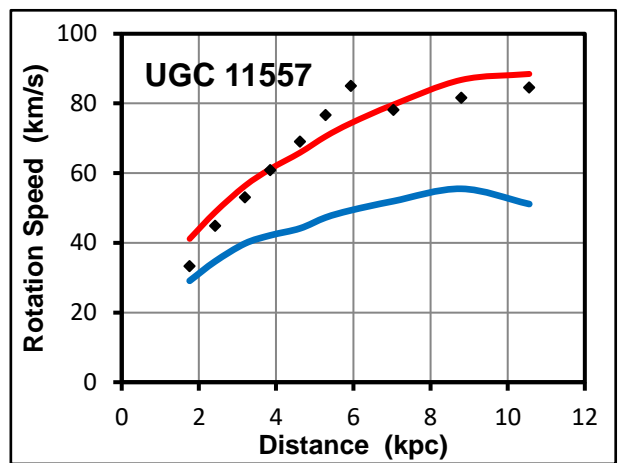
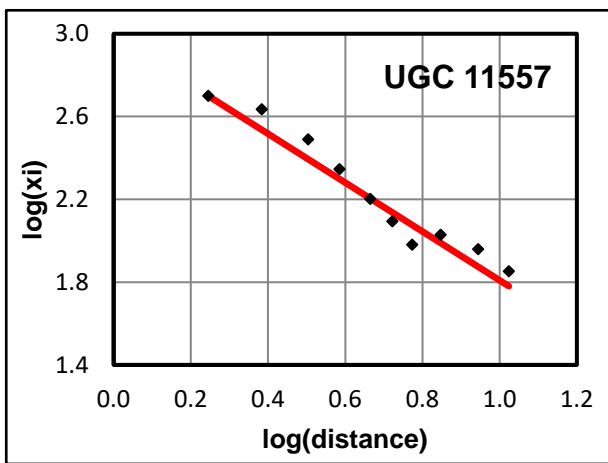
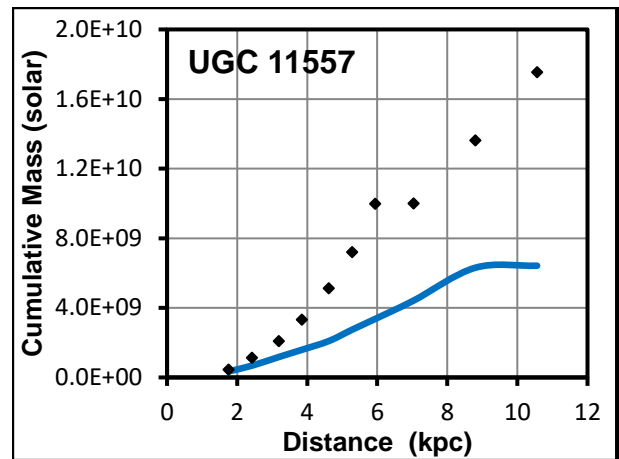
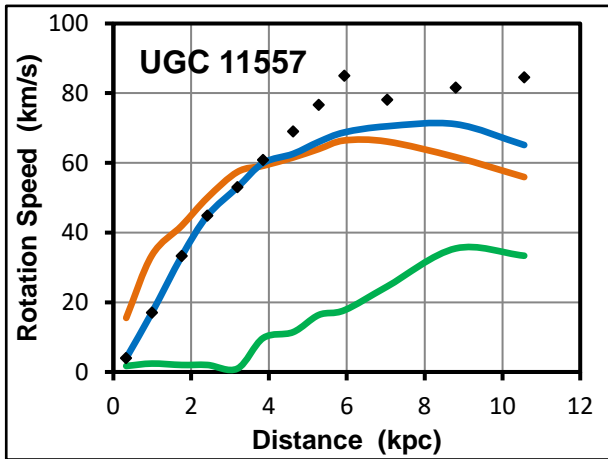
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	0.41
$\xi, \text{slope}$	-0.76
DM factor	2.3
Fit quality	OK, bumpy

Comments

### UGC 11557



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

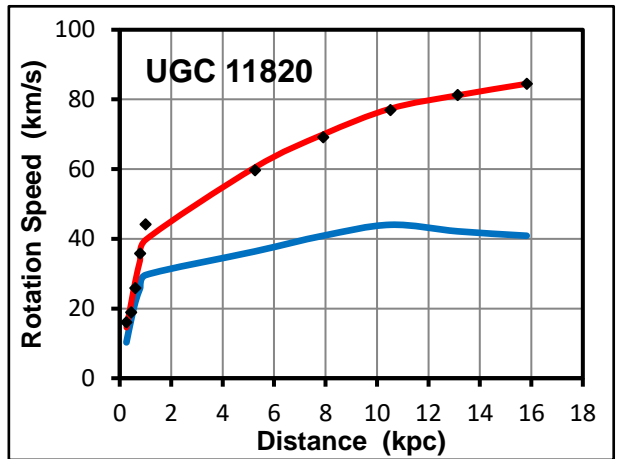
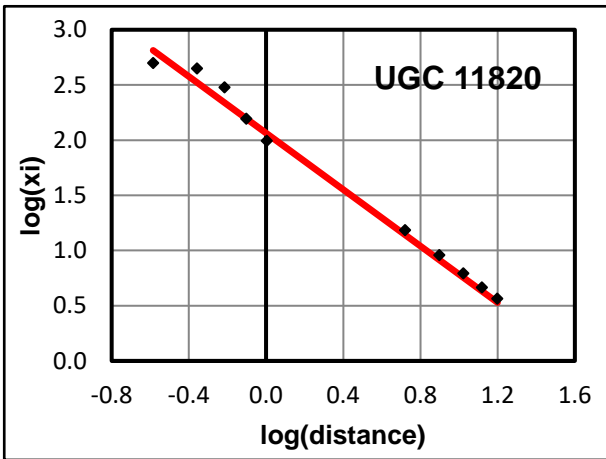
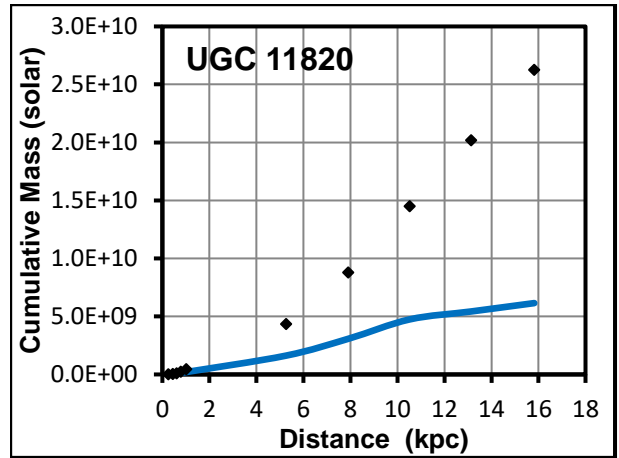
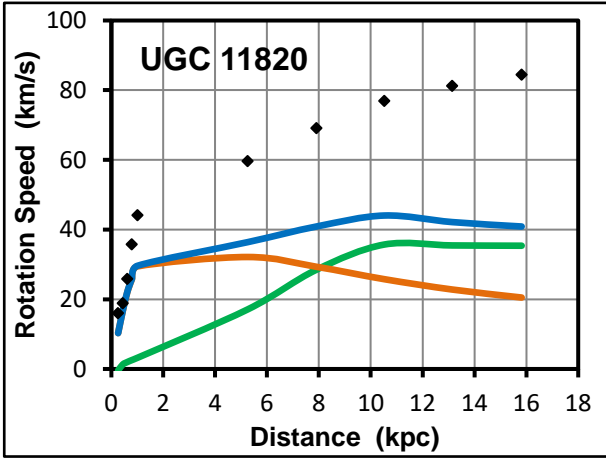
Fit parameters

$Y, M\text{-to-L}$	0.224
$\xi, \text{slope}$	-1.18
DM factor	1.7
Fit quality	poor

Comments

Fit omits innermost 2 data points.

### UGC 11820



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

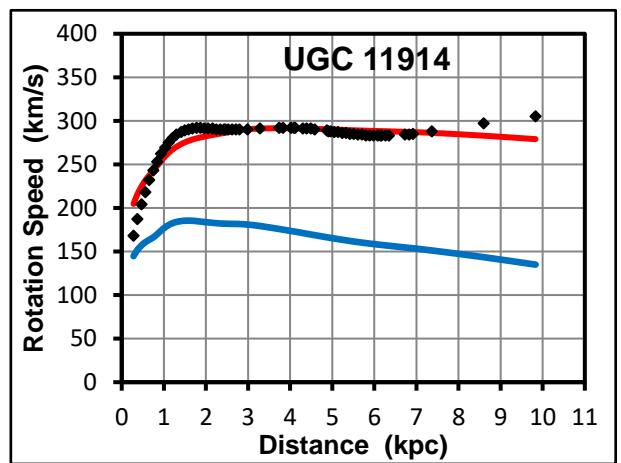
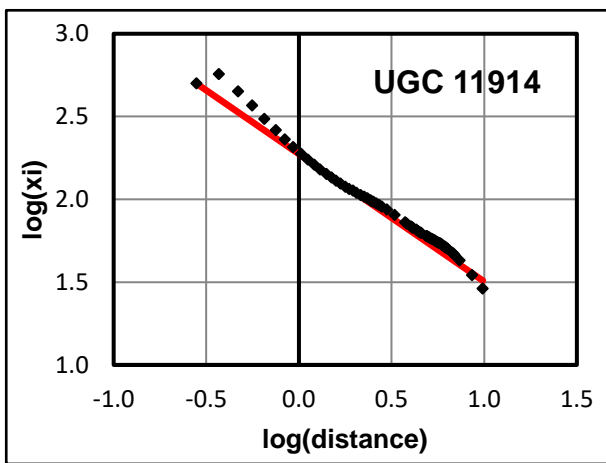
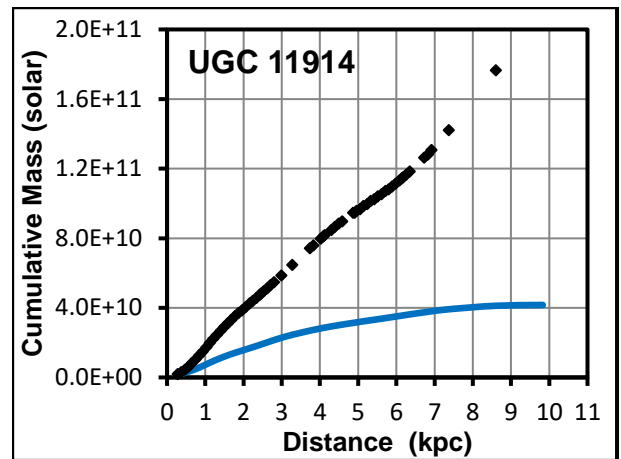
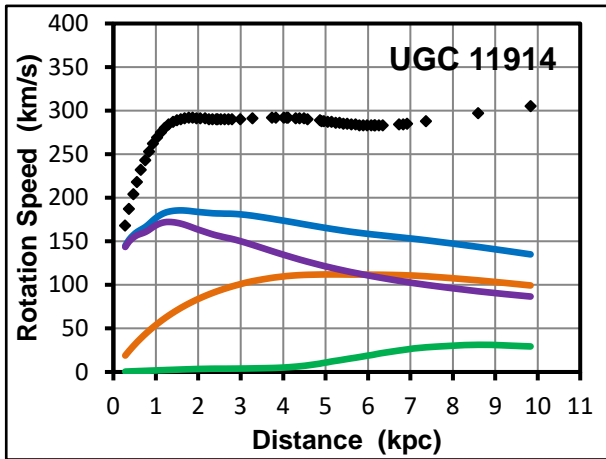
$Y$ , M-to-L	1.45
$\xi$ , slope	-1.25
DM factor	3.3
Fit quality	OK

Comments

High M-to-L ratio, 1.45. Galaxy is gas dominated in the outer regions.



### UGC 11914



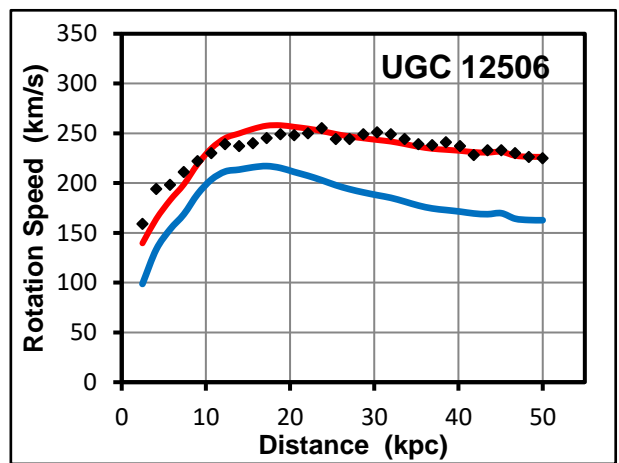
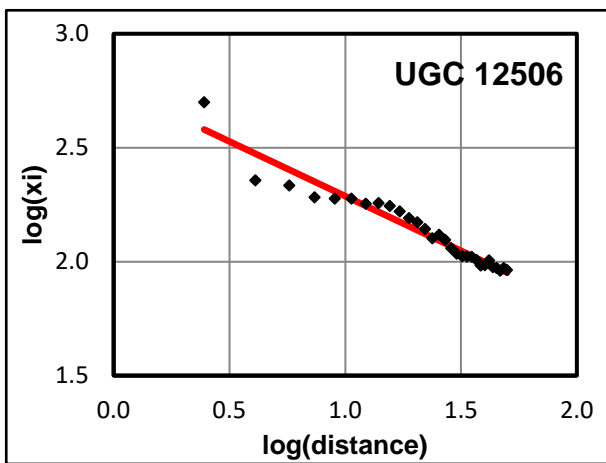
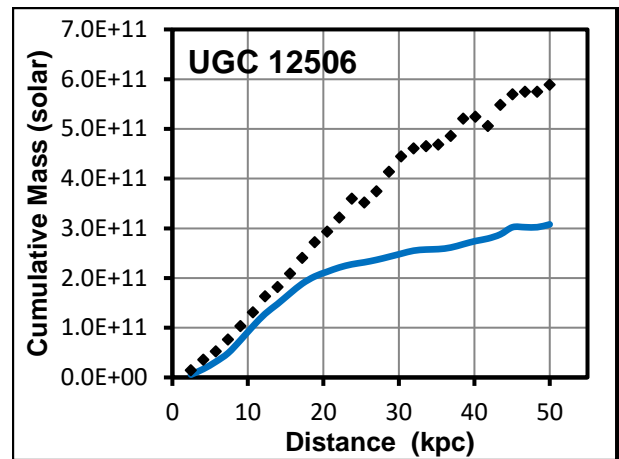
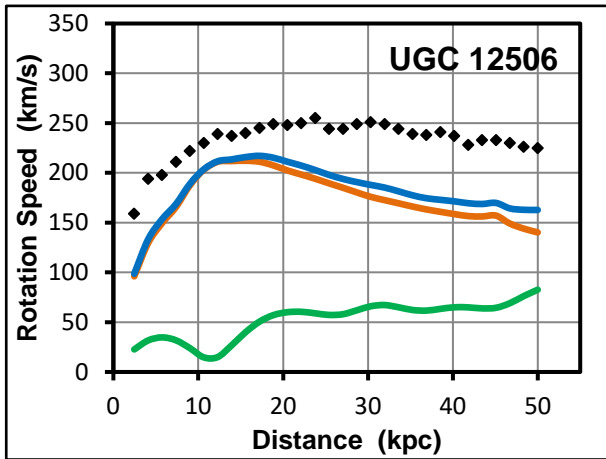
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

Bulge, M-to-L	0.46
Disk, M-to-L	0.20
$\xi$ , slope	-0.77
DM factor	4.1
Fit quality	poor

Comments

### UGC 12506



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

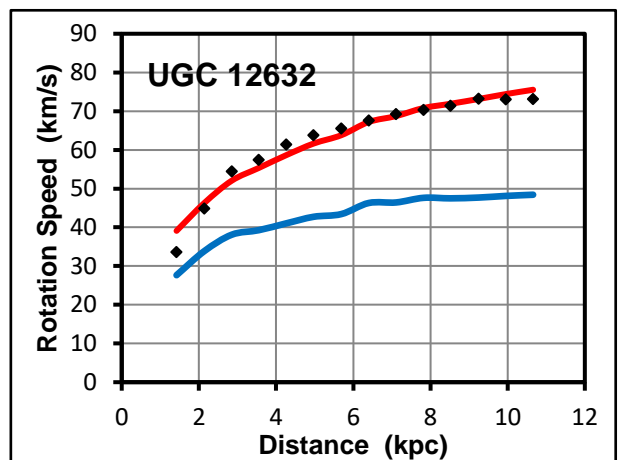
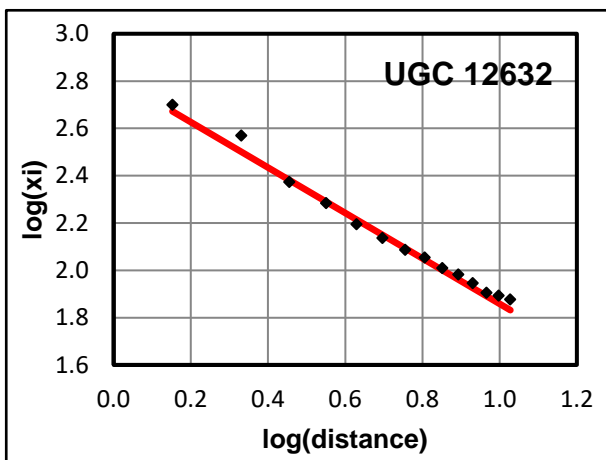
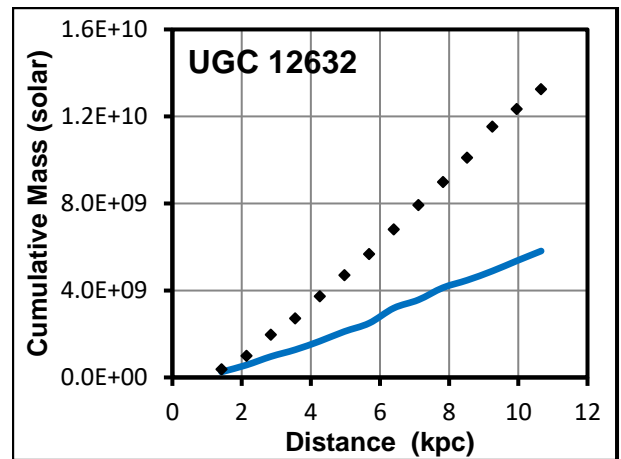
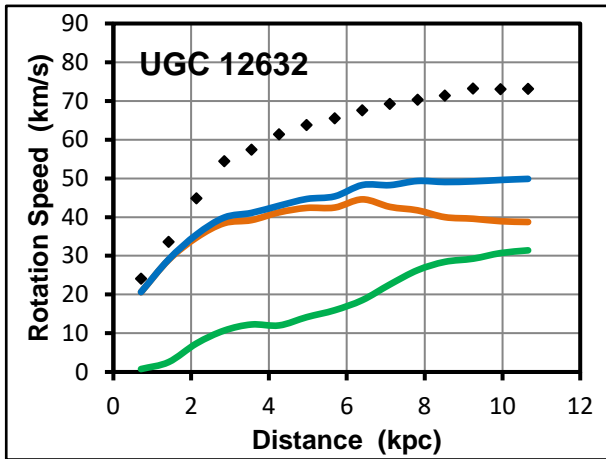
Fit parameters

$\Upsilon$ , M-to-L	1.45
$\xi$ , slope	-0.48
DM factor	0.9
Fit quality	bumpy

Comments

Fit omits first data point (not shown).

### UGC 12632



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

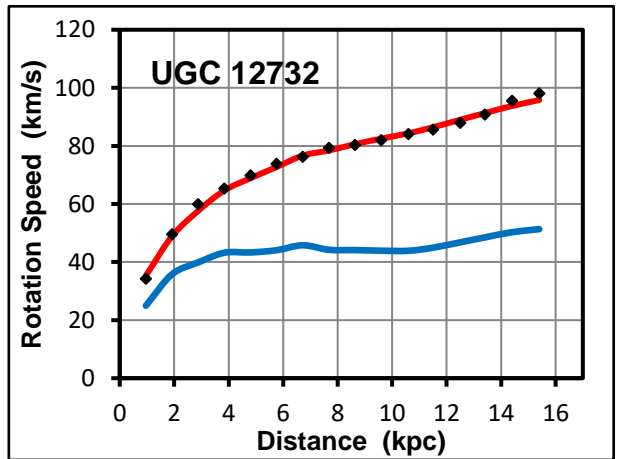
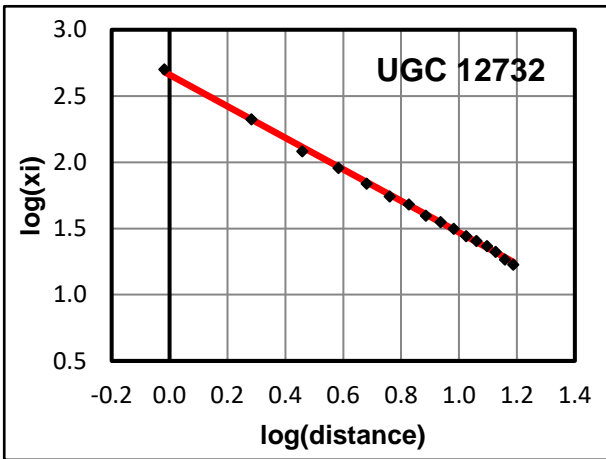
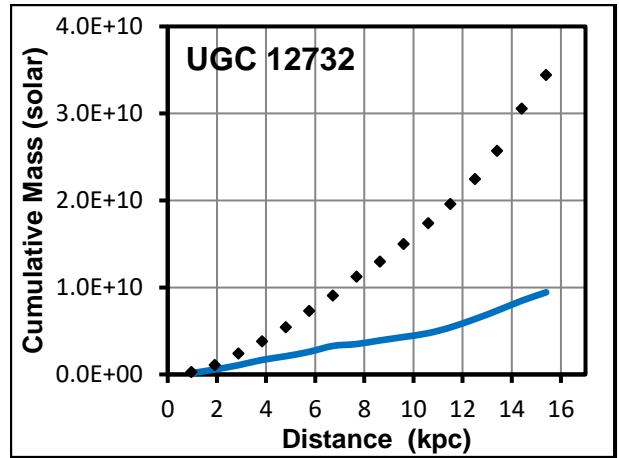
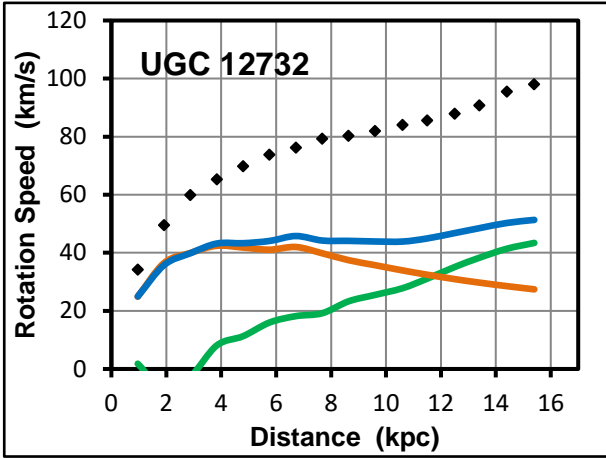
Fit parameters

$Y, M\text{-to-L}$	1.90
$\xi, \text{slope}$	-0.96
DM factor	1.3
Fit quality	OK

Comments

Fit omits 1st data point.

### UGC 12732



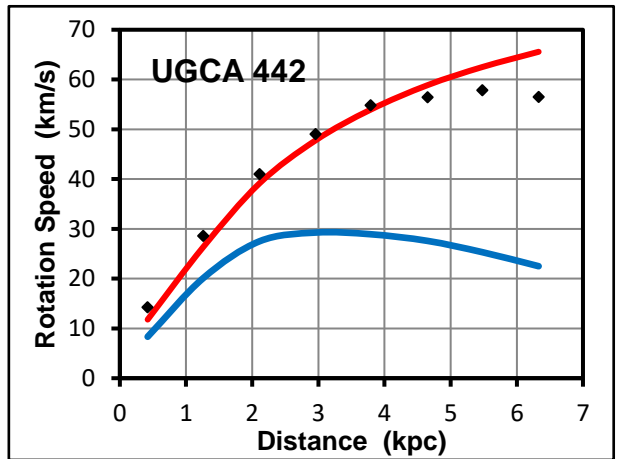
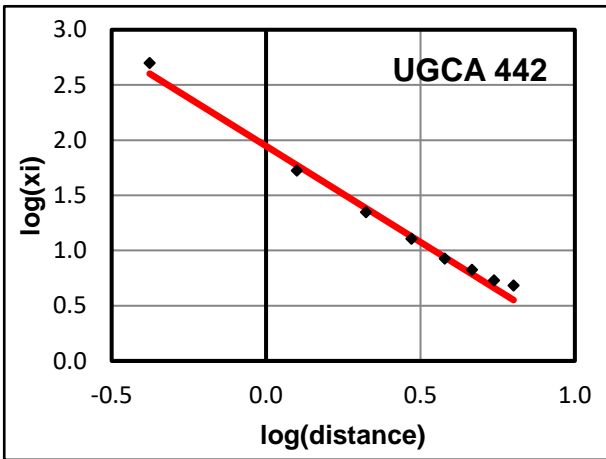
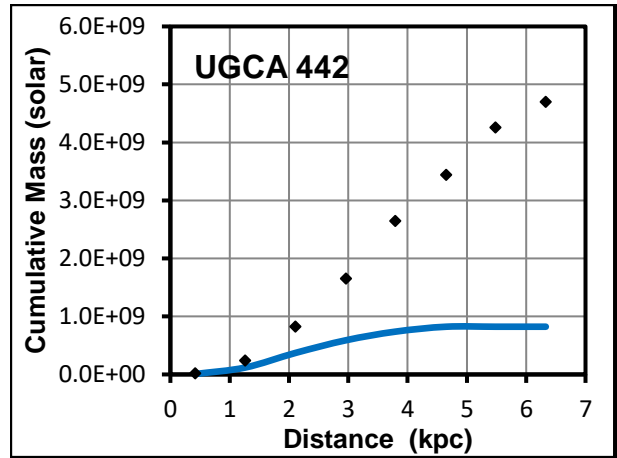
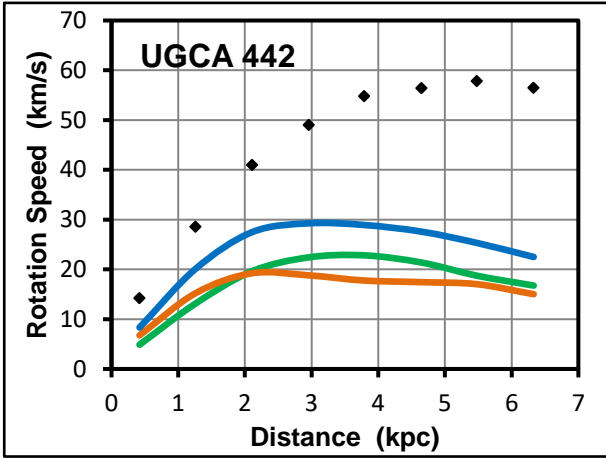
Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	1.45
$\xi, \text{slope}$	-1.19
DM factor	2.6
Fit quality	good

Comments

### UGCA 442



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

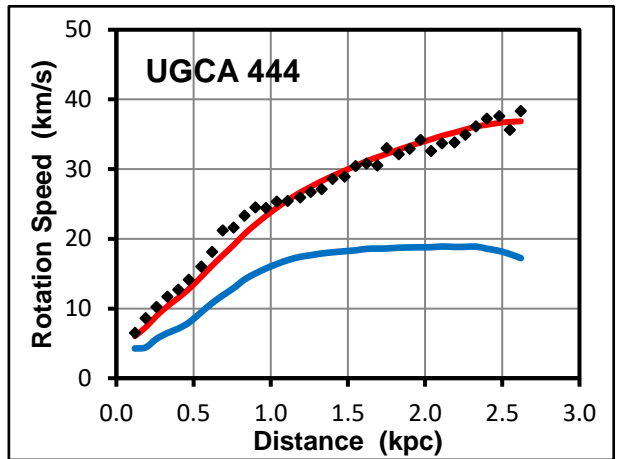
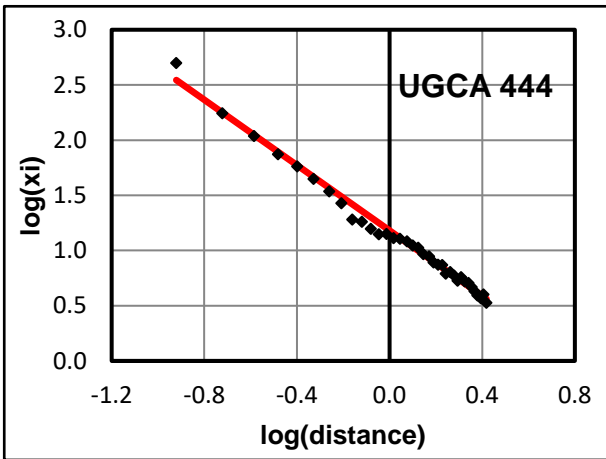
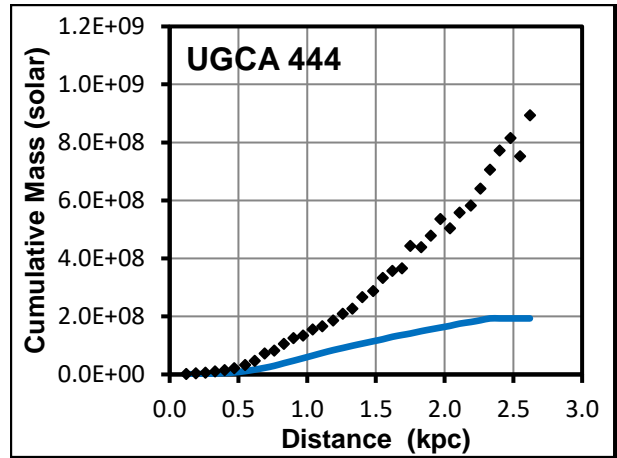
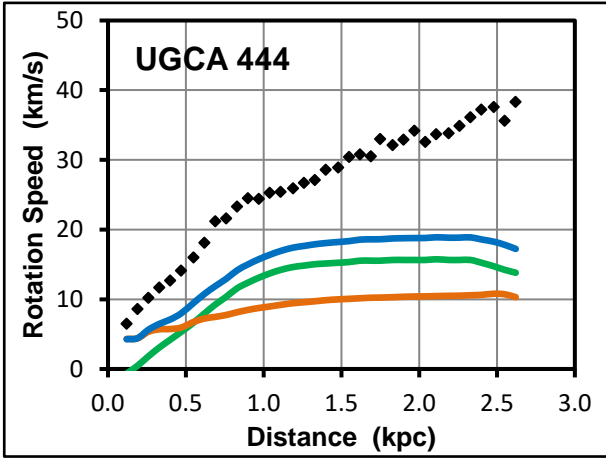
Fit parameters

$Y$ , M-to-L	2.00
$\xi$ , slope	-1.74
DM factor	4.7
Fit quality	good

Comments

Fit omits outermost 2 data points

### UGCA 444



Top left: rotation curve from SPARC data  
 Top right: cumulative mass  
 Bottom left:  $\xi$ -function  
 Bottom right: fitted rotation curve

Fit parameters

$Y, M\text{-to-L}$	3.85
$\xi, \text{slope}$	-1.48
DM factor	3.6
Fit quality	OK

Comments

Extremely high M-to-L ratio, 3.85. Rotation curve only covers 2.6kpc, very small.

### 3 References

JoKe22. (2019). "On the variation of the energy scale 22: An analysis of SPARC galaxies"  
[www.varensca.com](http://www.varensca.com)

JoKe23. (2019). "On the variation of the energy scale 23: SPARC galaxy rotation curves".  
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Lelli, L; McGaugh SS; Schombert JM. (2016). "SPARC: Mass Models for 175 Disk Galaxies with Spitzer Photometry and Accurate Rotation Curves".  
[arXiv.1606.09251](https://arxiv.org/abs/1606.09251)  
**The Astronomical Journal; volume 152; issue 6.**