GRAVITATIONAL LENSING

LECTURE 19

Docente: Massimo Meneghetti

AA 2015-2016

FROM SIE TO EPL

(SEE TESSORE & METCALF, 2015)

- Modifications of the SIE to change the slope of the density profile are discussed in Tessore & Metcalf (2015)
- Elliptical Power-Law lenses are difficult to treat analytically.
- The usage of numerical techniques is mandatory
- Here, we discuss some properties only qualitatively

FROM SIE TO EPL

(SEE TESSORE & METCALF, 2015)

$$\kappa(x) = \frac{3-n}{2} x^{1-n}$$

$$x = \sqrt{f^2 x_1^2 + x_2^2}$$

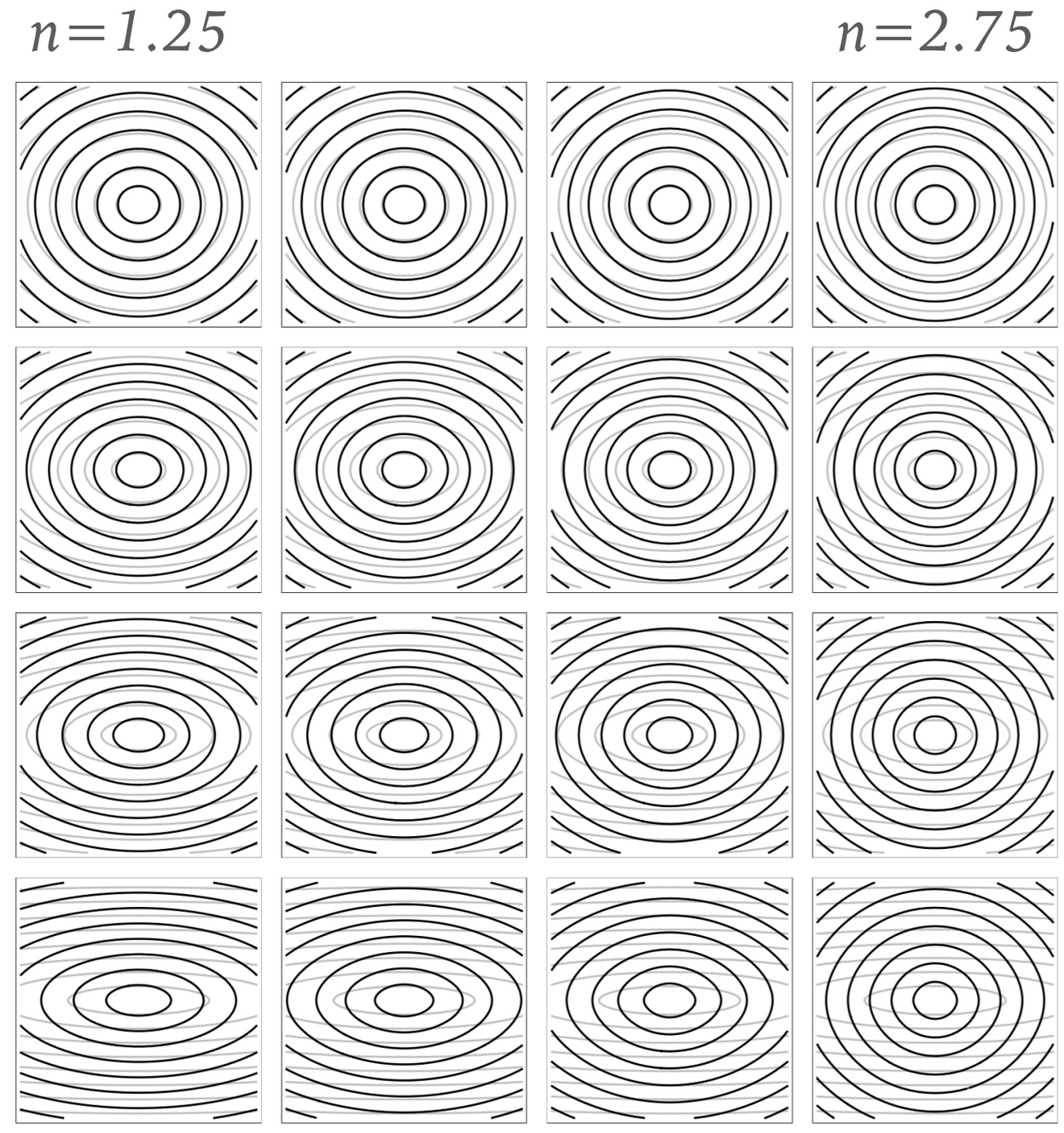
- Calculations can be better done using complex notation (e.g. Bourassa & Kantowski, 1975)
- The complex deflection angle involves the **Gauss Hypergeometric Function**:

$$\alpha(x,\varphi) = \frac{2}{1+f} x^{2-n} e^{i\varphi}\ {}_2F_1\left(1, \frac{n-1}{2}; 2 - \frac{n-1}{2}; -\frac{1-f}{1+f} e^{2i\varphi}\right)$$

- The potential can be found to be:

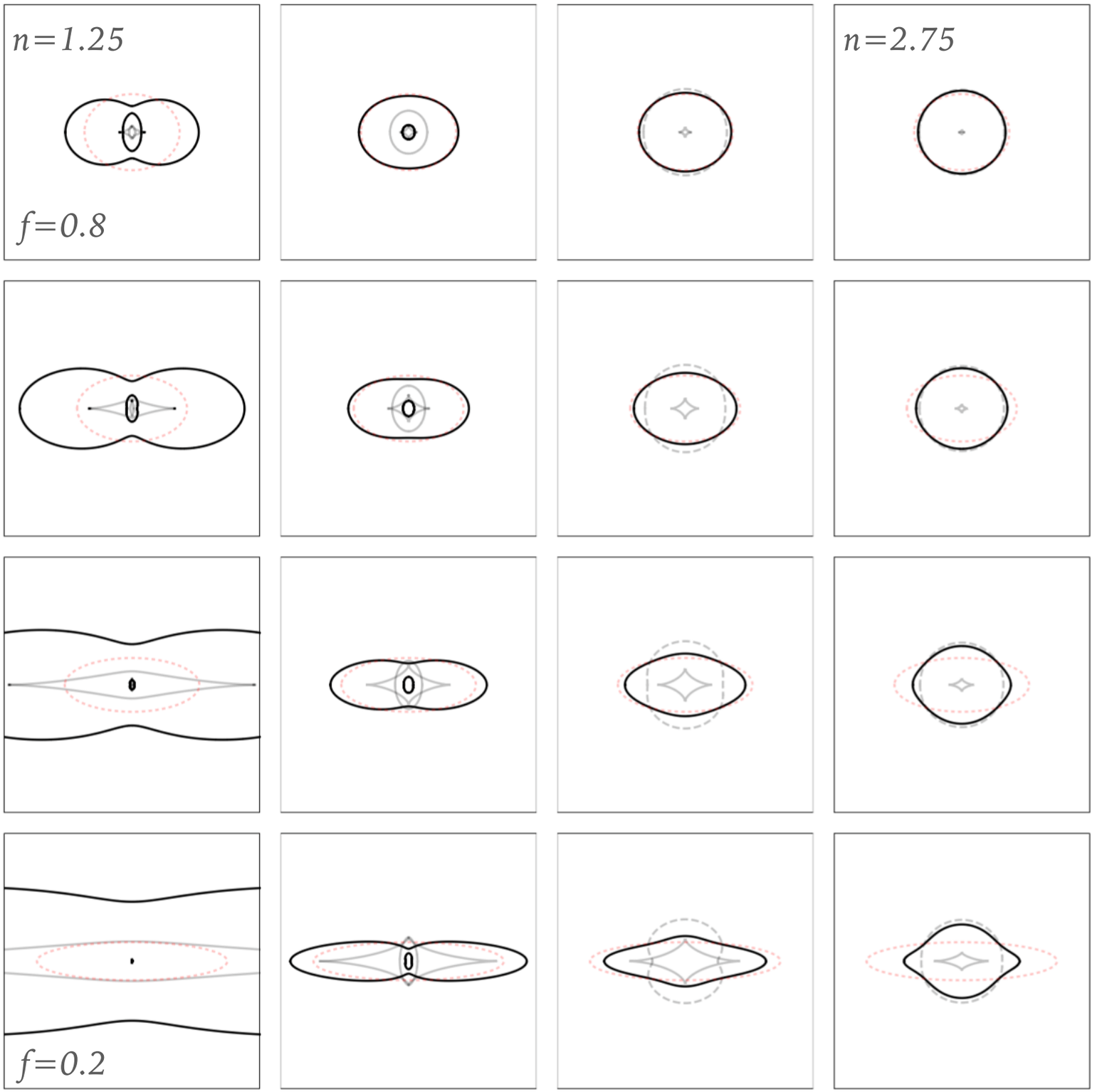
$$\psi(x_1, x_2) = \frac{x_1\alpha_1 + x_2\alpha_2}{3-n}$$

- Similarly, other properties such as the shear can be derived easily from the deflection angle.



FROM SIE TO EPL

(SEE TESSORE & METCALF, 2015)



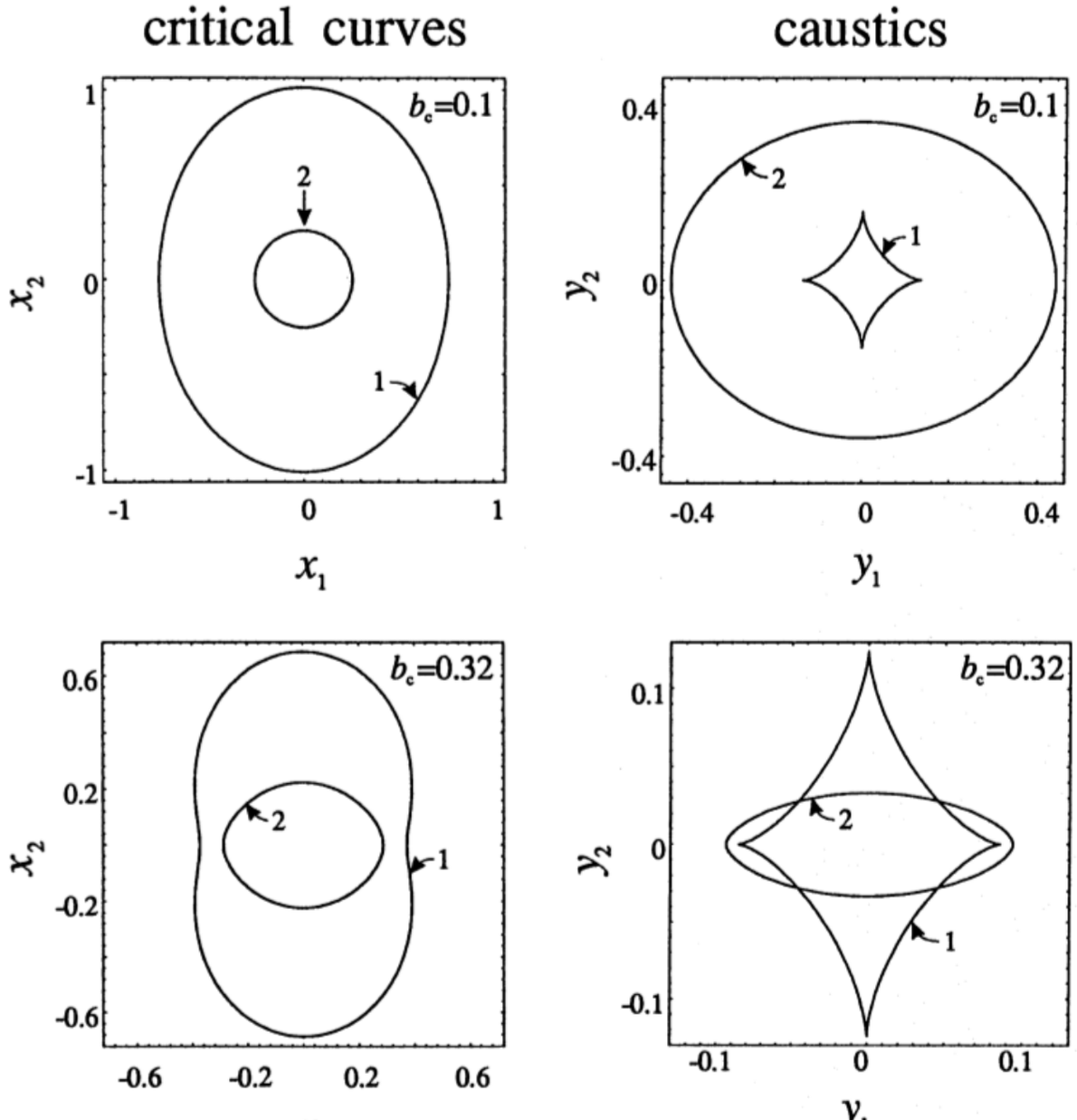
FROM SIE TO NIE

(SEE KOVNER, BARTELMANN & SCHNEIDER, 1994)

Introducing a core, the singularity is removed, thus the lens looses the CUT, turning it into a regular CAUSTIC.

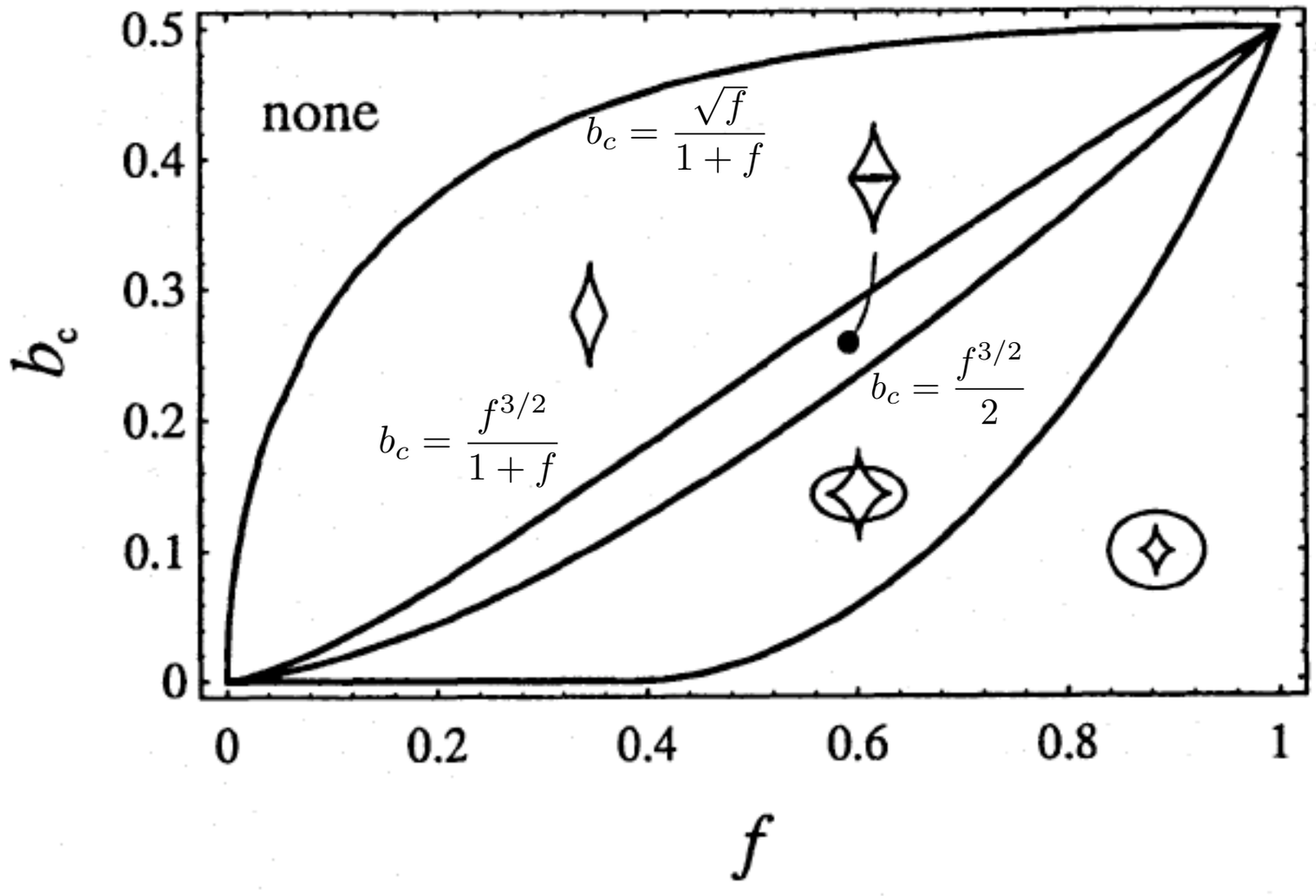
When this caustic exists, it corresponds to a CRITICAL LINE on the lens plane.

$$\kappa(b) = \frac{\sqrt{f}}{2\sqrt{b^2 + b_c^2}}$$



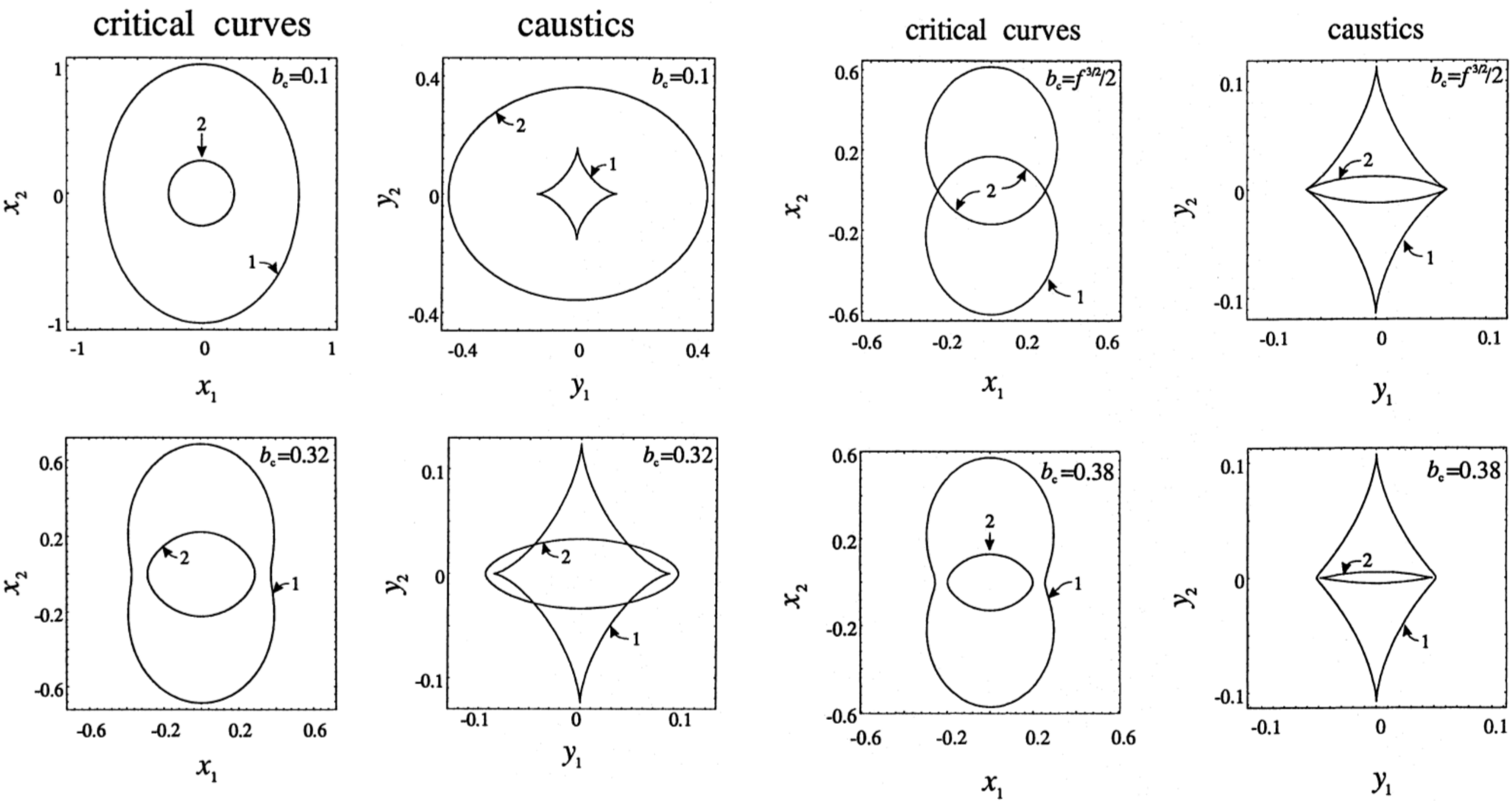
FROM SIE TO NIE

(SEE KOVNER, BARTELMANN & SCHNEIDER, 1994)



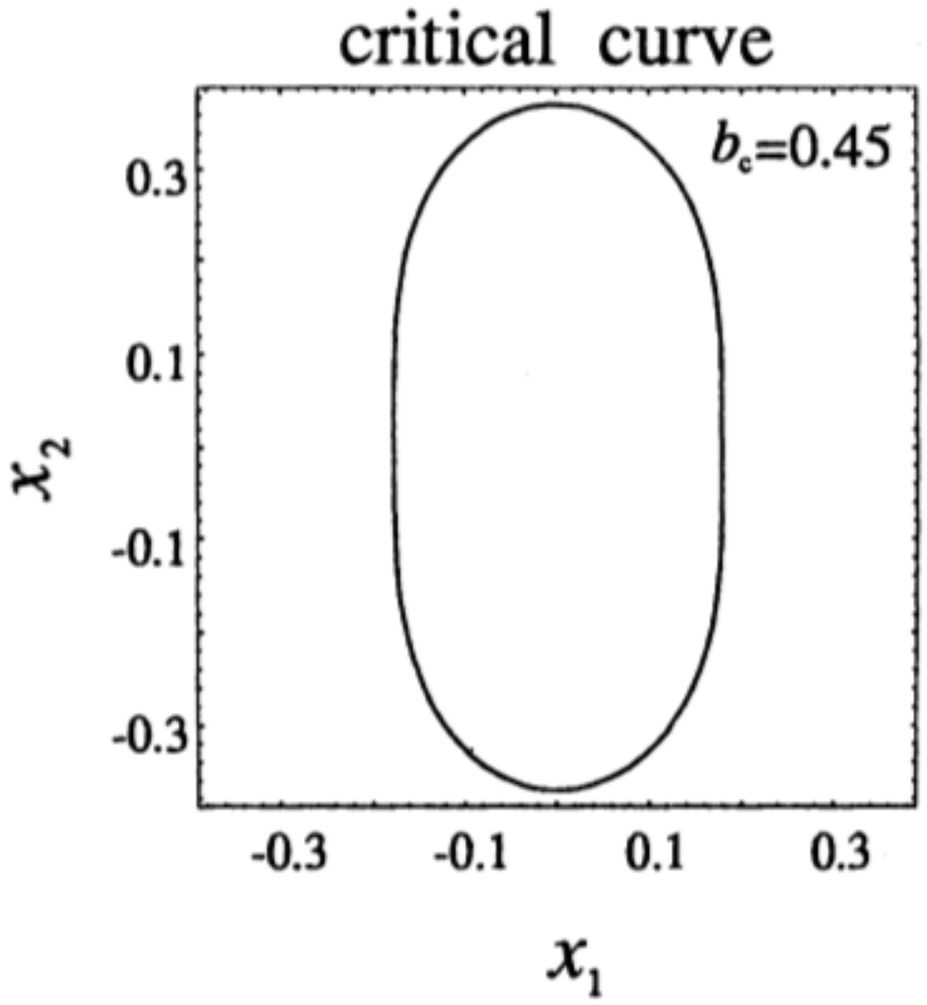
FROM SIE TO NIE

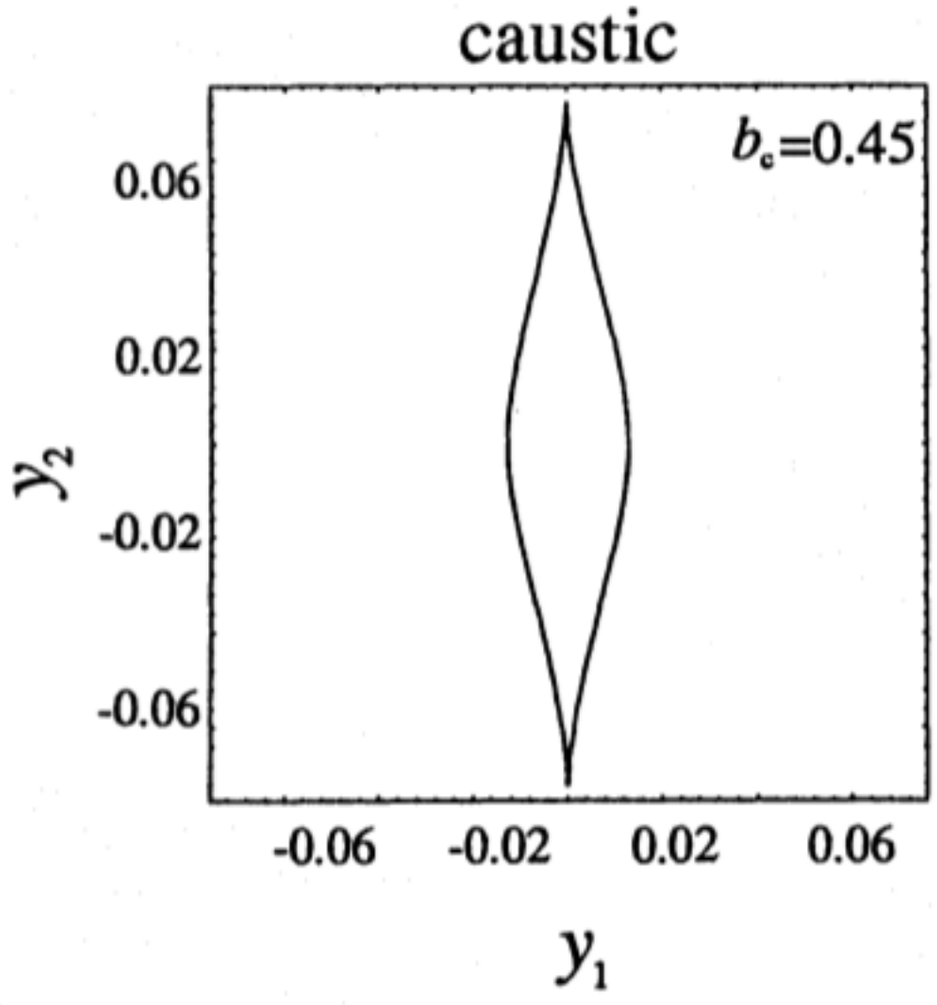
(SEE KOVNER, BARTELMANN & SCHNEIDER, 1994)



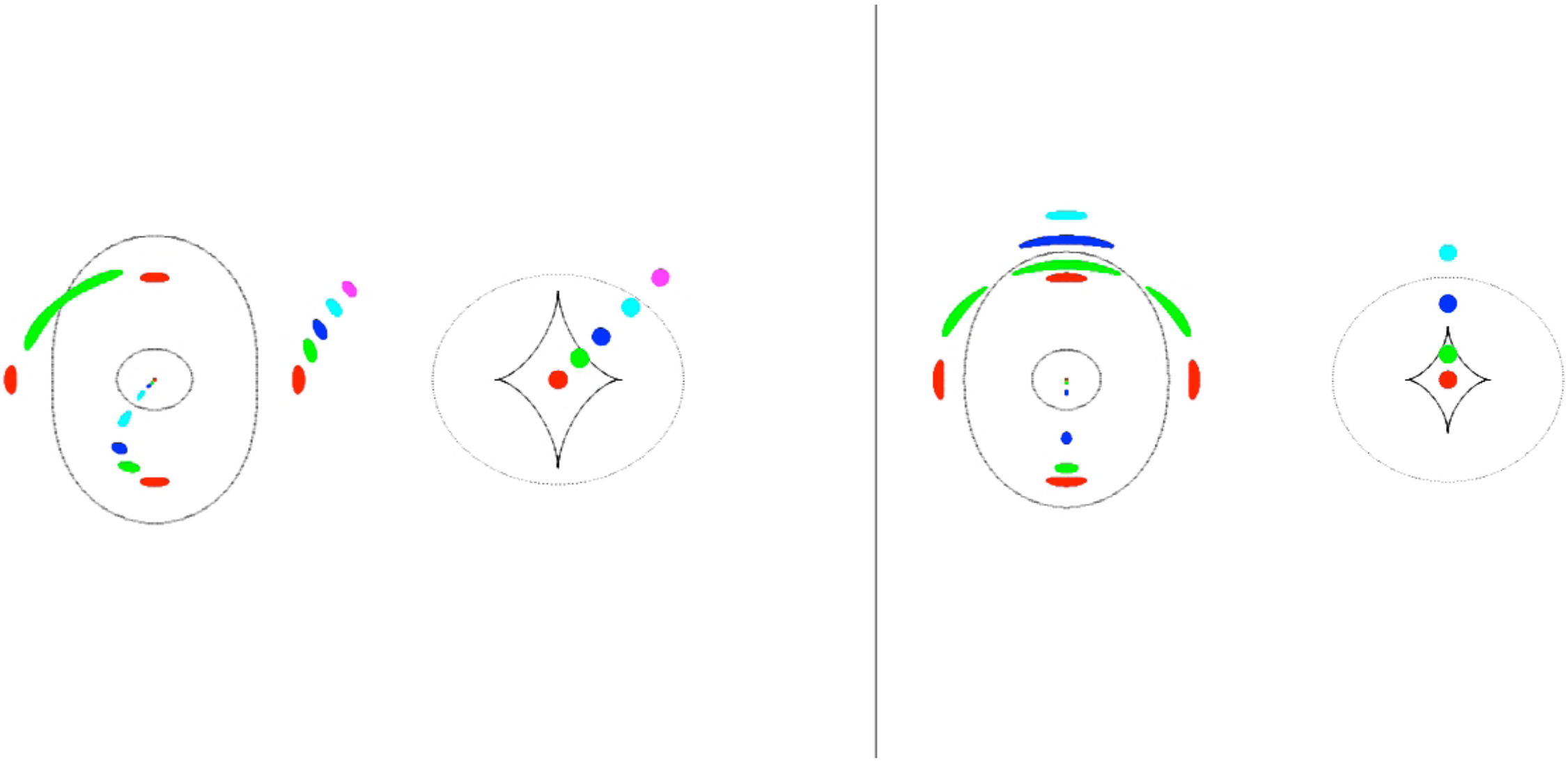
FROM SIE TO NIE

(SEE KOVNER, BARTELMANN & SCHNEIDER, 1994)

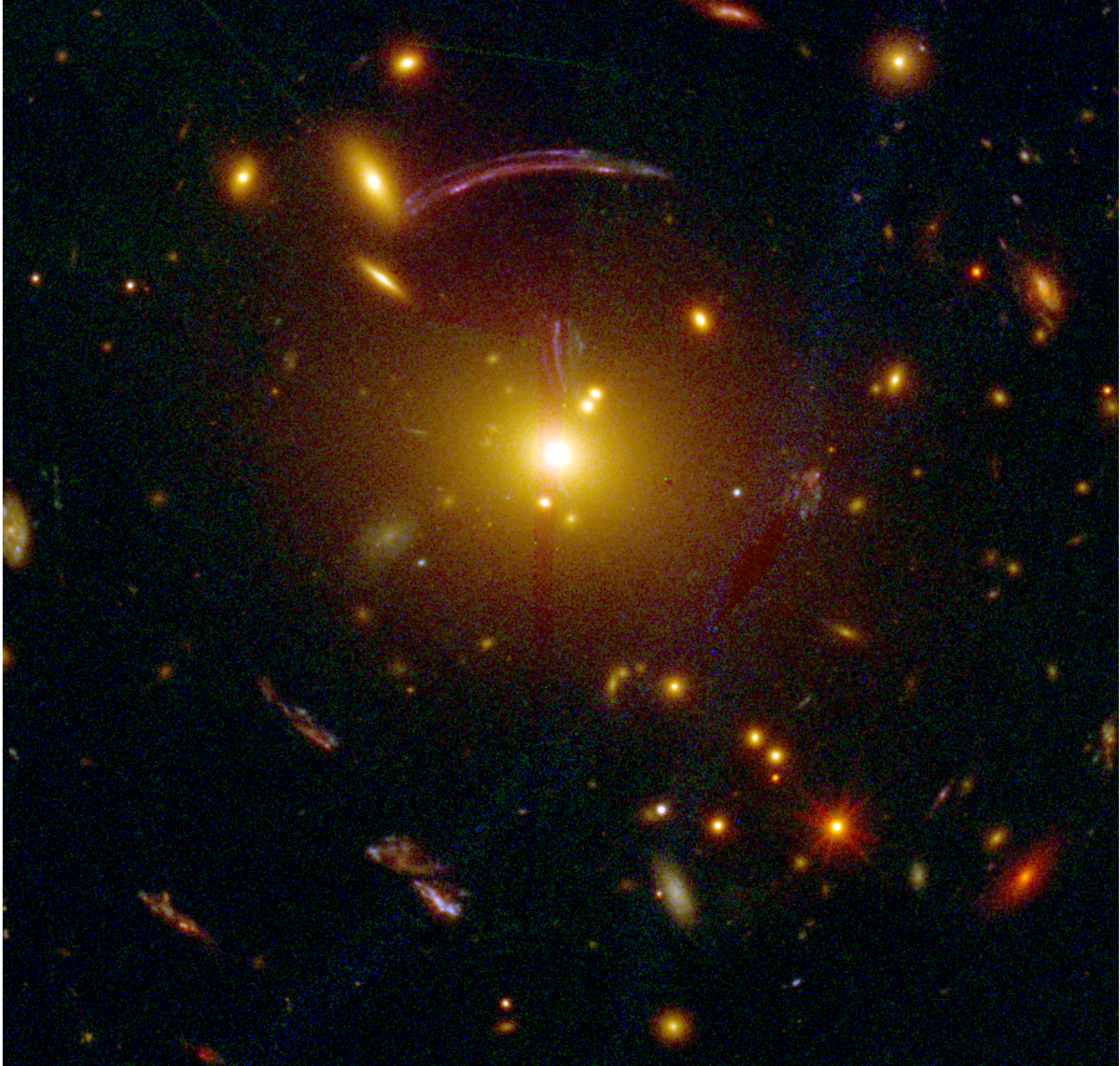




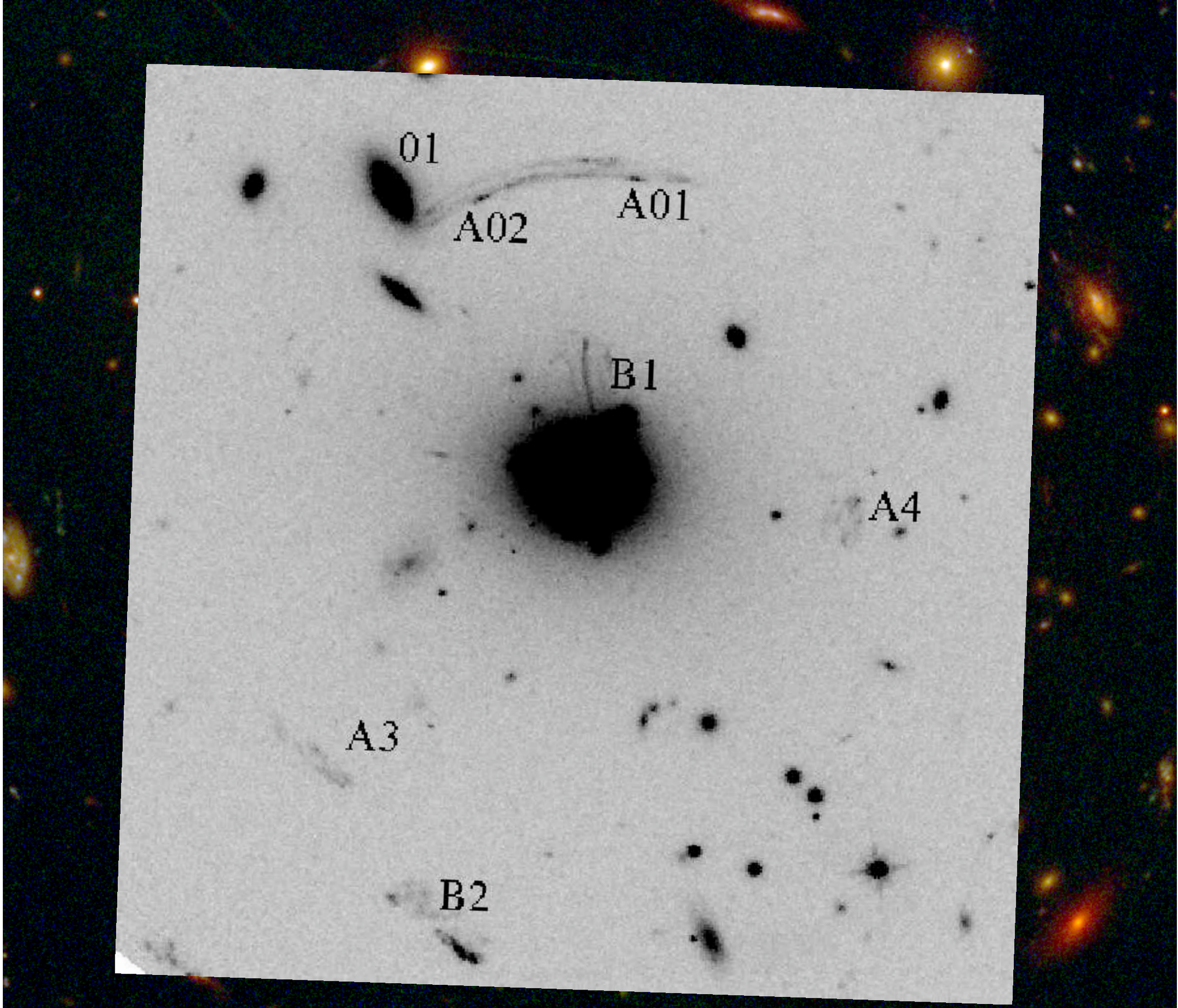
MULTIPLE IMAGES IN CORED LENSES



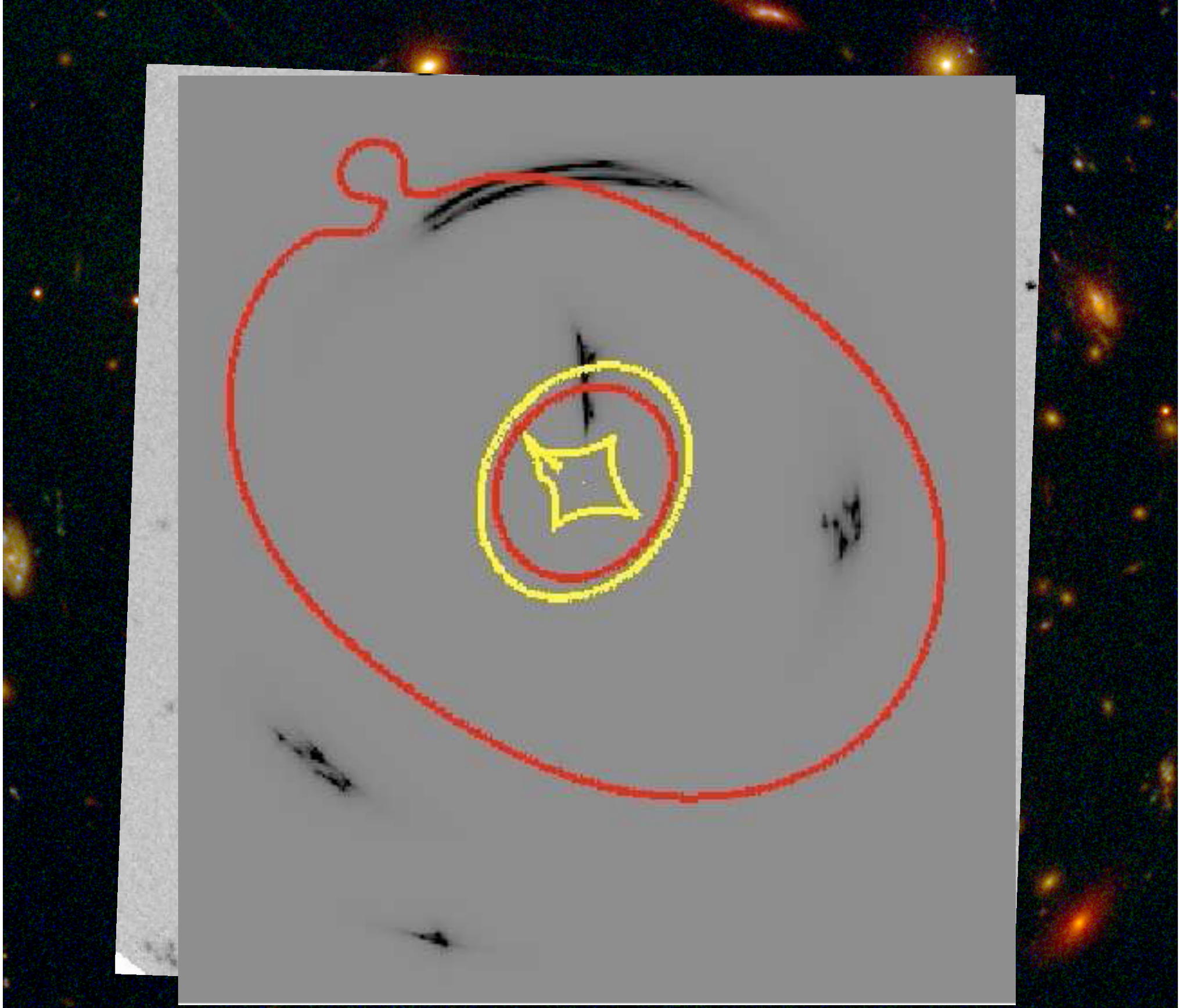
MS2137



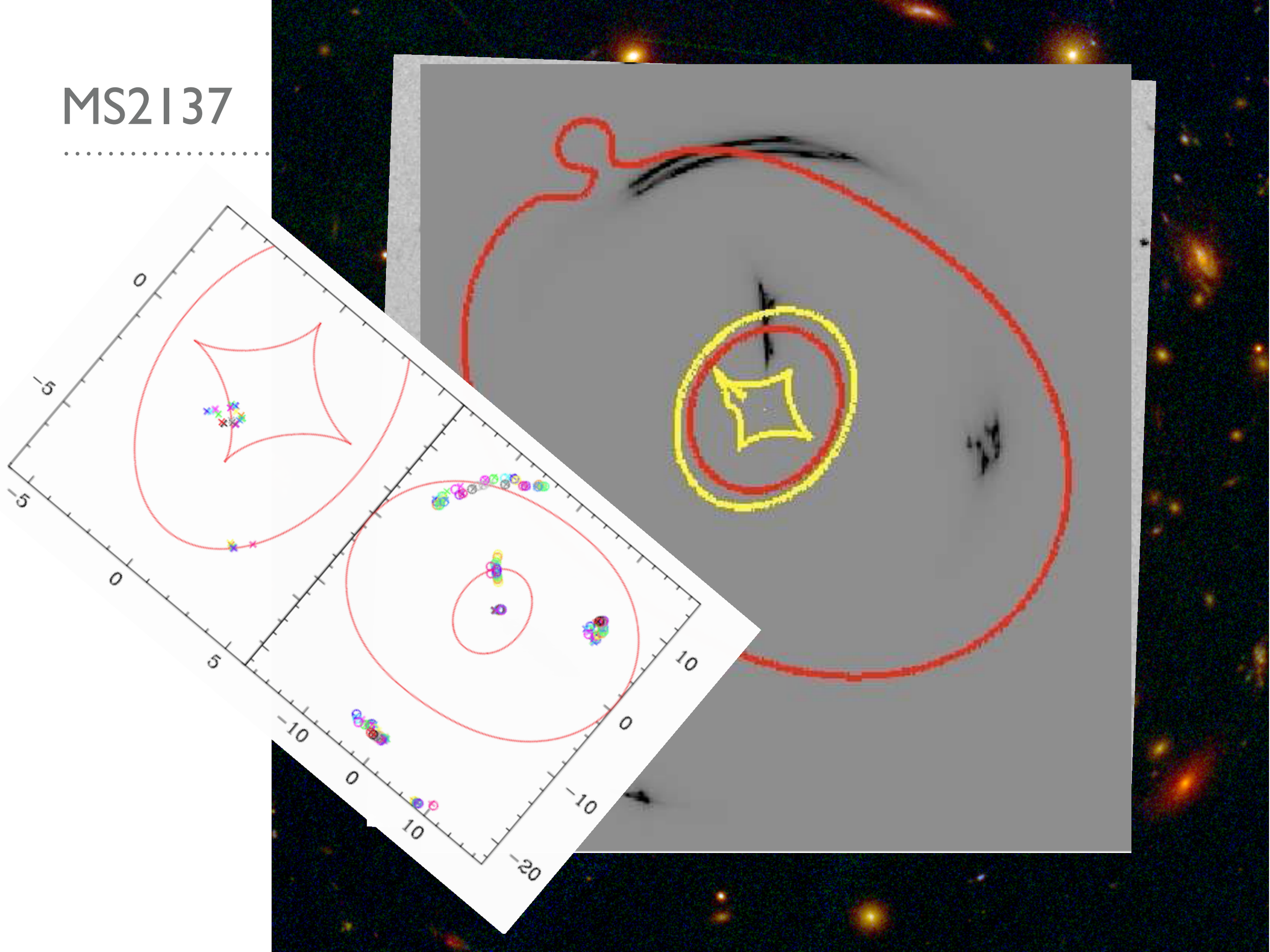
MS2137



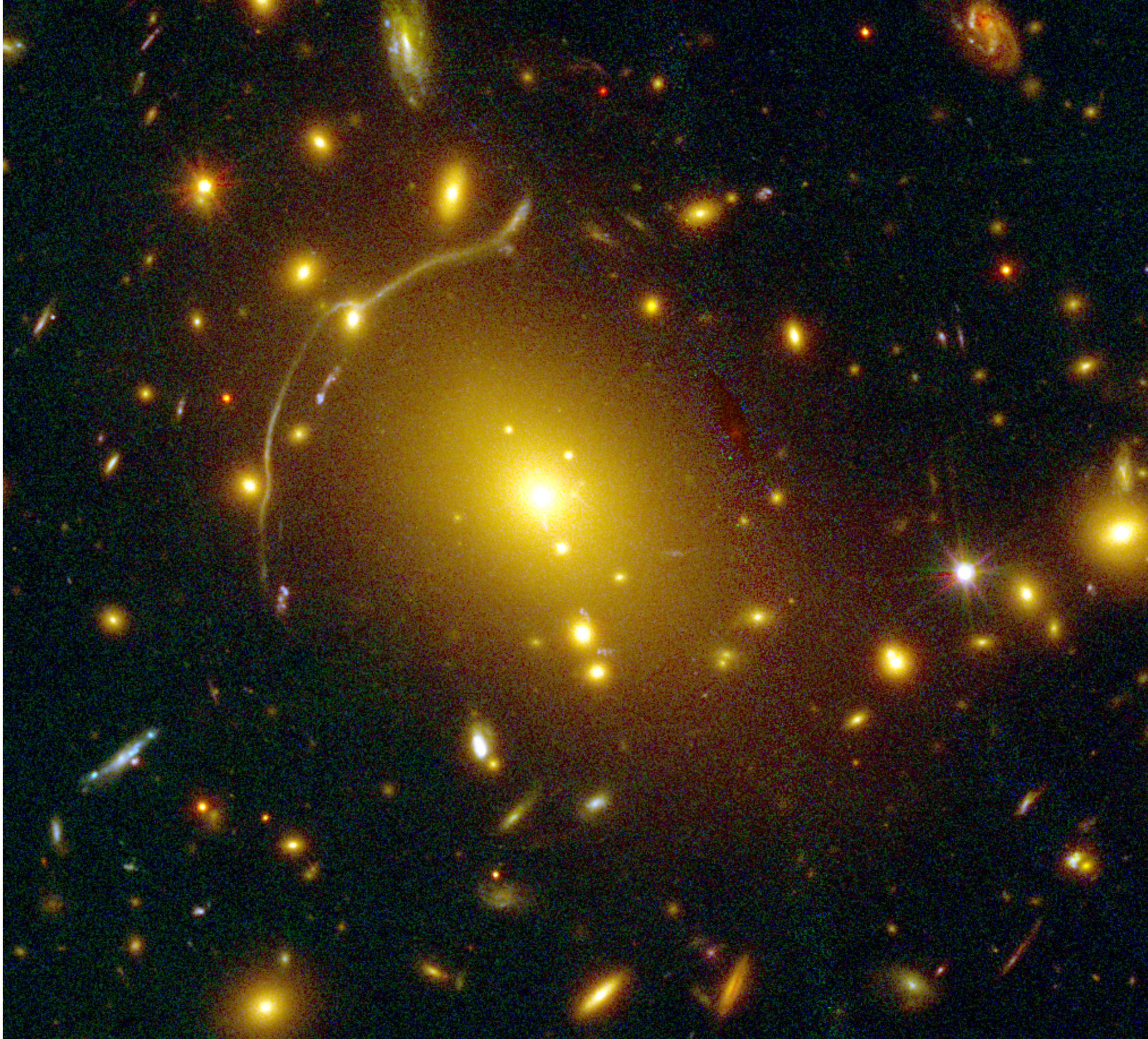
MS2137



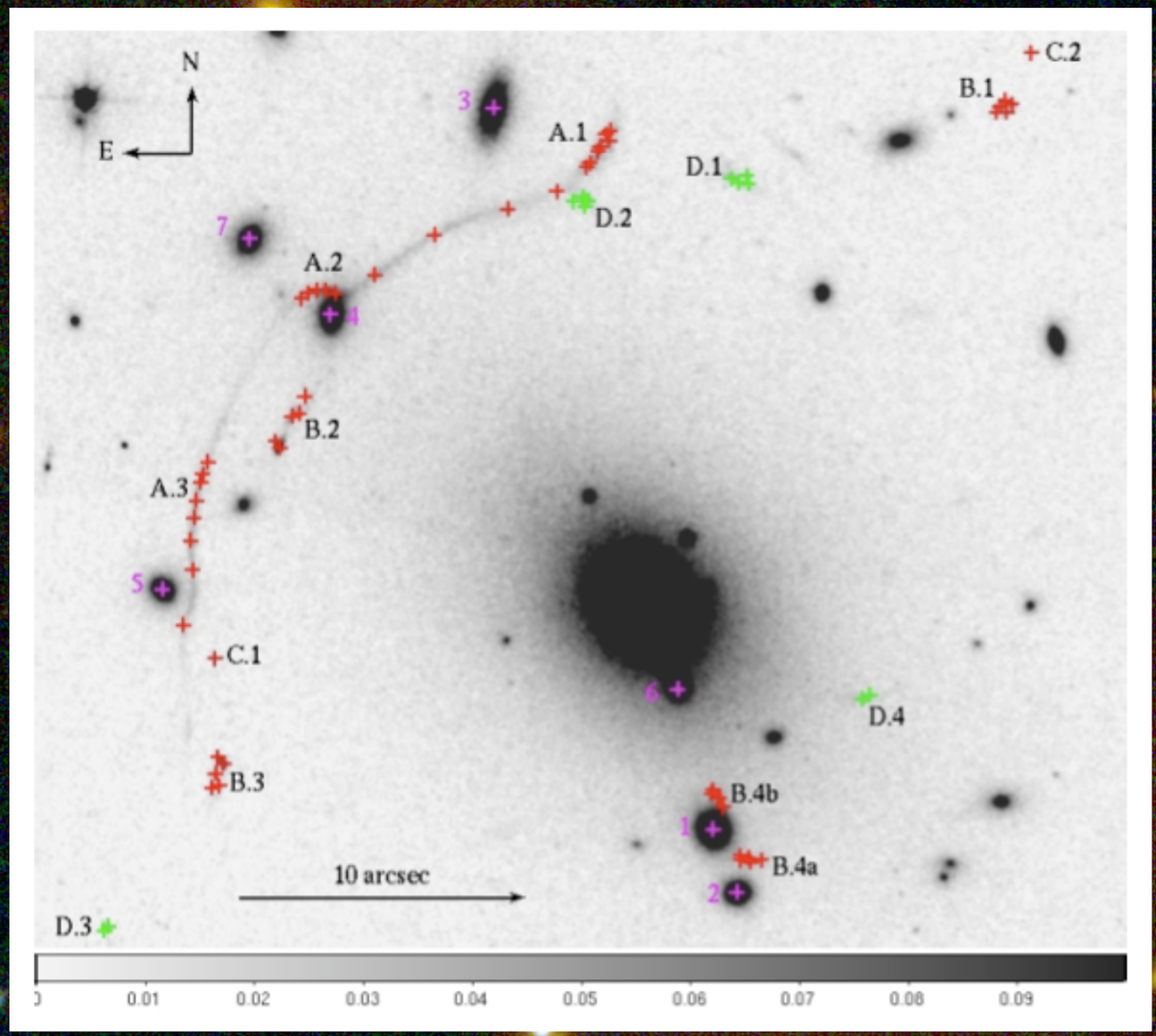
MS2137



A611



A611


N
E
3
A.1
C.2
B.1
D.1
D.2
7
A.2
4
B.2
A.3
5
C.1
6
D.4
B.3
B.4b
1
B.4a
2
10 arcsec
D.3
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09

A611