ESO 383–45, ram pressure stripping or tidal merger remnant?

- **Dr. Simon Nicholas Kemp, Instituto de Astronomía y Meteorología, Departamento de Física, Centro Universitario de Ciencias Exactas e Ingenierias, Universidad de Guadalajara**
- **Eduardo de la Fuente, IAM, UdG**
- **Alfredo Franco-Balderas, IAUNAM-DF**
- **Prof. John Meaburn, Jodrell Bank, Manchester, IA-UNAM, Ensenada**

Other members of the galaxy research group in Guadalajara

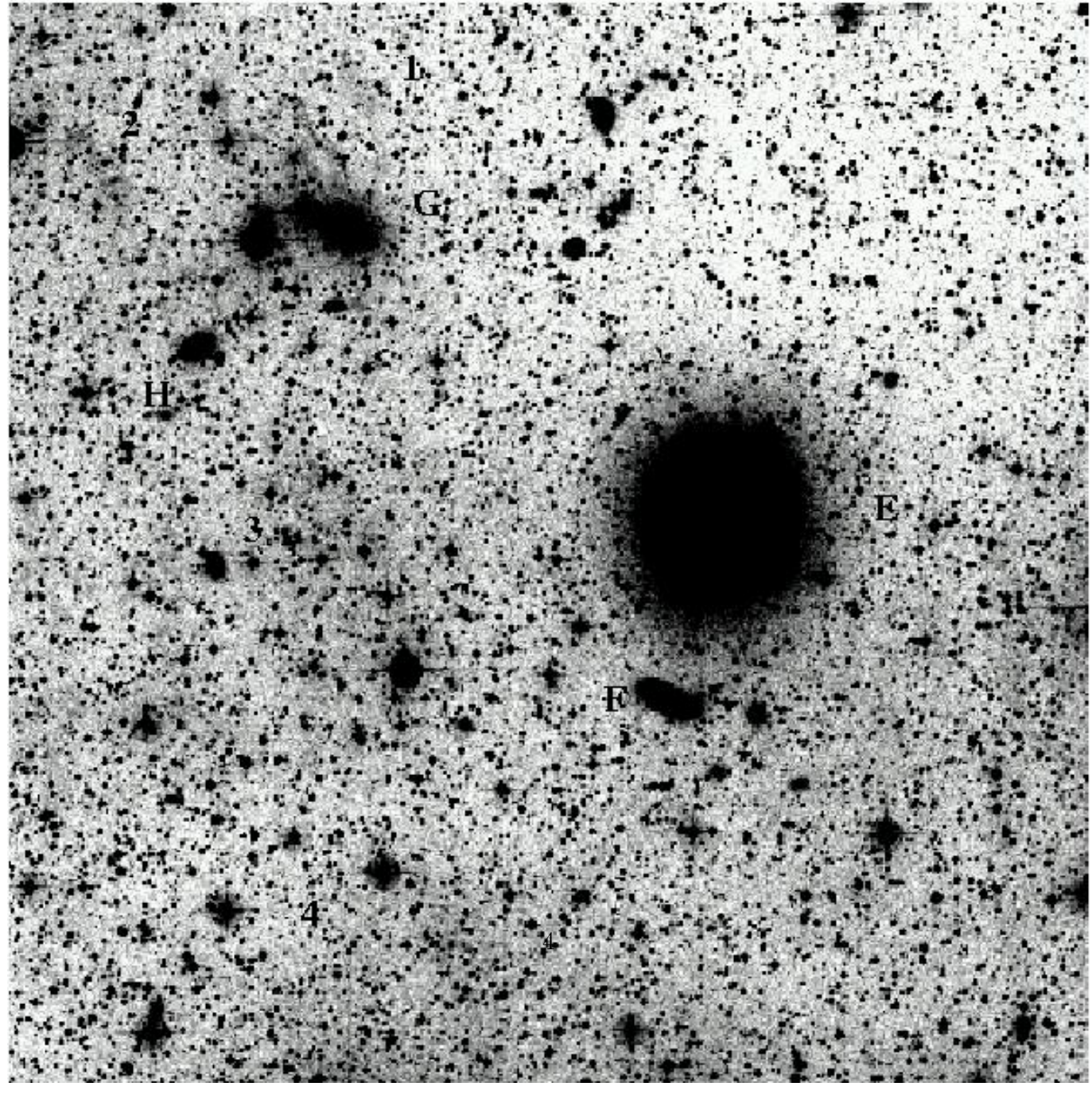
- Arturo Pérez Grana (see poster NGC 4410)
- Violeta Guzman Jiménez
- Pablo Ramírez Beraud
- Paulo Cesar Martínez
- Francisco Hernández
- Luis Alberto Sánchez

Project: Low Surface Brightness material in galaxies and clusters

- **Extended haloes of galaxies – cD galaxies –supergiant galaxies with diameters of 0.5–1.0 Mpc – extensive envelopes formed by tidal stripping, galactic cannibalism, o condensation of stars in a coolinng flow.**
- **Interactions and mergers of galaxies – Filamentary structures (bridges, tails, shells etc.) of tidally interacting galaxies are among the most common and spectacular strucures revealed in deep images.**
- **Intergalactic medium – diffuse emission between galaxies. "Tidal arcs" in clusters (Coma, Centaurus). Excess of faint stars in comparison with the HDFs. Direct detection of areas of diffuse emission – problems with sensitivity variation of photographic emulsions.**
- **Low Surface Brightness Galaxies (LSBGs). The LSBGs could dominate galaxy populations because they have an unknown contribution to the faint end of the galaxy LF, and so could contribute substantially to the baryonic mass of clusters.**
- **Data: co-addition of digitized Schmidt plates (IC 4296, Virgo). CCD $BVRI$ photometry of cDs and interesting objects in the Schmidt plate fields – AAT, SAAO, La Palma, Tenerife, SPM. JHK photometry – SPM.**

ESO 383–45

- **.The galaxy ESO 383–45 is a member of the cluster A3565. It lies 15 arcmin NE of the main galaxy in this cluster, the giant elliptical and radio galaxy IC 4296.**
- **ESO 383–45 looks like a normal S0 in an image of normal depth and contrast, but in co-added Schmidt plates at high contrast a very extensive halo can be seen (rare for S0's) and at least 4 filaments of extent up to 80 kpc (Kemp & Meaburn 1993).**
- **CCD images from the 3.9m Anglo-Australian Telescope (10 mins, BV) confirm the existence of the halo, filaments and much faint diffuse emission around this galaxy.**
- **The $B-V$ color for the bulge is 1.2, and 1.1 for the disk, typical of S0's, while the halo and filaments have $B-V$ of 0.6–0.8.**
- **There are various areas of possible faint IGM around ESO 383–45, mainly to the E and S.**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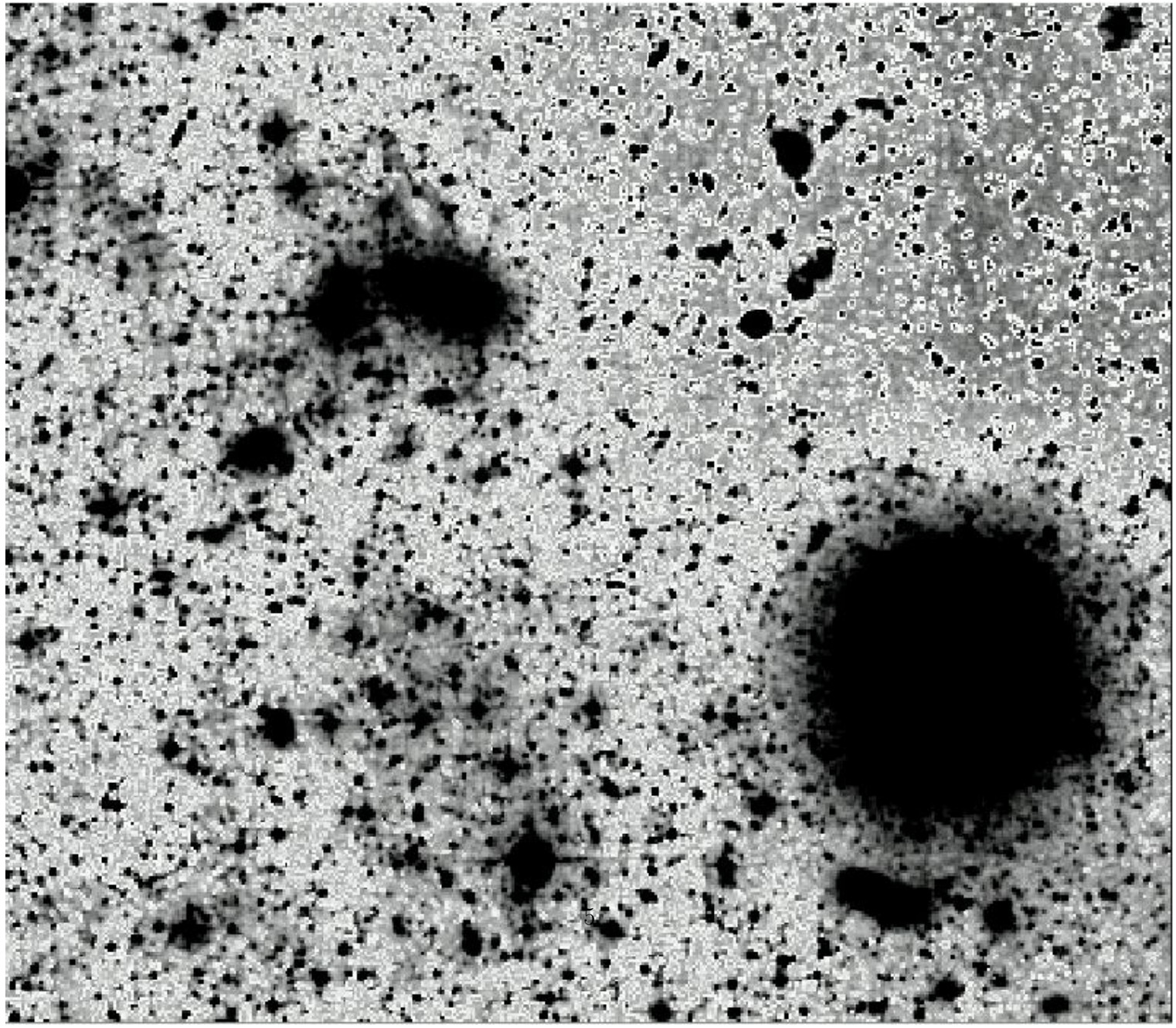


Figure 2: Parte de la misma imagen con la emición débil aumentada

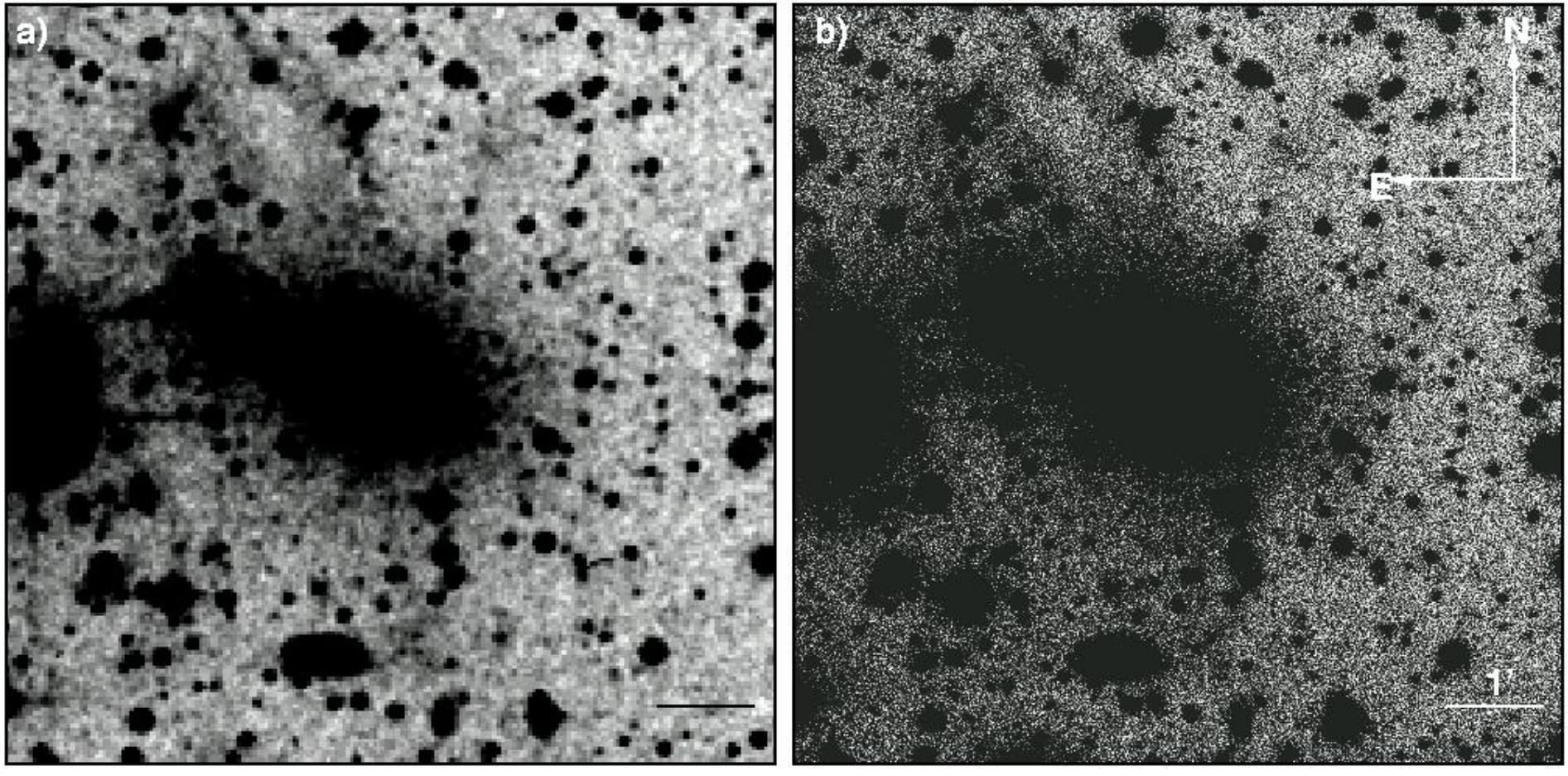


Figure 3: a) image of ESO 383–45 from Schmidt field b) same field with CCD, both at high contrast

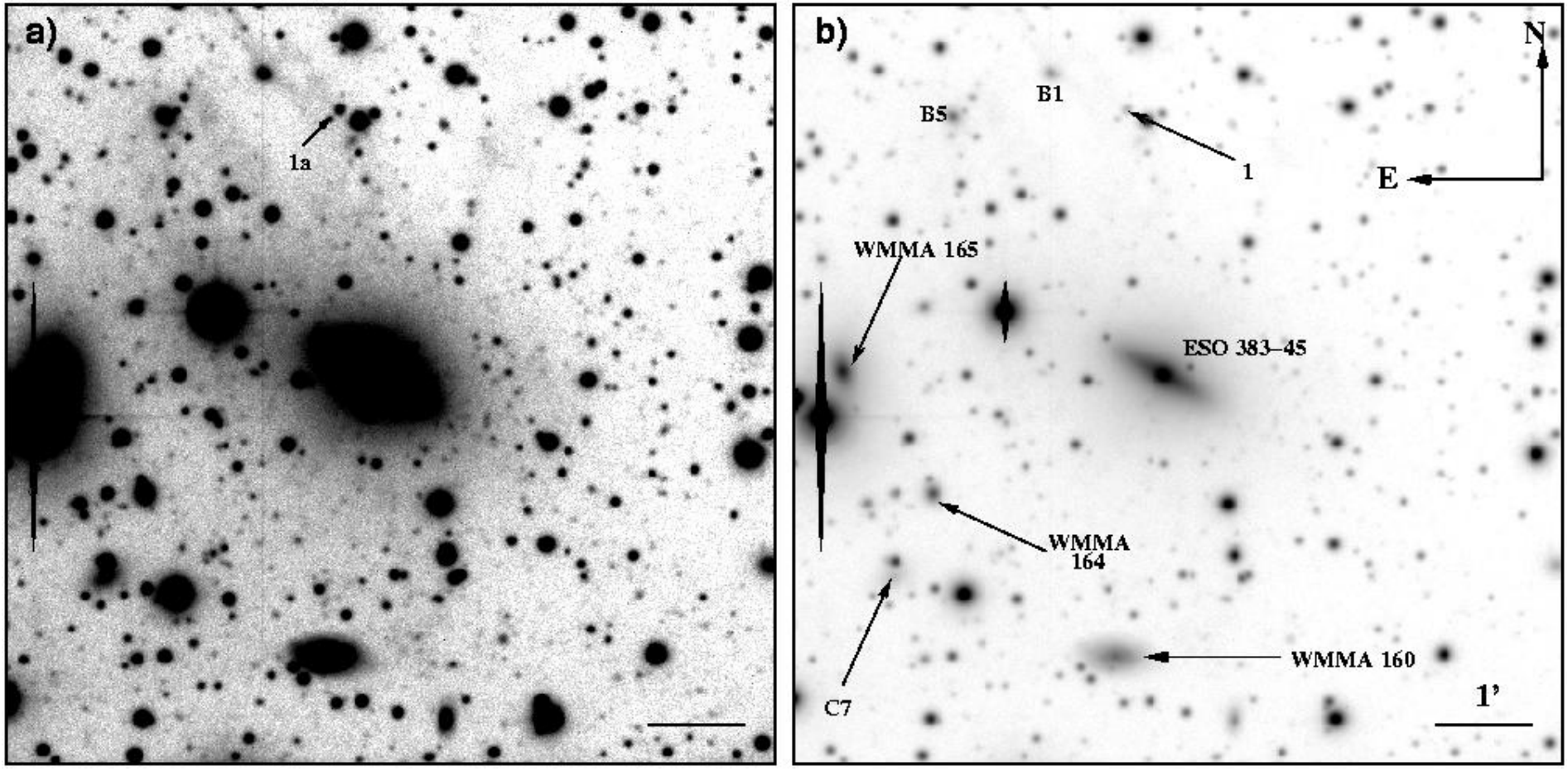


Figure 4: a) CCD image of ESO 383–45 at medium contrast b) low contrast

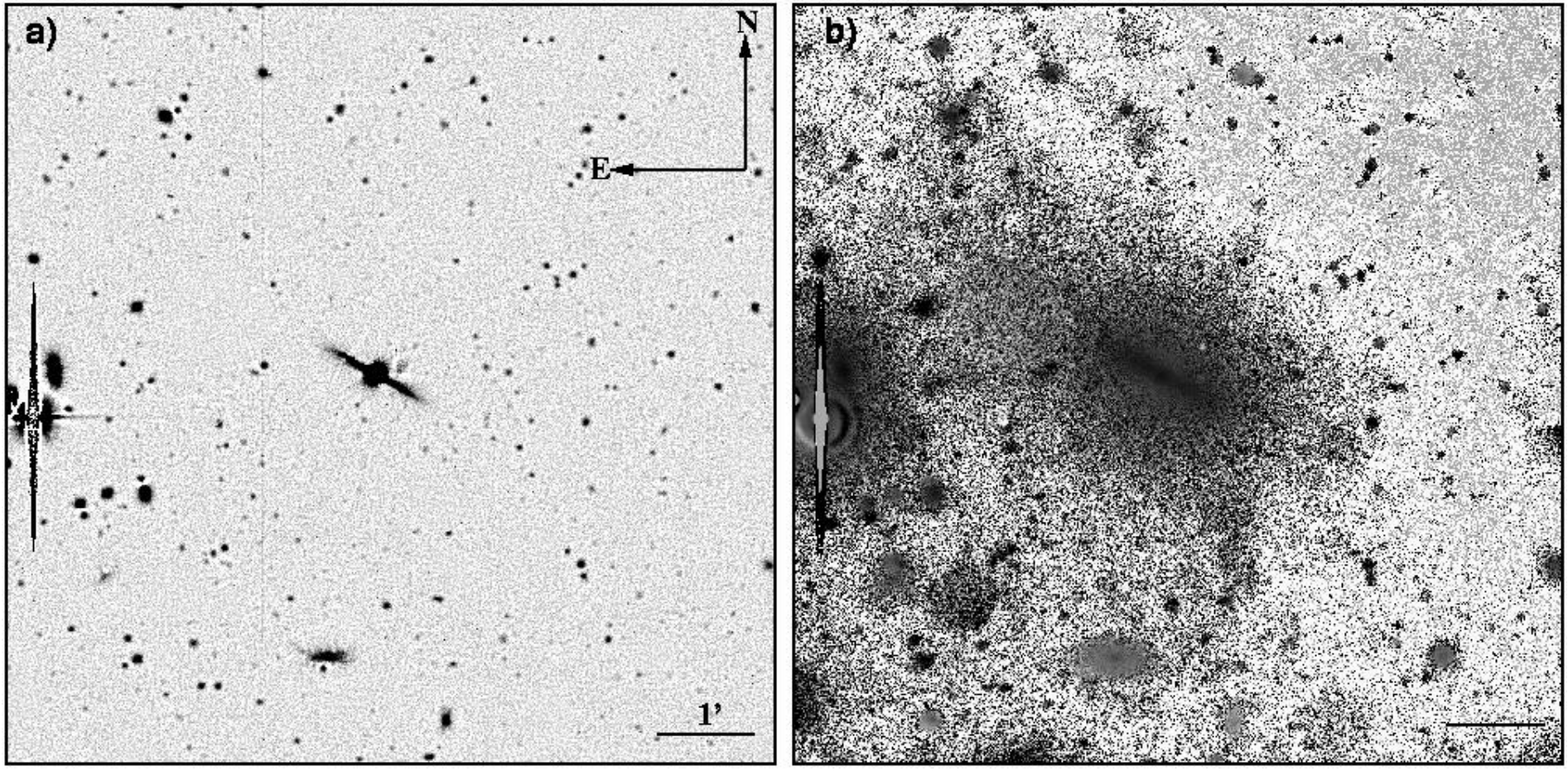
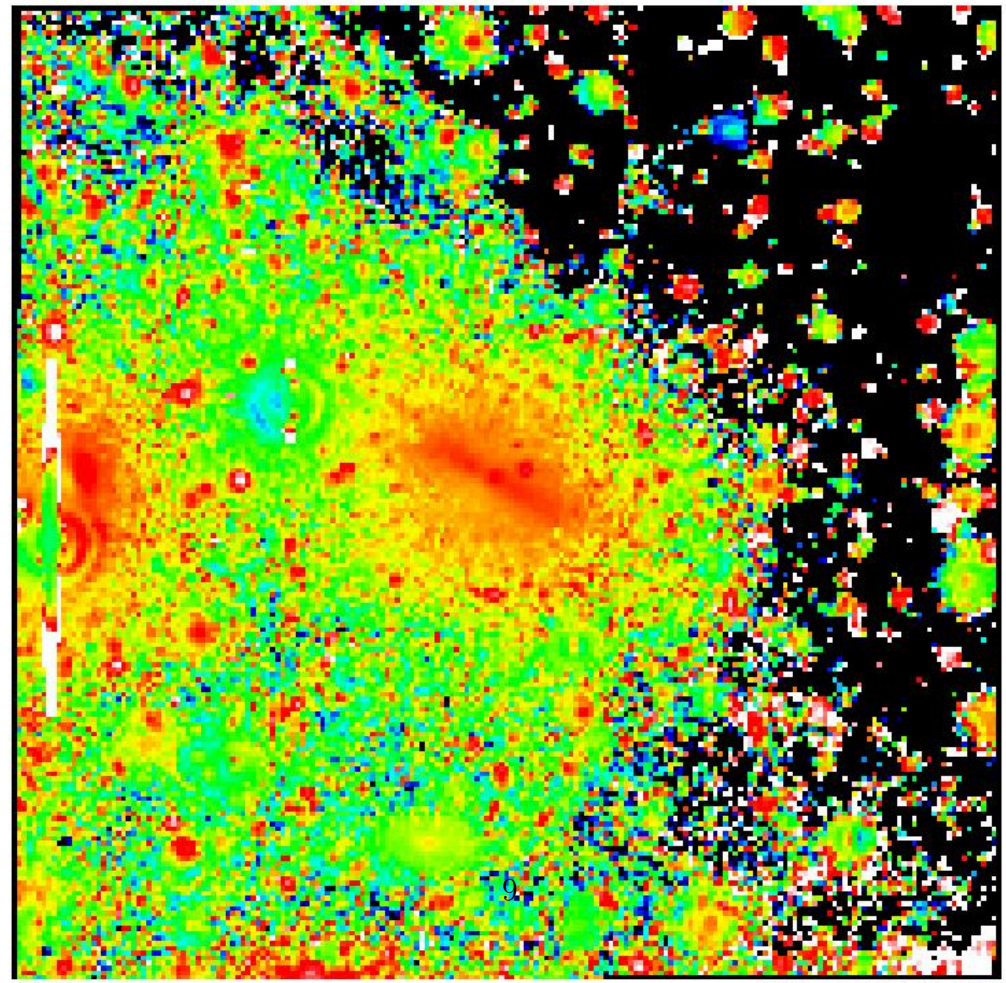


Figure 5: a) CCD image of ESO 383–45 with 'unsharp-masking' b) colour map $B - V$



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98.0 98.5

snk

Nov 05, 2003 at 17:23:59

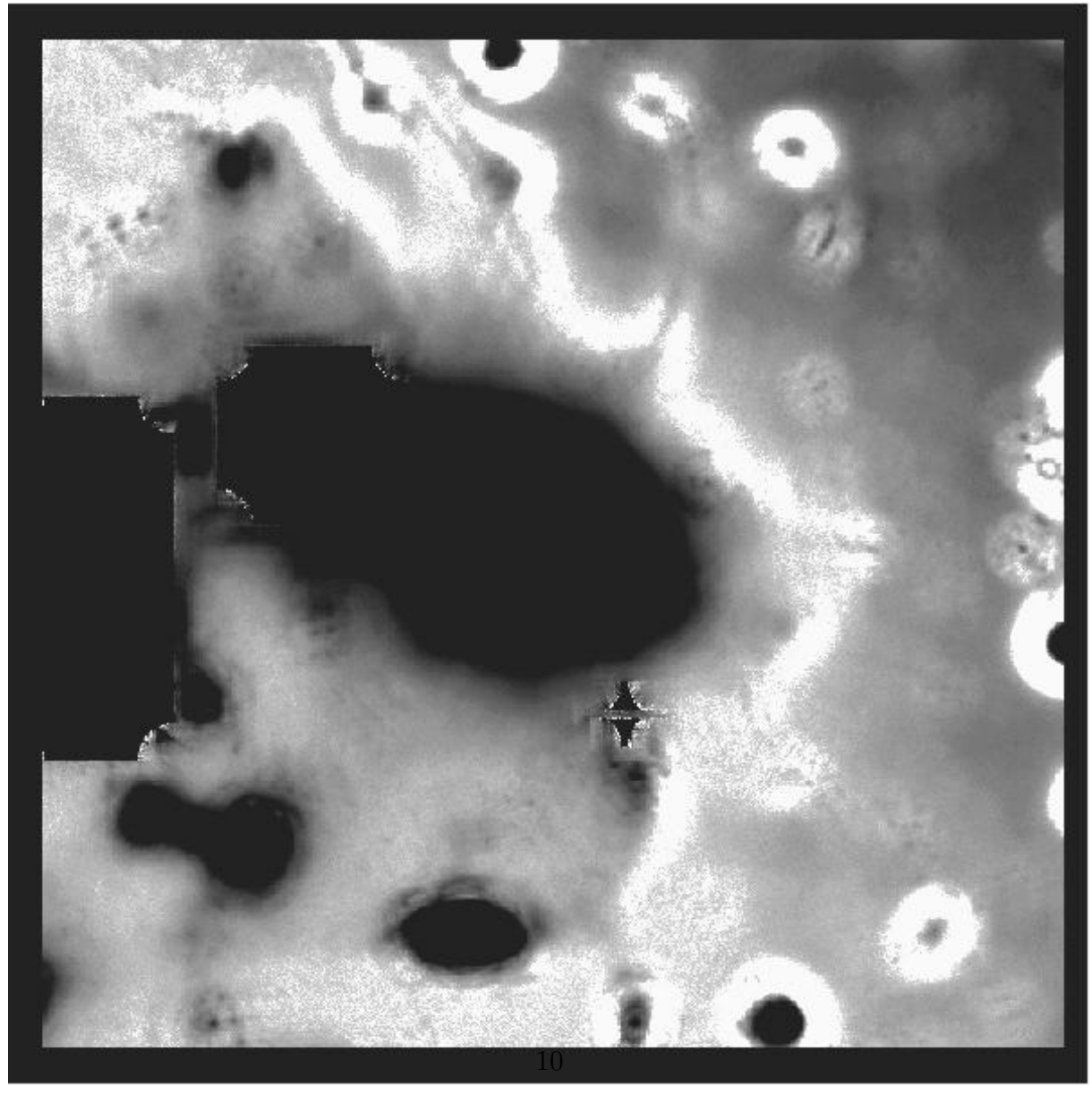


Figure 7: imagen CCD auto-correlada de ESO 383–45

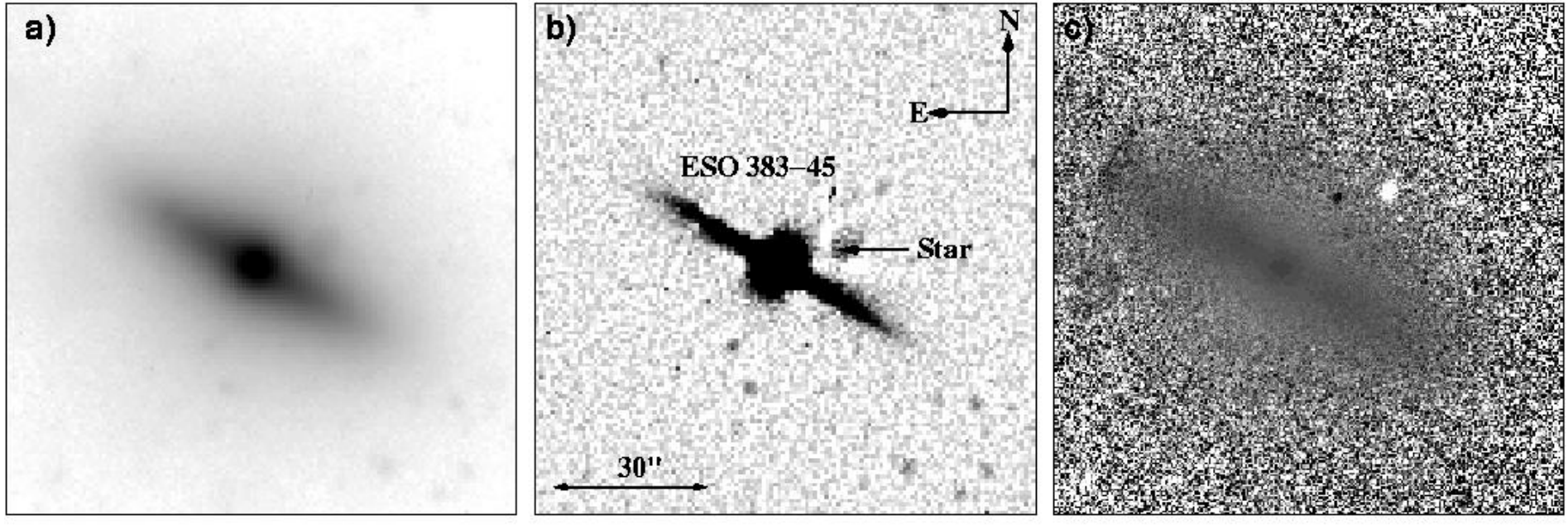
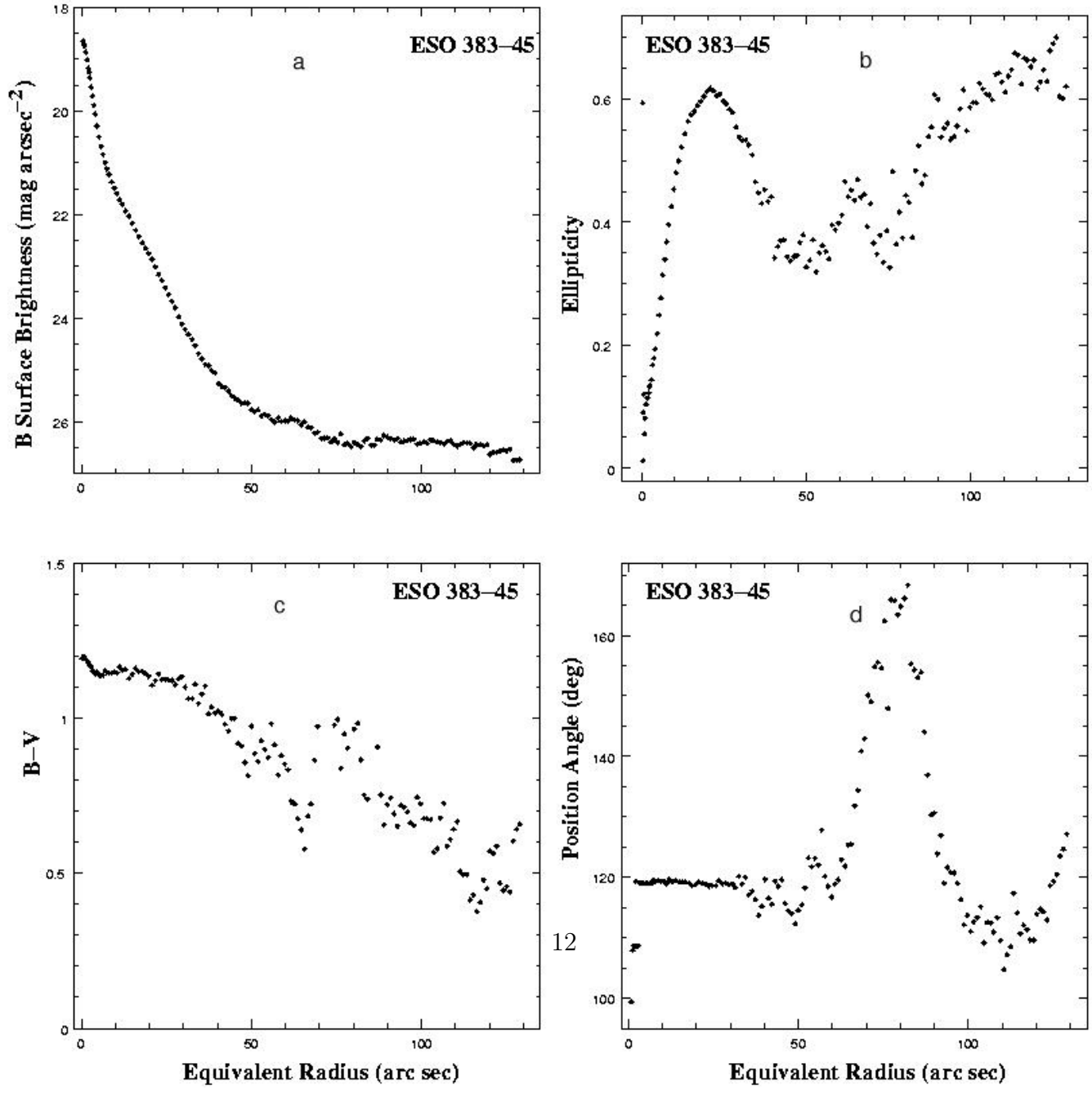


Figure 8: image of the disk and bulge of ESO 383–45 a) low contrast bajo b) 'unsharp-masking', c) colour map $B - V$


ESO 383–45
a
B Surface Brightness (mag arcsec^{-2})
18
20
22
24
26
0
50
100
ESO 383–45
b
Ellipticity
0
0.2
0.4
0.6
0
50
100
ESO 383–45
c
B–V
0
0.5
1
1.5
0
50
100
Equivalent Radius (arc sec)
ESO 383–45
d
Position Angle (deg)
100
120
140
160
0
50
100
Equivalent Radius (arc sec)

ESO 383–45: ram-pressure stripping by the IGM or tidal interaction/merger remnant?

- **This galaxy could be undergoing ram-pressure stripping of its ISM by the IGM of the cluster (A3565, IC 4296 group). Filaments made of new stars or ionisedgas? (gas too hot, cold, or diffuse to form stars?). Or filaments indicate areas of shocks between clumps of stripped gas.**
- **The curvature of the filaments may indicate gas interacting with a dense IGM. Something similar has been proposed (Killeen & Bicknell 1988) for the radio-jets of IC 4296 (15 arcmin SW of ESO 383–45) which have similar (but opposite) curvature. There are various areas of possible faint optical IGM near ESO 383–45 and IC 4296, and X-ray emission in the cluster, indicating a dense IGM.**
- **There are no very obvious candidates for galaxies participating in a tidal interaction with ESO 383–45. The small galaxies nearby are at a higher redshift, while IC 4296 and ESO 383–45 appear to be approaching each other in the plane of the sky.**
- **On the other hand, there are knots in the filaments which look like tidal dwarf galaxies, while simulations of the tidal interaction of two disk galaxies (Naab & Burkert 2003) have produced galaxies similar to ESO 383–45 (S0s with thick disk/'halo', but not with filaments). So ESO 383–45 could be the merger product of a tidal interaction.**

Future Work

- **H I 21 cm observations to discover where the neutral gas is.**
- **High-resolution X-ray observations to discover where the hot gas is.**
- **Optical narrow-band imaging (Hα etc) to see if the filaments are composed of stars or ionised gas, and if the knots are giant HII regions or dwarf galaxies.**
- **Optical spectroscopy to discover the kinematics of the gas and stars and confirm the nature of the knots.**
- **Simulations of the galaxy to see if a tidal interaction or ram-pressure stripping is sufficient to explain the form of the galaxy, or if both processes are necessary.**