SNe-Ia rate vs. environments

- SNe-Ia rate in Sturburst galaxies
  (Mannucci et al. 2004; Mannucci et al. 2007)
- SNe-Ia rate vs. Hosts colors (Hubble types) (Mannucci et al. 2005)
- SNe-Ia rate vs. Radio luminosity of the hosts (DV & Panagia 2003, DV et al. 2005)
- SNe-Ia rate in Clusters vs. Field
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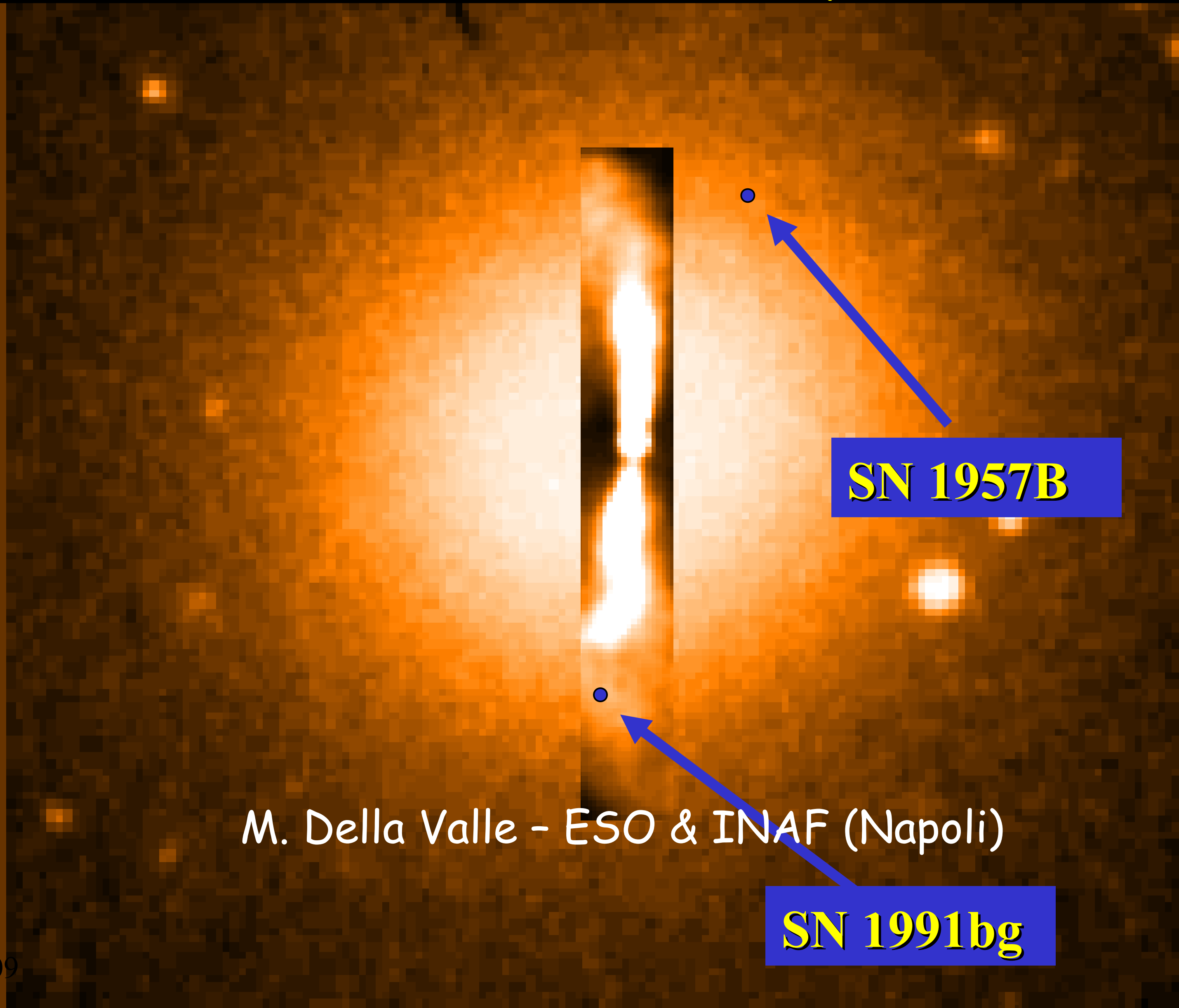

M. Della Valle – ESO & INAF (Napoli)

Asiago Survey T<-1.5

x

NRAO VLA SKY SURVEY

It is a Survey at 1.4 GHz covering the whole sky north of –40°

For galaxies below this limit →

Parkes MIT NRAO Survey at 4.85 GHz

f5 → f1.4 (radio spectral index -0.75)

Sadler, Jenkins & Kotanyi 1989

7 Discussion

We now summarize the main results of this work and discuss some simple ideas which may be relevant to their interpretation. Our main conclusions are as follows:

(i) Low-luminosity (10^{19}–10^{21} W Hz^{-1}) radio sources are common in E and S0 galaxies. Even at powers as low as 10^{19} W Hz^{-1}, the radio emission from galaxies brighter than $M_B = -18$ mag is probably non-thermal in origin. In galaxies fainter than $M_B = -18$ mag, thermal emission from H II regions may be the dominant source of radio emission.

(ii) The fraction of early-type galaxies which are strong radio sources (above 10^{22} W Hz^{-1}) increases with optical luminosity. At lower radio powers the optical luminosity has less influence, though a *characteristic* radio power such as P_{30} remains a strong function of absolute magnitude.

Radio-loud	Radio-faint	Radio-quiet
10^{29} erg s^{-1} Hz^{-1}	$>10^{27}$ & $<10^{29}$ erg s^{-1} Hz^{-1}	$< 10^{27}$ erg s^{-1} Hz^{-1}

SNe-Ia in Radio-Galaxies

Galaxies	C.T. (yr) x 10^{10} $L_{B\odot}$	SNe	Rate SNu(B)
Radio-Quiet 1729	7127		
Radio-Faint 212	1770		
Radio-Loud 267	2199		

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Galaxies	C.T. (yr) x 10^{10} $L_{B\odot}$	SNe	Rate SNu(B)
Radio-Quiet 1729	7127	7.5	
Radio-Faint 212	1770	4	
Radio-Loud 267	2199	9.5	

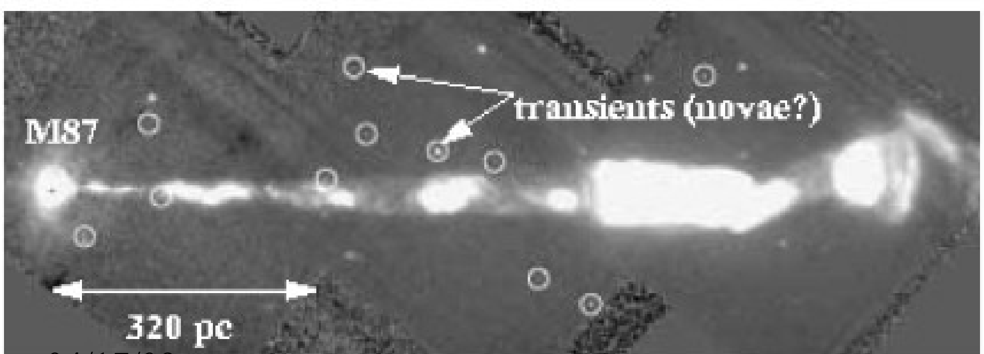
We concluded that the rate of SNeI-a in radio-loud galaxies is higher than it is in radio-quiet by a factor ~ 4 (2 up to 7)

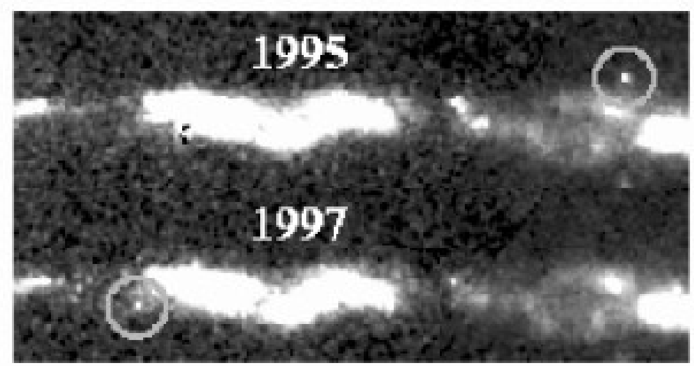
Significance level ~97%-99%

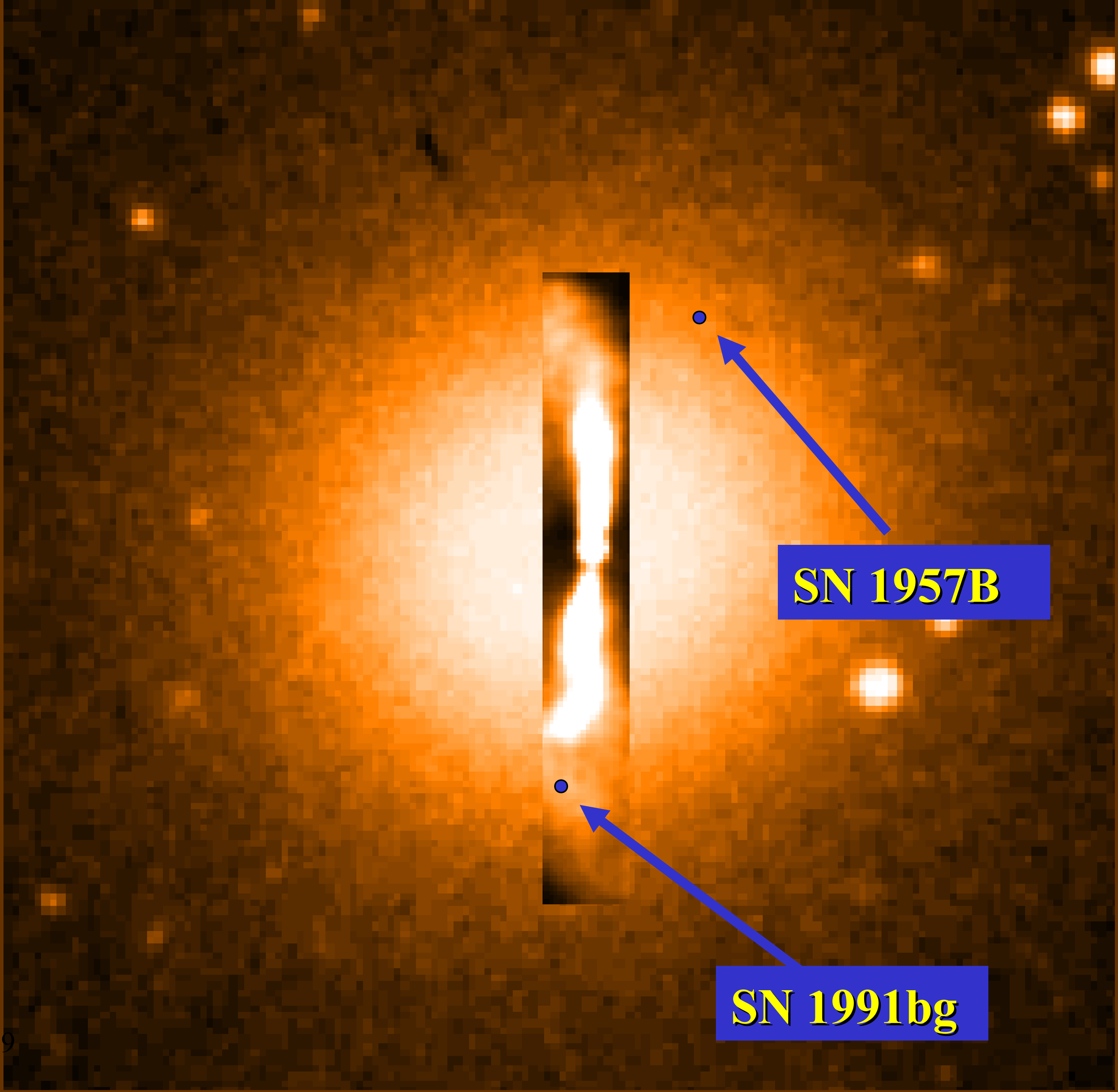
Radio-Quiet 1729	7127	7.5	$0.11^{+0.06}_{-0.03}$
Radio-Faint 212	1770	4	$0.23^{+0.18}_{-0.11}$
Radio-Loud 267	2199	9.5	$0.43^{+0.19}_{-0.14}$

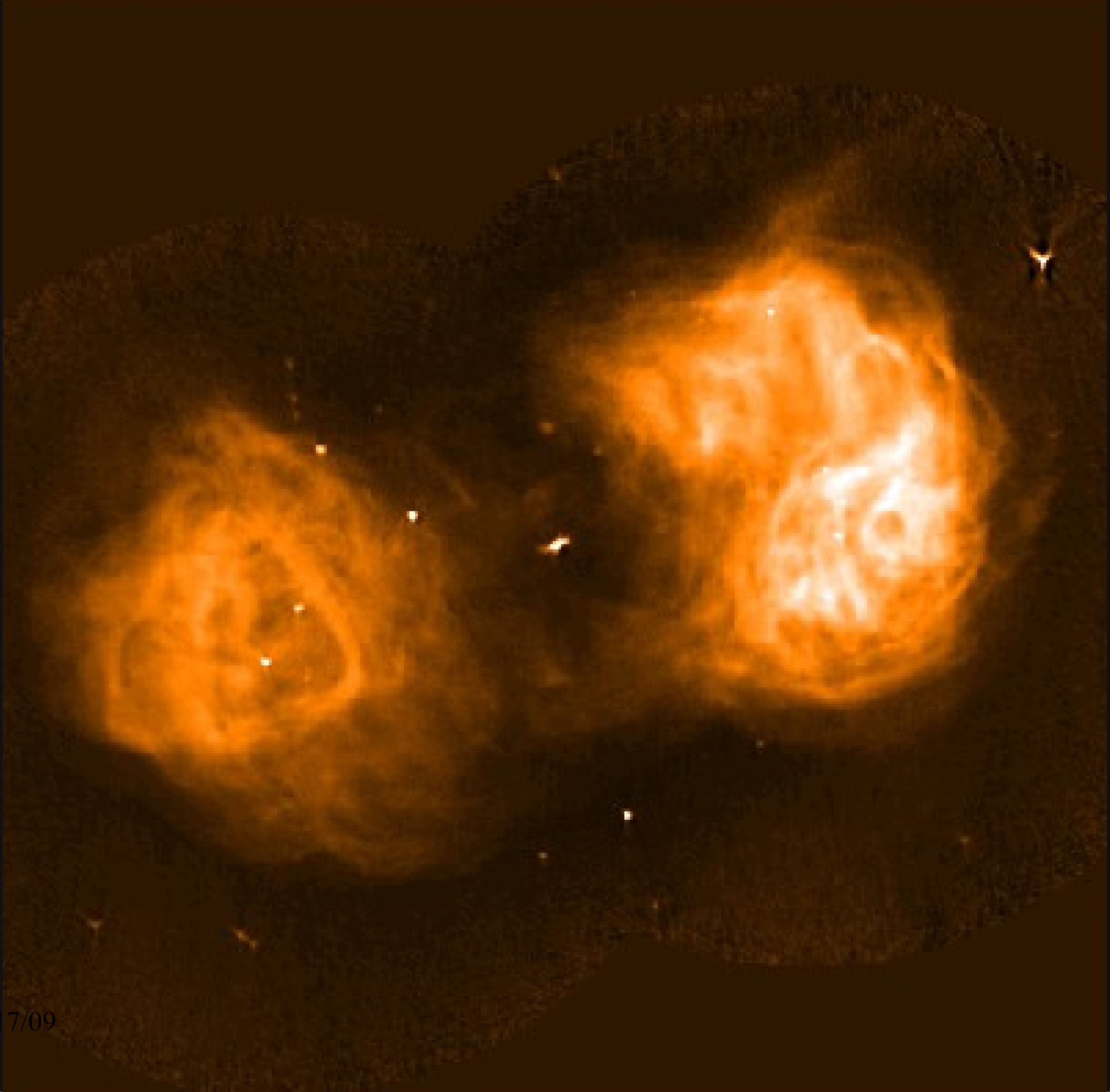
The 'jet-induced' accretion scenario

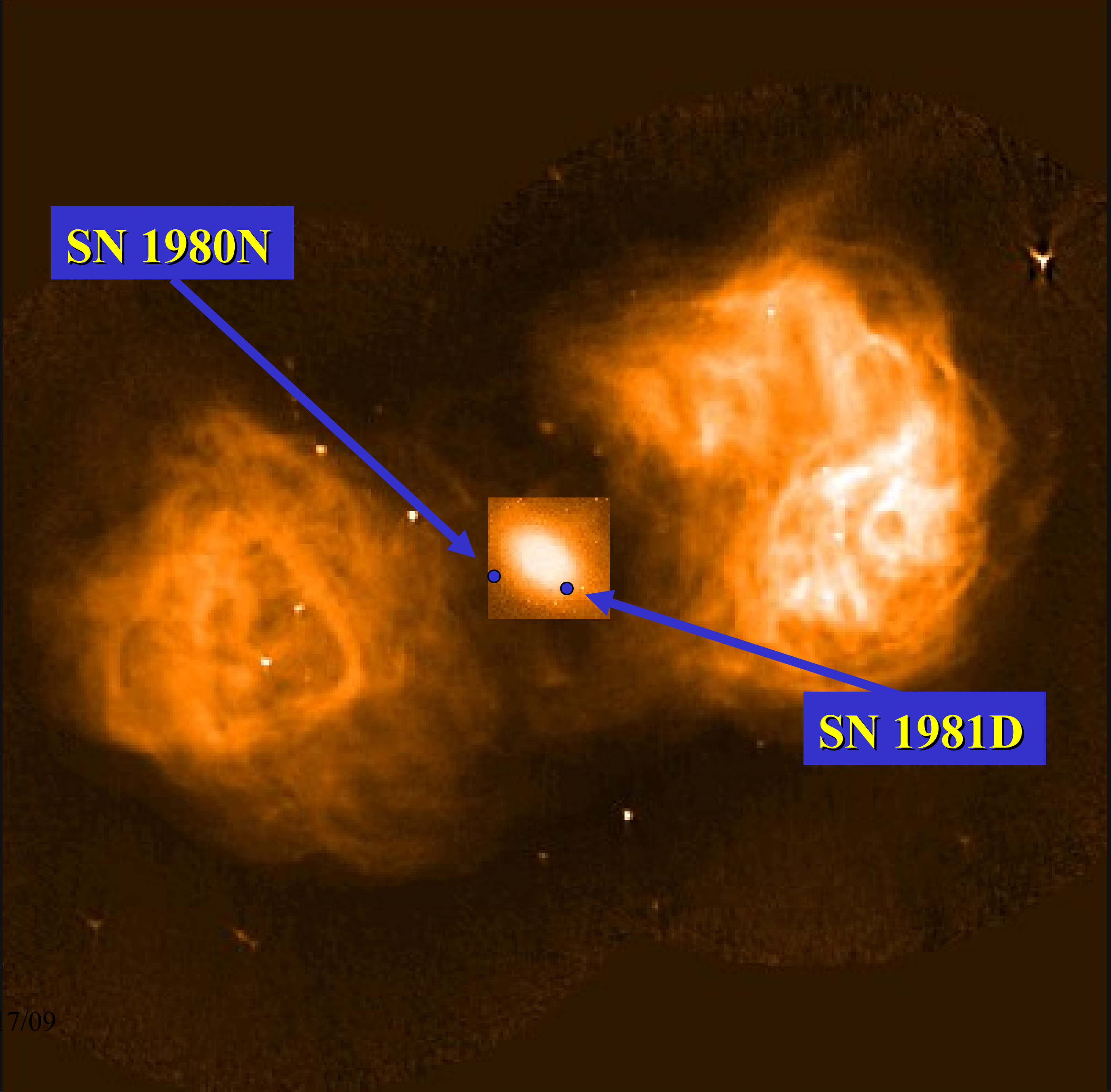
Capetti (2002) and Livio et al. (2002) suggest that jets may lead to an increase of the accretion onto the WDs from either ISM or the companion. In the 'jet-induced' accretion scenario the enhancement of the rate of SNeI-a (and Novae)

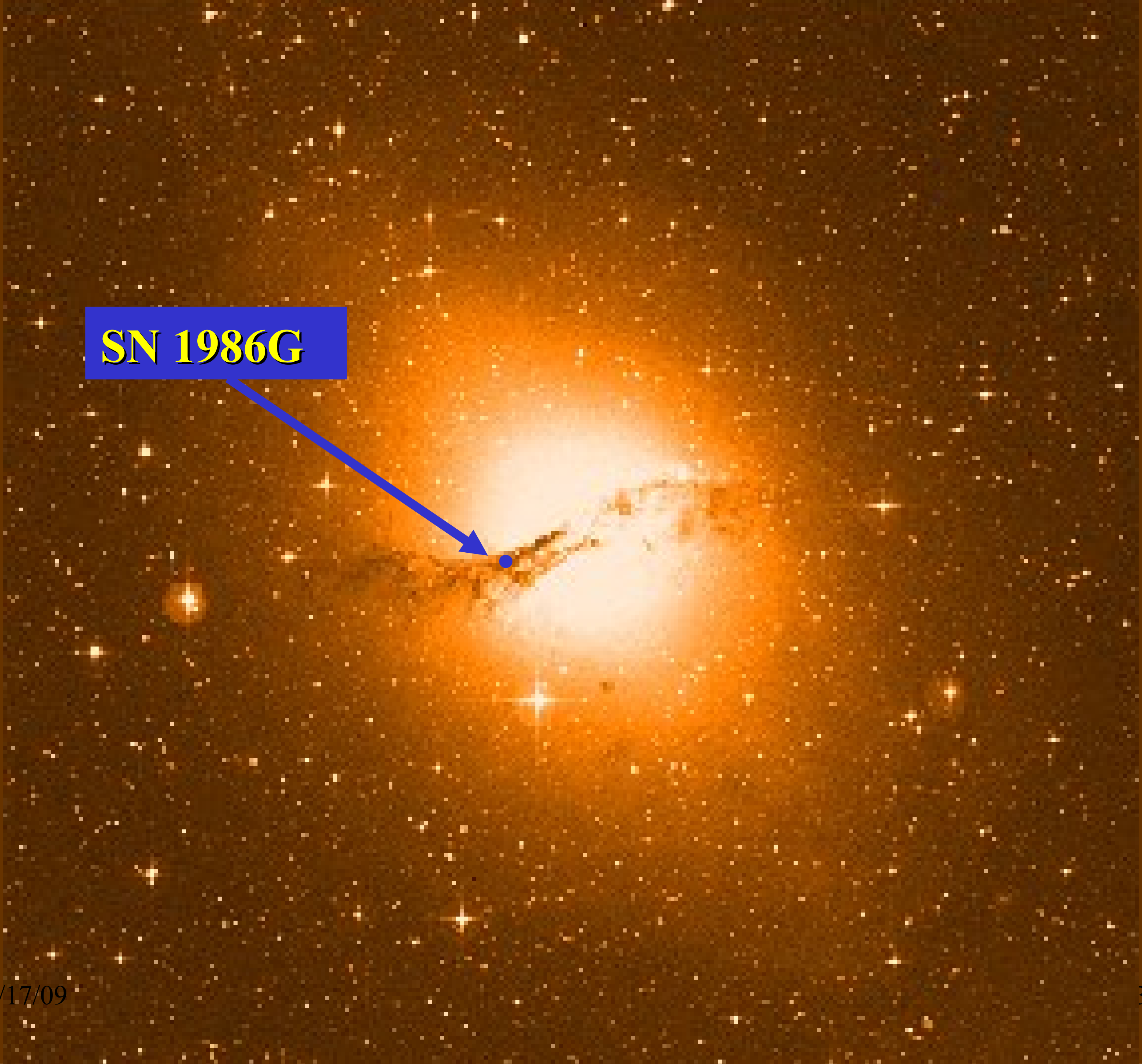


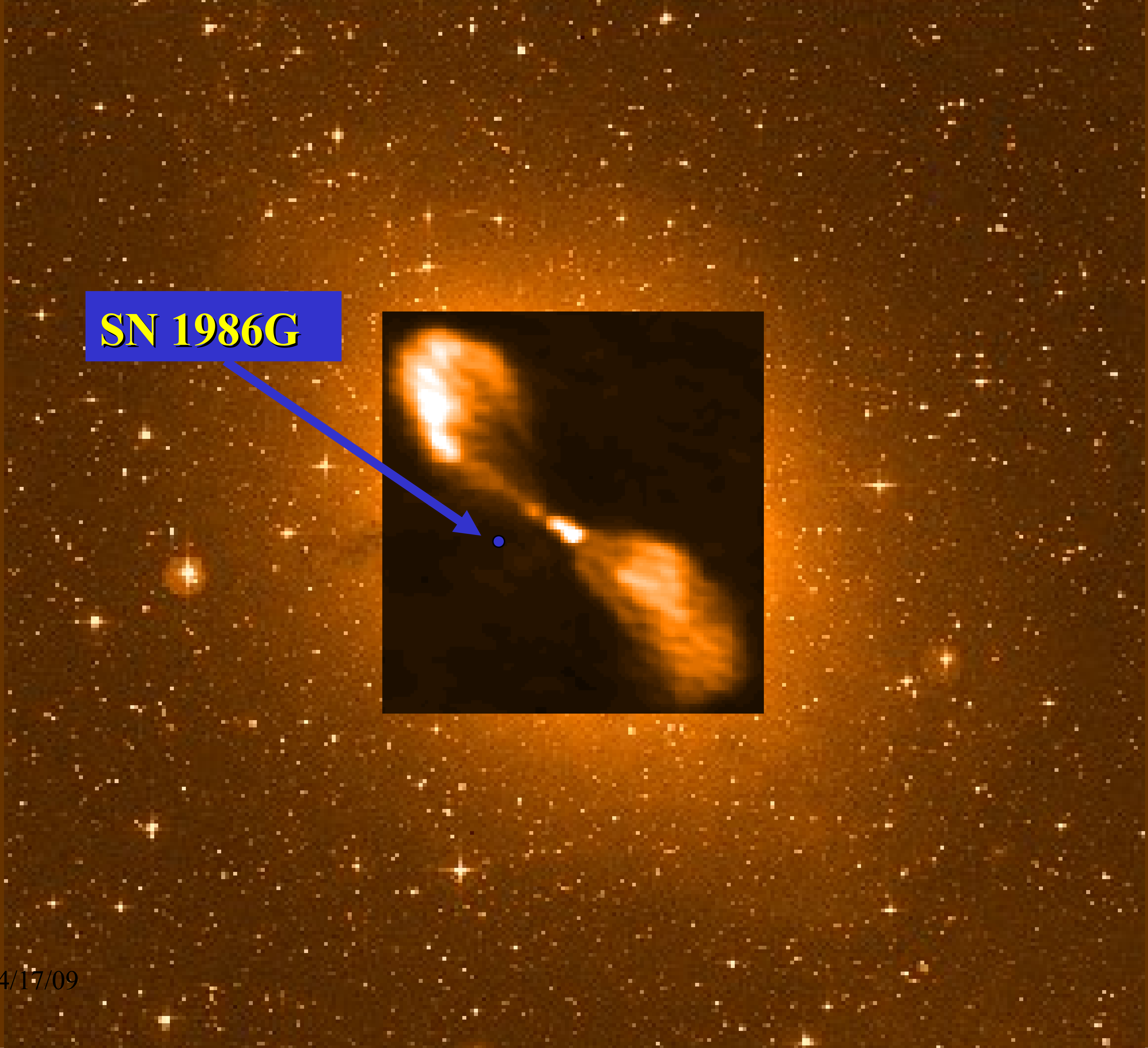



SN 1957B
SN 1991bg

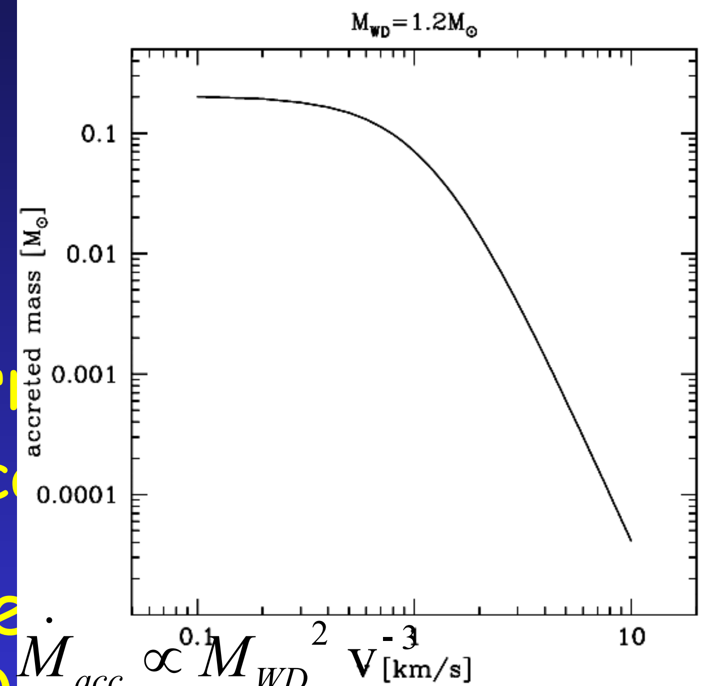



SN 1980N
SN 1981D


SN 1986G

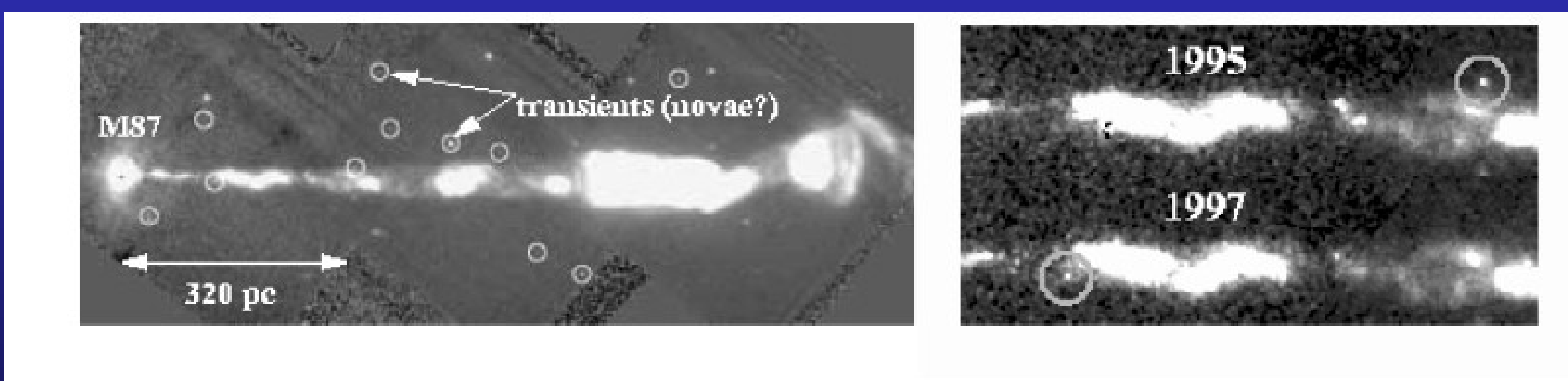

SN 1986G
04/17/09

Therefore….

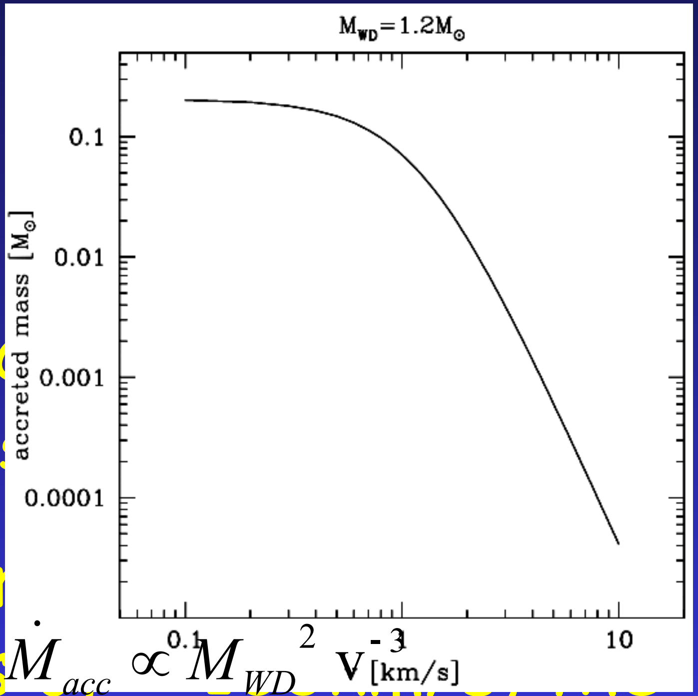


• There is no convincing spatial corr… SN sites and radio-jets (no statistic…

• The Bondi accretion becomes rele… $\dot{M}_{acc} \propto M_{WD}^{2} V^{-3}$ For typical star velocities of ~ 100km/s, the amount of accreted material onto the WD (for a crossing-time of 100Myr) is ~ $10^{-5}/^{-6}$ $M_{\odot}$



Therefore…



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- To produce a rate enhancement of ~ x3-4, jets should rise the efficiency of SN-Ia explosions (~5%-10%) up to ~ 100% over a significant fraction of the galaxy volume

The common origin of SNe-Ia and radio-jets

Repeated episodes of interactions or mergers between E's and dwarf companions are responsible for:

a) Strong radio activity in early-types galaxies (Baade & Minkowski 1954, Heckman et al. 1986)

b) fresh supplying of relatively young stellar population in which SNe-Ia are best produced (Mannucci et al. 2005)

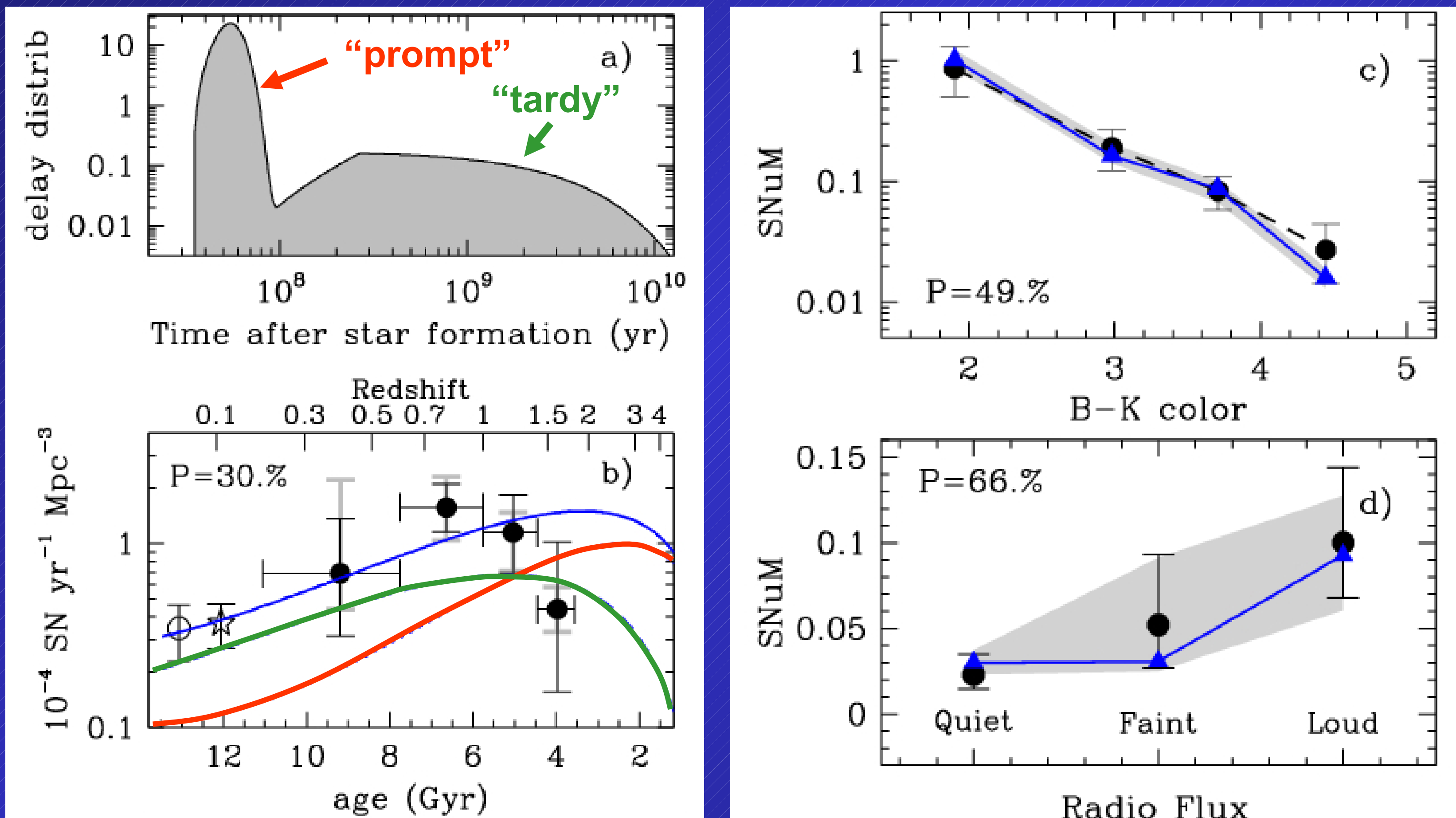
Merging Hypothesis

The enhancement of SN-Ia rate in radiogalaxies has the same common origine as the radio activity but **there is not** causality link between the two phenomena.

By assuming that the radio activity and an episode of star formation are coeval the observed excess of type Ia SNe in radio-loud galaxies implies evolutionary times (main sequence+time to accrete up to explosion) of the same order of magnitude than the duration of radio-activity, i.e. < 150 Myr **(Srinand & Gopal-Krishna; Wan et al. 2000)**

Deriving the DTD

Two populations: up to 50% prompt + 50% exp

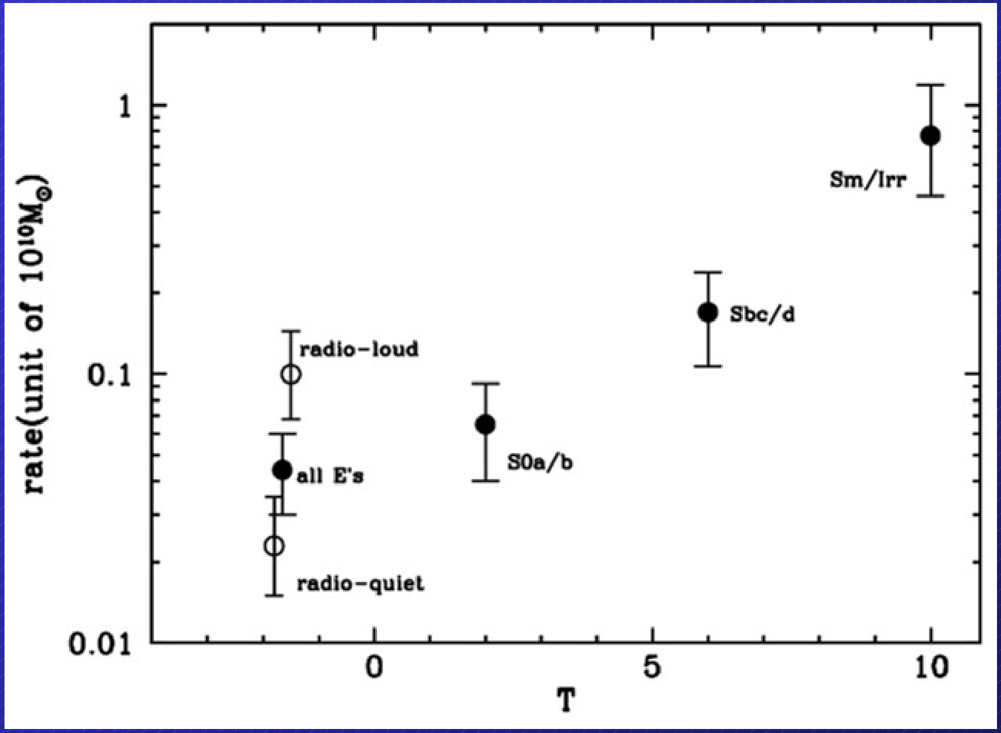


Mannucci, Della Valle & Panagia 2006

See Dallaporta 1973 "young" & "old" Ia

Conclusions

- SN-Ia rate in radio-galaxies is ~ 3x higher than measured in radio-quiet systems



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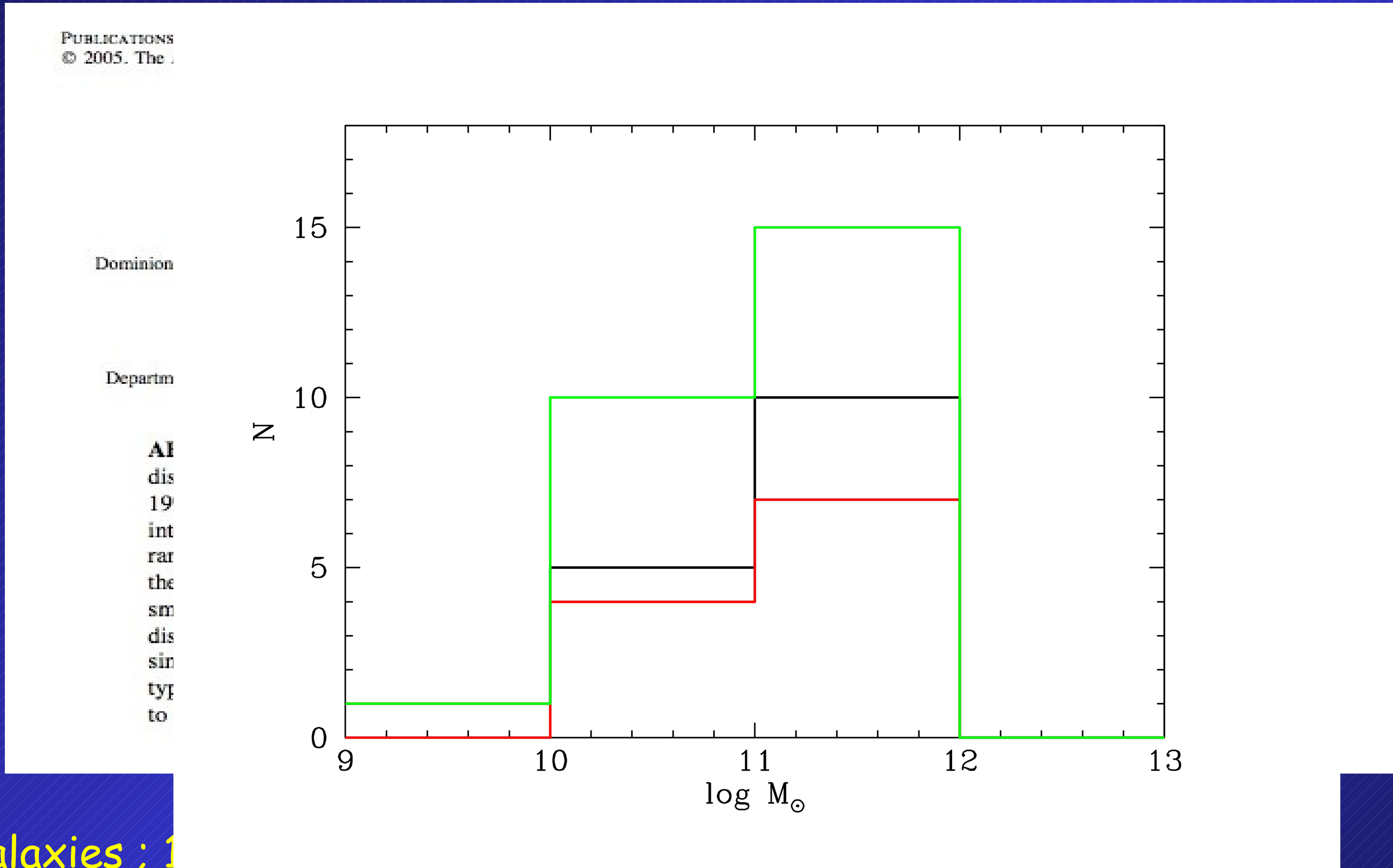
✂→ "Strong" bimodality

“Strong” bimodality after LOSS…..



79 Galaxies ; 1

We find 23 → c.l. > 0.995 and <0.998 → The effect seems real !