

CATALOGO  
DI  
NUCLEI GALATTICI ATTIVI:  
*BLAZAR*

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## INTRODUZIONE

Gli oggetti denominati *blazar* costituiscono una sottoclasse dei cosiddetti nuclei galattici attivi (AGN), caratterizzati da una marcata variabilità anche nell'ottico. Lo studio di questa variabilità è fondamentale per poter comprendere i processi di emissione e la fisica del motore centrale responsabile dell'emissione stessa. I *blazar* sono oggetti che emettono a tutte le frequenze, da quelle radio a quelle  $\gamma$  (sorgenti- $\gamma$ ), e un confronto tra le mappe-radio ad alta risoluzione e i dati di monitoraggio multi-frequenza, compresi quelli ottici, risulta determinante per comprendere se uno o più meccanismi sono responsabili dell'emissione osservata.

Il presente catalogo fornisce le cartine d'identificazione di 52 *blazar*, denominazione della classe di AGN comprendente i gruppi di oggetti di tipo BL Lacertae (BL), di oggetti OVV (quasar fortemente variabili nell'ottico), denominati anche FSRQ (radio-quasar con spettro piatto), di oggetti con un grado di polarizzazione alto, HPQ (high polarized quasar) e basso, LPQ (low polarized quasar); gli oggetti di tipo BL sono suddivisi a loro volta in oggetti XBL (con  $\alpha_{RX} < 0.75$ ) e RBL (con  $\alpha_{RX} > 0.75$ ), dove  $\alpha_{RX}$  è l'indice spettrale del flusso di radiazione nella regione dello spettro elettromagnetico che si estende dal radio alla regione X, tale che il flusso misurato è proporzionale a  $\nu^\alpha$  ( $\nu$  è la frequenza di emissione osservata e  $\alpha$  è l'indice spettrale della radiazione emessa osservata).

Di ogni oggetto è fornito il nome generico, le coordinate celesti, lo spostamento verso il rosso (redshift), le magnitudini apparenti medie nel visuale (V), il tipo di oggetto (XBL, RBL, FSRQ, OVV, HPQ, LPQ, sorgente- $\gamma$ ), il coefficiente di estinzione interstellare nel visuale ( $A_V$ ) e le magnitudini nei vari colori (B=blu, V=visuale, R=rosso, I=infrarosso) delle stelle di confronto.

I coefficienti  $A_V$  sono stati ricavati usando i valori di  $N_H$  (densità di una colonna di idrogeno che determina l'arrossamento e l'assorbimento che la radiazione ottica subisce nell'attraversare la Galassia), misurati con il radiotelescopio di Green Bank e i dati interpolati della "Bell Labs Survey".

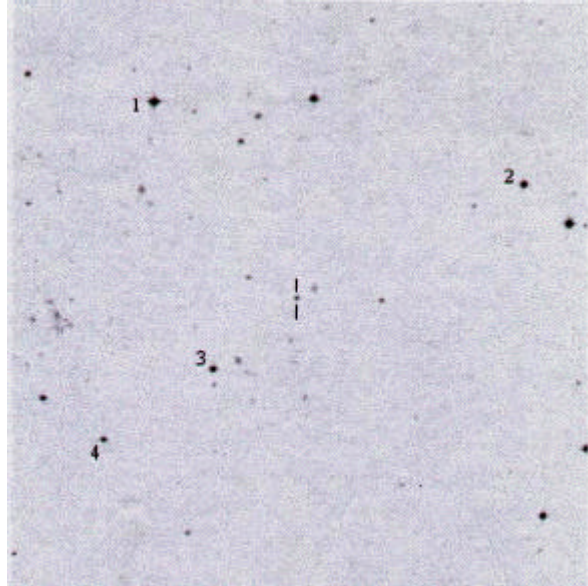
Le immagini di campo, che comprendono il *blazar* e le corrispondenti stelle di confronto, appartengono alla DSS (Digitized Sky Survey) con dimensioni di  $7' \times 7'$  e  $10' \times 10'$ .

Le curve ottiche sono state ottenute utilizzando il telescopio automatico di 40 cm dell'Osservatorio Astronomico dell'Università di Perugia, mentre le curve radio sono state ottenute nel programma di monitoraggio di *blazar* avviato all'Osservatorio Radioastronomico dell'Università del Michigan (dati UMRAO) con l'utilizzo del radiotelescopio di 26 m di diametro.

## **LISTA OGGETTI**

**0048-097 (PKS)**  
**0109+224 (GC)** - S2 0109 - TXS 0109+224  
**0219+428 (IES)** - 3C 66A - B3 0219+428A  
**0235+164 (IES)** - AO 0235 - OD 160  
**0300+470 (B3)** - 4C 47.08 - OE 400  
**0316+413** - NGC 1275 - PERSEUS A - 3C 84  
**0323+022 (IES)** - H 0323  
**0414+009 (IES)** - H 0414  
**0420-012 (PKS)**  
**0422+00 (PKS)** - OF 38 - TXS 0422+004  
**0716+714 (S5)** - 1H 0717 - TXS 0716+714  
**0735+178 (PKS)** - 1ES 0735+178 - DA 237  
**0754+100 (PKS)**  
**0806+524 (IES)** - GB 0806+5227  
**0827+243** - OJ 248  
**0829+046 (PKS)** - OJ 49 - TXS 0829+046  
**0836+710** - 4C 71.07  
**0851+202 (PKS)** - PG 0851+202 - OJ 287  
**0906+430** - 3C 216  
**0912+293(B2)**  
**0954+658 (S4)** - TXS 0954+658  
**1101+38 (B2)** - MRK 421  
**1147+24 (B2)** - OM 280 - TXS 1147+245  
**1156+295** - 4C 29.45  
**1215+30 (B2)** - ON 325 - TON 605  
**1219+28 (B2)** - ON 231 - W Com  
**1226+02 (PKS)** - 3C 273 - ON 44  
**1229-022 (PKS)**  
**1253-05 (PKS)** - CTA 56 - 3C 279  
**1308+32 (B2)** - OP 313  
**1415.6+2557 (MS)** - NGC 5548 - 1E 1415  
**1418+54 (S4)** - OQ 530 - PG 1418+546  
**1424+240 (PKS)** - OQ 240 - PG 1424+240  
**1458.8+2249 (MS)** - 1E 1458  
**1510-089 (PKS)**  
**1611+34 (B2)** - OS 319 - DA 406  
**1633+38 (B2)**  
**1641+39 (B2)** - OS 368 - 3C 345  
**1652+398 (S4)** - MRK 501  
**1720+117 (IH)** - H 1722 - GB 1722+1155  
**1727+502 (TXS)** - IZW 187 - OT 546  
**1749+096 (PKS)** - 4C 09.57 - OT 081  
**1807+69 (S4)** - 3C 371  
**1959+65 (IES)** - TXS 1959+650  
**2032+107 (PKS)** - OW 154.9  
**2155-304 (PKS)**  
**2200+42 (S4)** - BL Lac - OY 401  
**2223-052** - 3C 446  
**2230+114 (H)** - CTA 102 - OY 150  
**2251+158 (H)** - 3C 454.3 - OY 185  
**2254+074 (PKS)** - OY 91 - TXS 2254+074  
**2344+514 (IES)** - TXS 2344+514

## **CARTINE D'IDENTIFICAZIONE**



**NOME OGGETTO:** PKS 0048

**ASCENS. RETTA (J2000.0):** 00(h) 50(m) 41(s)

**DECLINAZIONE (J2000.0):** -09(°) 29( ) 05( )

**REDSHIFT:** 0.200

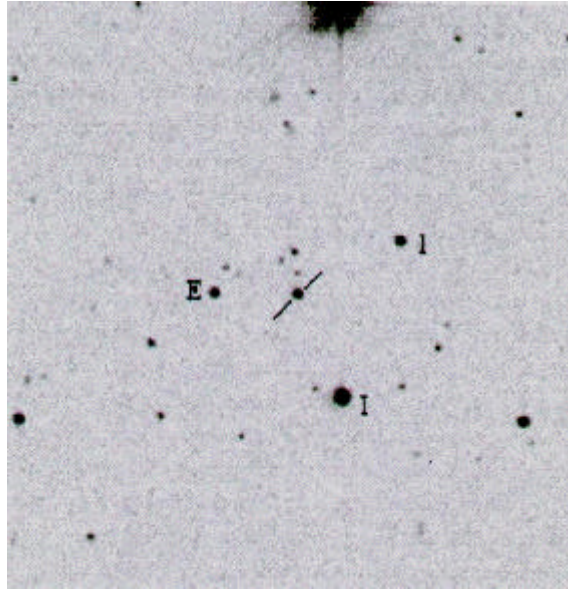
$$V_{\text{medio}} = 16.30$$

**TIPO OGGETTO:** RBL

$$A_V = 0.21$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	12.77-0.04	12.47-0.04	00
2	00	13.86-0.02	13.33-0.03	00
3	00	14.12-0.03	13.55-0.02	00
4	00	15.00-0.02	14.60-0.04	00



**NOME OGGETTO:** S2 0109

**ASCENS. RETTA (J2000.0):** 01(h) 12(m) 06(s)

**DECLINAZIONE (J2000.0):** +22(°) 44(') 38(")

**REDSHIFT:**

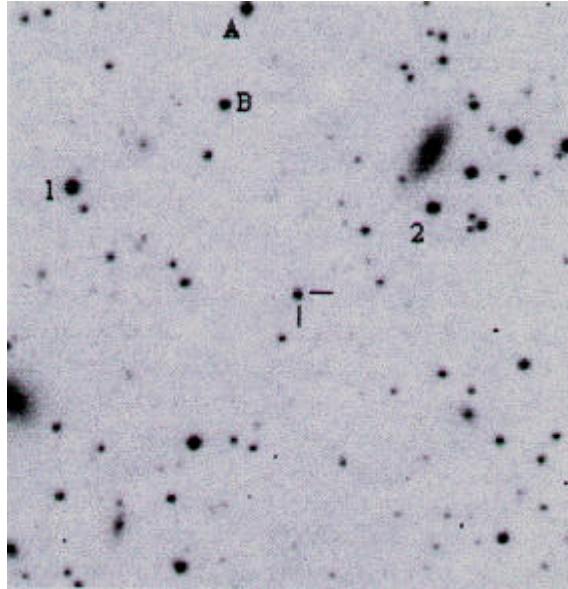
$$V_{\text{medio}} = 15.10$$

**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.27$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
I	13.30–0.10	12.51–0.05	12.11–0.04	11.76–0.04
E	16.00–0.10	15.29–0.07	14.94–0.05	14.60–0.07
1	16.30–0.10	15.28–0.07	14.72–0.06	14.22–0.08



**NOME OGGETTO:** 3C 66A

**ASCENS. RETTA (J2000.0):** 02(h) 22(m) 40(s)

**DECLINAZIONE (J2000.0):** +43(°) 02(') 08(")

**REDSHIFT:** 0.444

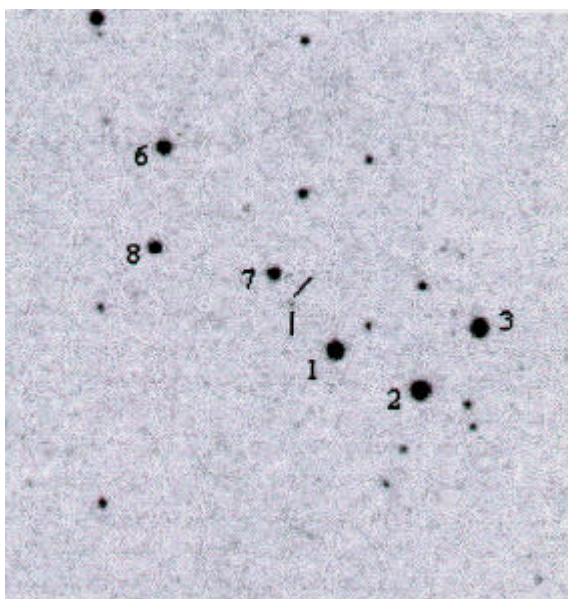
$$V_{\text{medio}} = 15.00$$

**TIPO OGGETTO:** RBL, sorgente<sup>-a</sup>, HPQ

$$A_V = 0.45$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	14.10–0.06	13.60–0.04	13.38–0.04	13.06–0.04
B	15.80–0.10	14.78–0.05	14.27–0.04	13.76–0.04
1	12.96–0.06	12.81–0.04	12.71–0.04	12.60–0.04
2	15.20–0.07	14.18–0.05	13.62–0.05	13.10–0.05



**NOME OGGETTO:** AO 0235

**ASCENS. RETTA (J2000.0):** 02(h) 38(m) 39(s)

**DECLINAZIONE (J2000.0):** +16(°) 36(') 59(")

**REDSHIFT:** 0.940

$$V_{\text{medio}} = 17.00$$

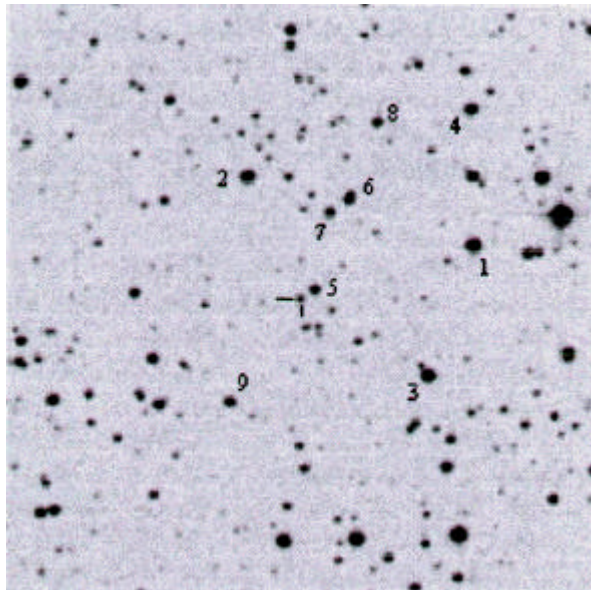
**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.45$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	13.07–0.04	12.73–0.04	12.44–0.08
2	00	12.75–0.03	12.27–0.03	11.89–0.08
3	00	12.95–0.04	12.48–0.04	12.11–0.08
6	00	14.02–0.05	13.64–0.04	13.30–0.07
7	00	15.01–0.05	14.32–0.05	13.78–0.08
8	00	14.78–0.05	14.23–0.05	13.76–0.08





**NOME OGGETTO:** 4C 47.08

**ASCENS. RETTA (J2000.0):** 03(h) 03(m) 35(s)

**DECLINAZIONE (J2000.0):** +47(°) 16(') 16(")

**REDSHIFT:** 0.475

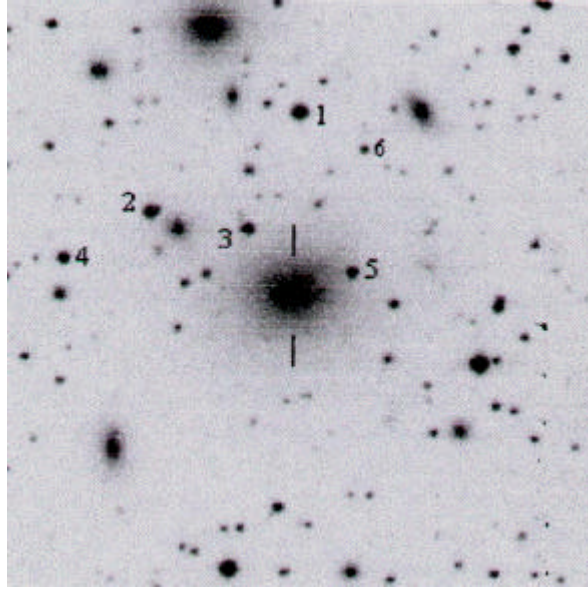
$$V_{\text{medio}} = 17.00$$

**TIPO OGGETTO:** RBL

$$A_V = 1.13$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	12.95–0.03	12.30–0.03	11.76–0.03
2	00	13.55–0.04	13.13–0.04	12.73–0.04
3	00	13.58–0.04	12.90–0.04	12.28–0.04
4	00	14.00–0.04	13.51–0.04	13.03–0.04
5	00	14.75–0.05	14.36–0.04	14.01–0.04
6	00	14.95–0.06	14.37–0.06	13.78–0.05
7	00	15.01–0.05	14.49–0.05	14.01–0.05
8	00	15.03–0.05	14.70–0.05	14.35–0.05
9	00	15.24–0.06	14.74–0.05	14.34–0.05



**NOME OGGETTO:** NGC 1275

**ASCENS. RETTA (J2000.0):** 03(h) 19(m) 48(s)

**DECLINAZIONE (J2000.0):** +41(°) 30( ) 42( )

**REDSHIFT:** 0.017

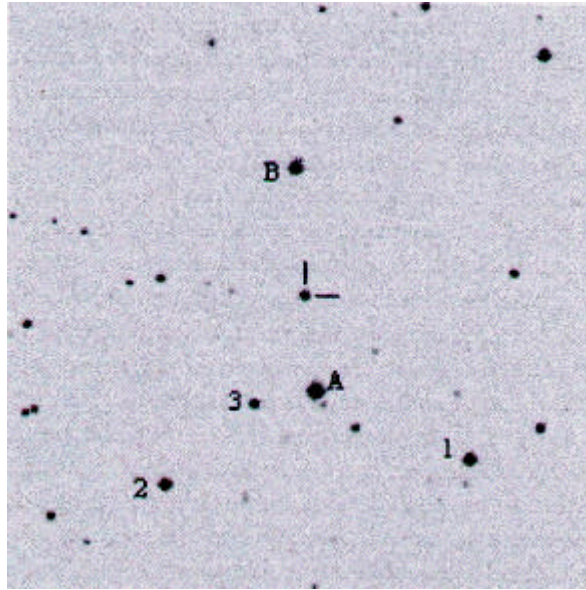
$$V_{\text{medio}} = 14.10$$

**TIPO OGGETTO:** RBL

$$A_V = 0.52$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	12.98–0.05	12.40–0.03	12.05–0.03	11.69–0.03
2	13.28–0.05	12.90–0.03	12.62–0.03	12.36–0.03
3	14.90–0.05	13.76–0.04	13.15–0.04	12.54–0.04
4	14.61–0.07	14.04–0.04	13.68–0.04	13.33–0.04
5	15.64–0.14	14.56–0.04	13.99–0.04	13.46–0.04
6	00	14.83–0.04	14.15–0.04	13.39–0.04



**NOME OGGETTO:** H 0323

**ASCENS. RETTA (J2000.0):** 03(h) 26(m) 14(s)

**DECLINAZIONE (J2000.0):** +02(°) 25(') 14(")

**REDSHIFT:** 0.147

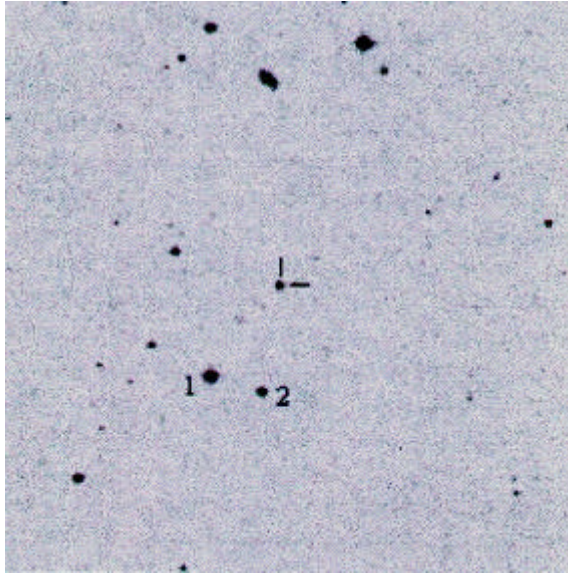
$$V_{\text{medio}} = 17.40$$

**TIPO OGGETTO:** XBL

$$A_V = 0.52$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	00	12.85–0.03	12.33–0.03	11.82–0.03
B	00	14.38–0.04	14.01–0.04	13.64–0.04
1	00	14.00–0.04	13.34–0.04	12.81–0.04
2	00	14.44–0.04	13.84–0.04	13.32–0.04
3	00	15.75–0.05	15.36–0.05	14.93–0.05



**NOME OGGETTO:** H 0414

**ASCENS. RETTA (J2000.0):** 04(h) 16(m) 52(s)

**DECLINAZIONE (J2000.0):** +01(°) 05(') 24(")

**REDSHIFT:** 0.287

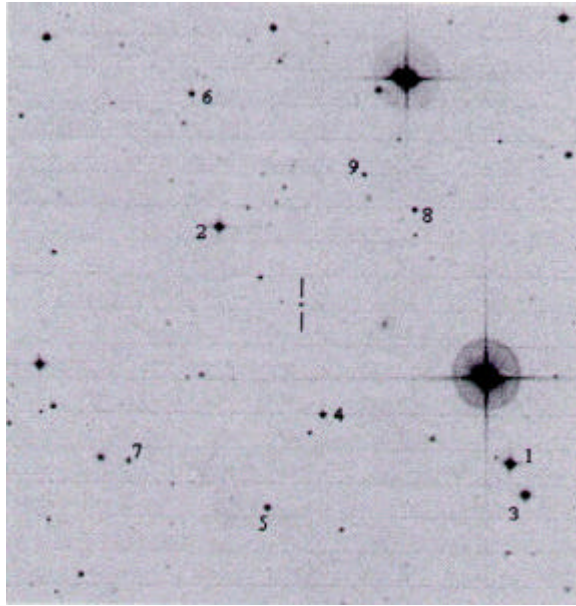
$$V_{\text{medio}} = 17.50$$

**TIPO OGGETTO:** XBL

$$A_V = 0.54$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	13.95-0.05	13.56-0.05	13.15-0.05
2	00	15.17-0.07	14.63-0.07	14.06-0.07



**NOME OGGETTO:** PKS 0420

**ASCENS. RETTA (J2000.0):** 04(h) 23(m) 16(s)

**DECLINAZIONE (J2000.0):** -01(°) 20(') 33(")

**REDSHIFT:** 0.915

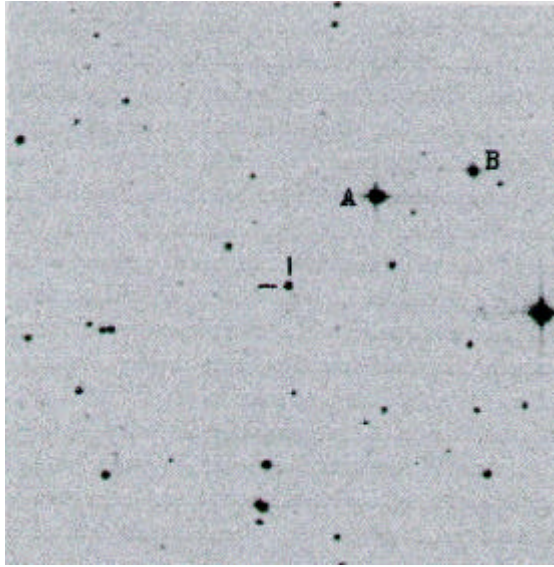
$$V_{\text{medio}} = 18.50$$

**TIPO OGGETTO:** FSRQ, sorgente<sup>-a</sup>

$$A_V = 0.59$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	13.02–0.03	12.45–0.02	12.09–0.03	00
2	13.64–0.03	13.15–0.02	12.81–0.02	00
3	13.92–0.03	13.29–0.03	12.87–0.03	00
4	15.69–0.03	14.95–0.03	14.47–0.03	00
5	00	14.96–0.03	14.37–0.03	00
6	16.03–0.03	15.18–0.03	14.70–0.03	00
7	00	15.31–0.03	14.91–0.03	00
8	00	15.99–0.03	15.46–0.03	00
9	00	16.29–0.03	15.58–0.04	00



**NOME OGGETTO: PKS 0422**

**ASCENS. RETTA (J2000.0): 04(h) 24(m) 47(s)**

**DECLINAZIONE (J2000.0): +00(°) 36( ) 06( )**

**REDSHIFT: 0.310**

$$V_{\text{medio}} = 17.10$$

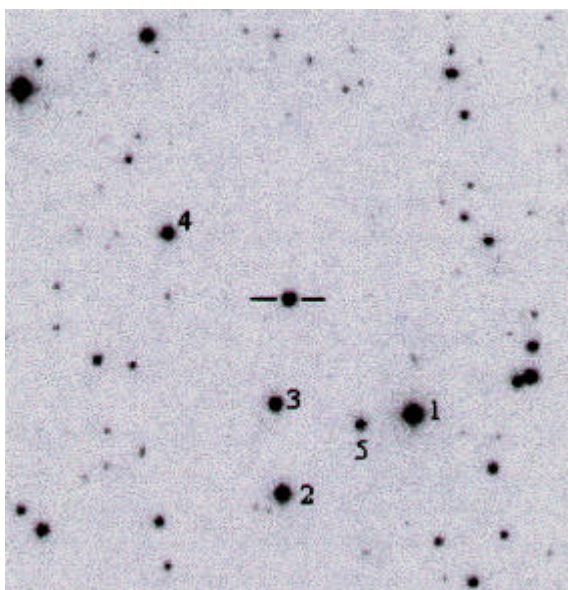
**TIPO OGGETTO: RBL**

$$A_V = 0.42$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	13.24–0.06	12.54–0.04	12.15–0.04	11.78–0.04
B	14.68–0.10	14.00–0.04	13.63–0.05	13.26–0.05





**NOME OGGETTO:** S5 0716

**ASCENS. RETTA (J2000.0):** 07(h) 21(m) 53(s)

**DECLINAZIONE (J2000.0):** +71(°) 20( ) 36( )

**REDSHIFT:** 0.300

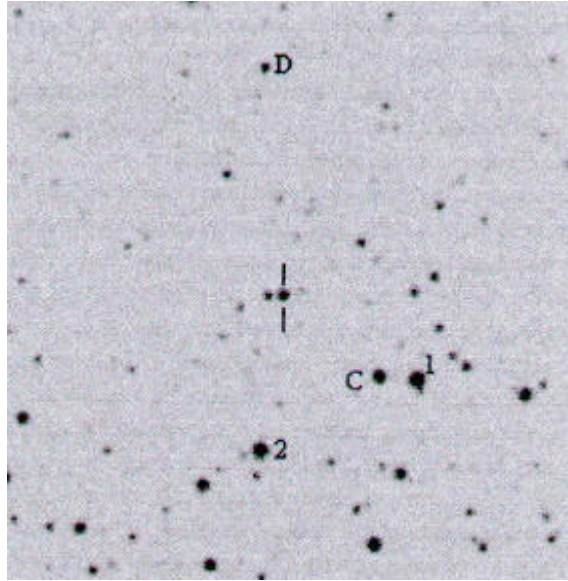
$$V_{\text{medio}} = 14.40$$

**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.23$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	12.07–0.06	11.51–0.04	11.21–0.04	10.92–0.04
2	13.06–0.08	12.43–0.05	12.10–0.05	11.78–0.05
3	14.11–0.08	13.54–0.06	13.20–0.05	12.84–0.05
4	14.24–0.05	13.64–0.04	13.28–0.04	12.94–0.04
5	00	14.97–0.04	14.62–0.05	14.25–0.05



**NOME OGGETTO:** PKS 0735

**ASCENS. RETTA (J2000.0):** 07(h) 38(m) 07(s)

**DECLINAZIONE (J2000.0):** +17(°) 42( ) 19( )

**REDSHIFT:** 0.424

$$V_{\text{medio}} = 15.40$$

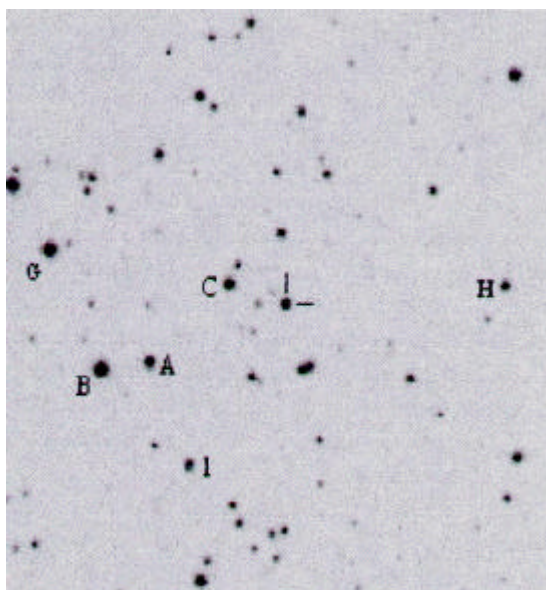
**TIPO OGGETTO:** RBL, OVV, sorgente<sup>-a</sup>

$$A_V = 0.26$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
C	00	14.44–0.05	13.84–0.04	13.33–0.06
D	00	15.88–0.05	15.44–0.04	15.08–0.04
1	00	13.24–0.06	12.91–0.04	12.59–0.07
2	00	13.30–0.07	12.81–0.05	12.37–0.07





**NOME OGGETTO:** PKS 0754

**ASCENS. RETTA (J2000.0):** 07(h) 57(m) 07(s)

**DECLINAZIONE (J2000.0):** +09(°) 56( ) 35( )

**REDSHIFT:** 0.660

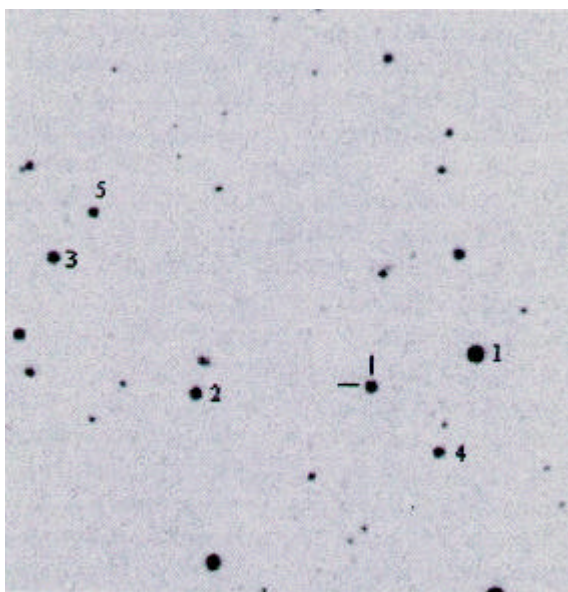
$V_{\text{medio}} = 15.00$

**TIPO OGGETTO:** RBL

$A_V = 0.16$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	00	14.48–0.03	14.15–0.03	13.84–0.04
B	00	13.02–0.03	12.66–0.03	12.30–0.04
C	00	14.80–0.05	14.33–0.05	13.90–0.04
G	00	13.28–0.05	12.88–0.05	12.49–0.05
H	00	15.68–0.08	15.25–0.07	14.85–0.06
1	00	15.29–0.06	14.94–0.06	14.58–0.06



**NOME OGGETTO:** 1ES 0806

**ASCENS. RETTA (J2000.0):** 08(h) 09(m) 49(s)

**DECLINAZIONE (J2000.0):** +52(°) 18( ) 58( )

**REDSHIFT:** 0.138

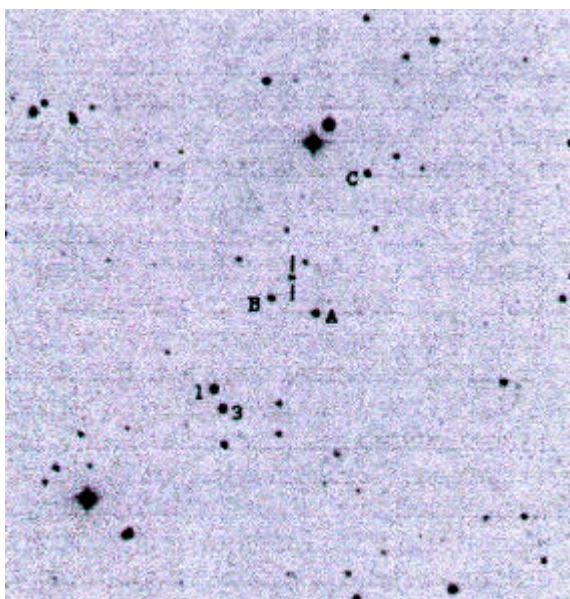
$$V_{\text{medio}} = 15.00$$

**TIPO OGGETTO:** XBL

$$A_V =$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	13.04–0.05	12.56–0.05	12.14–0.05
2	00	14.61–0.05	14.22–0.04	13.86–0.04
3	00	14.77–0.05	14.39–0.05	14.04–0.05
4	00	15.49–0.06	15.14–0.06	14.81–0.06
5	00	15.62–0.06	15.32–0.05	14.99–0.06



**NOME OGGETTO:** OJ 248

**ASCENS. RETTA (J2000.0):** 08(h) 30(m) 52(s)

**DECLINAZIONE (J2000.0):** +24(°) 11( ) 00( )

**REDSHIFT:** 2.046

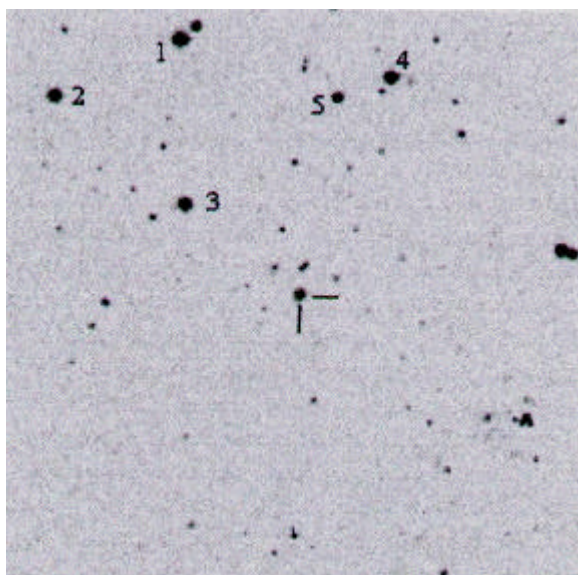
$$V_{\text{medio}} = 17.30$$

**TIPO OGGETTO:** FSRQ, sorgente<sup>a</sup>

$$A_V = 0.07$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	15.02–0.00	14.71–0.00	14.43–0.00	00
B	16.34–0.00	15.77–0.00	15.36–0.00	00
C	16.08–0.00	15.57–0.00	15.12–0.00	00
1	00	14.16–0.04	13.76–0.02	00
3	00	14.76–0.04	14.32–0.02	00



**NOME OGGETTO: PKS 0829**

**ASCENS. RETTA (J2000.0): 08(h) 31(m) 49(s)**

**DECLINAZIONE (J2000.0): +04(°) 29( ) 39( )**

**REDSHIFT: 0.180**

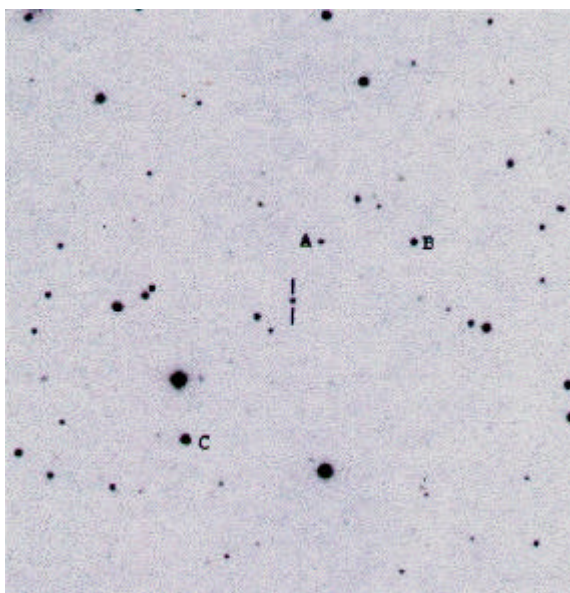
$$V_{\text{medio}} = 16.00$$

**TIPO OGGETTO: RBL**

$$A_V = 0.18$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	12.90–0.04	12.47–0.06	12.10–0.05
2	00	13.58–0.05	13.27–0.06	12.93–0.06
3	14.14–0.07	13.61–0.03	13.23–0.05	12.91–0.05
4	00	13.61–0.05	13.19–0.06	12.85–0.06
5	00	15.64–0.06	14.77–0.06	13.93–0.06



**NOME OGGETTO:** 4C 71.07

**ASCENS. RETTA (J2000.0):** 08(h) 41(m) 24(s)

**DECLINAZIONE (J2000.0):** +70(°) 53( ) 42( )

**REDSHIFT:** 2.172

$$V_{\text{medio}} = 17.00$$

**TIPO OGGETTO:** FSRQ, sorgente<sup>a</sup>

$$A_V = 0.08$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	18.36-0.00	17.60-0.00	16.59-0.00	00
B	15.94-0.00	15.30-0.00	14.85-0.00	00
C	14.44-0.00	13.91-0.00	13.53-0.00	00



**NOME OGGETTO:** OJ 287

**ASCENS. RETTA (J2000.0):** 08(h) 54(m) 49(s)

**DECLINAZIONE (J2000.0):** +20(°) 06( ) 31( )

**REDSHIFT:** 0.306

$$V_{\text{medio}} = 15.10$$

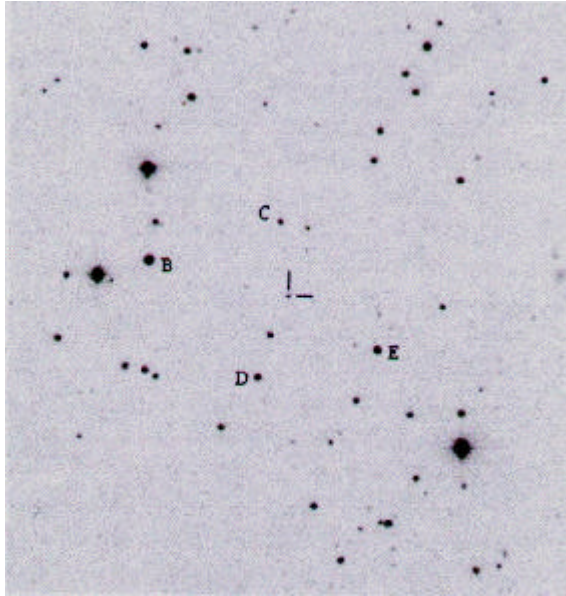
**TIPO OGGETTO:** RBL, OVV, sorgente-<sup>a</sup>

$$A_V = 0.16$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
4	15.02–0.08	14.18–0.04	13.74–0.04	13.28–0.04
10	15.05–0.08	14.60–0.05	14.34–0.05	14.03–0.05
11	15.40–0.10	14.94–0.04	14.64–0.04	14.32–0.04
1	00	15.88–0.07	15.50–0.07	15.08–0.07
2	00	16.12–0.08	15.66–0.08	15.21–0.08





**NOME OGGETTO:** 3C 216

**ASCENS. RETTA (J2000.0):** 09(h) 09(m) 33(s)

**DECLINAZIONE (J2000.0):** +42(°) 53( ) 47( )

**REDSHIFT:** 0.668

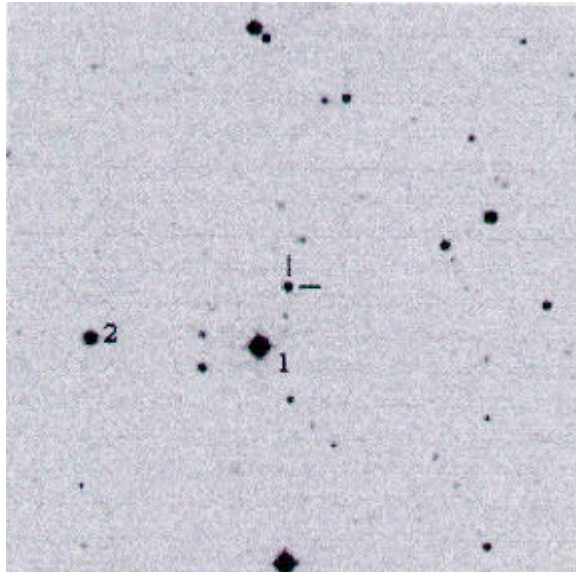
$$V_{\text{medio}} = 18.40$$

**TIPO OGGETTO:** FSRQ, sorgente<sup>-a</sup>

$$A_V = 0.03$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
B	15.04-0.00	14.10-0.00	13.54-0.00	00
C	17.44-0.00	16.87-0.00	16.38-0.00	00
D	17.14-0.00	16.21-0.00	15.70-0.00	00
E	16.56-0.00	15.29-0.00	14.58-0.00	00



**NOME OGGETTO:** B2 0912

**ASCENS. RETTA (J2000.0):** 09(h) 15(m) 52(s)

**DECLINAZIONE (J2000.0):** +29(°) 33(') 23(")

**REDSHIFT:**

$$V_{\text{medio}} = 16.40$$

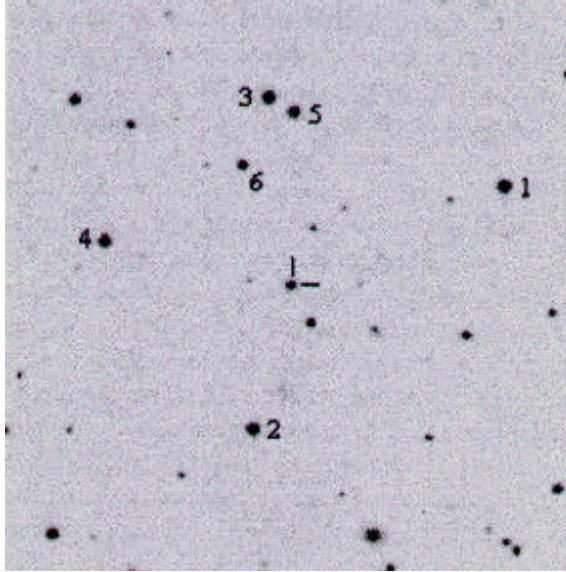
**TIPO OGGETTO:** XBL

$$A_V = 0.17$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	11.54–0.08	10.86–0.06	10.20–0.05
2	00	13.26–0.20	13.06–0.05	12.78–0.06





**NOME OGGETTO:** S4 0954

**ASCENS. RETTA (J2000.0):** 09(h) 58(m) 47(s)

**DECLINAZIONE (J2000.0):** +65(°) 33( ) 55( )

**REDSHIFT:** 0.367

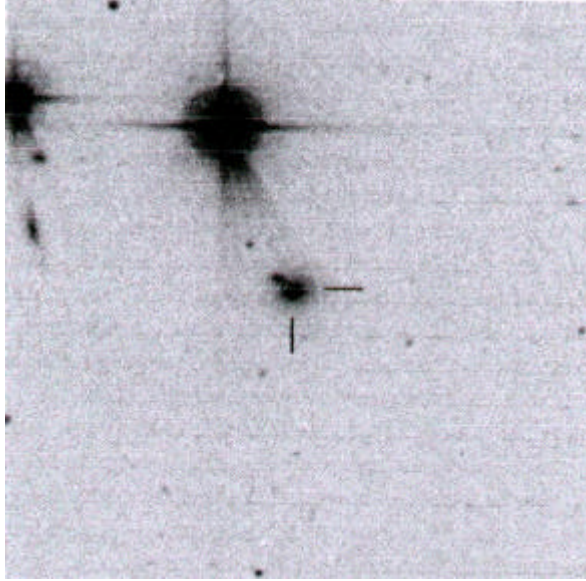
$$V_{\text{medio}} = 17.10$$

**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.22$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	14.38–0.05	13.96–0.05	13.58–0.05
2	00	14.64–0.08	14.09–0.06	13.67–0.07
3	00	14.91–0.06	14.21–0.05	13.56–0.04
4	00	15.32–0.06	14.39–0.05	13.55–0.05
5	00	15.75–0.06	15.18–0.08	14.73–0.06
6	00	16.16–0.09	15.59–0.07	15.11–0.07



**NOME OGGETTO: MRK 421**

**ASCENS. RETTA (J2000.0): 11(h) 04(m) 27(s)**

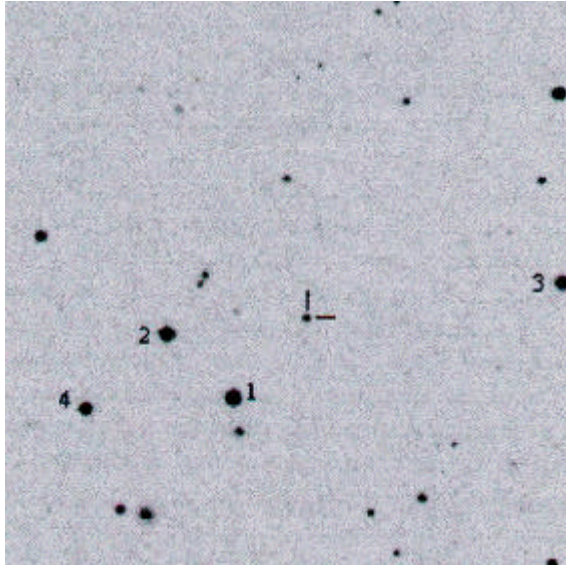
**DECLINAZIONE (J2000.0): +38(°) 12(') 32(")**

**REDSHIFT: 0.031**

$$V_{\text{medio}} = 14.40$$

**TIPO OGGETTO: XBL, sorgente<sup>a</sup>**

$$A_{\text{v}} = 0.09$$



**NOME OGGETTO:** B2 1147

**ASCENS. RETTA (J2000.0):** 11(h) 50(m) 19(s)

**DECLINAZIONE (J2000.0):** +24(°) 17(') 54(")

**REDSHIFT:** 0.200

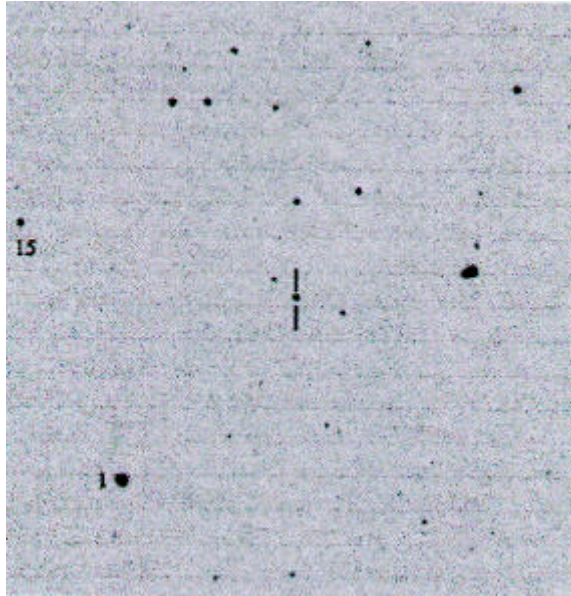
$$V_{\text{medio}} = 16.20$$

**TIPO OGGETTO:** RBL

$$A_V = 0.12$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	13.10–0.10	12.52–0.05	12.18–0.05	11.81–0.05
2	13.46–0.10	12.68–0.05	12.32–0.05	11.94–0.05
3	00	13.13–0.05	12.78–0.06	12.47–0.06
4	00	13.68–0.06	13.18–0.06	12.64–0.06



**NOME OGGETTO:** 4C 29.45

**ASCENS. RETTA (J2000.0):** 11(h) 59(m) 32(s)

**DECLINAZIONE (J2000.0):** +29(°) 14( ) 42( )

**REDSHIFT:** 0.729

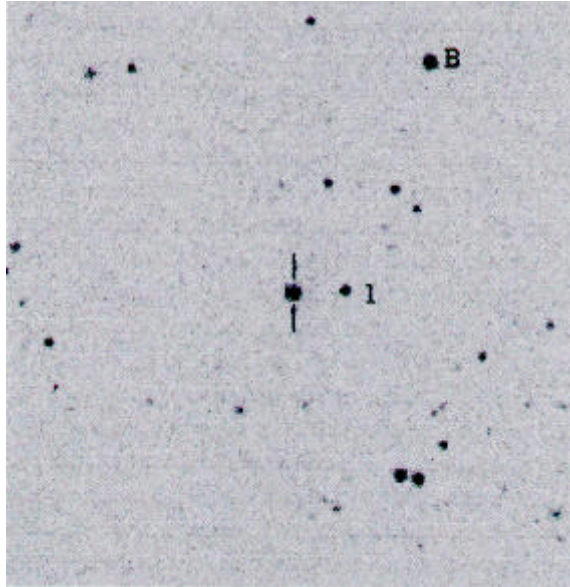
$$V_{\text{medio}} = 15.70$$

**TIPO OGGETTO:** FSRQ, sorgente<sup>-a</sup>

$$A_V = 0.10$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	14.01–0.06	13.39–0.05	13.01–0.02	00
15	17.14–0.05	16.60–0.05	16.30–0.04	15.88–0.30



**NOME OGGETTO: B2 1215**

**ASCENS. RETTA (J2000.0): 12(h) 17(m) 52(s)**

**DECLINAZIONE (J2000.0): +30(°) 07(') 00(")**

**REDSHIFT: 0.237**

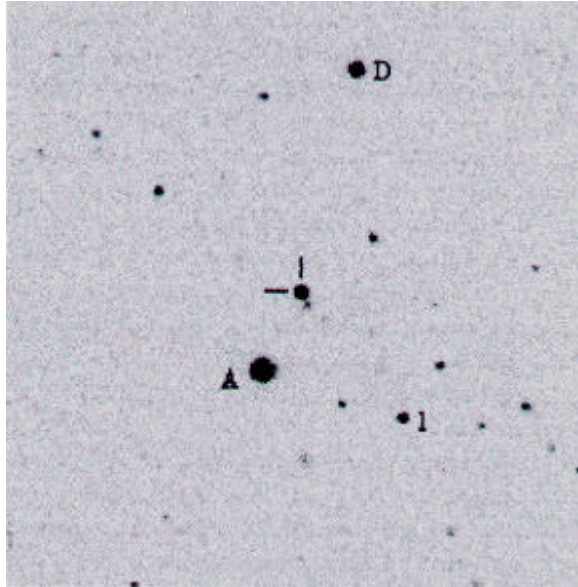
$$V_{\text{medio}} = 15.60$$

**TIPO OGGETTO: XBL, OVV**

$$A_V = 0.10$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
B	00	14.96–0.04	14.59–0.04	14.21–0.04
1	00	16.50–0.14	16.21–0.11	15.92–0.15



**NOME OGGETTO:** ON 231

**ASCENS. RETTA (J2000.0):** 12(h) 21(m) 32(s)

**DECLINAZIONE (J2000.0):** +28(°) 13(') 58(")

**REDSHIFT:** 0.102

$$V_{\text{medio}} = 16.50$$

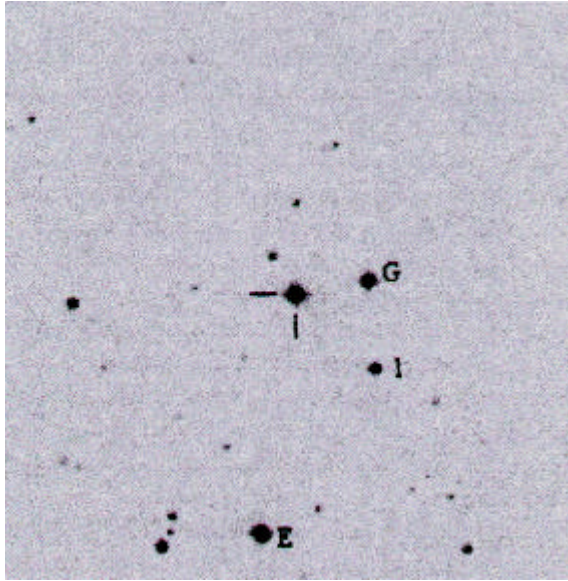
**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.17$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	12.64–0.06	12.08–0.04	11.72–0.04	11.40–0.04
D	00	14.81–0.04	13.86–0.04	12.68–0.04
1	00	16.60–0.12	16.03–0.10	15.50–0.11





**NOME OGGETTO:** 3C 273

**ASCENS. RETTA (J2000.0):** 12(h) 29(m) 07(s)

**DECLINAZIONE (J2000.0):** +02(°) 03(') 08(")

**REDSHIFT:** 0.158

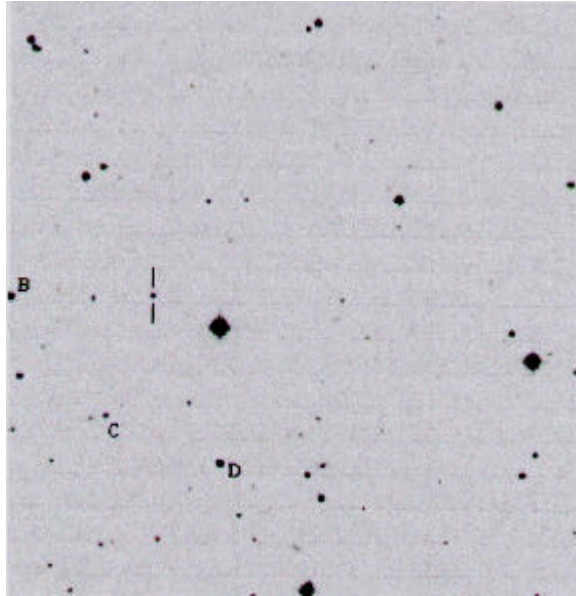
$$V_{\text{medio}} = 12.80$$

**TIPO OGGETTO:** FSRQ, LPQ, sorgente<sup>-a</sup>

$$A_V = 0.11$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
G	14.09–0.05	13.54–0.04	13.19–0.03	12.86–0.04
E	00	12.72–0.03	12.31–0.03	11.90–0.03
1	00	14.89–0.05	14.22–0.04	13.60–0.05



**NOME OGGETTO:** PKS 1229

**ASCENS. RETTA (J2000.0):** 12(h) 32(m) 00(s)

**DECLINAZIONE (J2000.0):** -02(°) 24( ) 06( )

**REDSHIFT:** 1.045

$$V_{\text{medio}} = 16.50$$

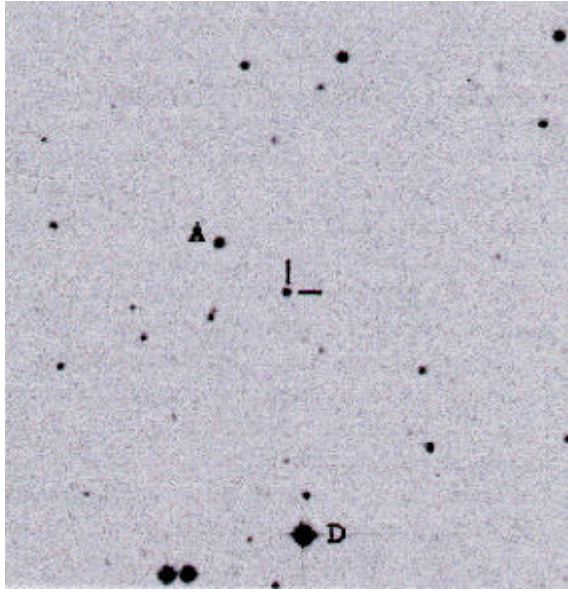
**TIPO OGGETTO:** FSRQ, sorgente<sup>-a</sup>

$$A_V = 0.03$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
B	16.74-0.00	15.97-0.00	15.51-0.00	00
C	17.79-0.00	17.24-0.00	16.92-0.00	00
D	16.50-0.00	15.74-0.00	15.31-0.00	00





**NOME OGGETTO:** 3C 279

**ASCENS. RETTA (J2000.0):** 12(h) 56(m) 11(s)

**DECLINAZIONE (J2000.0):** -05(°) 47(') 22(")

**REDSHIFT:** 0.538

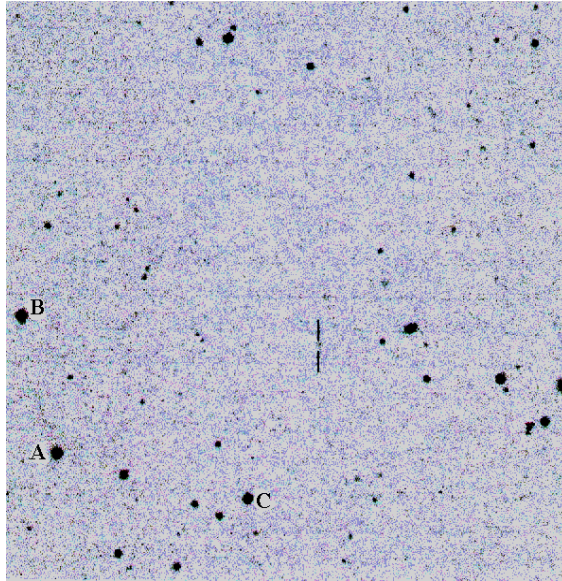
$$V_{\text{medio}} = 15.40$$

**TIPO OGGETTO:** FSRQ, HPQ, sorgente-<sup>a</sup>

$$A_V = 0.13$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	16.84-0.03	15.84-0.03	15.46-0.03	00
D	13.05-0.03	12.39-0.03	12.06-0.03	00



**NOME OGGETTO:** B2 1308

**ASCENS. RETTA (J2000.0):** 13(h) 10(m) 29(s)

**DECLINAZIONE (J2000.0):** +32(°) 20(') 44(")

**REDSHIFT:** 0.996

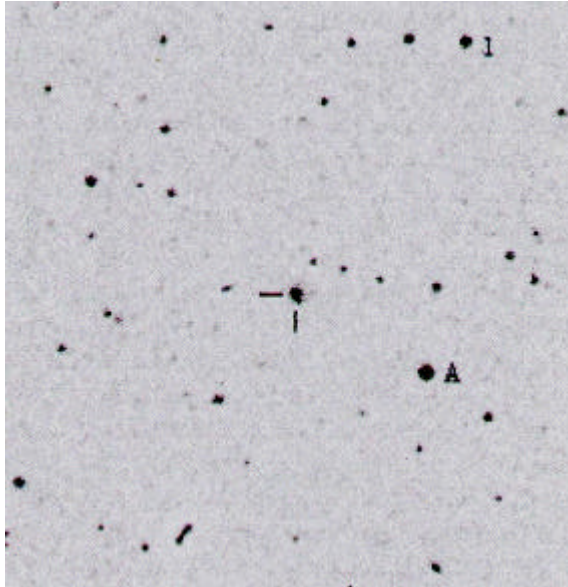
$$V_{\text{medio}} = 17.10$$

**TIPO OGGETTO:** RBL, HPQ

$$A_V =$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	13.53–0.03	13.05–0.04	12.71–0.04	12.38–0.04
B	13.38–0.02	12.73–0.03	12.35–0.03	12.03–0.03
C	14.39–0.07	13.56–0.03	13.20–0.03	12.84–0.03
F	14.67–0.07	14.31–0.10	13.88–0.20	13.72–0.14



**NOME OGGETTO: 1E 1415**

**ASCENS. RETTA (J2000.0): 14(h) 17(m) 57(s)**

**DECLINAZIONE (J2000.0): +25(°) 43(') 26(")**

**REDSHIFT: 0.237**

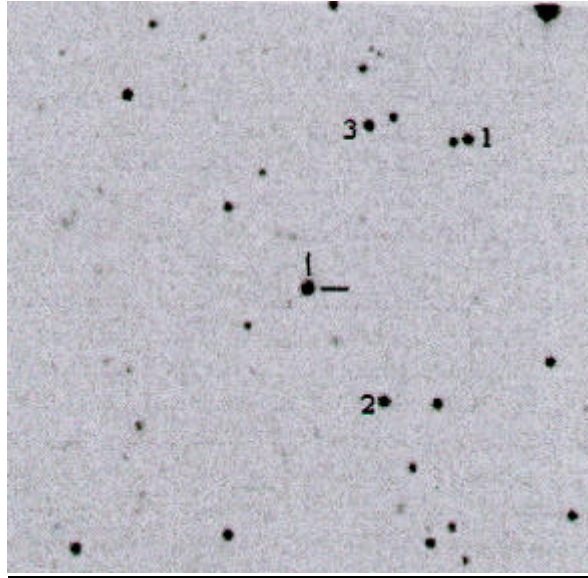
$V_{\text{medio}} = 16.00$

**TIPO OGGETTO: XBL**

$A_V = 0.10$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	00	14.35-0.04	13.78-0.04	13.29-0.04
1	00	16.39-0.07	15.47-0.07	14.25-0.06



**NOME OGGETTO:** OQ 530

**ASCENS. RETTA (J2000.0):** 14(h) 19(m) 47(s)

**DECLINAZIONE (J2000.0):** +54(°) 23(') 15(")

**REDSHIFT:** 0.152

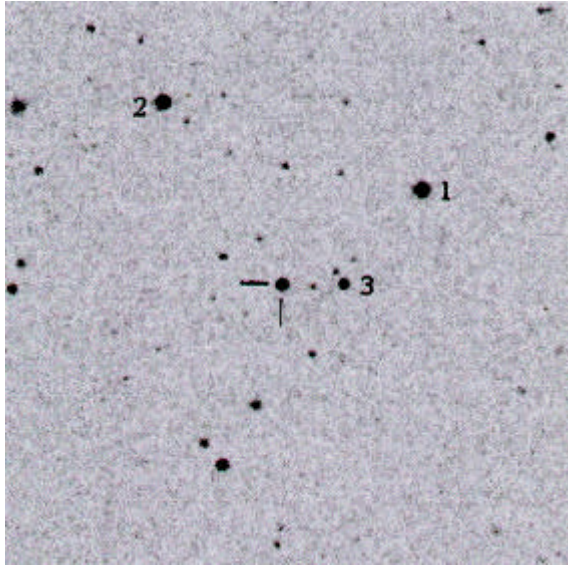
$$V_{\text{medio}} = 15.30$$

**TIPO OGGETTO:** RBL

$$A_V = 0.07$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	15.79–0.08	15.40–0.10	14.89–0.08
2	00	15.90–0.12	15.31–0.07	14.70–0.07
3	00	15.92–0.10	15.47–0.08	14.89–0.07



**NOME OGGETTO:** PKS 1424

**ASCENS. RETTA (J2000.0):** 14(h) 27(m) 00(s)

**DECLINAZIONE (J2000.0):** +23(°) 48( ) 01( )

**REDSHIFT:**

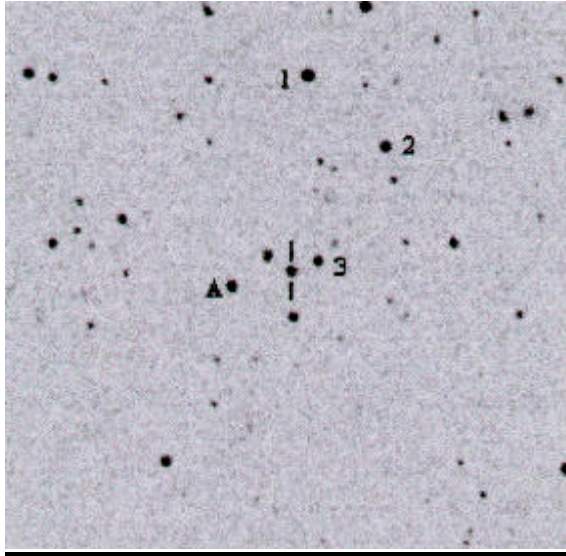
$$V_{\text{medio}} = 15.40$$

**TIPO OGGETTO:** XBL

$$A_V = 0.17$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	14.25–0.10	13.59–0.04	13.20–0.04	12.80–0.04
2	00	13.70–0.05	13.32–0.05	12.91–0.04
3	00	15.91–0.08	15.57–0.08	15.21–0.08



**NOME OGGETTO:** 1E 1458

**ASCENS. RETTA (J2000.0):** 15(h) 01(m) 02(s)

**DECLINAZIONE (J2000.0):** +22(°) 38( ) 04( )

**REDSHIFT:** 0.235

$$V_{\text{medio}} = 16.80$$

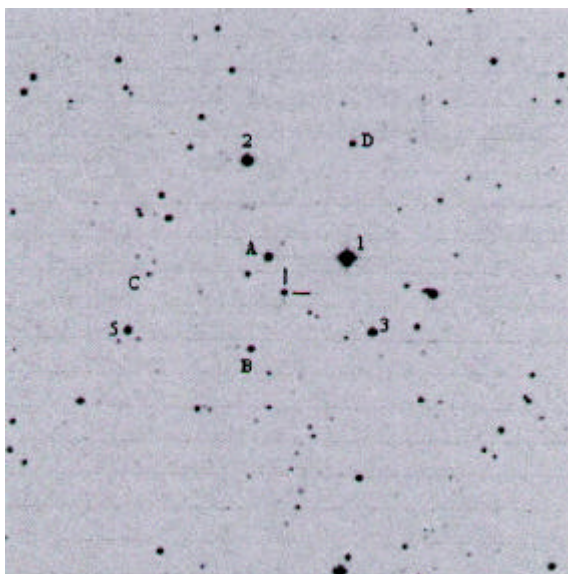
**TIPO OGGETTO:** XBL

$$A_V = 0.20$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	00	15.58-0.06	15.08-0.05	14.57-0.05
1	00	14.90-0.05	14.55-0.05	14.19-0.05
2	00	15.36-0.06	14.93-0.05	14.47-0.06
3	00	16.44-0.09	16.44-0.07	14.45-0.09





**NOME OGGETTO:** PKS 1510

**ASCENS. RETTA (J2000.0):** 15(h) 12(m) 50(s)

**DECLINAZIONE (J2000.0):** -09(°) 05( ) 59( )

**REDSHIFT:** 0.360

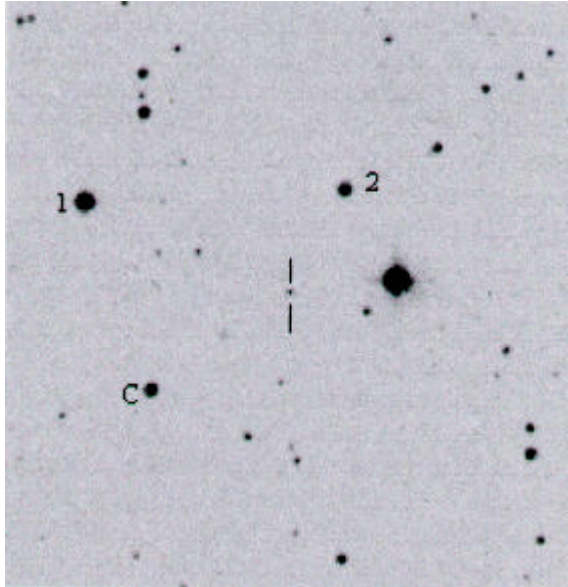
$$V_{\text{medio}} = 17.30$$

**TIPO OGGETTO:** FSRQ, sorgente-<sup>a</sup>

$$A_V = 0.43$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	15.31-0.00	14.62-0.00	14.25-0.00	00
B	16.20-0.00	15.18-0.00	14.63-0.00	00
C	18.15-0.00	17.52-0.00	16.93-0.00	00
D	17.27-0.00	16.53-0.00	16.10-0.00	00
1	12.13-0.03	11.54-0.02	11.14-0.02	00
2	13.65-0.03	13.17-0.02	12.88-0.03	00
3	15.06-0.04	14.35-0.02	13.95-0.03	00
5	15.43-0.05	14.70-0.05	14.35-0.05	00



**NOME OGGETTO:** DA 406

**ASCENS. RETTA (J2000.0):** 16(h) 13(m) 41(s)

**DECLINAZIONE (J2000.0):** +34(°) 12( ) 48( )

**REDSHIFT:** 1.404

$$V_{\text{medio}} = 17.20$$

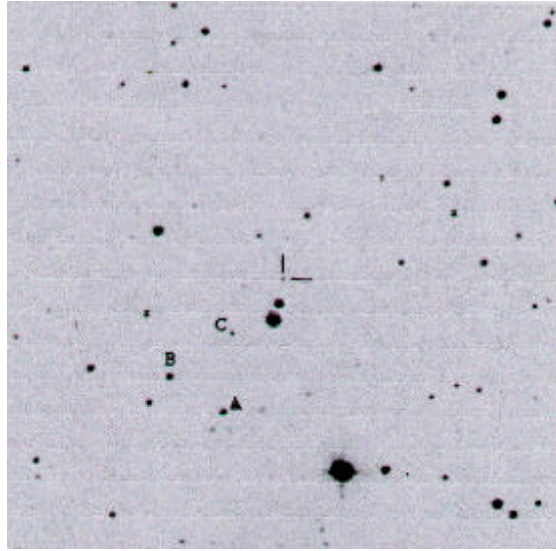
**TIPO OGGETTO:** FSRQ, LPQ, sorgente<sup>-a</sup>

$$A_V = 0.09$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
C	00	14.13–0.04	13.69–0.04	13.29–0.04
1	00	12.14–0.03	11.63–0.03	11.14–0.03
2	00	13.71–0.03	13.34–0.03	13.00–0.03





**NOME OGGETTO:** B2 1633

**ASCENS. RETTA (J2000.0):** 16(h) 35(m) 15(s)

**DECLINAZIONE (J2000.0):** +38(°) 08( ) 04( )

**REDSHIFT:** 1.814

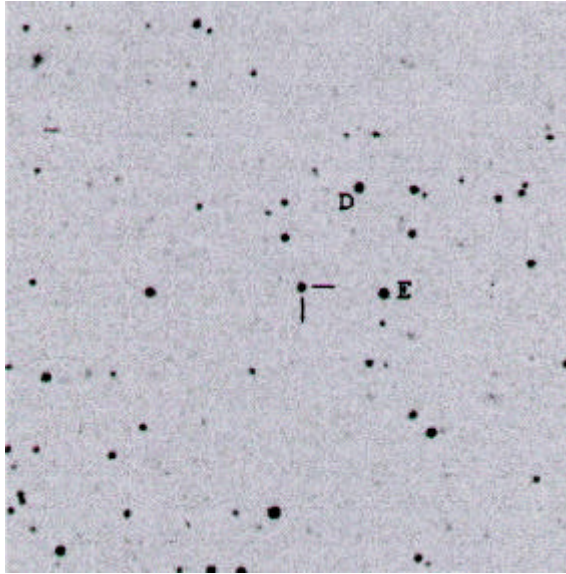
$$V_{\text{medio}} = 17.20$$

**TIPO OGGETTO:** FSRQ, sorgente<sup>-a</sup>

$$A_V = 0.07$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	16.39-0.00	15.83-0.00	15.48-0.00	00
B	16.69-0.00	15.91-0.00	15.44-0.00	00
C	19.06-0.00	17.91-0.00	17.22-0.00	00



**NOME OGGETTO:** 3C 345

**ASCENS. RETTA (J2000.0):** 16(h) 41(m) 18(s)

**DECLINAZIONE (J2000.0):** +39(°) 54(') 11(")

**REDSHIFT:** 0.595

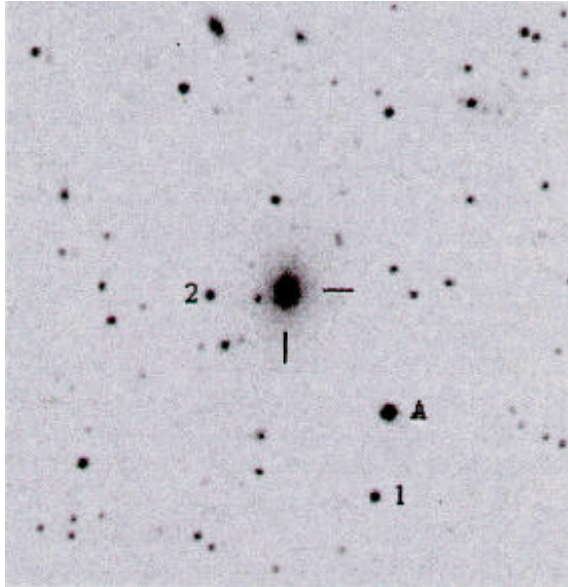
$$V_{\text{medio}} = 17.00$$

**TIPO OGGETTO:** FSRQ, HPQ, sorgente-<sup>a</sup>

$$A_V = 0.05$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
D	16.10–0.06	15.22–0.06	14.80–0.05	14.37–0.07
E	16.43–0.09	15.17–0.07	14.51–0.04	13.86–0.08



**NOME OGGETTO: MRK 501**

**ASCENS. RETTA (J2000.0): 16(h) 53(m) 52(s)**

**DECLINAZIONE (J2000.0): +39(°) 45(') 37(")**

**REDSHIFT: 0.033**

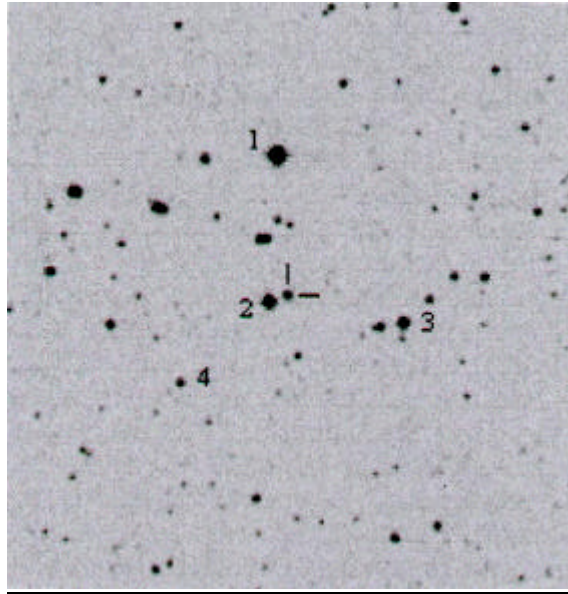
$$V_{\text{medio}} = 16.70$$

**TIPO OGGETTO: XBL, sorgente<sup>a</sup>**

$$A_V = 0.10$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	13.55–0.05	12.61–0.03	12.15–0.03	11.65–0.04
1	00	15.30–0.07	14.91–0.07	14.56–0.07
2	00	15.68–0.08	14.97–0.08	14.34–0.08



**NOME OGGETTO:** H 1722

**ASCENS. RETTA (J2000.0):** 17(h) 25(m) 04(s)

**DECLINAZIONE (J2000.0):** +11(°) 52(') 15(")

**REDSHIFT:** 0.159

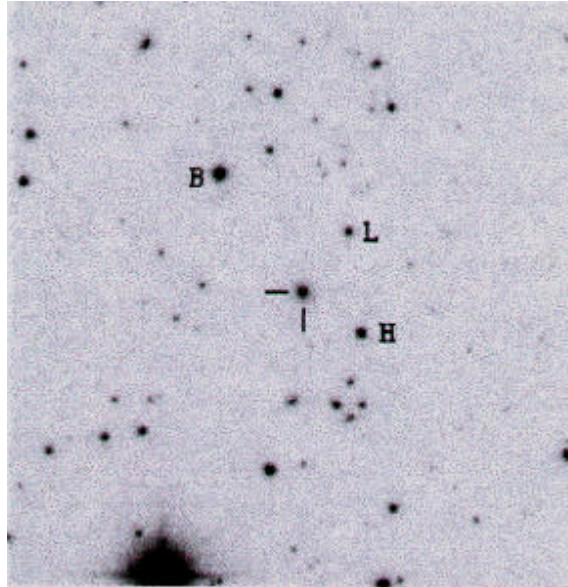
$$V_{\text{medio}} = 15.80$$

**TIPO OGGETTO:** XBL, HPQ

$$A_V = 0.51$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	13.77–0.10	11.98–0.05	10.94–0.05	9.75–0.05
2	14.16–0.10	13.21–0.05	12.62–0.05	12.10–0.05
3	14.82–0.12	14.10–0.05	13.63–0.05	13.18–0.05
4	00	15.74–0.08	15.14–0.08	14.70–0.07



**NOME OGGETTO:** IZW 187

**ASCENS. RETTA (J2000.0):** 17(h) 28(m) 19(s)

**DECLINAZIONE (J2000.0):** +50(°) 13(') 11(")

**REDSHIFT:** 0.055

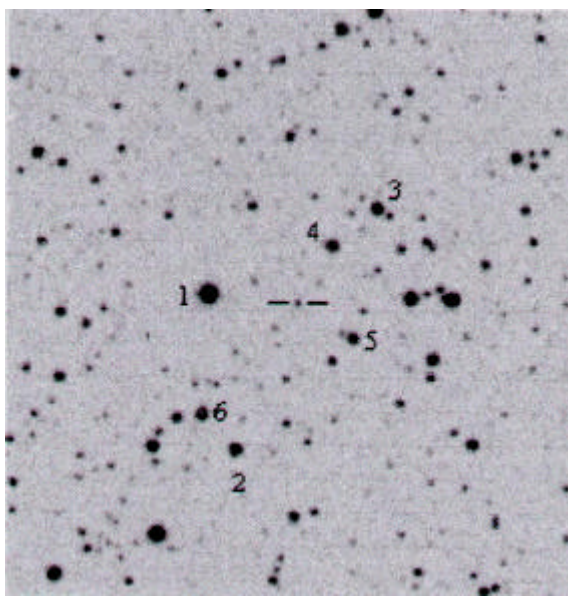
$$V_{\text{medio}} = 16.70$$

**TIPO OGGETTO:** XBL

$$A_V = 0.15$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
B	00	13.14–0.06	12.81–0.06	12.49–0.06
H	00	15.29–0.06	14.99–0.06	14.66–0.06
L	00	16.10–0.09	15.71–0.08	15.35–0.08



**NOME OGGETTO:** OT 081

**ASCENS. RETTA (J2000.0):** 17(h) 51(m) 33(s)

**DECLINAZIONE (J2000.0):** +09(°) 39( ) 01( )

**REDSHIFT:** 0.322

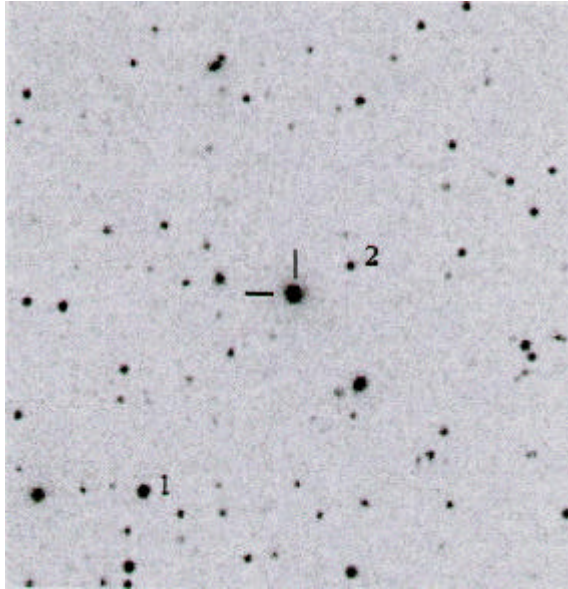
$$V_{\text{medio}} = 17.40$$

**TIPO OGGETTO:** FSRQ, RBL

$$A_V = 0.57$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	11.95–0.04	11.45–0.04	11.00–0.03
2	00	14.17–0.04	13.75–0.04	13.38–0.04
3	00	14.23–0.04	13.80–0.04	13.39–0.04
4	00	14.36–0.04	13.94–0.04	13.55–0.04
5	00	14.89–0.04	14.45–0.04	14.02–0.04
6	00	14.91–0.05	14.32–0.05	13.88–0.04



**NOME OGGETTO:** 3C 371

**ASCENS. RETTA (J2000.0):** 18(h) 06(m) 51(s)

**DECLINAZIONE (J2000.0):** +69(°) 49(') 28(")

**REDSHIFT:** 0.051

$$V_{\text{medio}} = 14.40$$

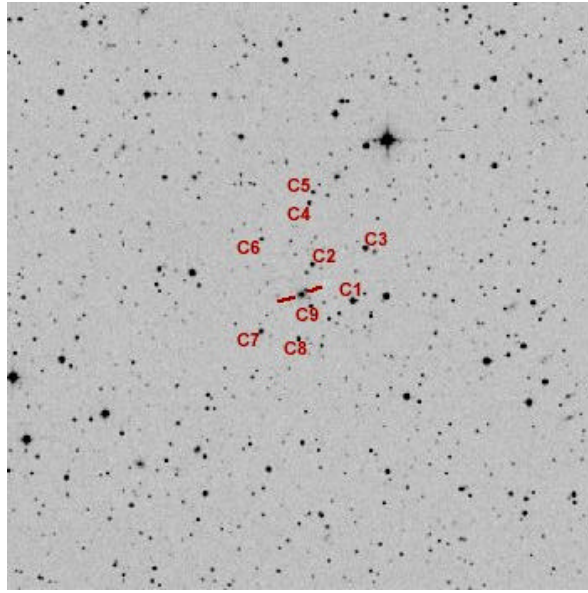
**TIPO OGGETTO:** RBL, OVV

$$A_V = 0.26$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	14.26–0.06	13.78–0.06	13.42–0.06
2	00	16.31–0.10	15.95–0.10	15.60–0.10





**NOME OGGETTO:** 1ES 1959+65

**ASCENS. RETTA (J2000.0):** 19(h) 59(m) 59(s)

**DECLINAZIONE (J2000.0):** +65(°) 08(') 55(")

**REDSHIFT:** 0.047

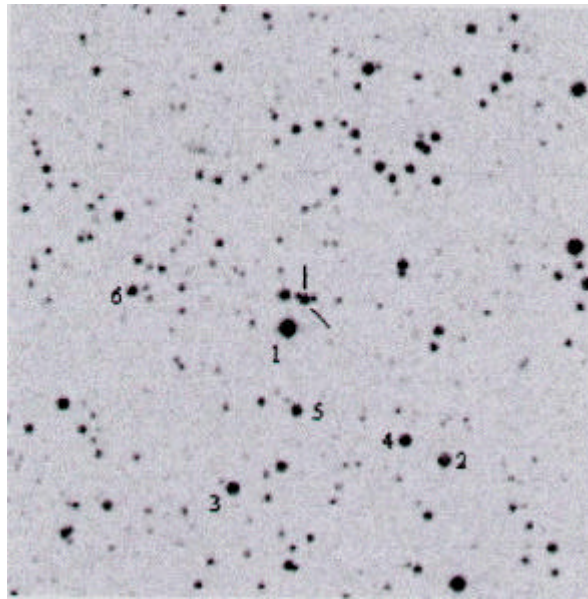
$$V_{\text{medio}} = 15.00$$

**TIPO OGGETTO:** XBL

$$A_V =$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
C1	00	13.12–0.02	12.49–0.04	00
C2	00	14.48–0.05	14.10–0.04	00
C3	00	14.58–0.05	13.94–0.02	00
C8	00	15.14–0.01	14.77–0.01	00
C7	00	15.25–0.01	14.74–0.04	00
C4	00	00	15.08–0.08	00
C9	00	16.26–0.06	15.58–0.17	00
C5	00	00	15.69–0.10	00



**NOME OGGETTO:** PKS 2032

**ASCENS. RETTA (J2000.0):** 20(h) 35(m) 22(s)

**DECLINAZIONE (J2000.0):** +10(°) 56(') 06(")

**REDSHIFT:** 0.601

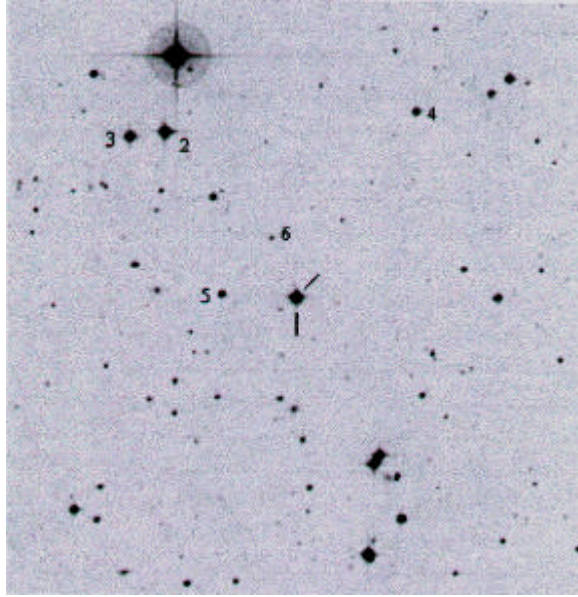
$$V_{\text{medio}} = 16.40$$

**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.49$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	11.77-0.04	11.44-0.04	11.14-0.03
2	00	14.04-0.05	13.50-0.05	13.02-0.05
3	00	14.41-0.05	13.87-0.05	13.38-0.05
4	00	14.53-0.04	14.03-0.04	13.58-0.04
5	00	14.89-0.07	14.48-0.06	14.06-0.07
6	00	15.36-0.06	14.56-0.06	13.85-0.05



**NOME OGGETTO:** PKS 2155

**ASCENS. RETTA (J2000.0):** 21(h) 58(m) 52(s)

**DECLINAZIONE (J2000.0):** -30(°) 13( ) 31( )

**REDSHIFT:** 0.117

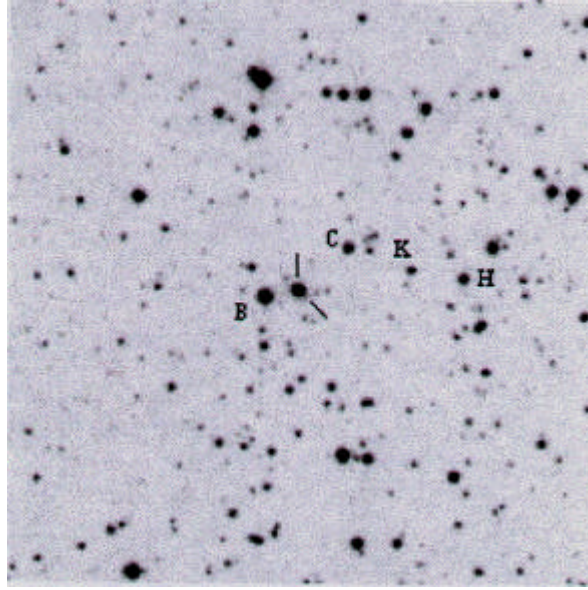
$$V_{\text{medio}} = 13.50$$

**TIPO OGGETTO:** XBL, sorgente<sup>a</sup>

$$A_V = 0.11$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
2	12.74–0.01	12.05–0.01	11.67–0.01	11.30–0.02
3	13.90–0.01	13.00–0.01	12.47–0.02	12.04–0.02
4	14.93–0.01	14.28–0.01	13.92–0.02	13.92–0.02
5	16.01–0.03	15.35–0.03	15.01–0.04	14.69–0.03



**NOME OGGETTO:** BL LAC

**ASCENS. RETTA (J2000.0):** 22(h) 02(m) 43(s)

**DECLINAZIONE (J2000.0):** +42(°) 16( ) 40( )

**REDSHIFT:** 0.069

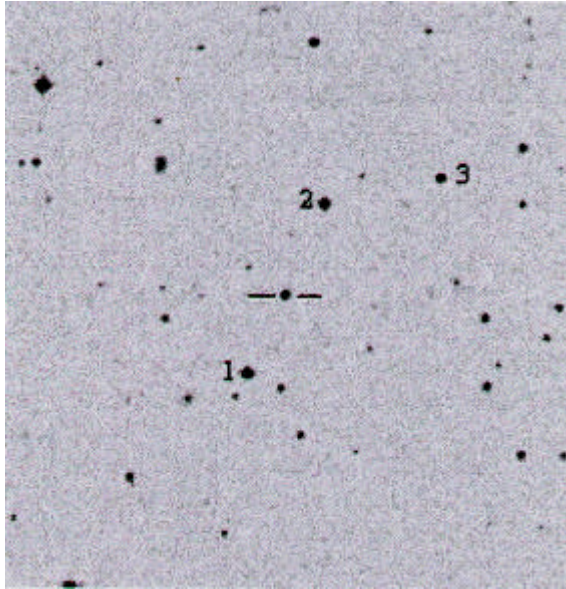
$$V_{\text{medio}} = 14.90$$

**TIPO OGGETTO:** RBL

$$A_V = 1.20$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
B	00	12.90–0.04	11.99–0.04	11.12–0.04
C	00	14.26–0.06	13.79–0.05	13.33–0.05
H	00	14.40–0.06	13.73–0.06	13.07–0.06
K	00	15.45–0.10	15.00–0.06	14.54–0.07



**NOME OGGETTO:** 3C 446

**ASCENS. RETTA (J2000.0):** 22(h) 25(m) 47(s)

**DECLINAZIONE (J2000.0):** -04(°) 57( ) 01( )

**REDSHIFT:** 1.404

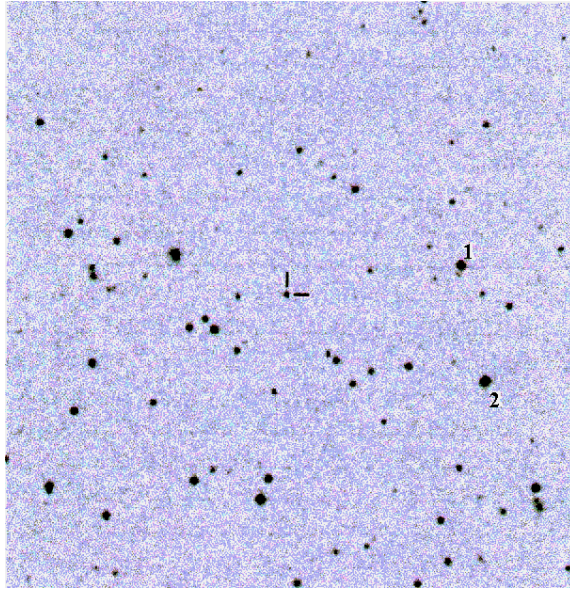
$$V_{\text{medio}} = 15.60$$

**TIPO OGGETTO:** RBL

$$A_V = 0.33$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	15.91-0.03	15.17-0.04	14.77-0.09	14.59-0.21
2	16.17-0.05	15.56-0.07	15.21-0.10	15.00-0.33
3	16.62-0.05	15.96-0.13	15.63-0.14	15.34-0.27



**NOME OGGETTO:** CTA 102

**ASCENS. RETTA (J2000.0):** 22(h) 32(m) 36(s)

**DECLINAZIONE (J2000.0):** +11(°) 43(') 51(")

**REDSHIFT:** 1.037

$$V_{\text{medio}} = 17.60$$

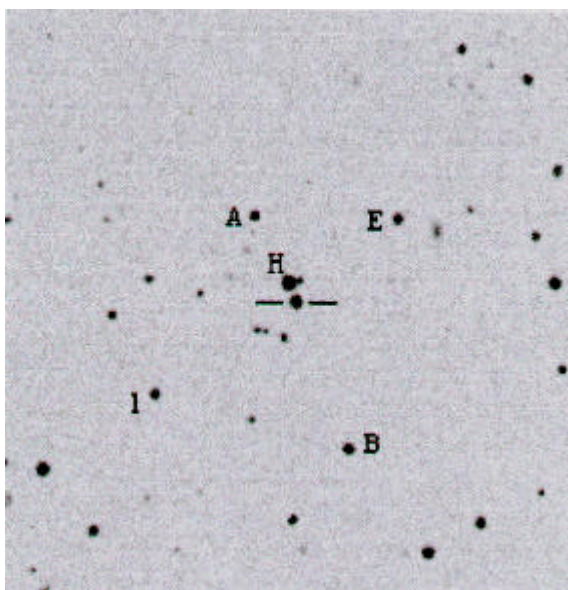
**TIPO OGGETTO:** FSRQ, HPQ, sorgente-<sup>a</sup>

$$A_V = 0.36$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	14.77-0.04	13.98-0.03	13.56-0.04	00
2	16.17-0.04	14.88-0.03	14.07-0.07	00





**NOME OGGETTO:** 3C 454.3

**ASCENS. RETTA (J2000.0):** 22(h) 53(m) 58(s)

**DECLINAZIONE (J2000.0):** +16(°) 08(') 53(")

**REDSHIFT:** 0.859

$$V_{\text{medio}} = 16.30$$

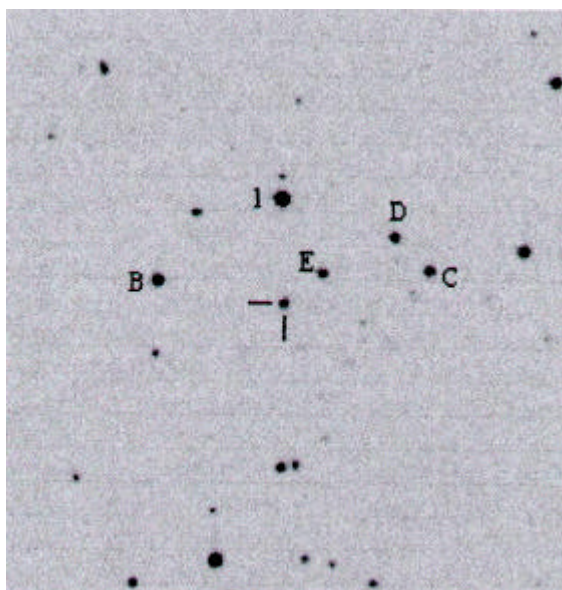
**TIPO OGGETTO:** FSRQ, HPQ, sorgente-<sup>a</sup>

$$A_V = 0.50$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
A	00	15.86–0.09	15.32–0.09	14.80–0.06
B	00	15.21–0.06	14.73–0.05	14.31–0.05
E	00	15.76–0.09	14.92–0.08	14.26–0.08
H	00	13.65–0.04	13.10–0.04	12.58–0.04
1	00	15.67–0.06	15.27–0.06	14.71–0.06





**NOME OGGETTO:** PKS 2254

**ASCENS. RETTA (J2000.0):** 22(h) 57(m) 17(s)

**DECLINAZIONE (J2000.0):** +07(°) 43(') 12(")

**REDSHIFT:** 0.190

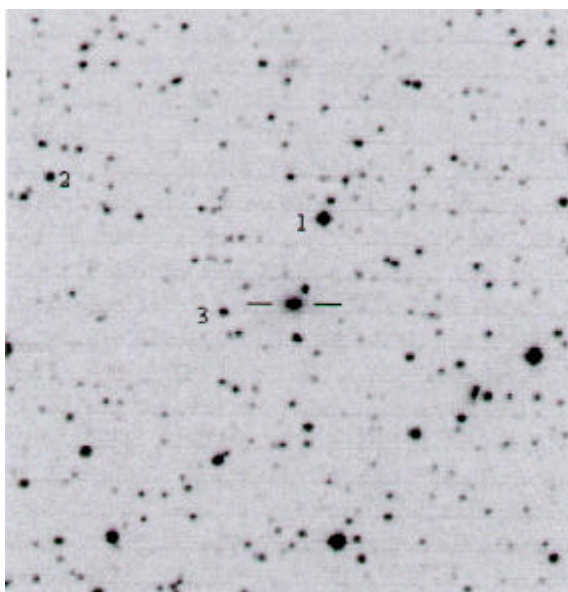
$$V_{\text{medio}} = 16.40$$

**TIPO OGGETTO:** RBL, sorgente<sup>a</sup>

$$A_V = 0.32$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
B	00	13.97–0.04	13.53–0.04	13.13–0.04
C	00	15.04–0.05	14.55–0.05	14.08–0.05
D	00	15.10–0.07	14.78–0.06	14.41–0.06
E	00	15.30–0.05	14.94–0.05	14.56–0.05
1	00	12.71–0.03	12.21–0.03	11.79–0.03



**NOME OGGETTO:** 1ES 2344

**ASCENS. RETTA (J2000.0):** 23(h) 47(m) 05(s)

**DECLINAZIONE (J2000.0):** +51(°) 42(') 18(")

**REDSHIFT:** 0.044

$$V_{\text{medio}} = 15.50$$

**TIPO OGGETTO:** XBL, sorgente-<sup>a</sup>

$$A_V =$$

**STELLE DI CONFRONTO:**

Nome	B	V	R	I
1	00	12.61–0.04	12.25–0.04	11.90–0.04
2	00	14.62–0.06	14.20–0.05	13.84–0.04
3	00	15.89–0.08	15.40–0.08	14.89–0.08

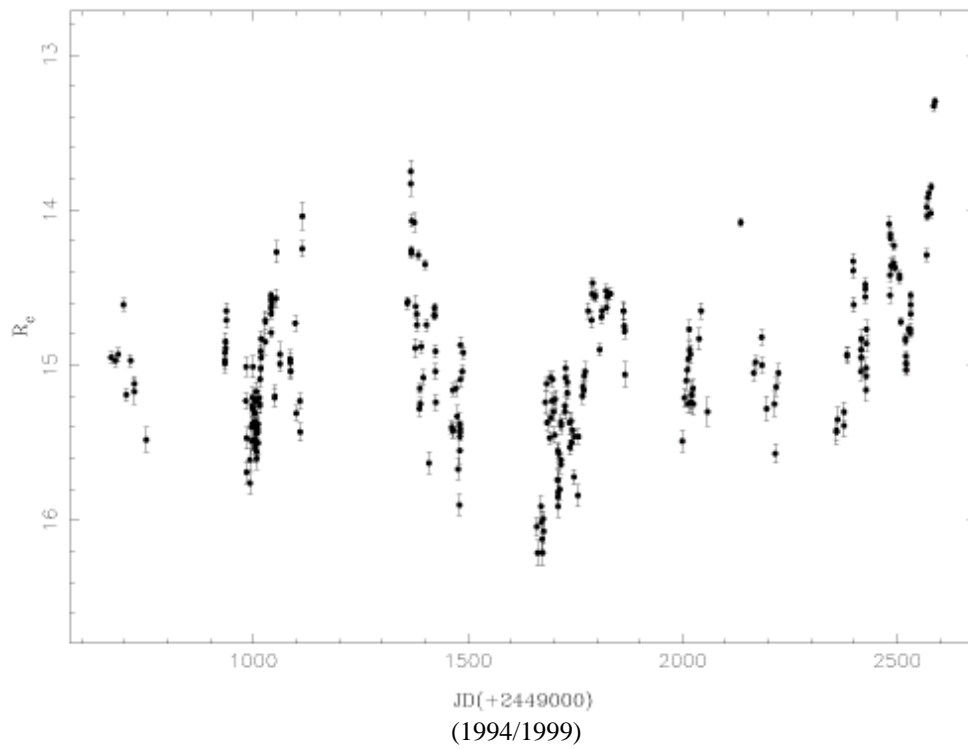
# *CURVE FOTOMETRICHE*

-- *Curve ottiche* --



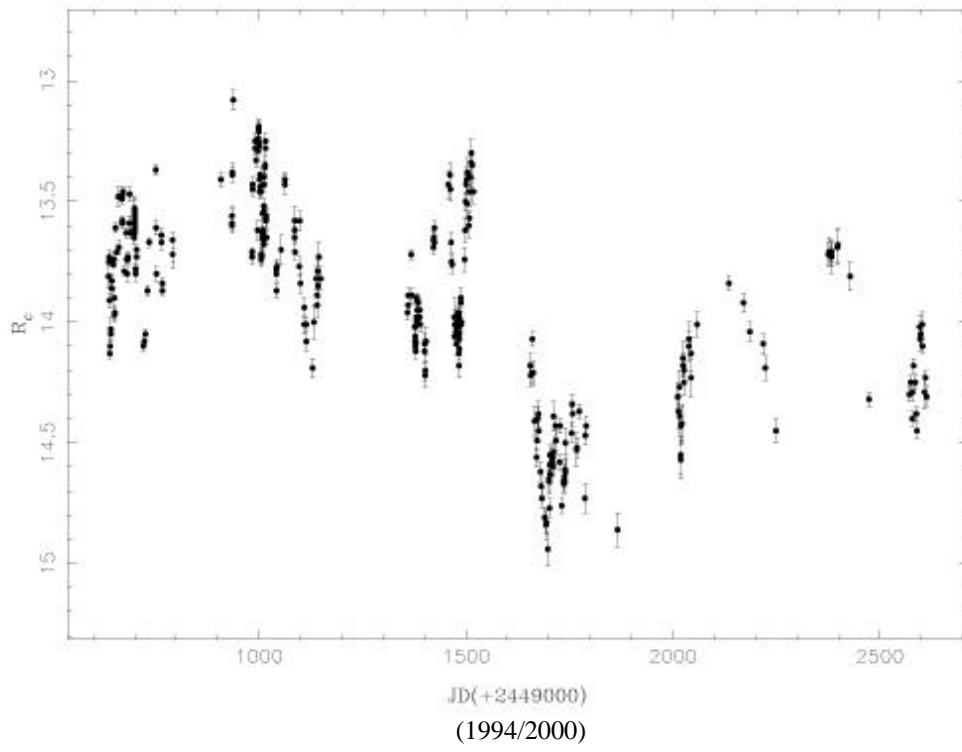
- Il telescopio di 40 cm di diametro dell'Osservatorio Astronomico dell'Università di Perugia.

## **GC 0109+224**

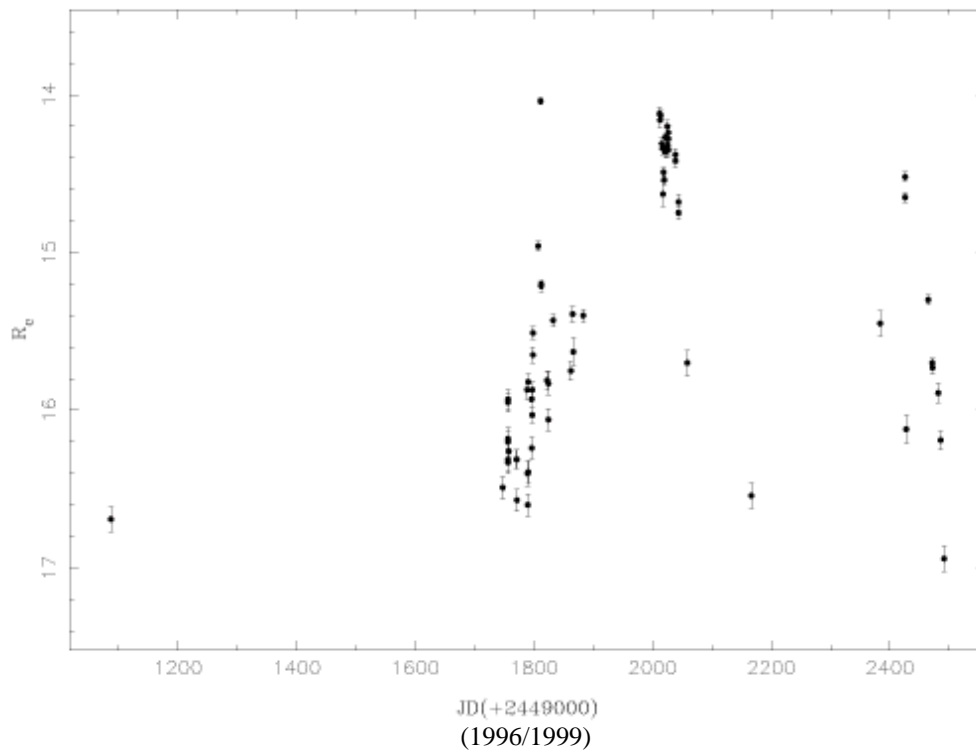


# 0219+428

3C 66A

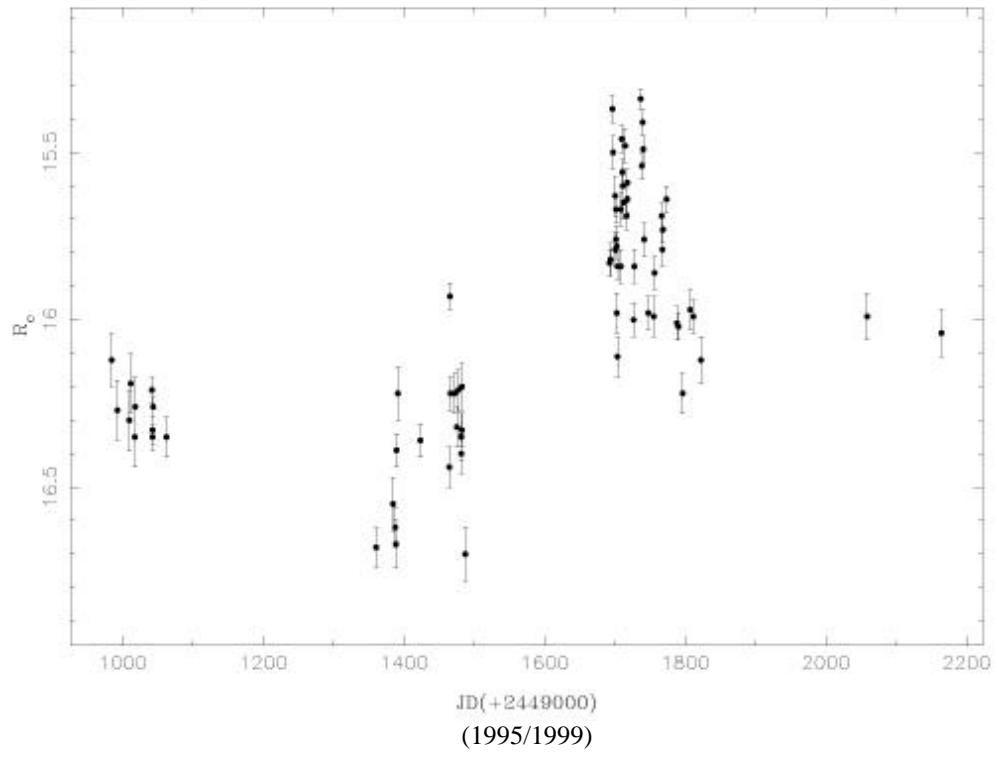


# 0235+164



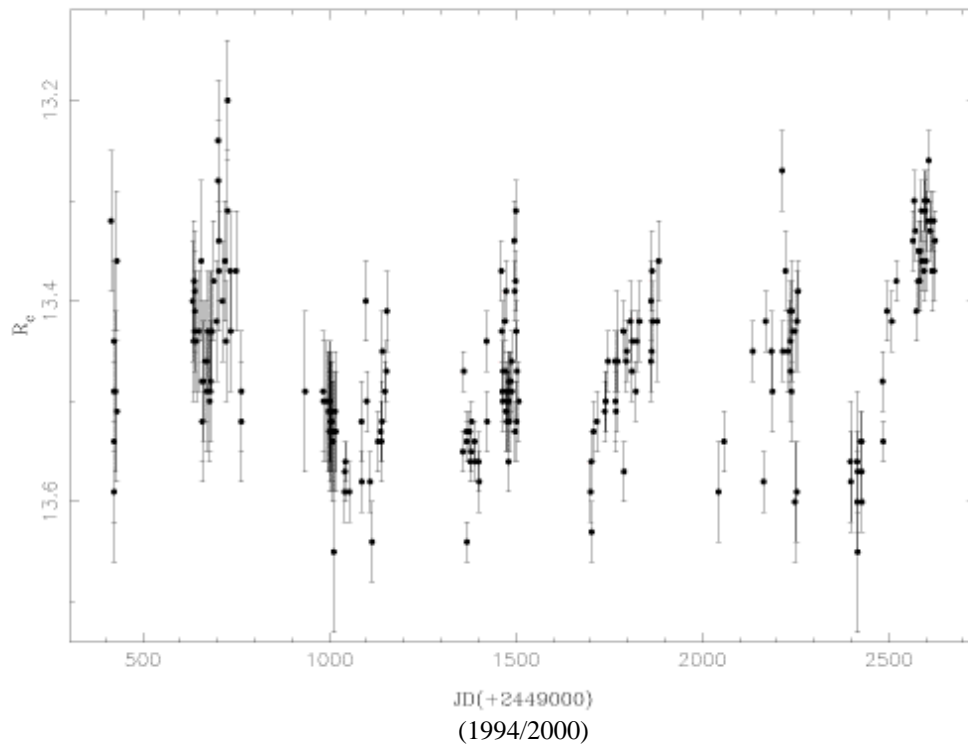
# 0300+470

4C +47.08



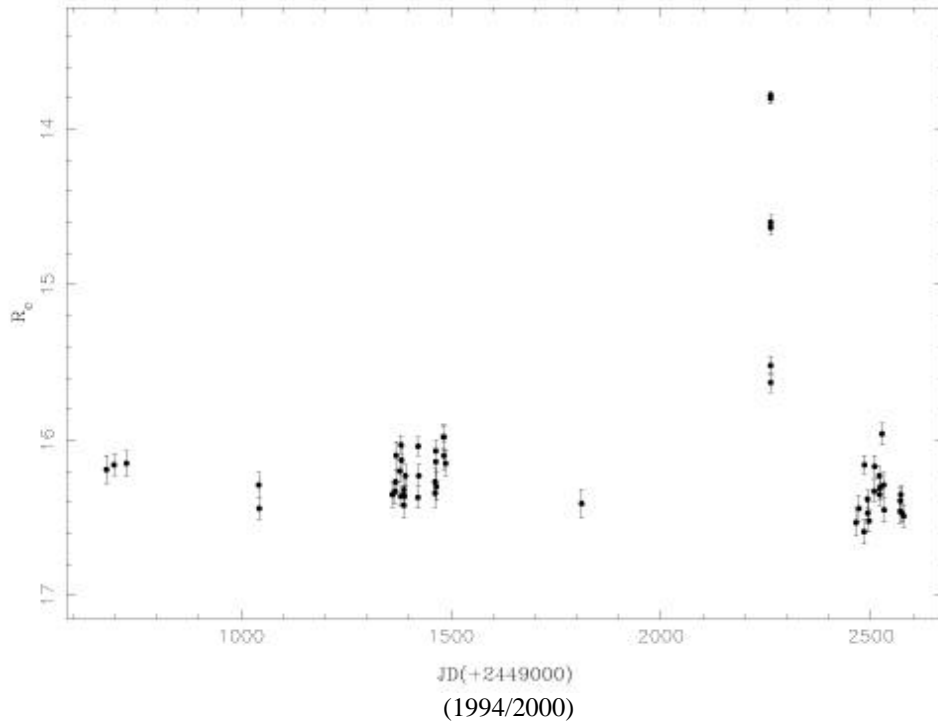
# 0316+413

NGC 1275

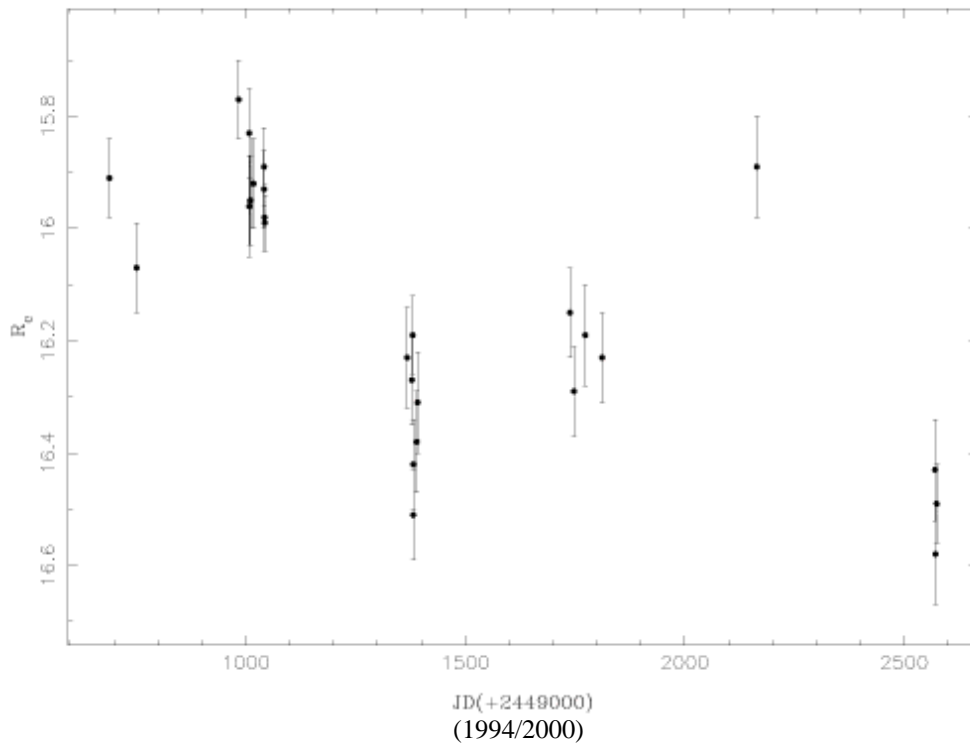


# 0323+022

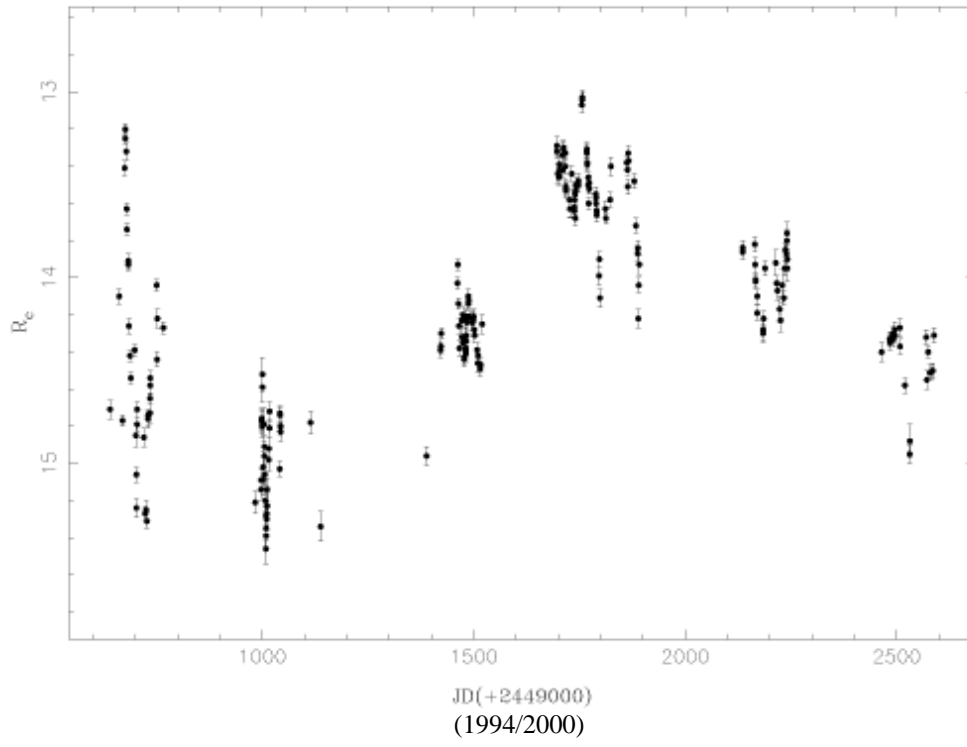
H 0323+022



# 1H 0414+009

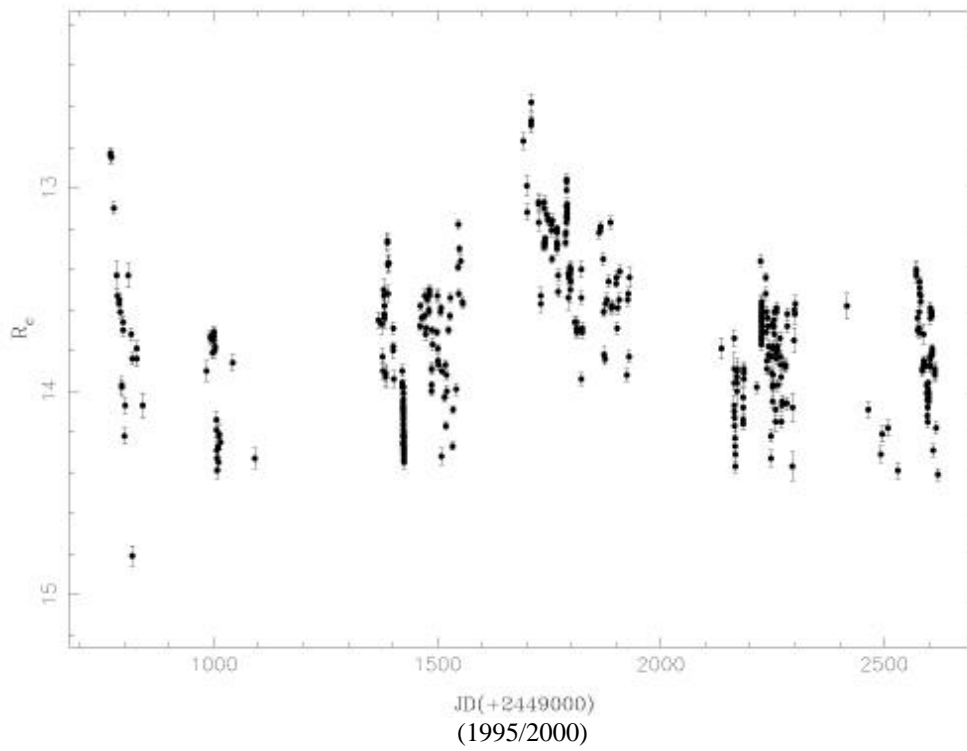


### PKS 0422+004



### 0716+71

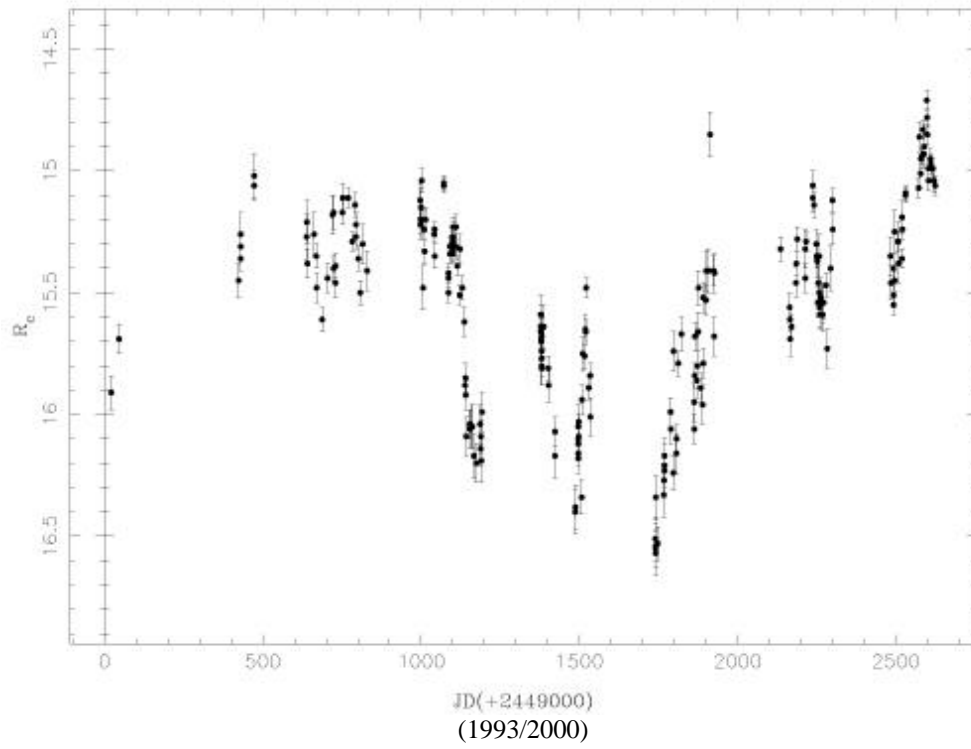
S5 0716+71



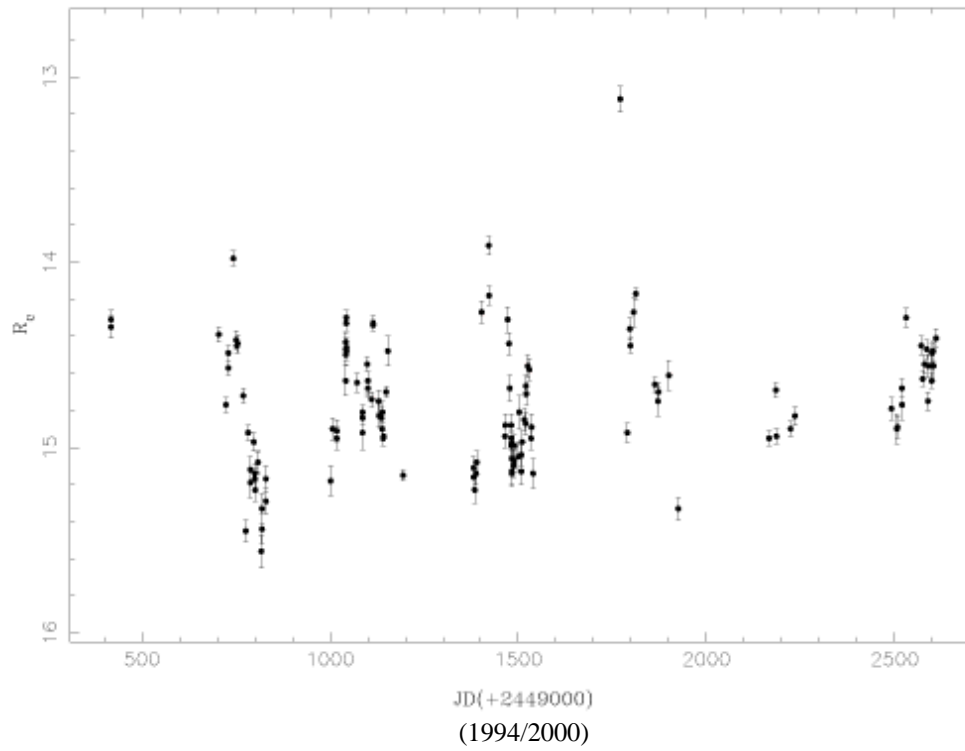


# 0735+178

PKS 0735+17

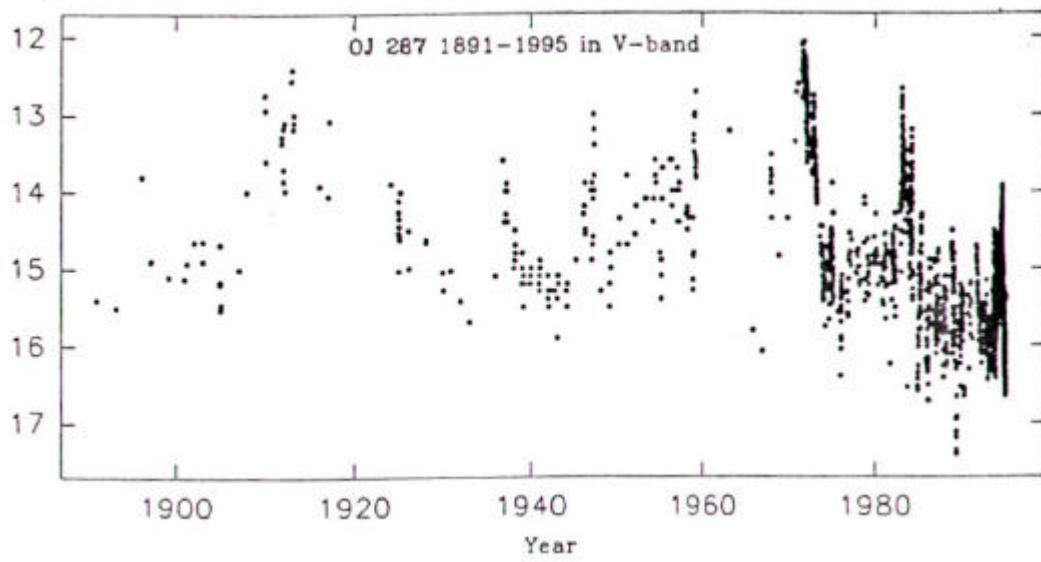
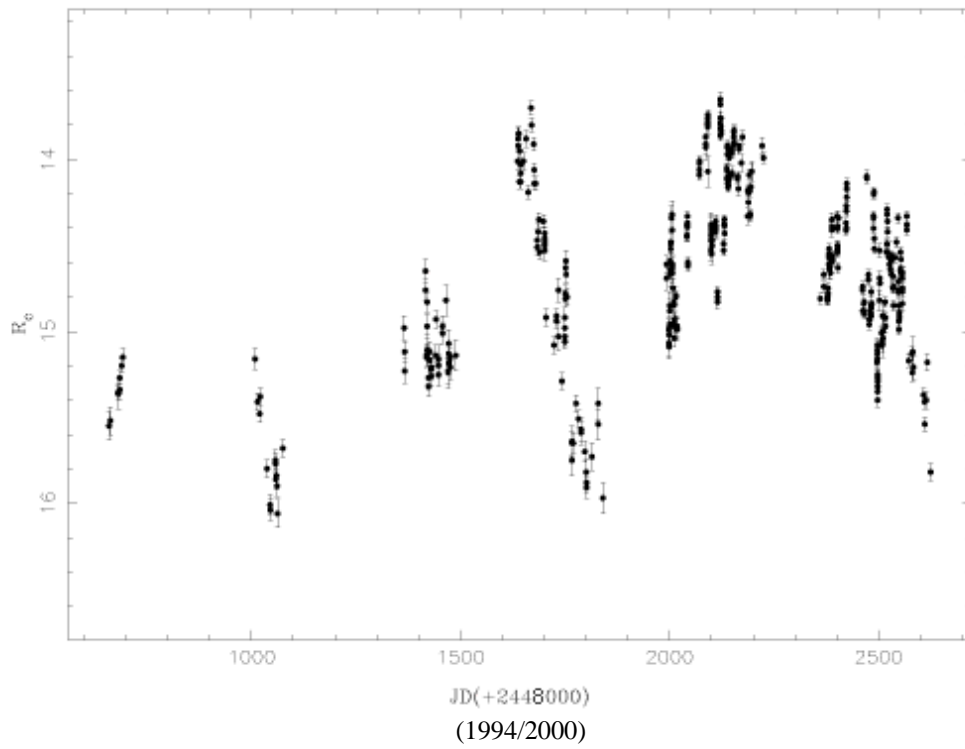


# PKS 0829+046



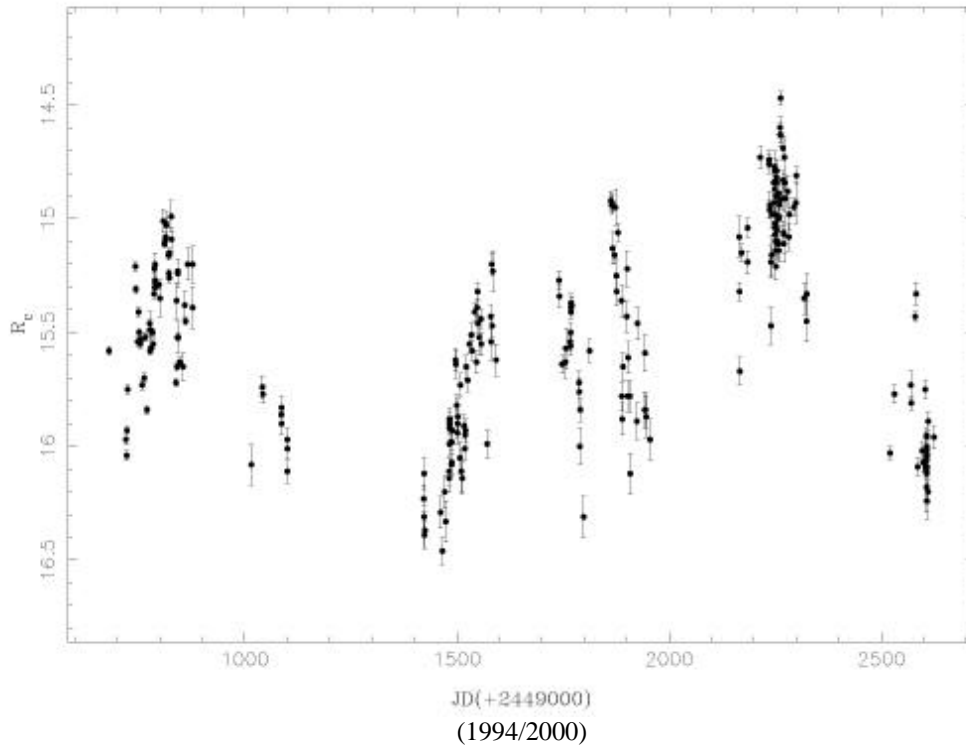
**0851+202**

**OJ 287**



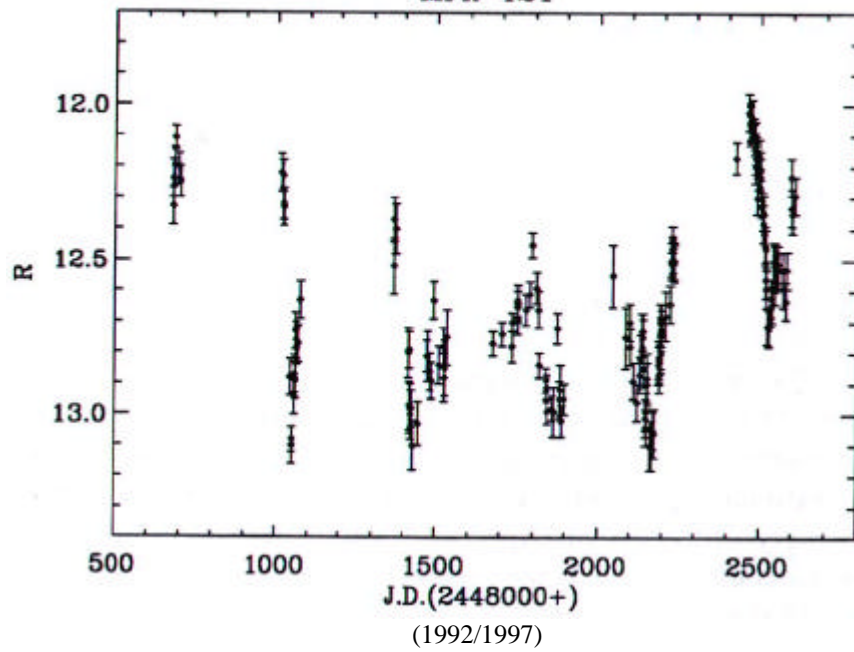
# 0954+658

S4 0954+658



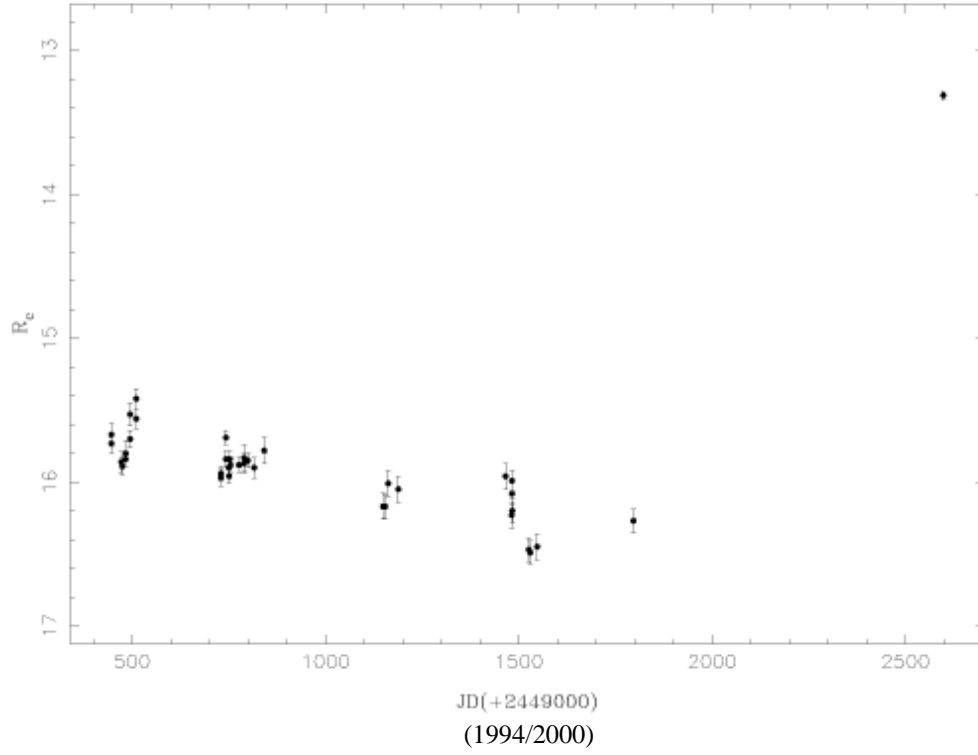
# 1101+380

Mrk 421



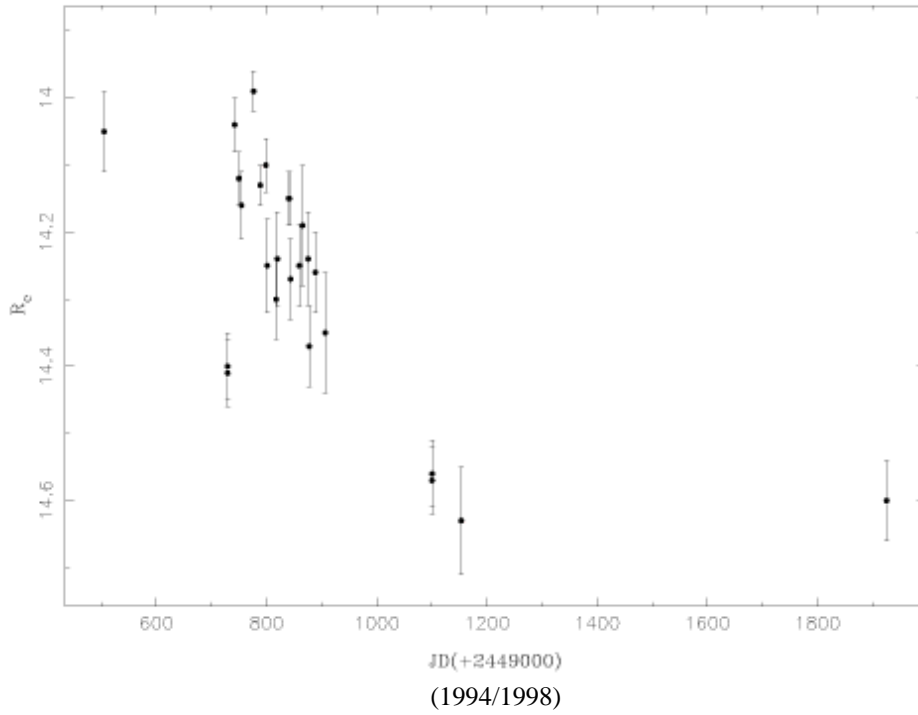
**1147+240**

**OM 280**

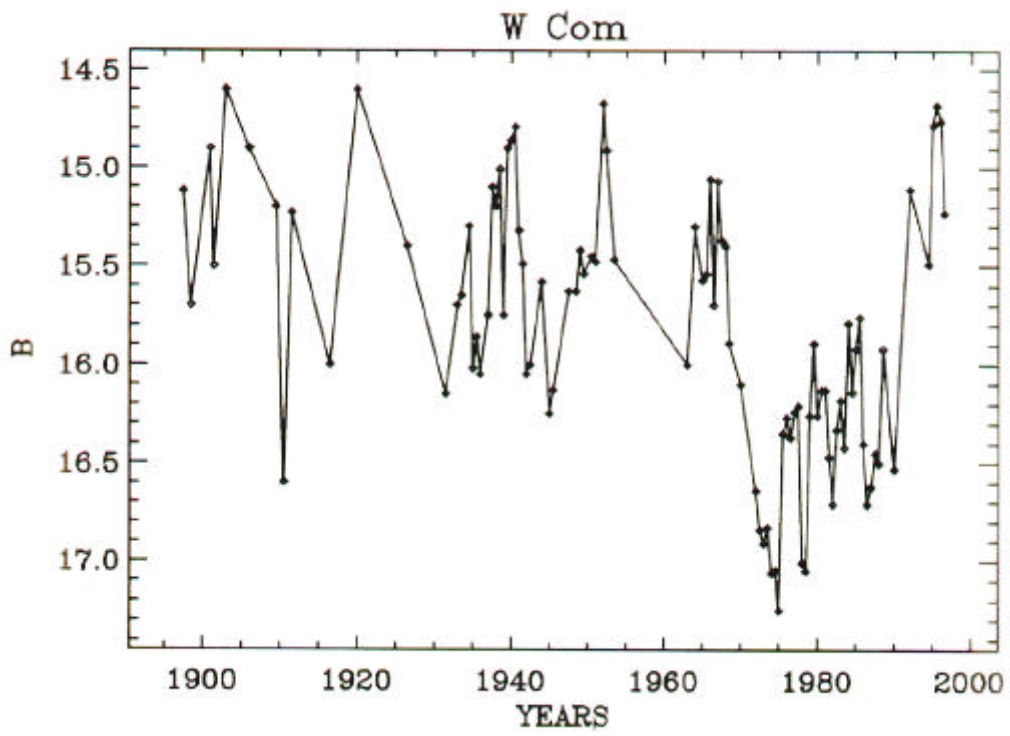
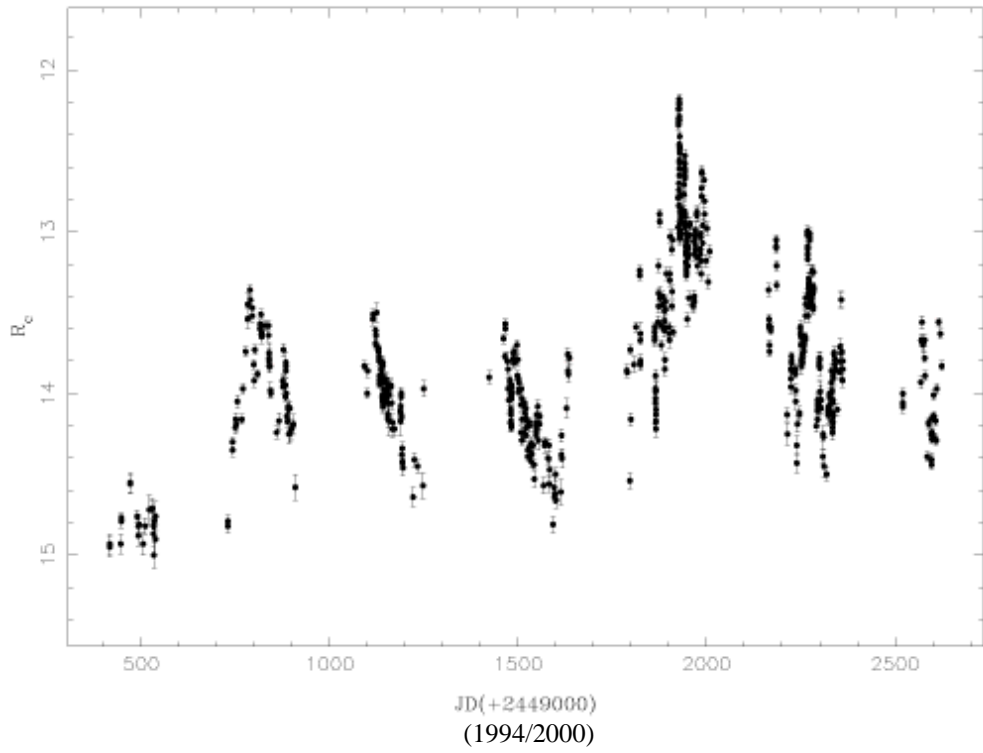


**1215+300**

**TON 605 (ON 325)**

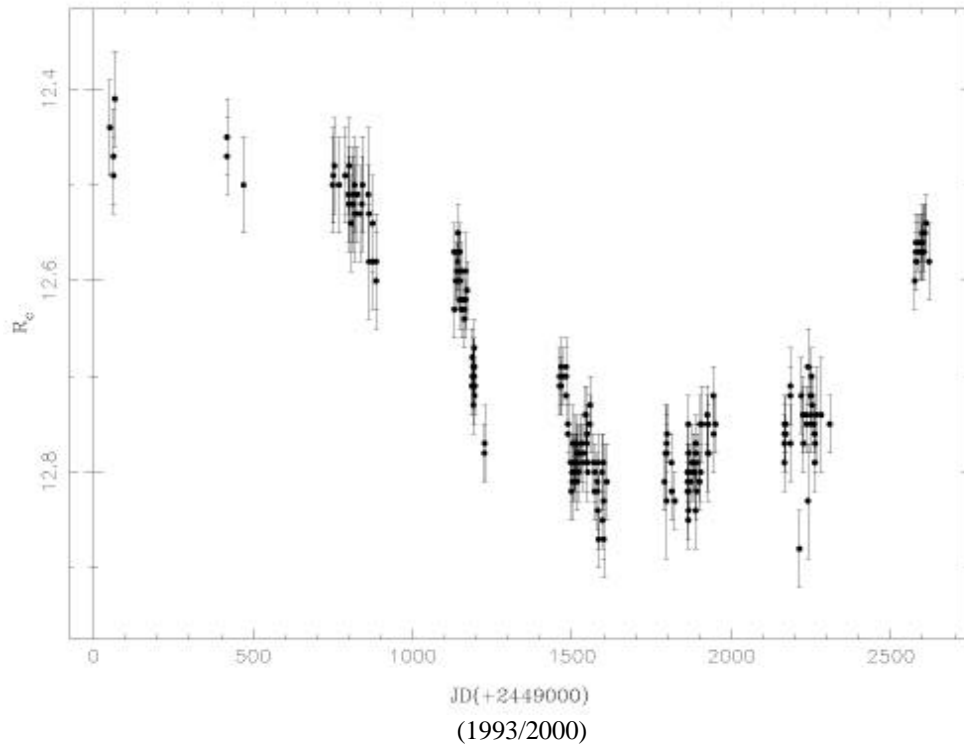


**1219+280**  
**W Com (ON 231)**



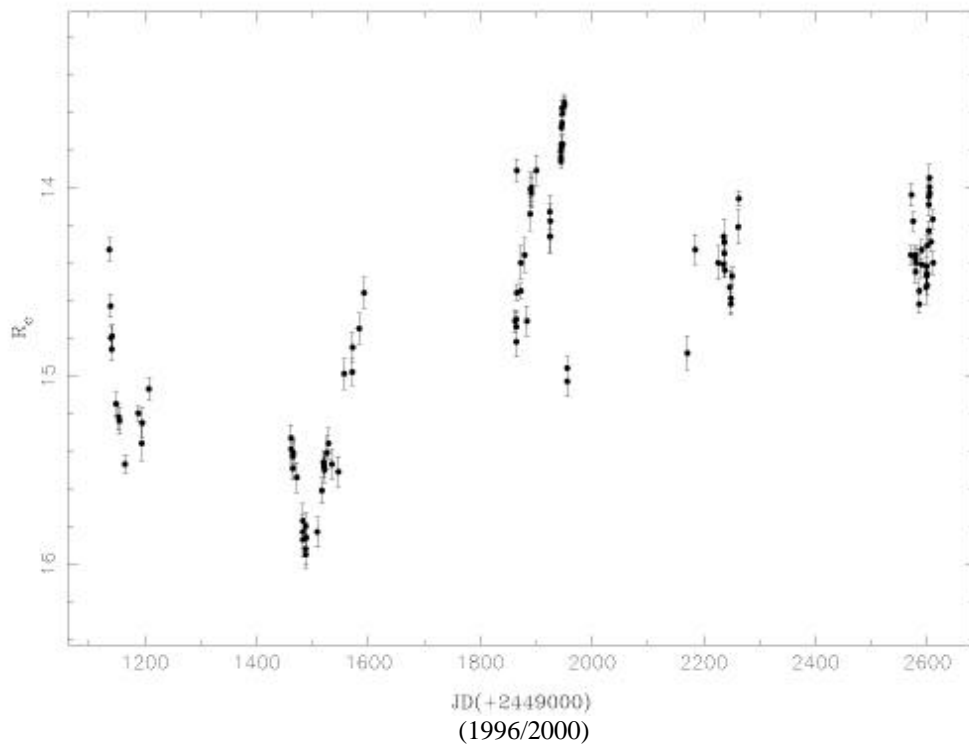
# 1226+020

3C 273



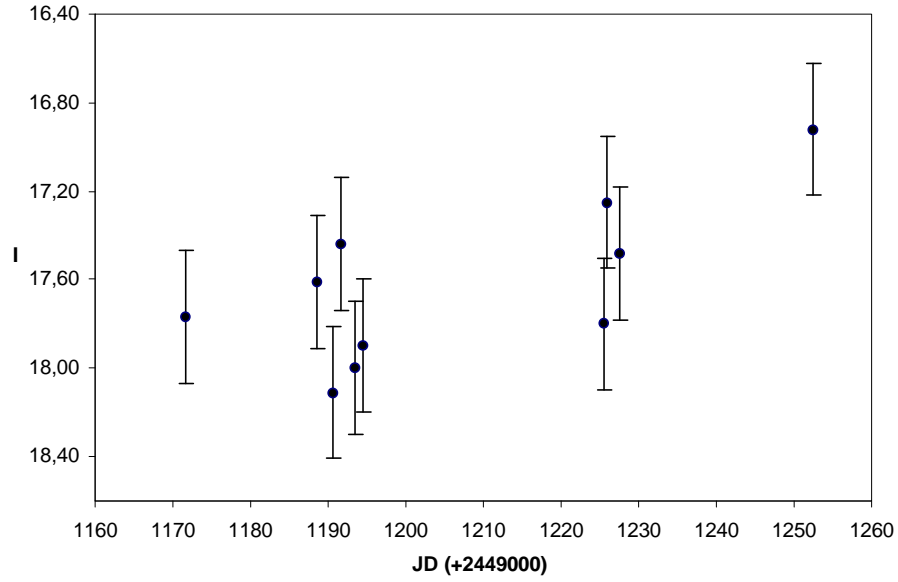
# 1253-050

3C 279



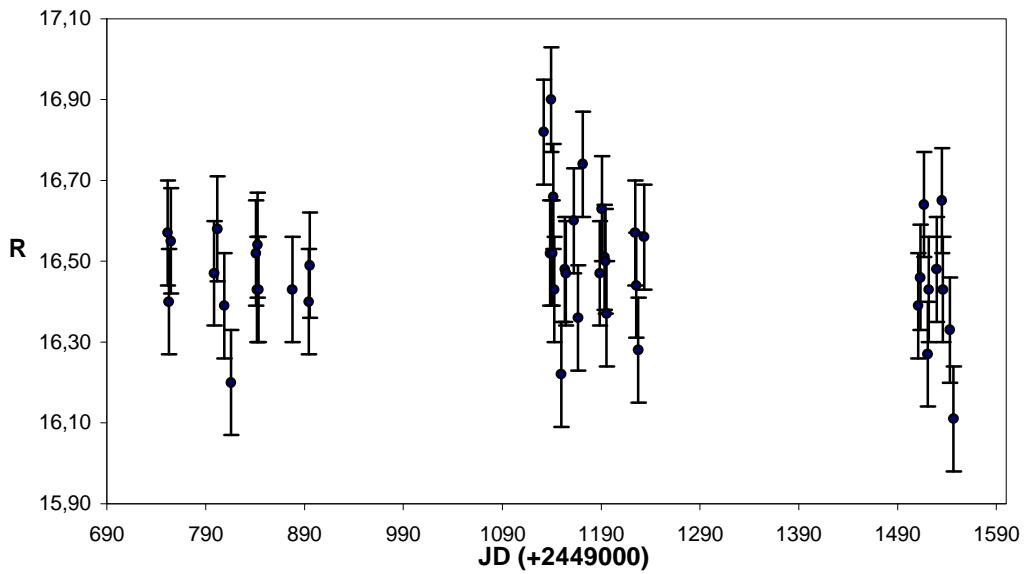
**1308+320**

**B2 1308 (1996/03/28-1996/06/17)**



**1415.6+2557**

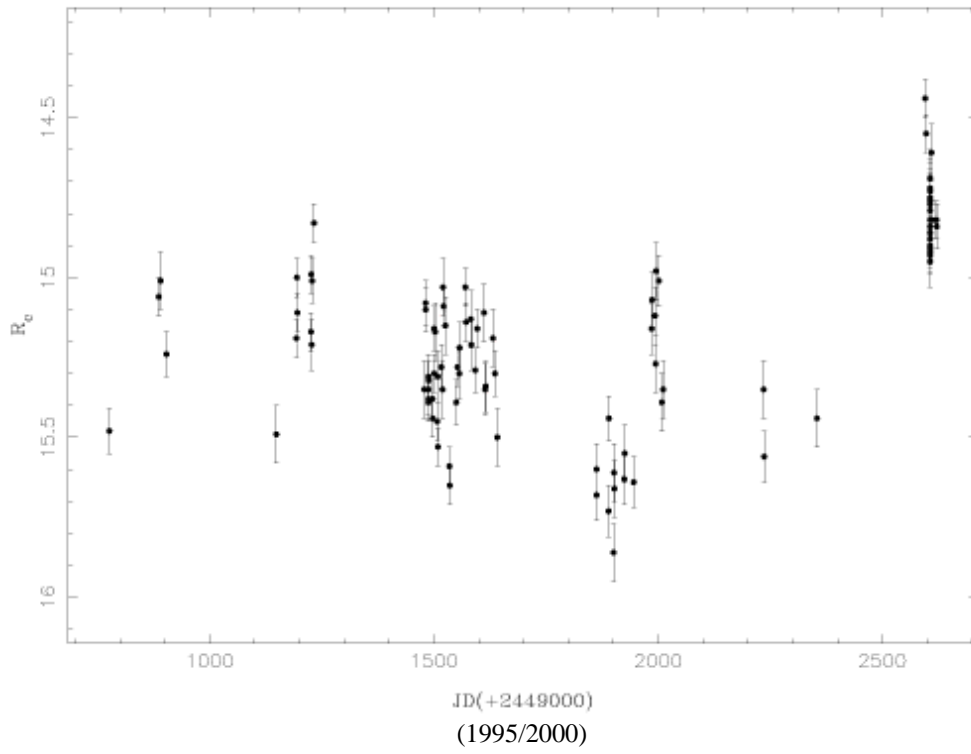
**1E 1415 (1995-1997)**





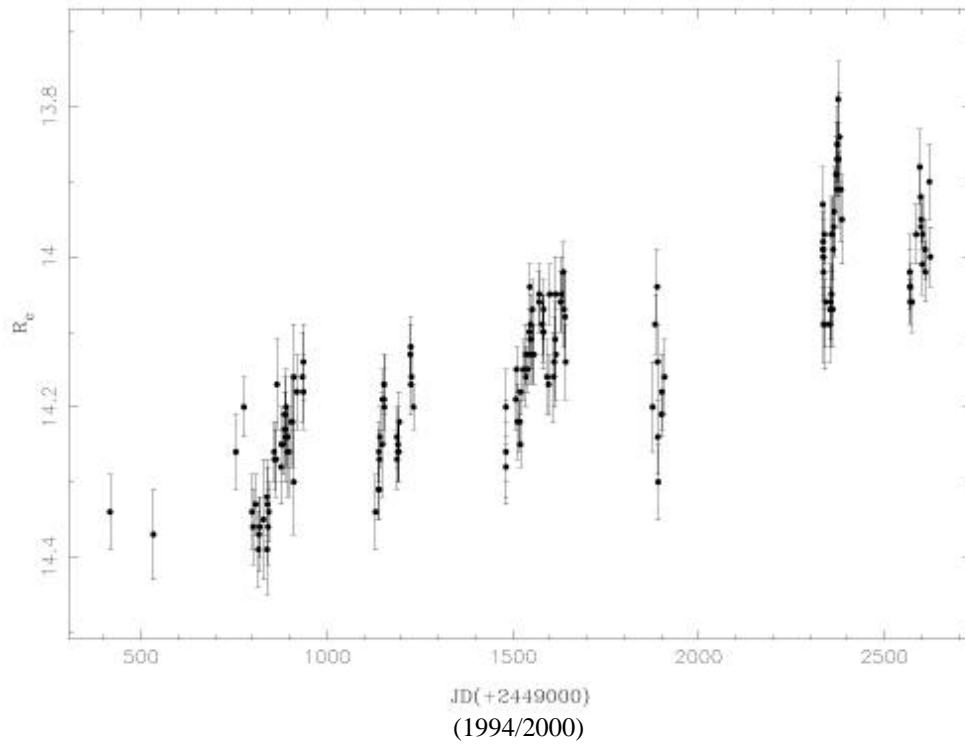
**1418+540**

**OQ 530**



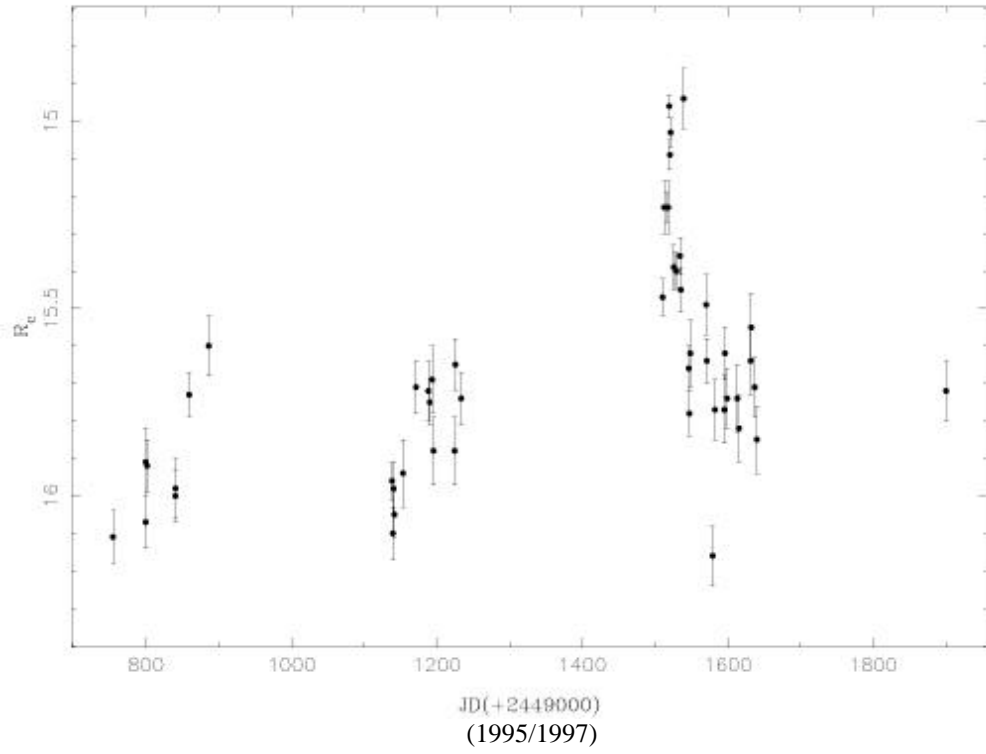
**1424+240**

PKS 1424+240



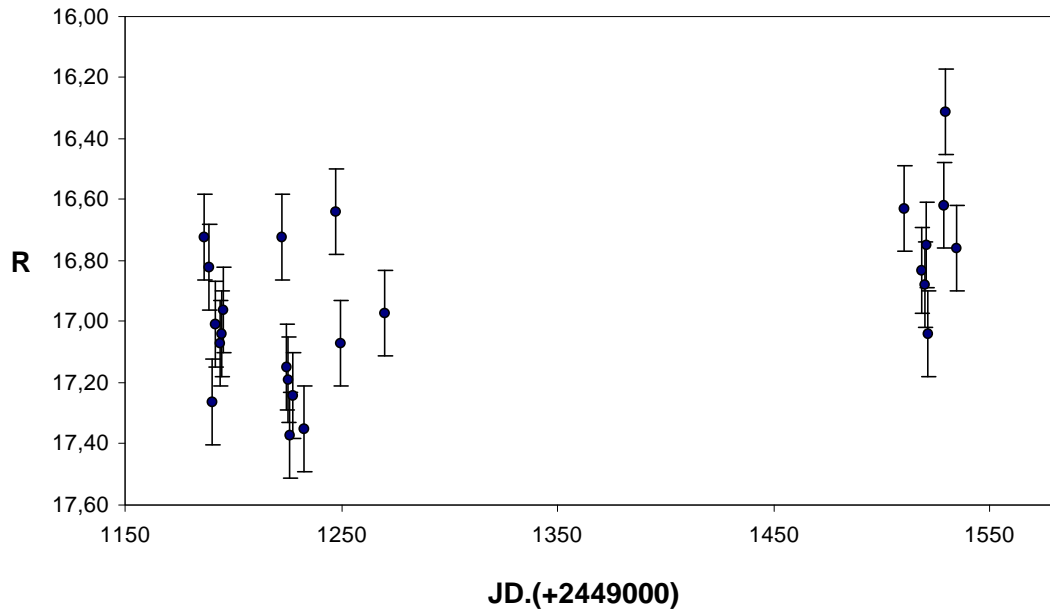
# 1458.8+2249

1458+2249



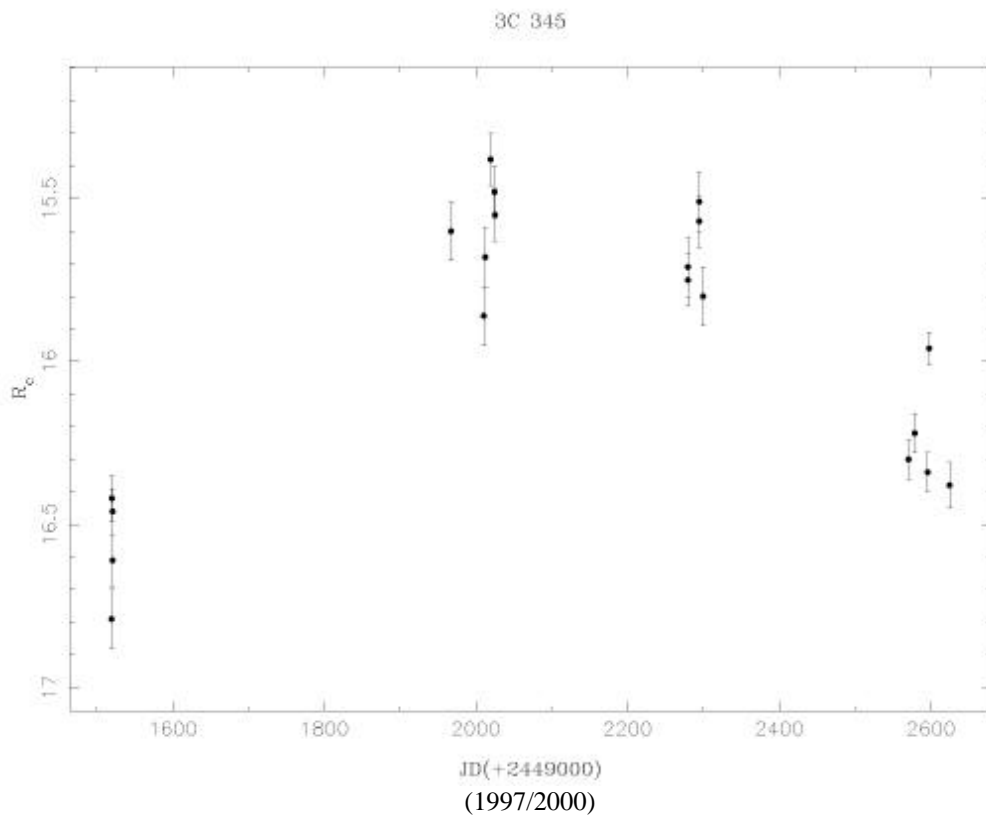
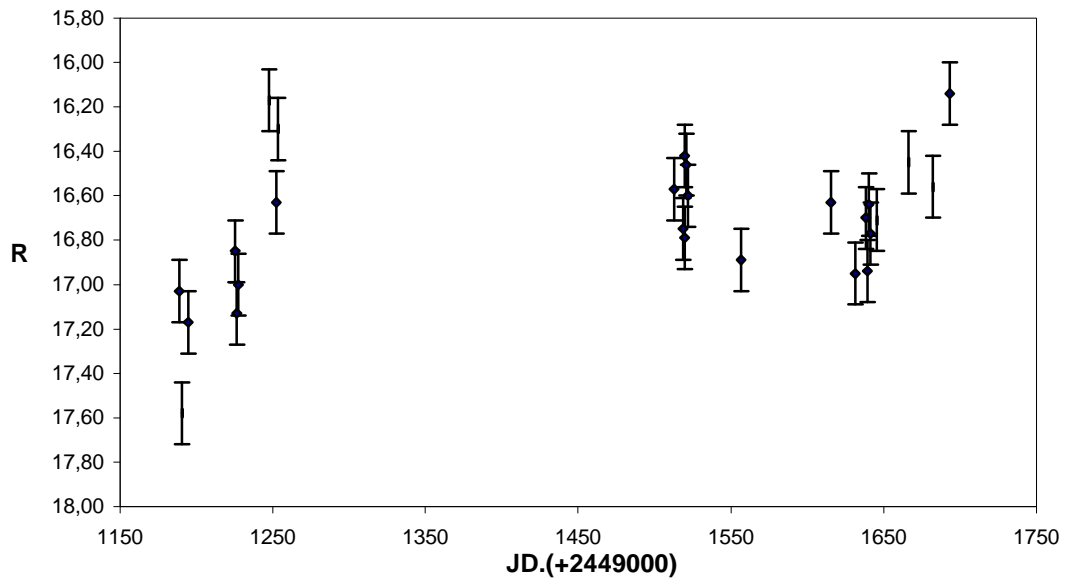
# 1611+340

DA 406 (1996/04-1997/03)



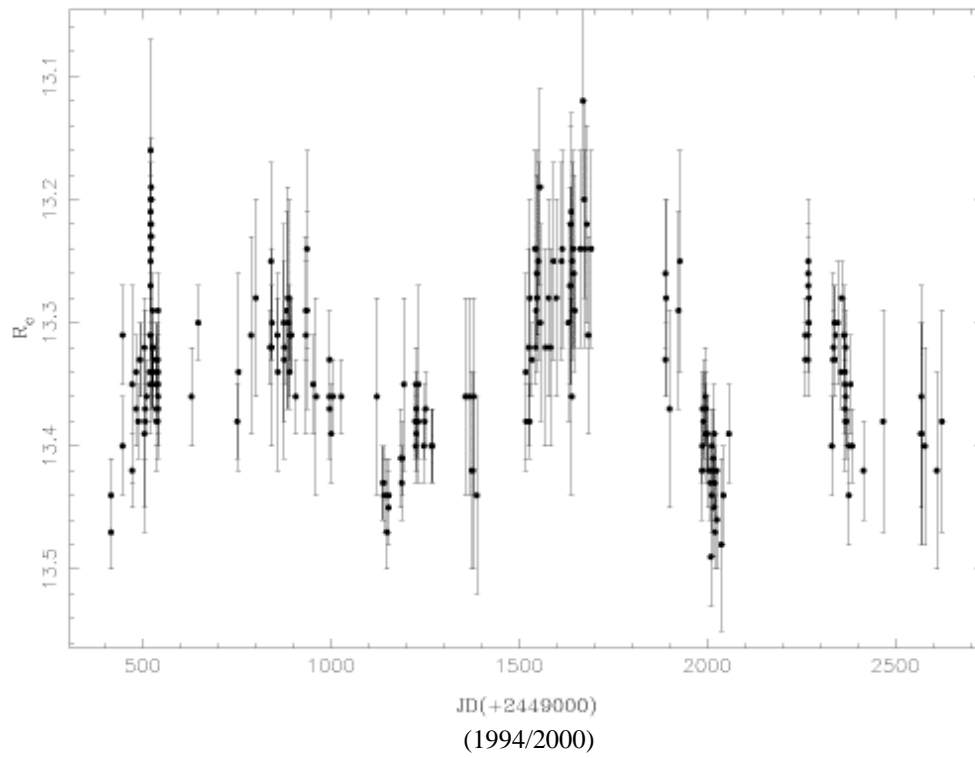
**1641+390**

**3C 345 (1996/04/15-1997/09/01)**



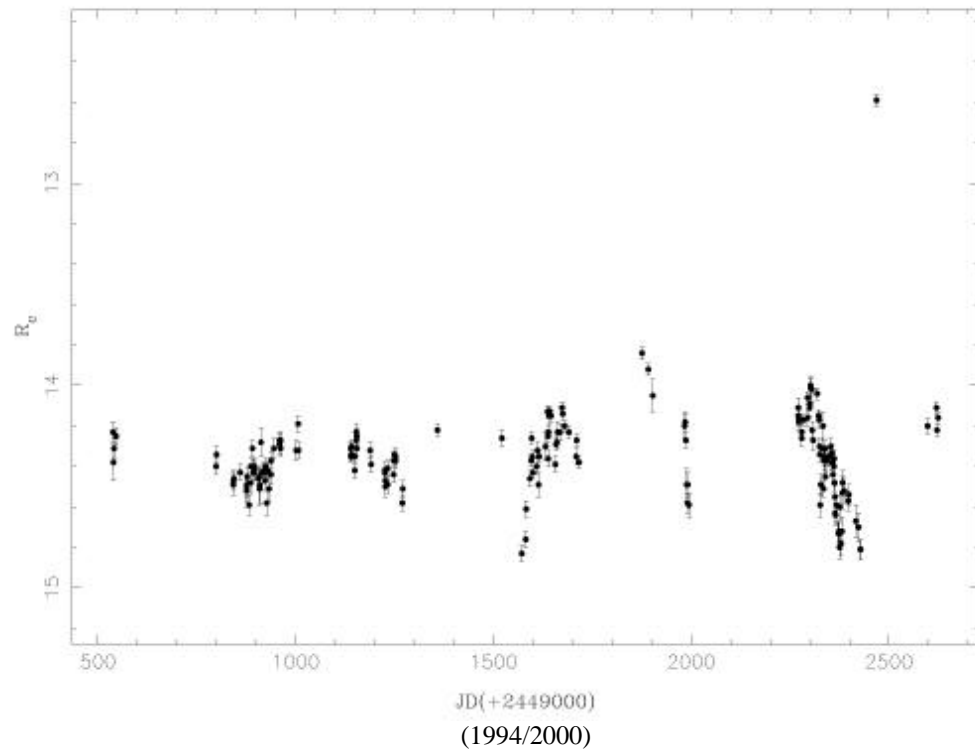
**1652+398**

**MRK 501**

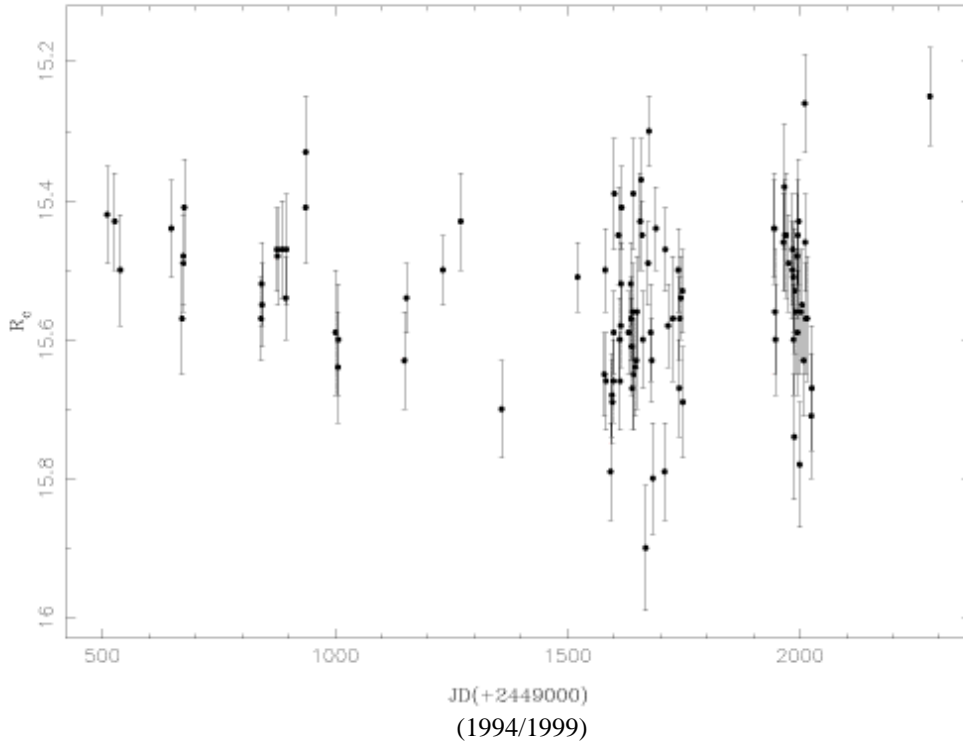


**1722+119**

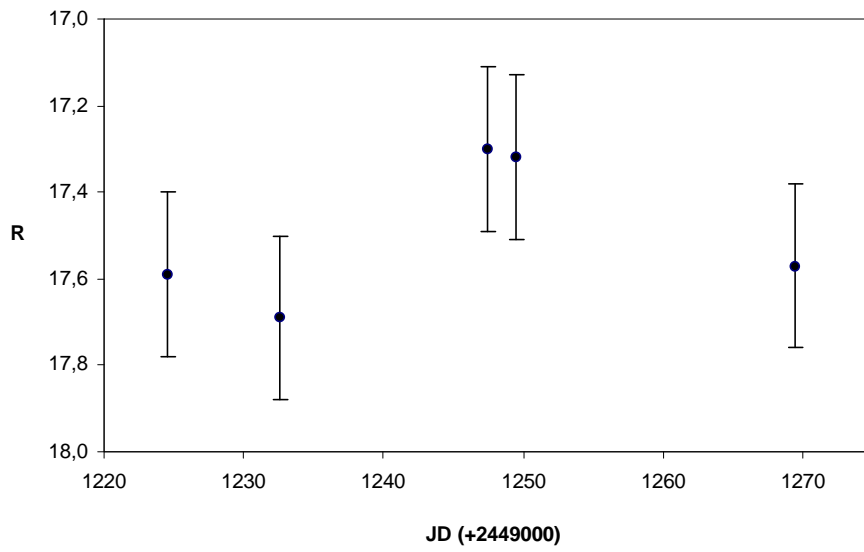
H 1722+119



**1727+502**  
**I ZW 187 (OT 546)**

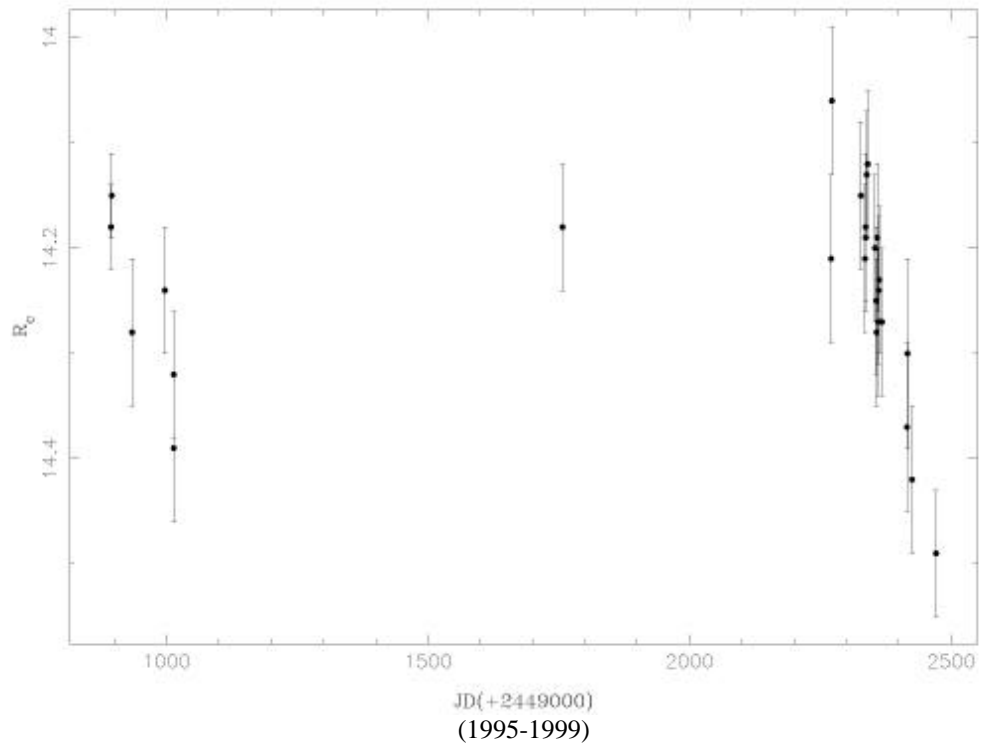


**1749+096**  
**OT 081 (1996/05/20-1996/07/04)**

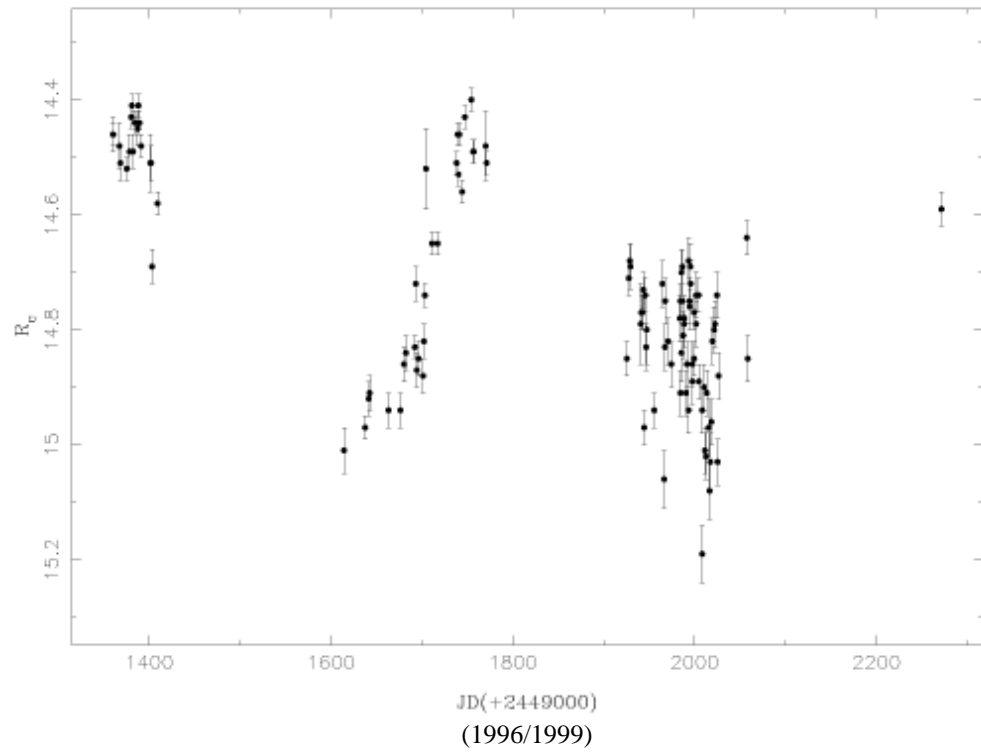


# 1807+690

3C 371

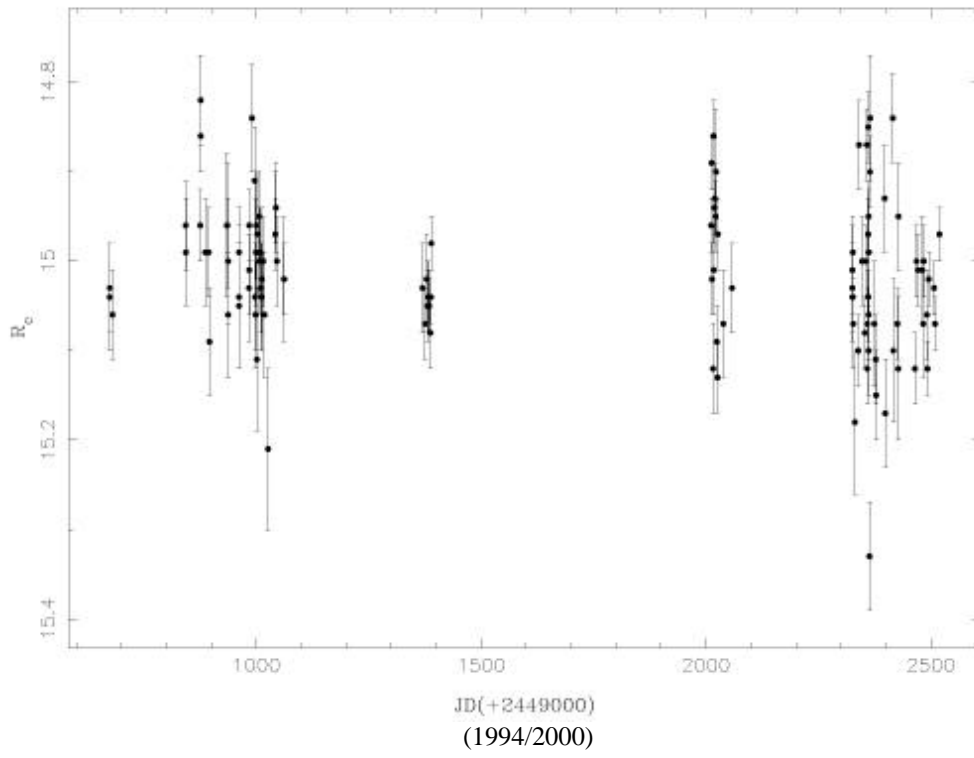


# 1ES 1959+650



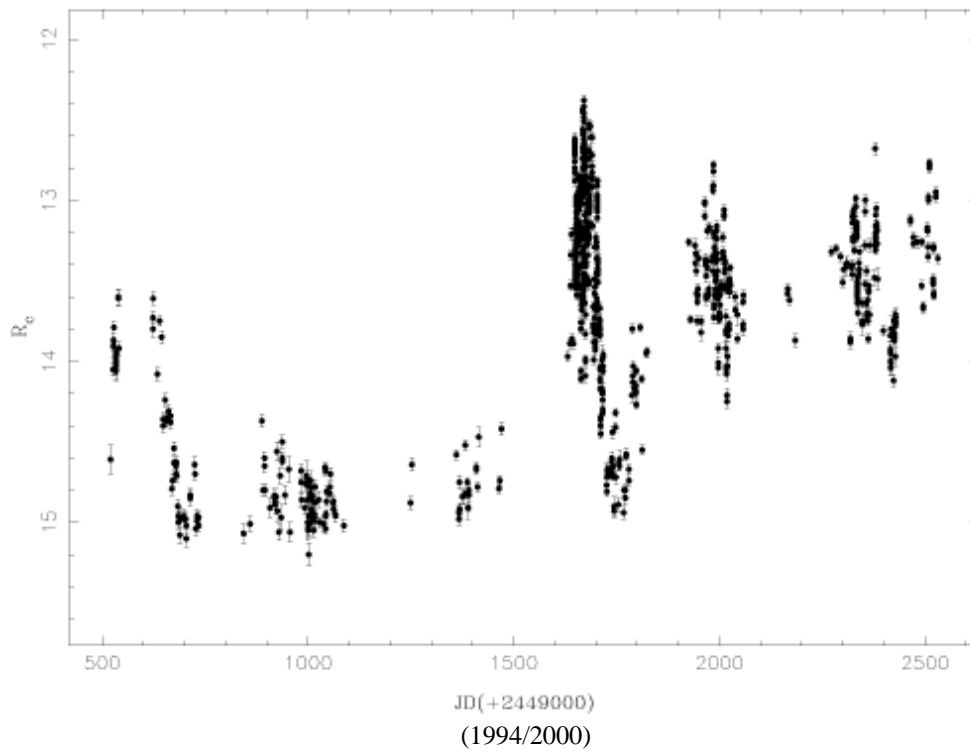
## 2032+107

PKS 2032+107



## 2200+420

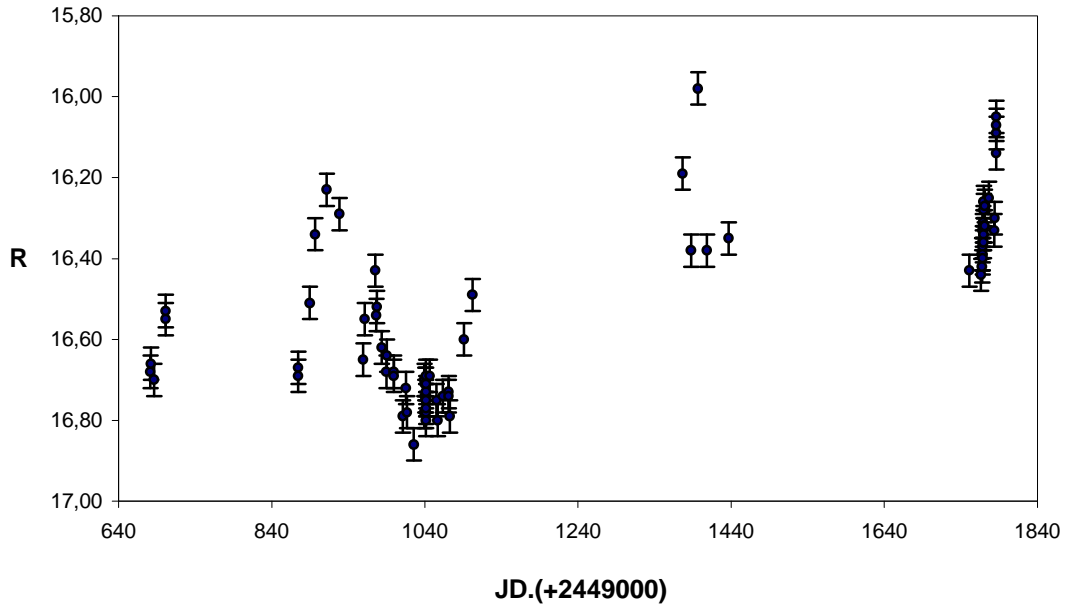
BL Lac





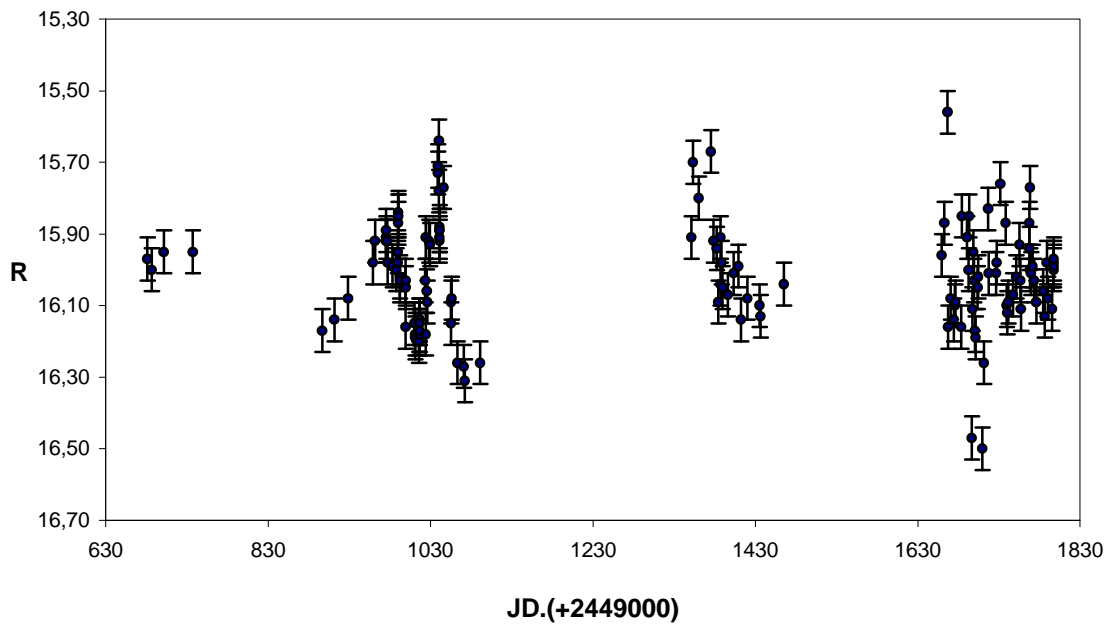
**2230+114**

**CTA 102 (1994/11/24-1997/12/10)**



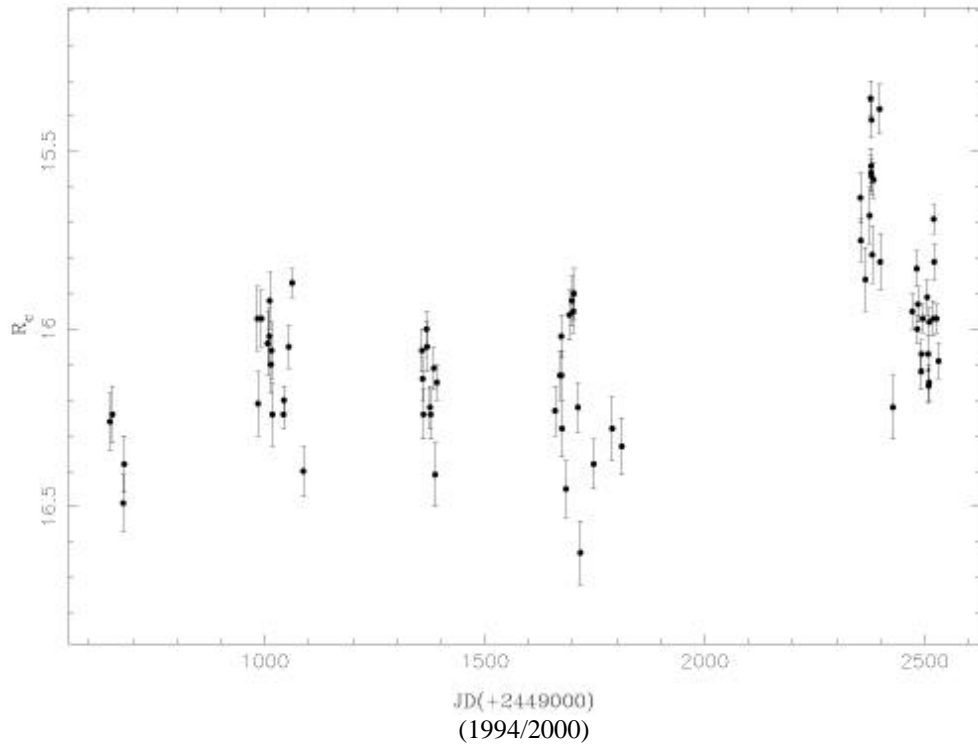
**2251+158**

**3C 454.3 (1994/11/24-1997/12/14)**



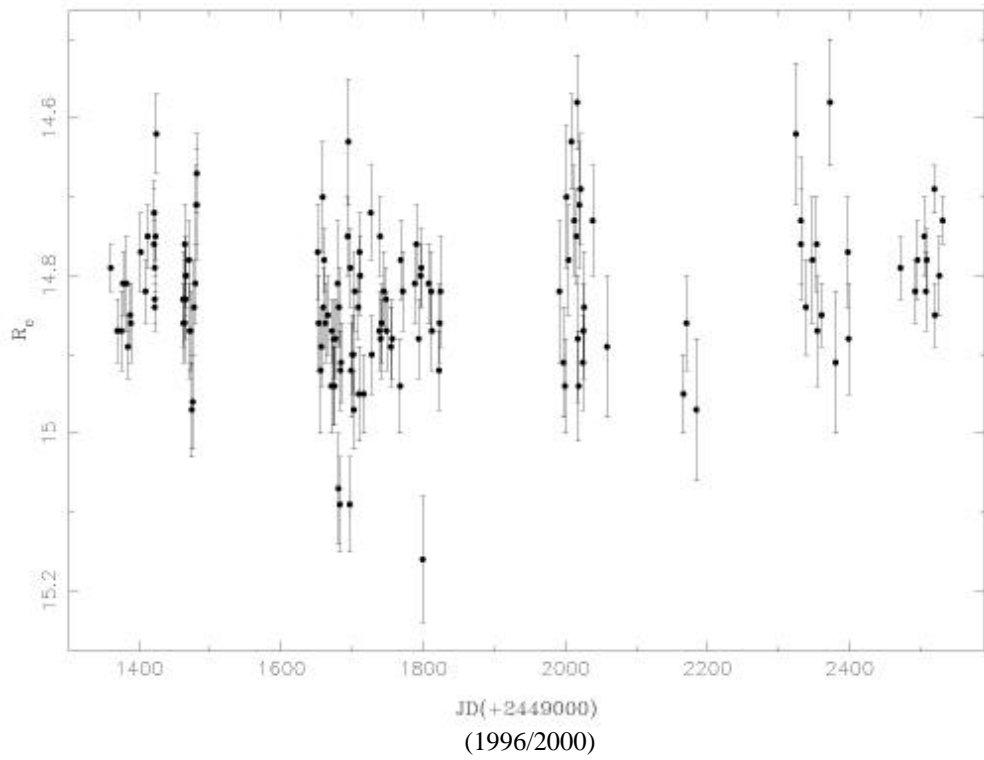
# 2254+074

PKS 2254+074



# 2344+514

IES 2344+514

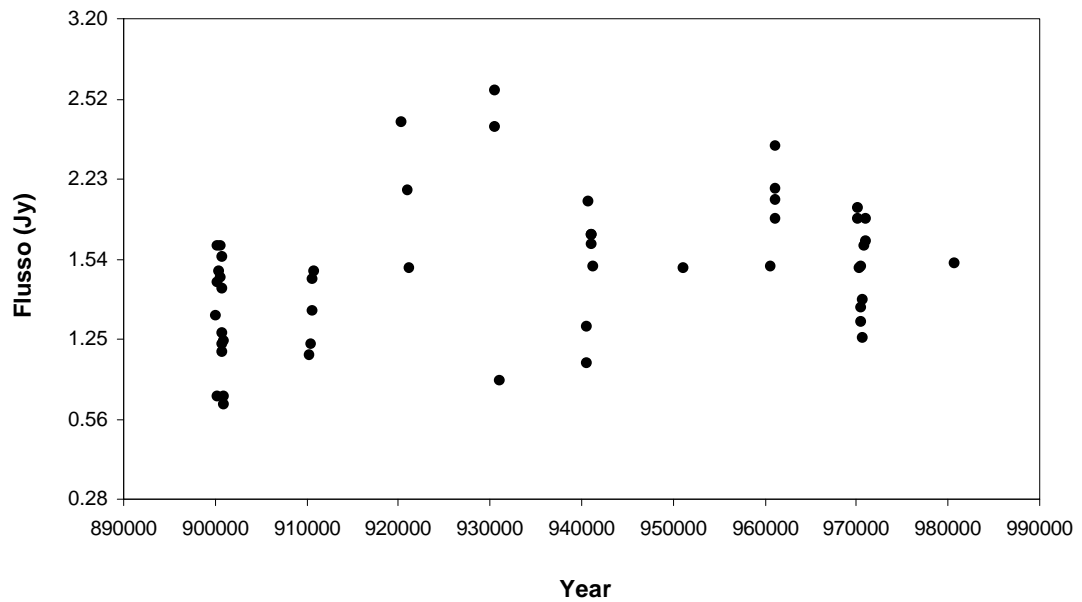


-- Curve radio --

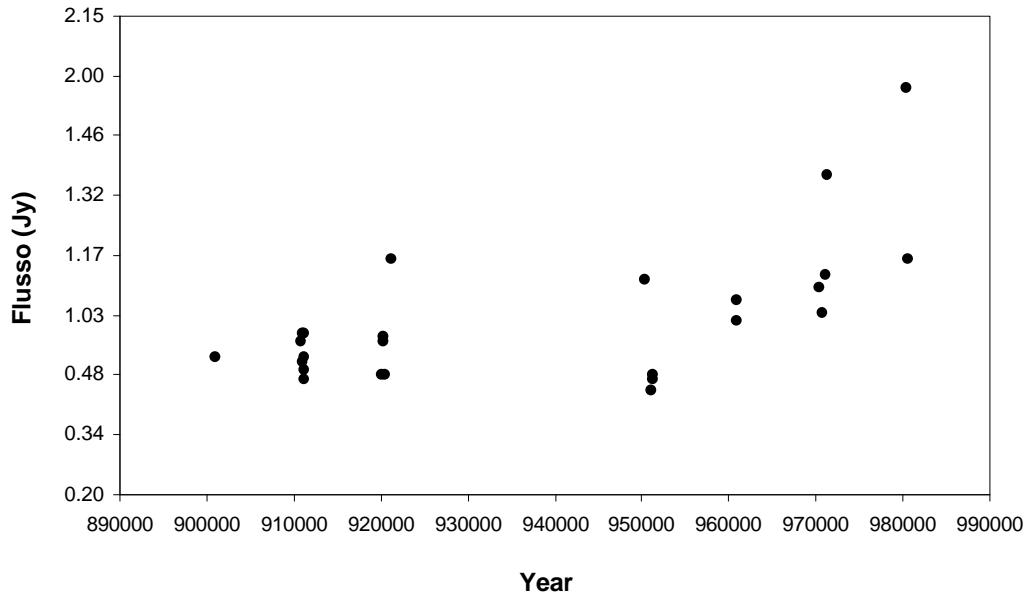


- Radiotelescopio di 26 m di diametro dell'Osservatorio Radioastronomico dell'Università del Michigan.

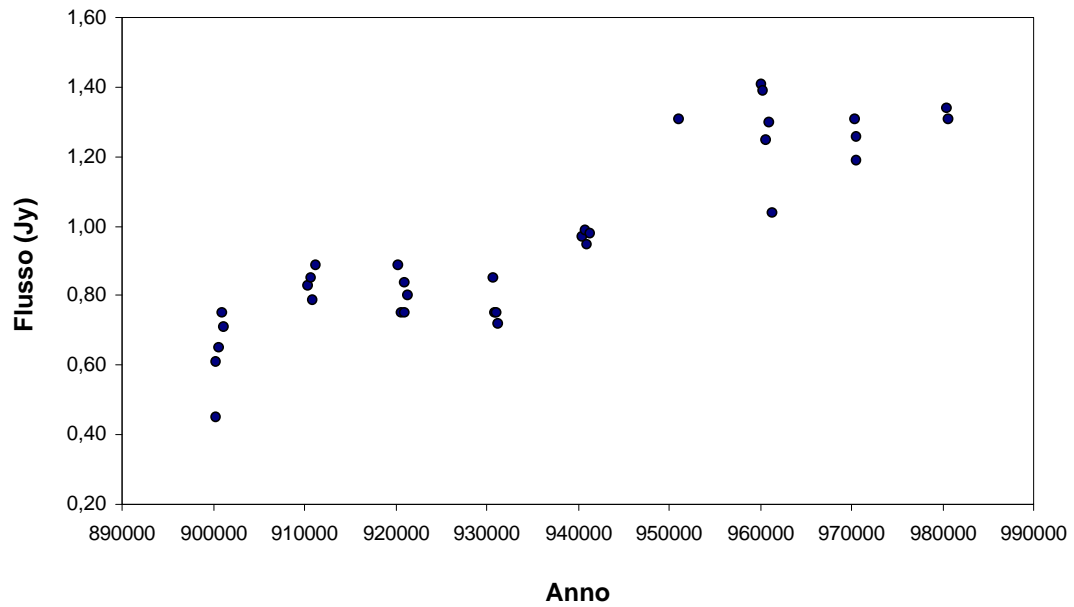
**0048-097 (8 GHz)**

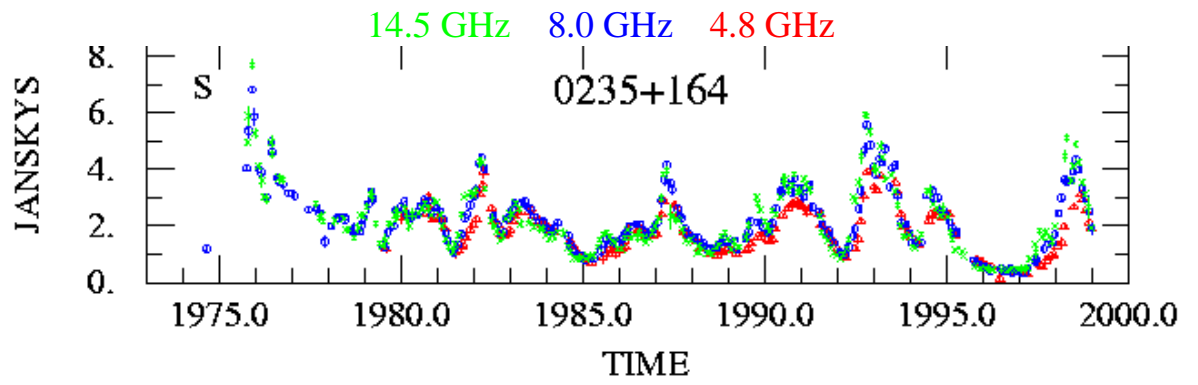


## 0109+224 (8 GHz)

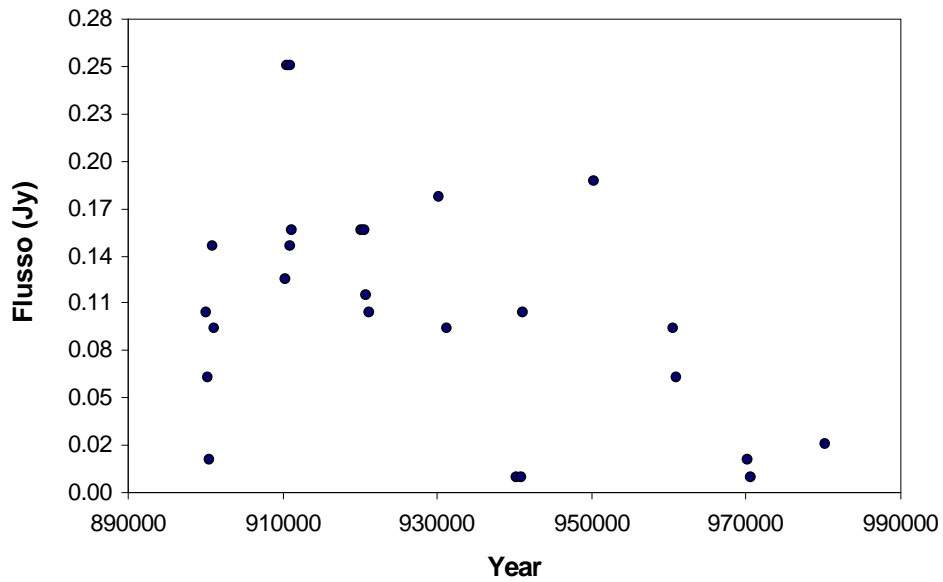


## 0219+428 (14.5 GHz)

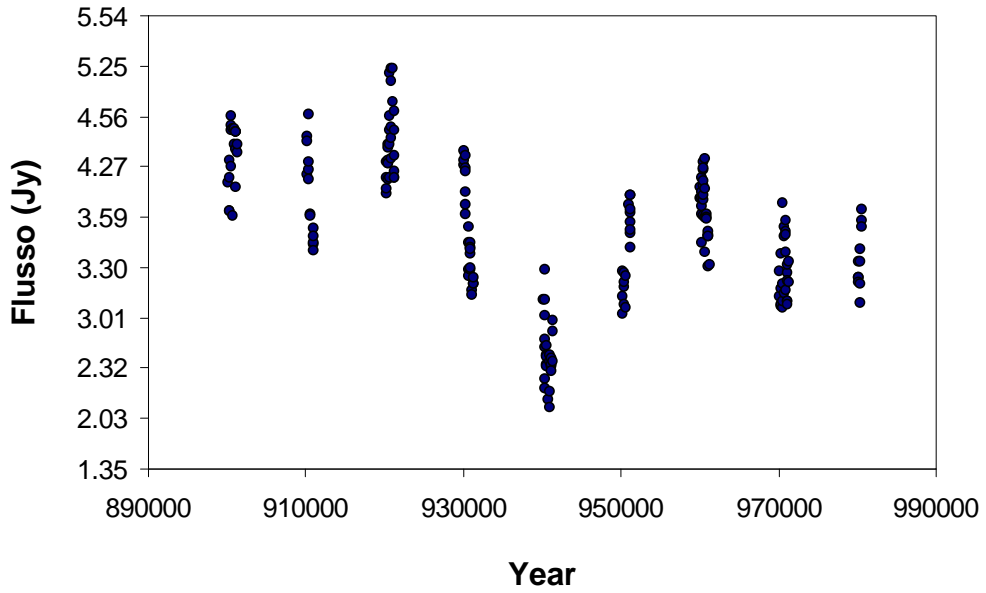




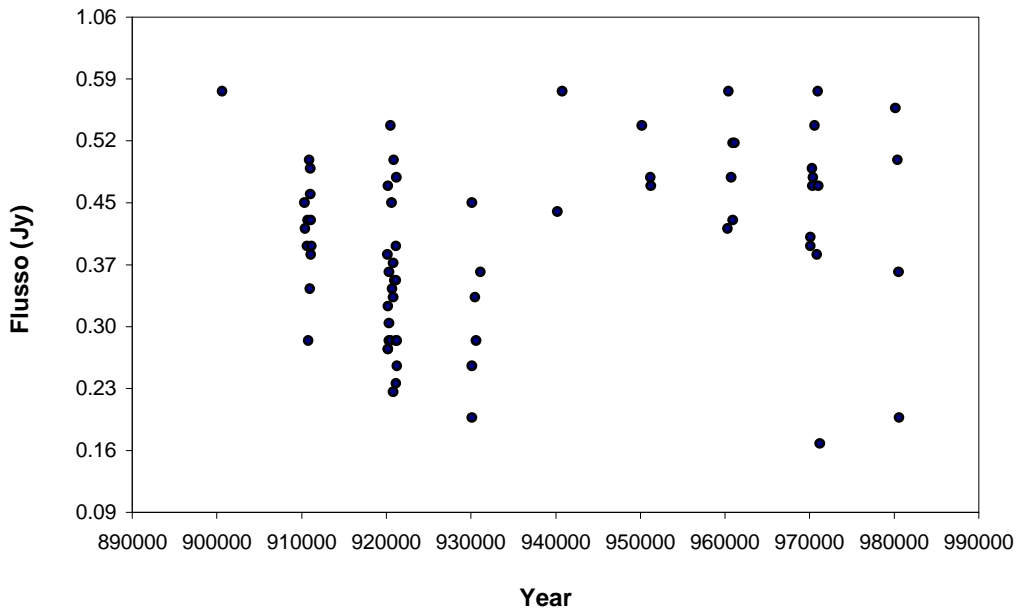
**0323+022 (8 GHz)**



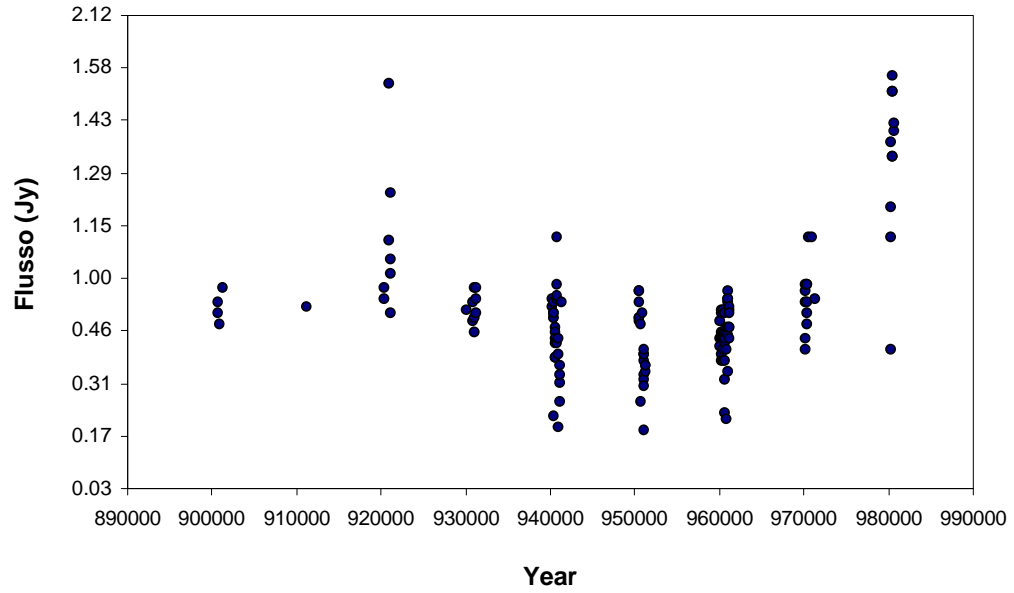
### 0420-012 (8 GHz)



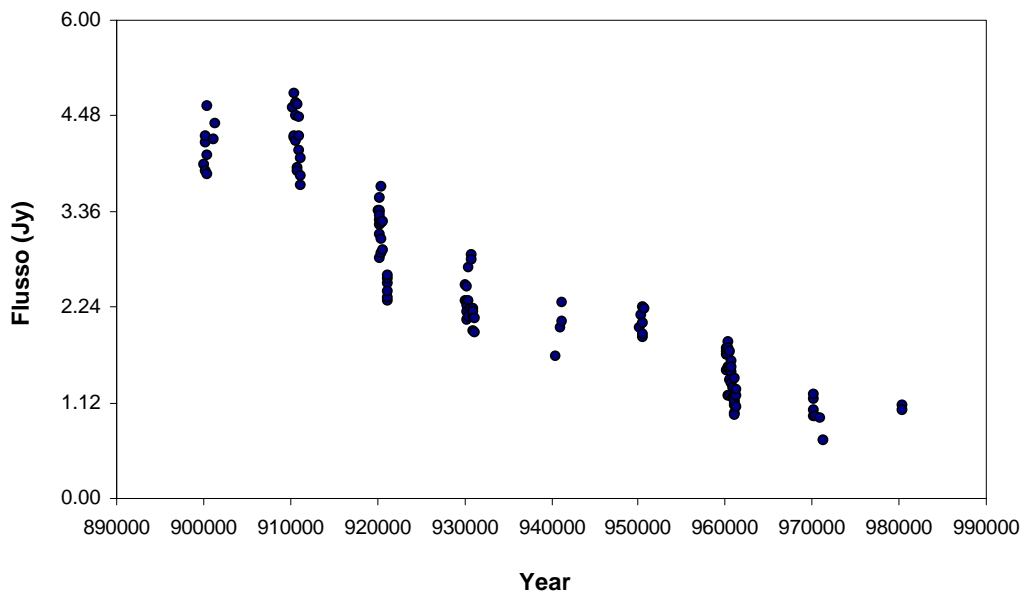
### 0422+004 (8 GHz)



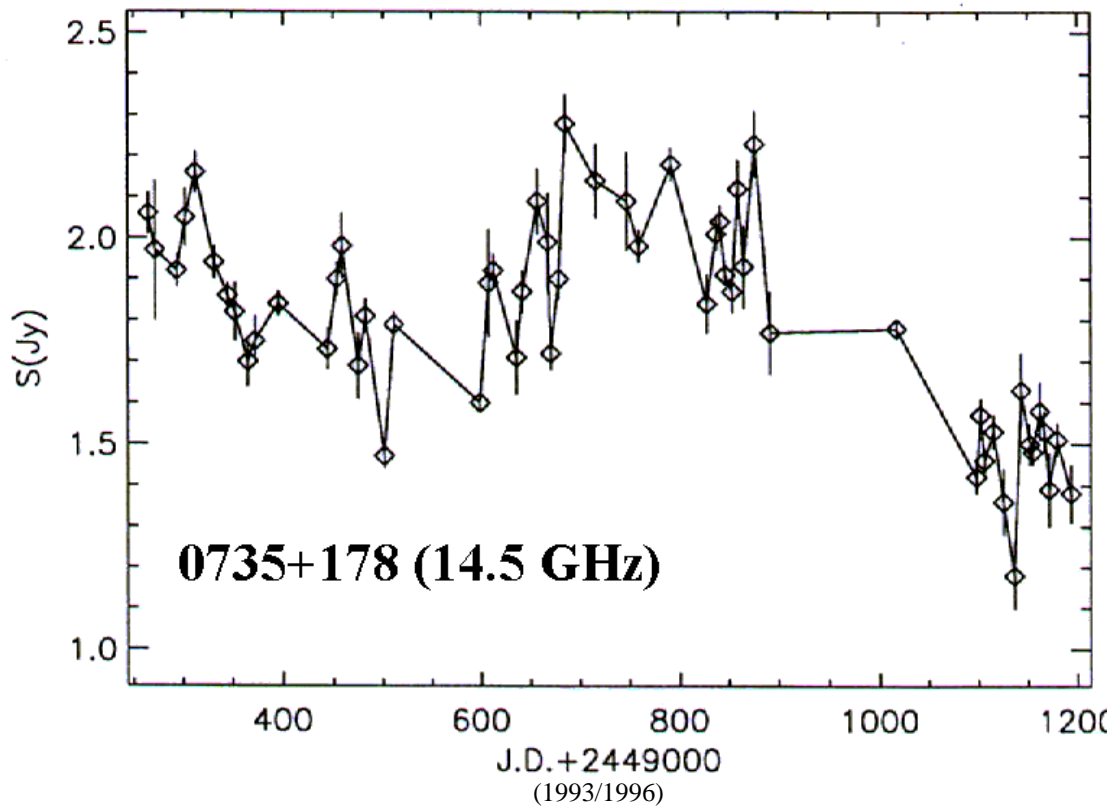
### 0716+714 (14.5 GHz)



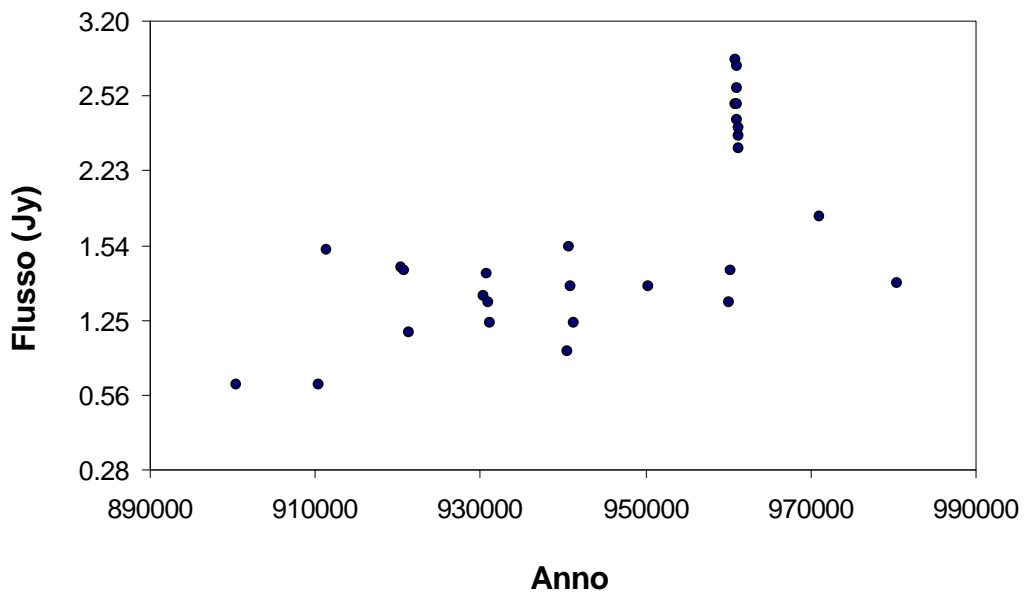
### 0735+178 (14.5 GHz)

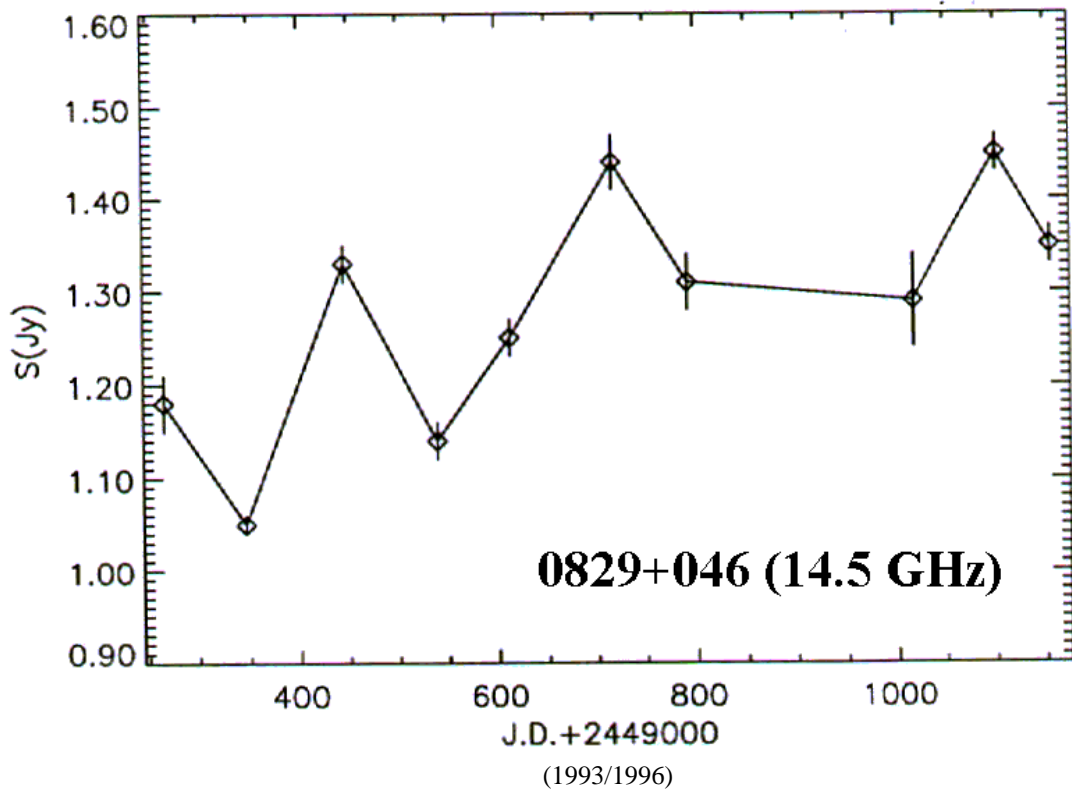




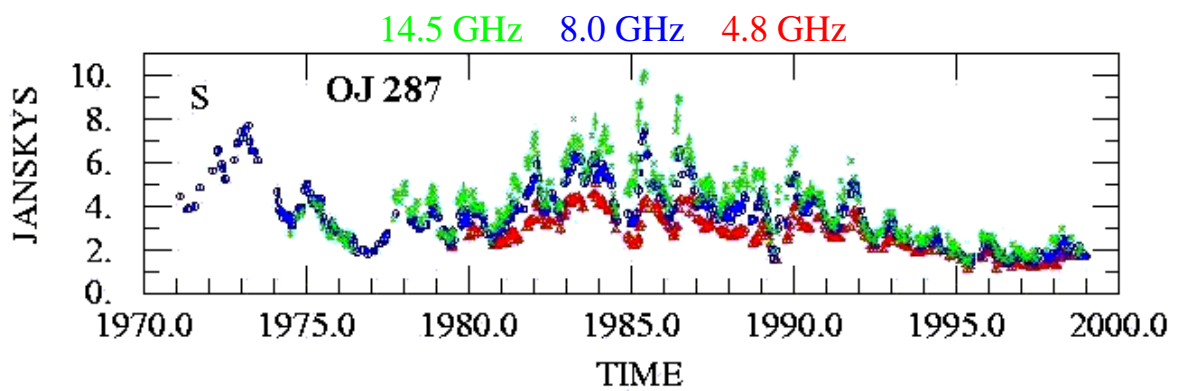


**0754+095 (14.5 GHz)**

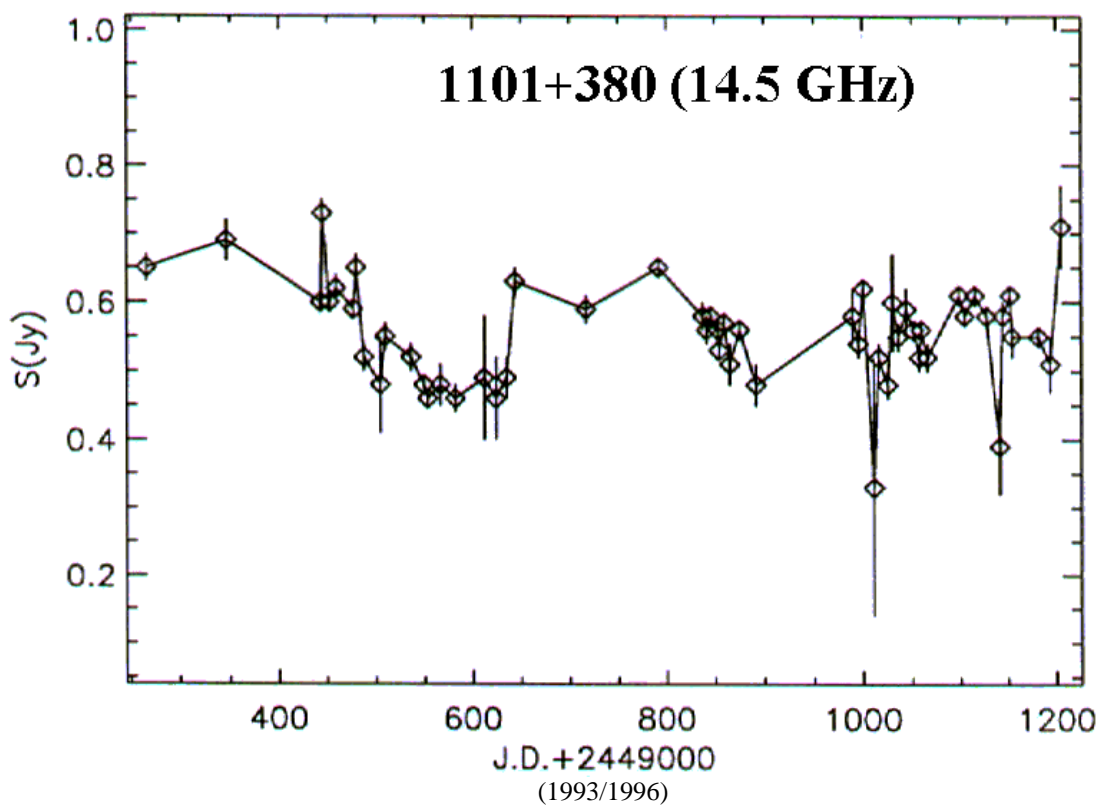
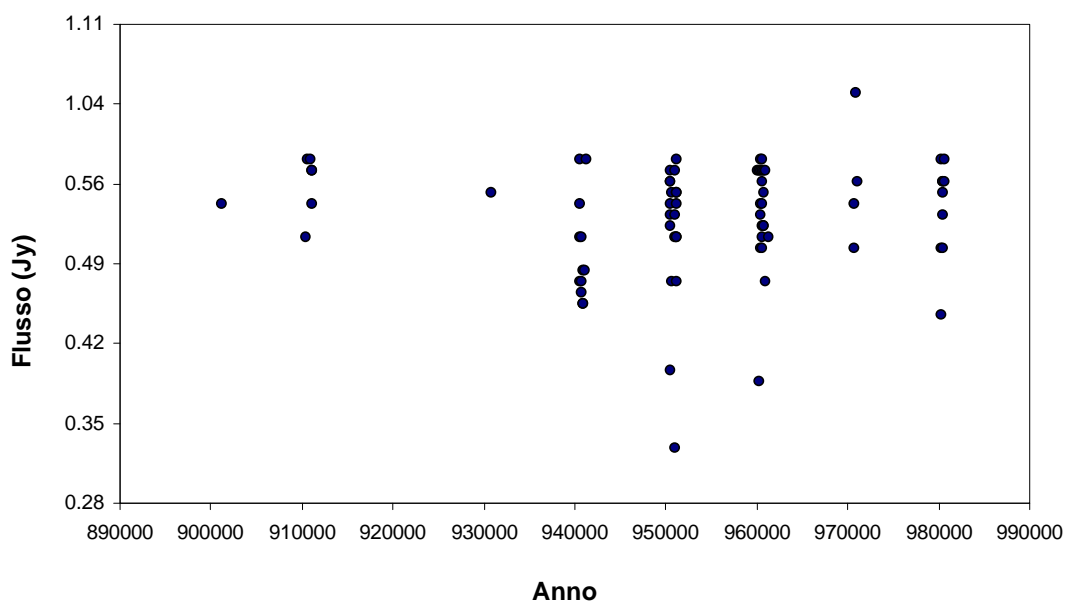




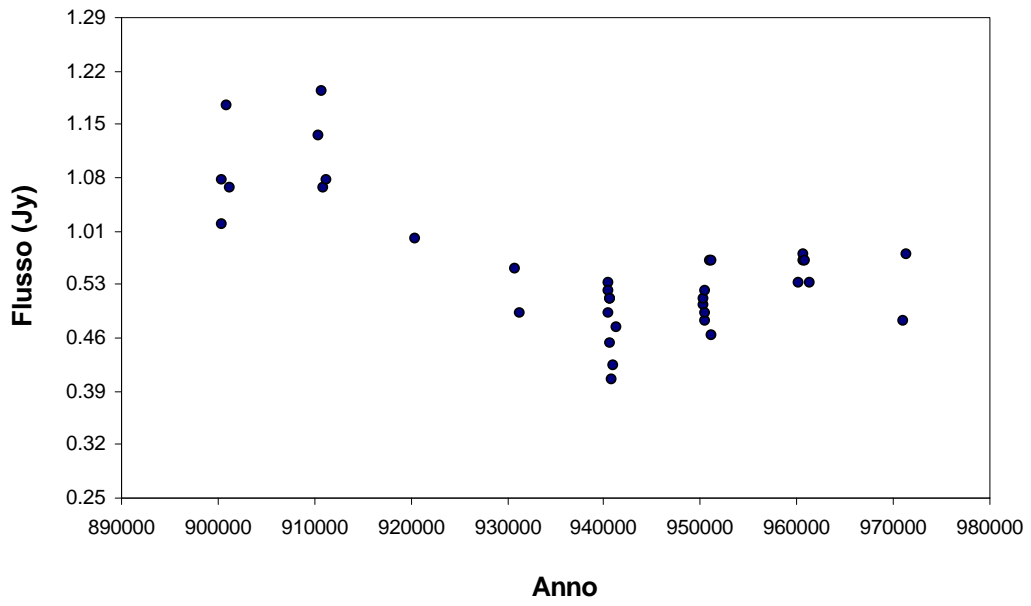
**0851+202**



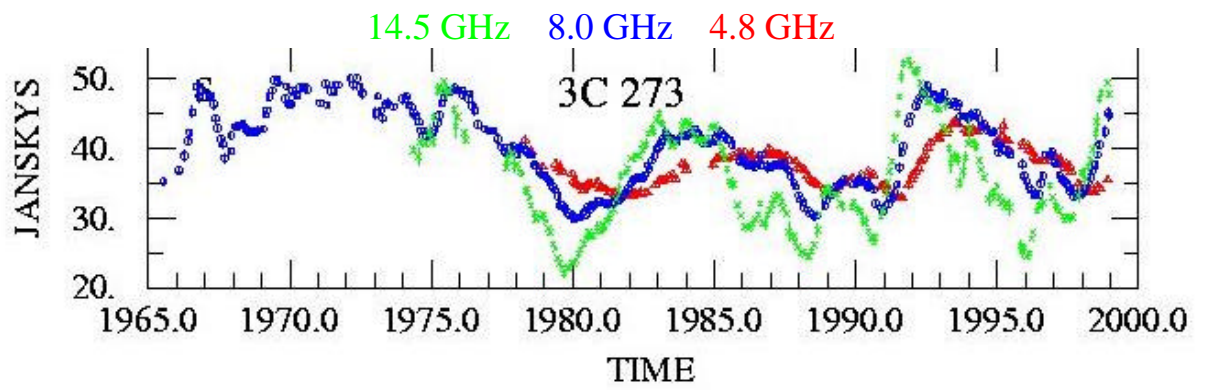
# 1101+38 (14.5 GHz)



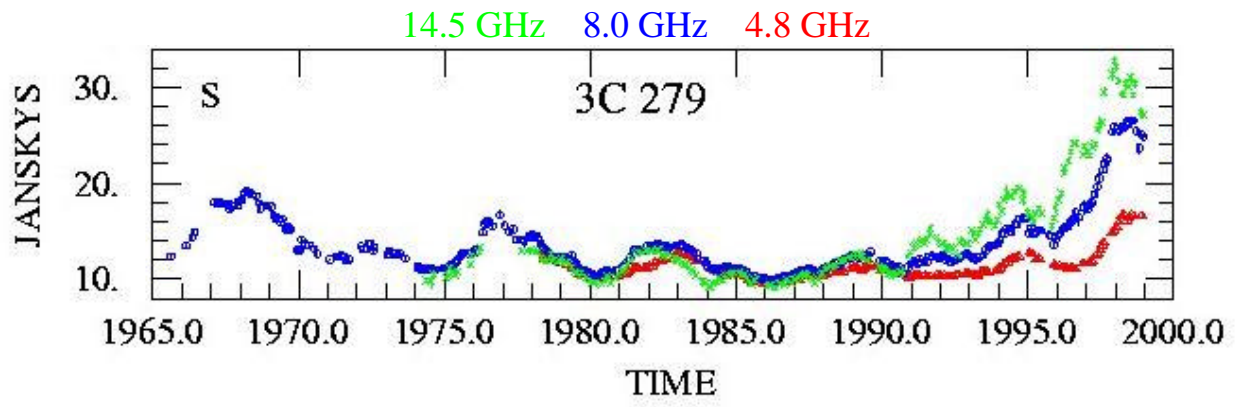
### 1219+28 (14.5 GHz)



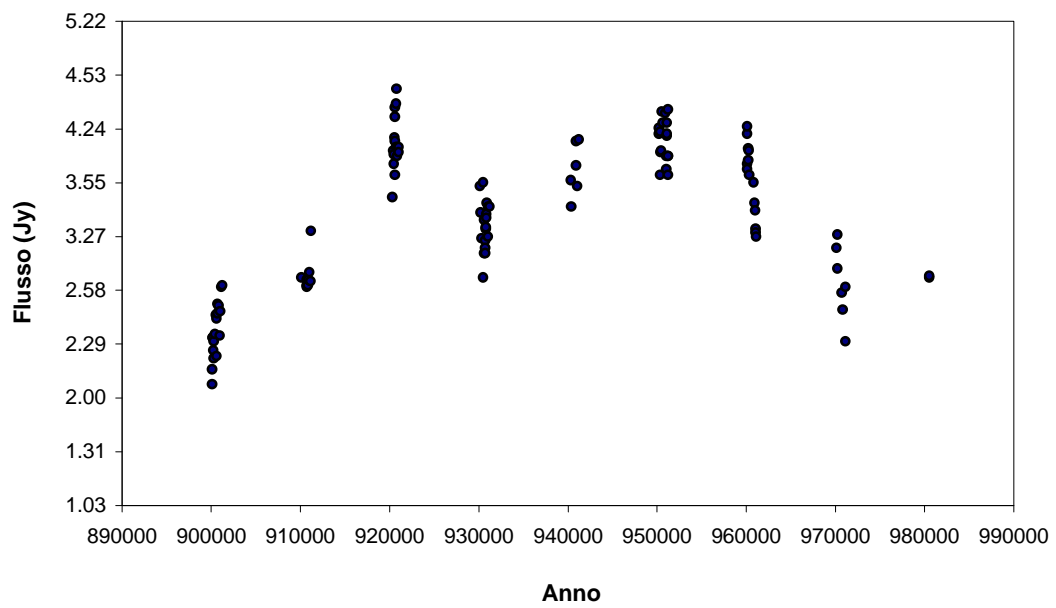
### 1226+020



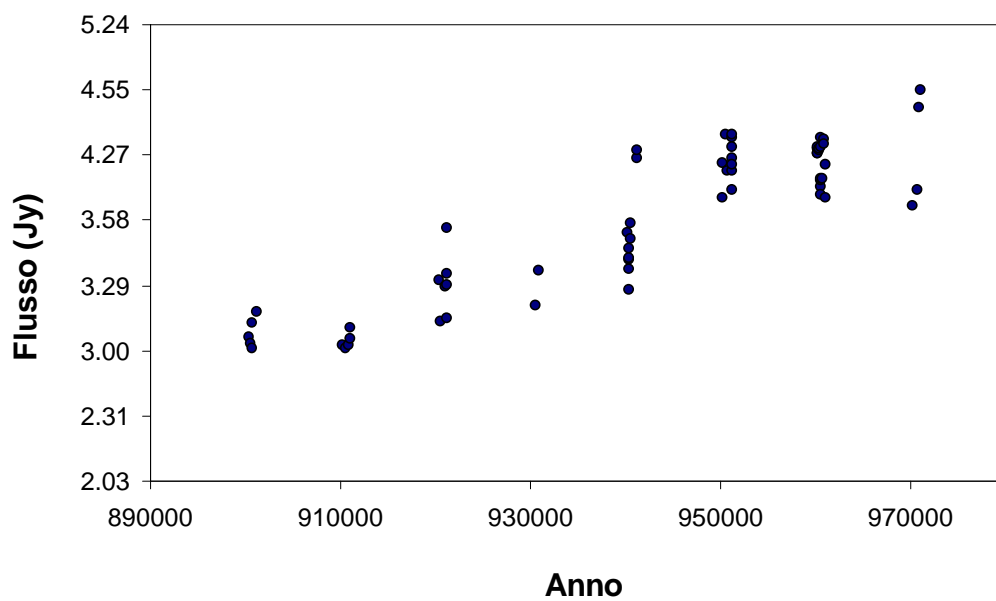
# 1253-050



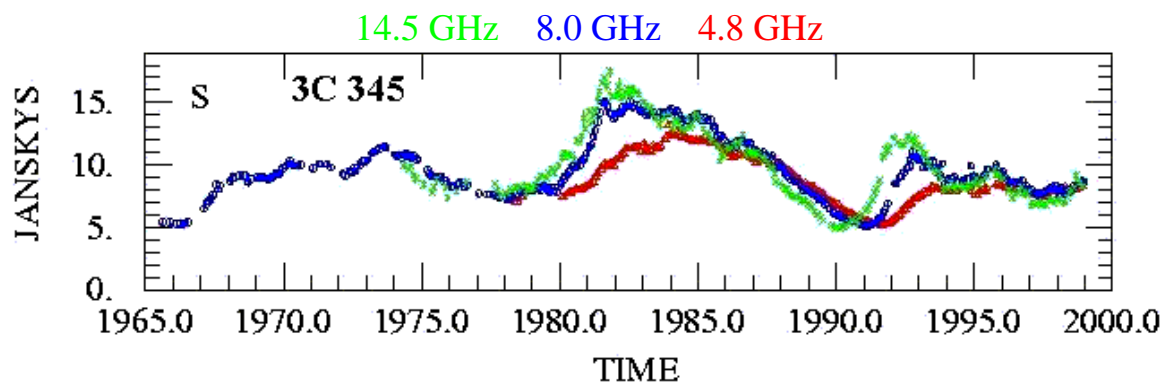
# 1308+32 (8 GHz)



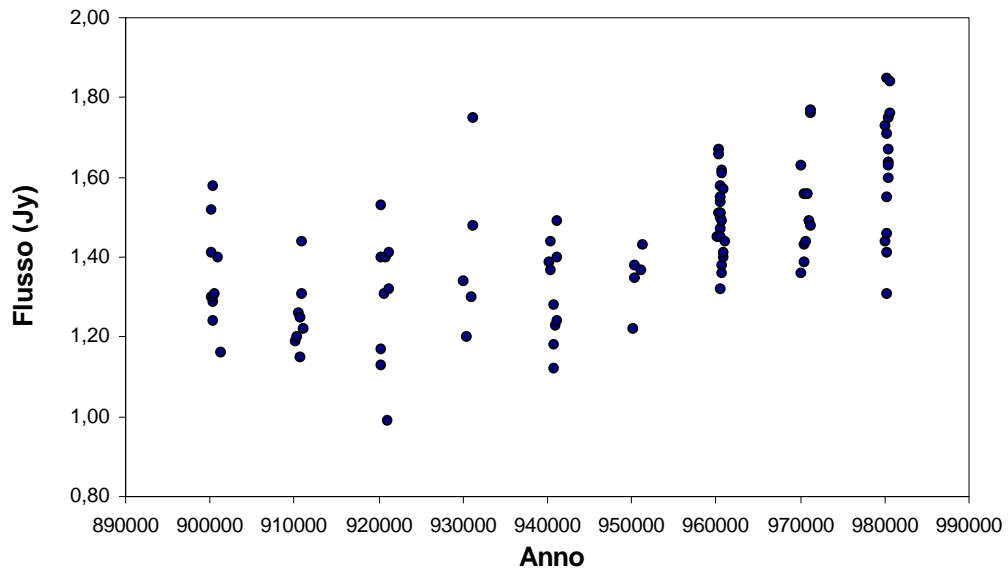
### 1611+34 (8 GHz)



### 1641+390

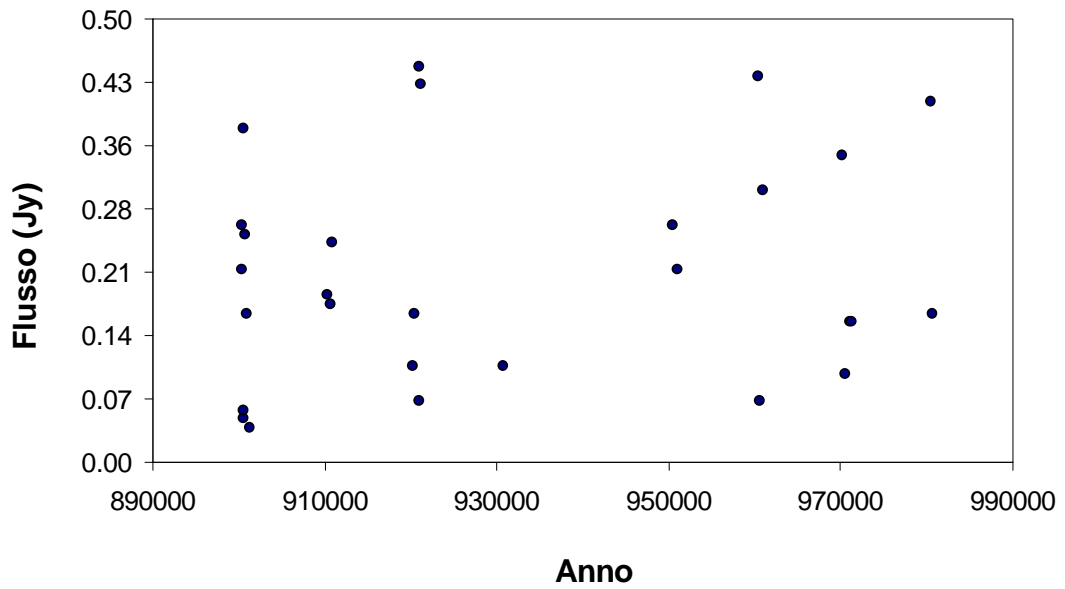


### 1652+398 (8 GHz)



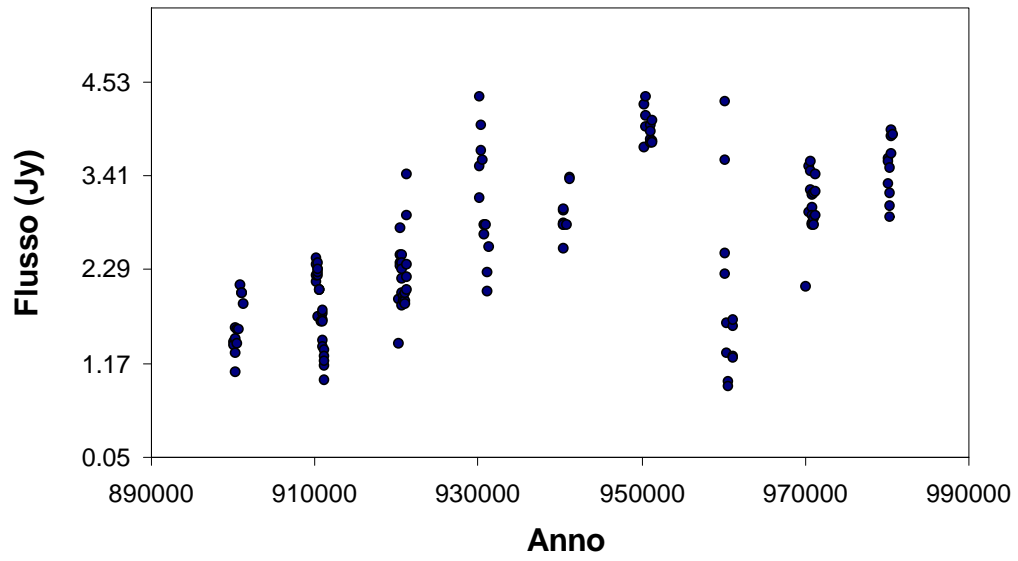
### 1727+502

### IZW 187 (8 GHz)

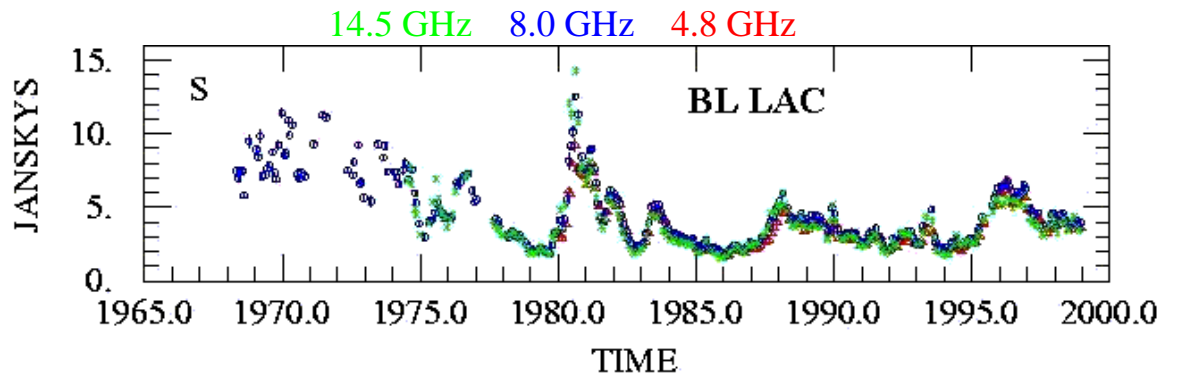




### 1749+096 (8 GHz)

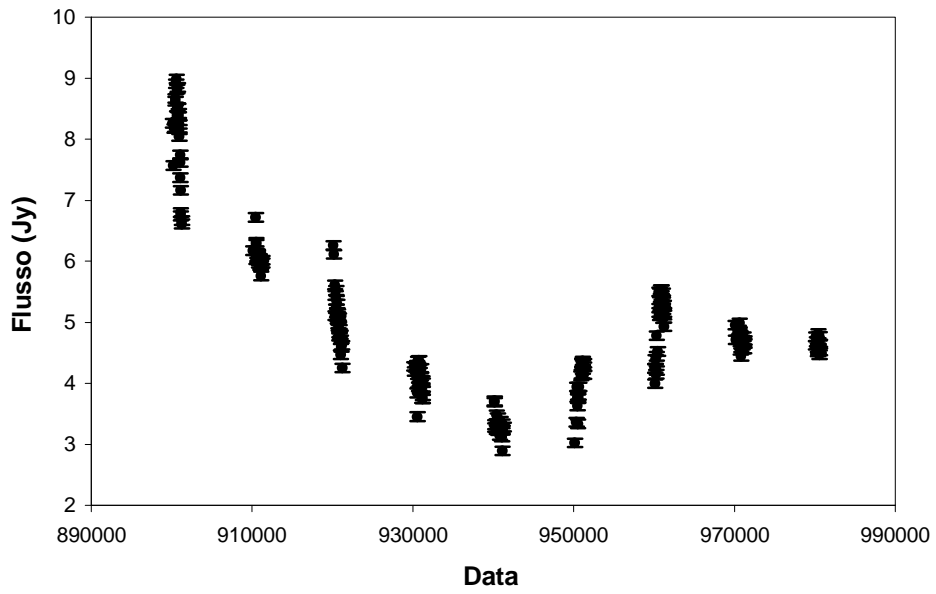


### 2200+420

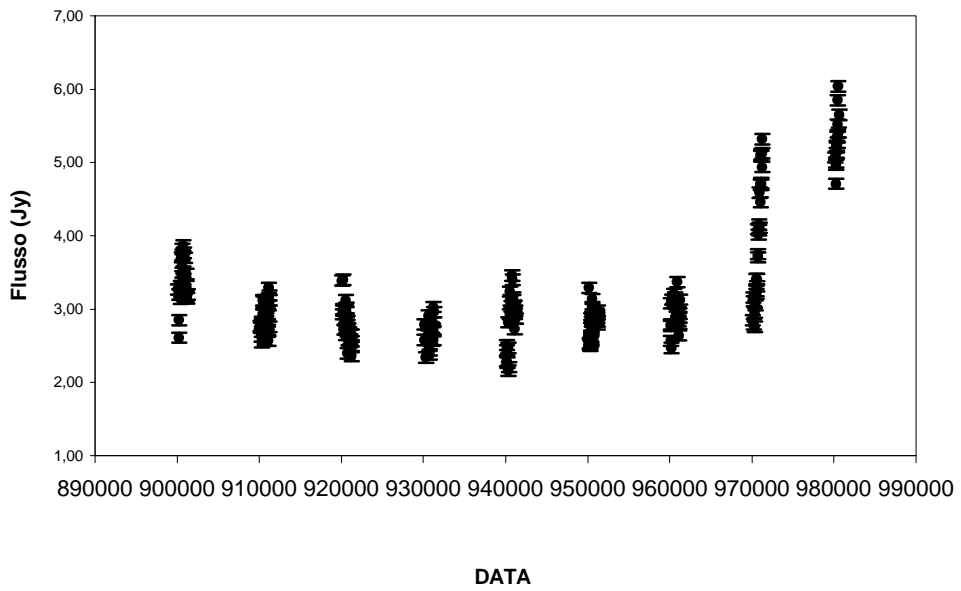


### 2223-052

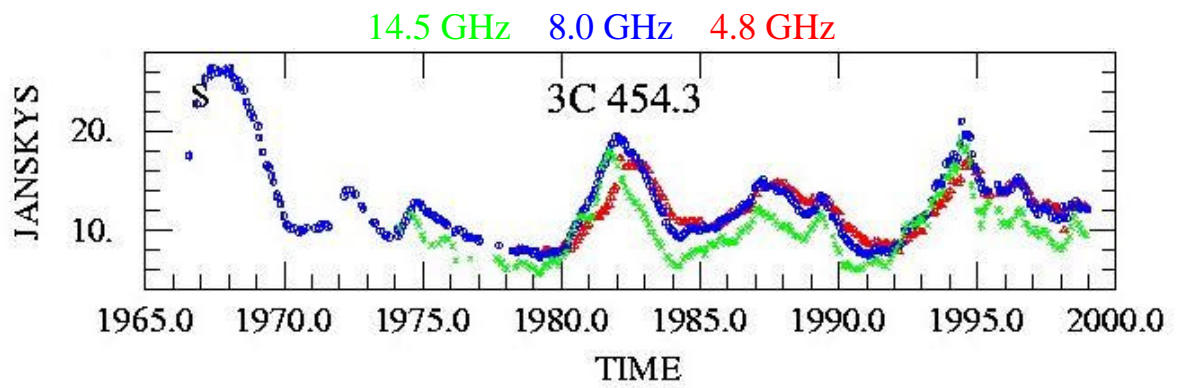
### 3C 446 (14.5 GHz)



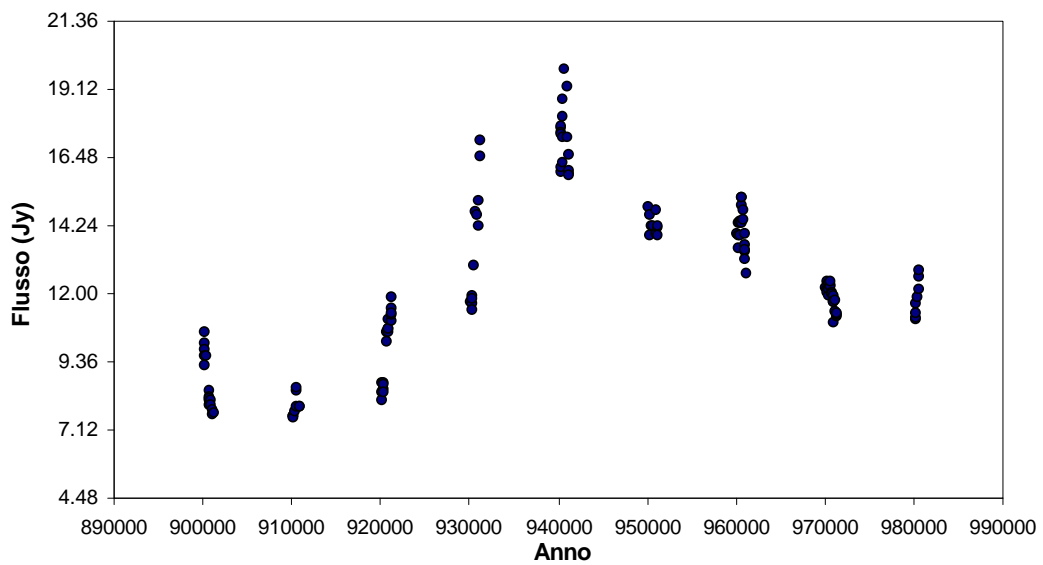
### 2230+114 CTA 102 (14.5 GHz)



## 2251+158

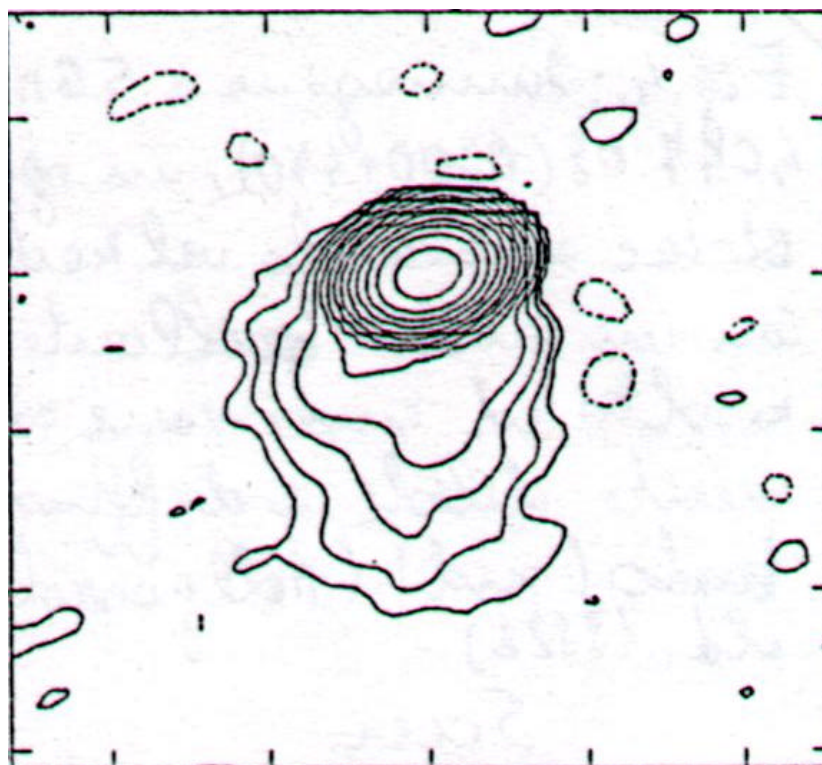


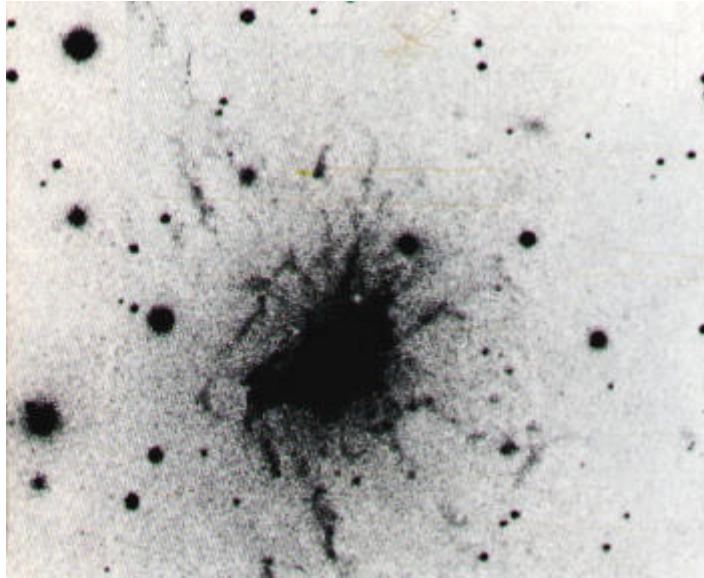
## 2251+158 (8 GHz)



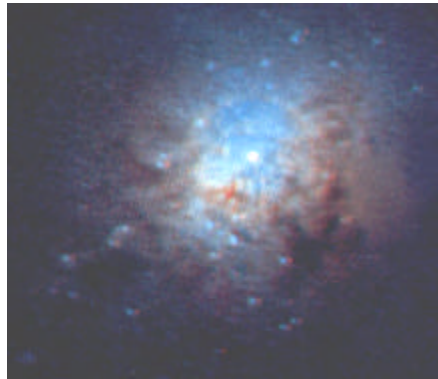
**MAPPE RADIO**

**0300+470 (4C 47.04) - 5 GHz**



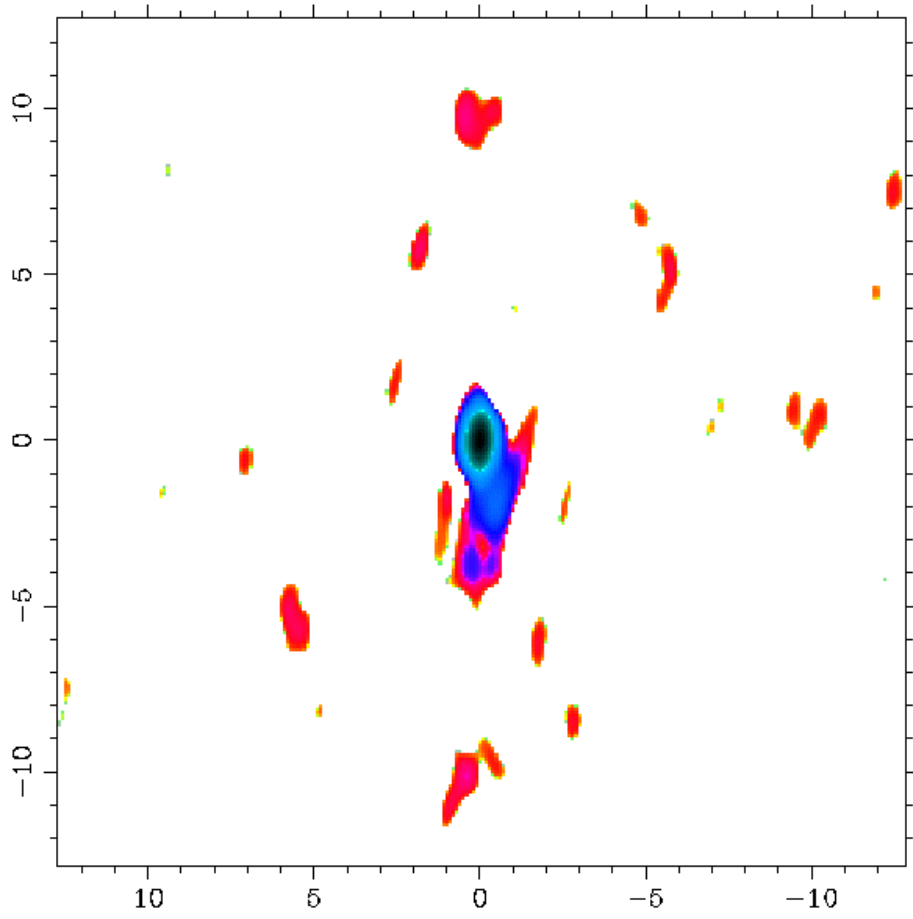


- La galassia NGC 1275, caratterizzata dai getti di gas violentemente espulsi dal nucleo (foto ESO).

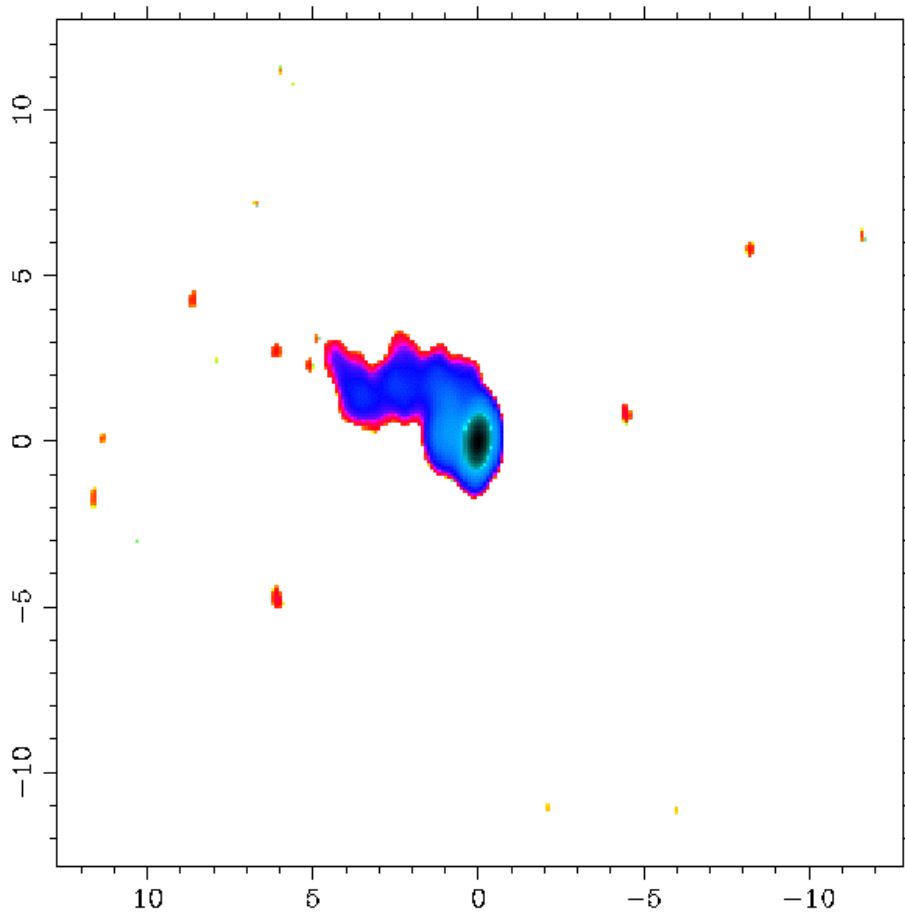


- Parte centrale della galassia NGC 1275 ripresa dalla WFPC del Telescopio Spaziale Hubble; sono visibili gli ammassi globulari blu, mentre al centro la sorgente bianca  $\epsilon$  il nucleo molto luminoso e compatto.

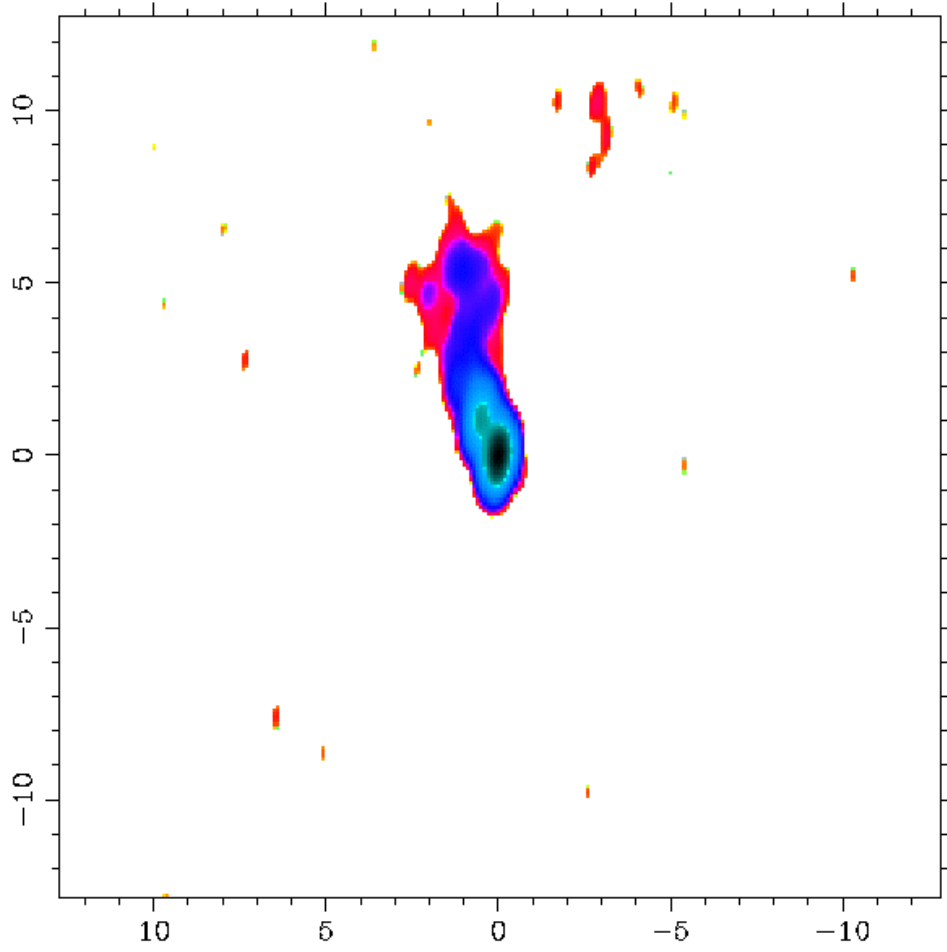
# 0420-012 (8 GHz)



# 0735+178 (8 GHz)

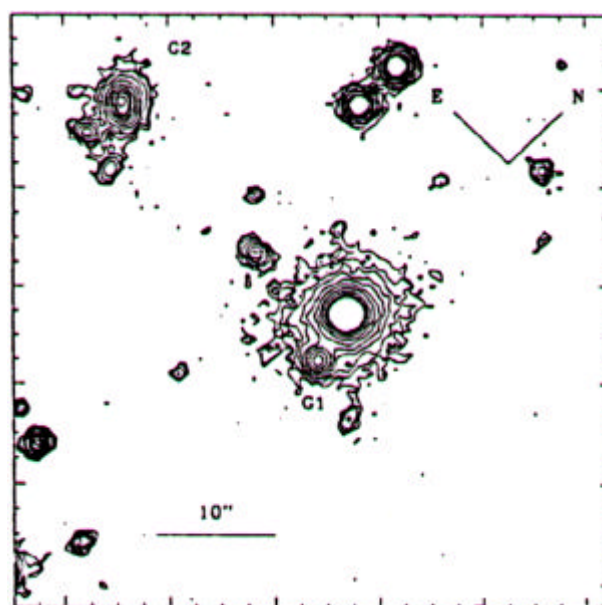
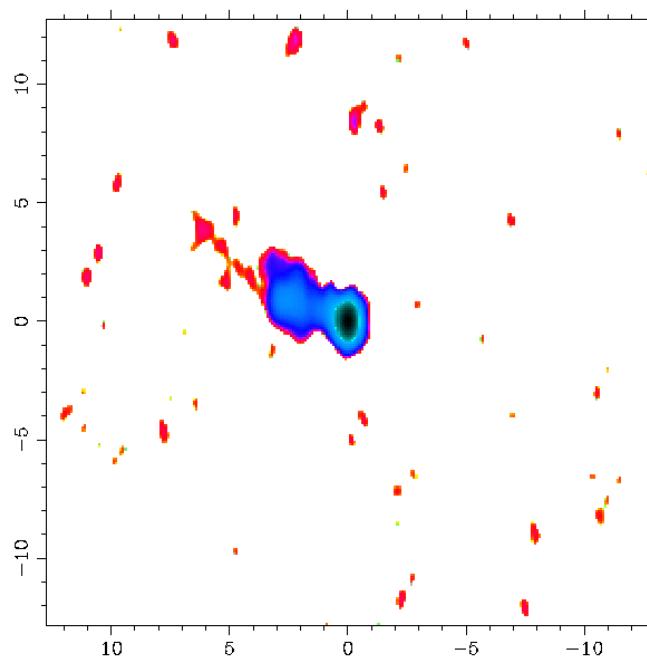


**0754+095 (8 GHz)**



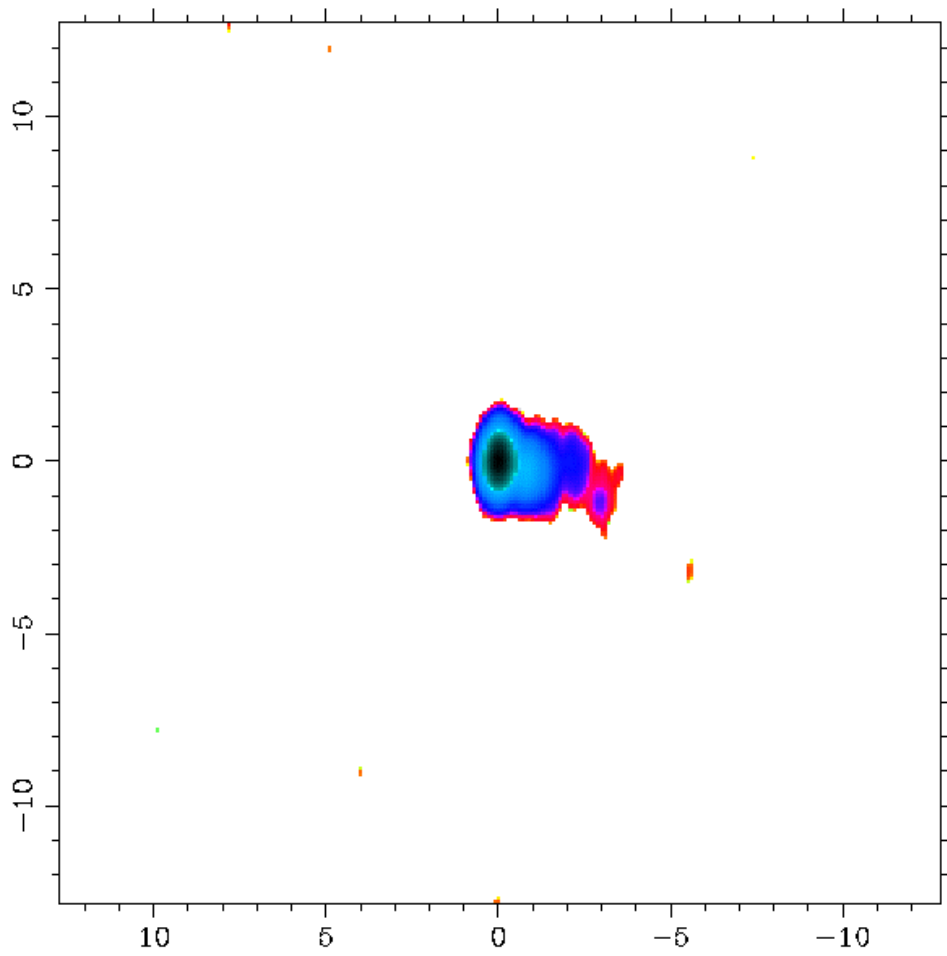


## 0829+046 (8 GHz)



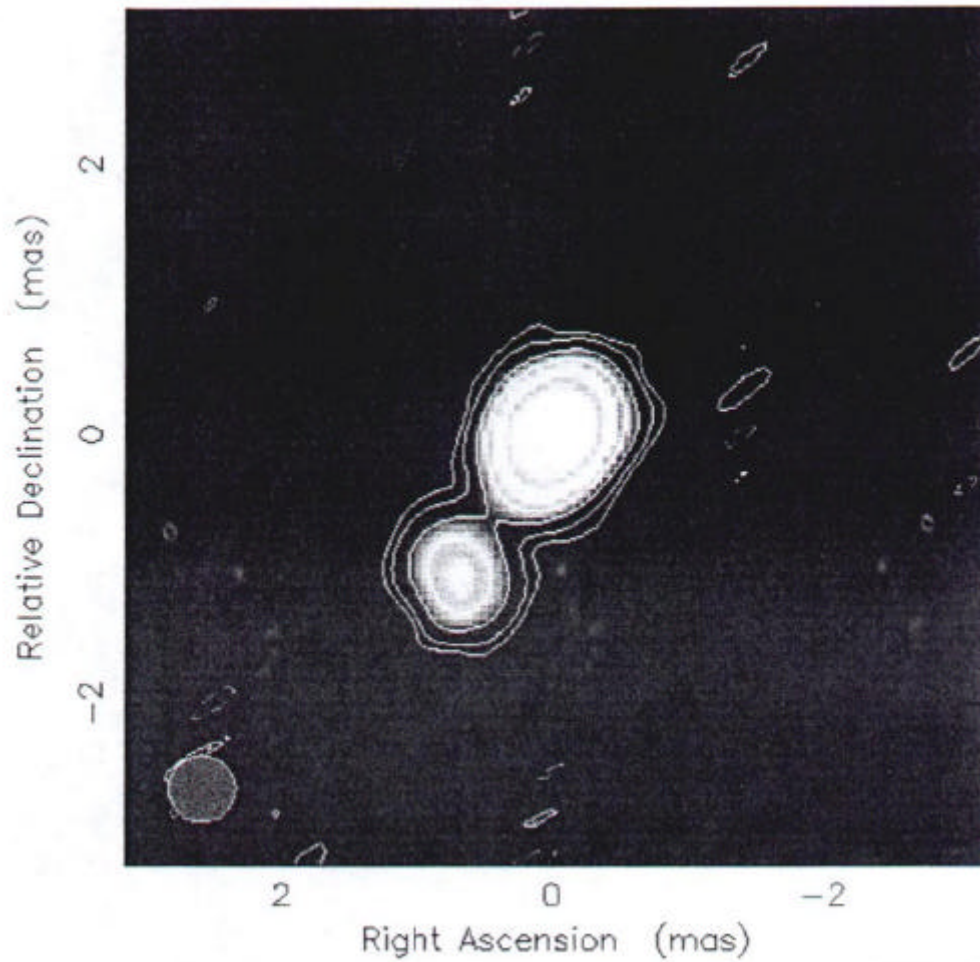
- Immagine nella banda-R della galassia che ospita l'oggetto PKS 0829+046 e due galassie vicine, G1 e G2.

# 0851+202 (OJ 287) - 8 GHz



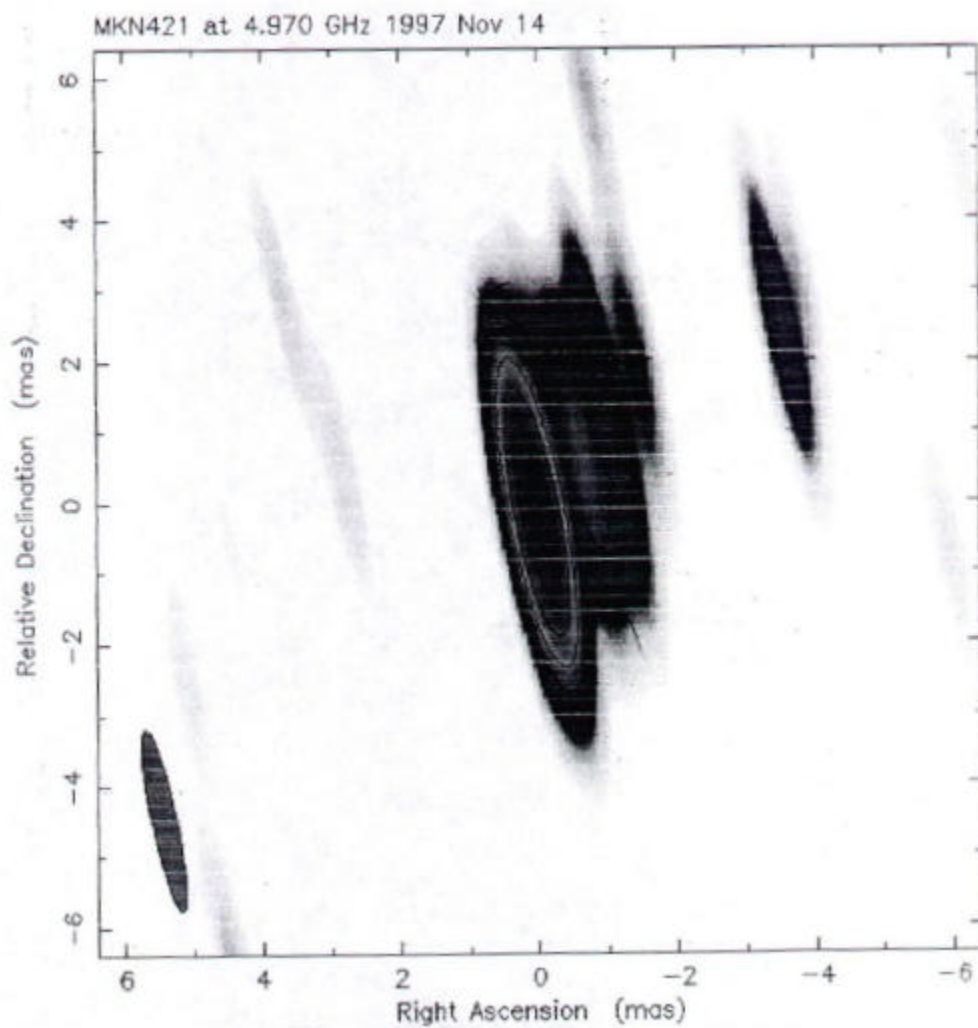
# 0906+430

3C216 at 4.970 GHz 1999 Feb 14

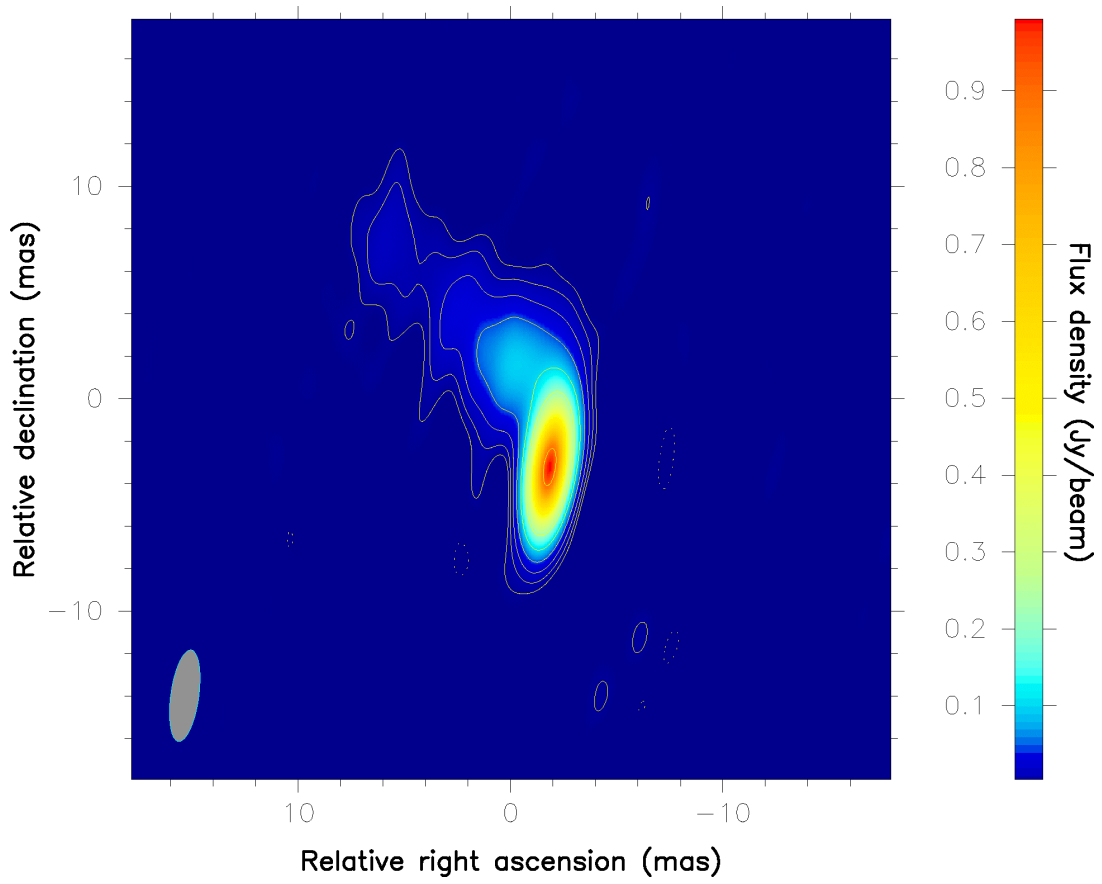


Map center: RA: 09 09 33.471, Dec: +42 53 46.475 (2000.0)

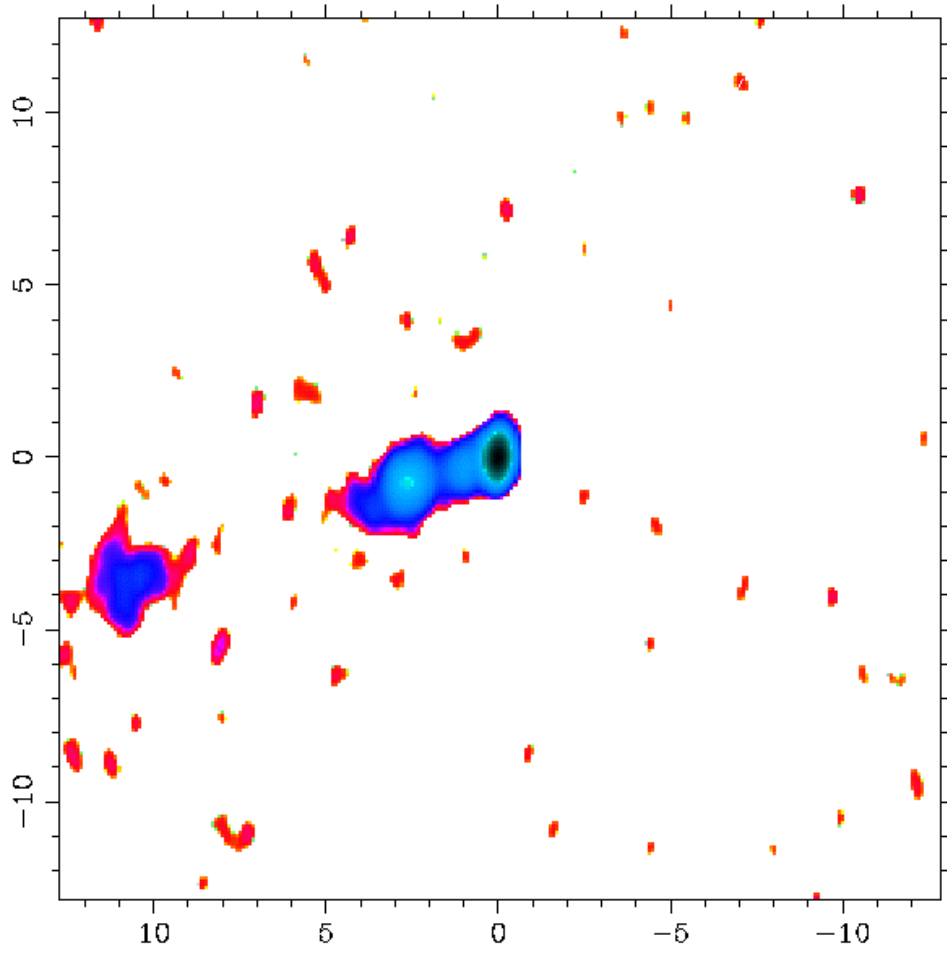
# 1101+380 (MRK 421)



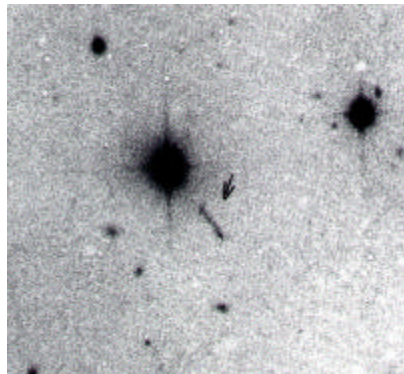
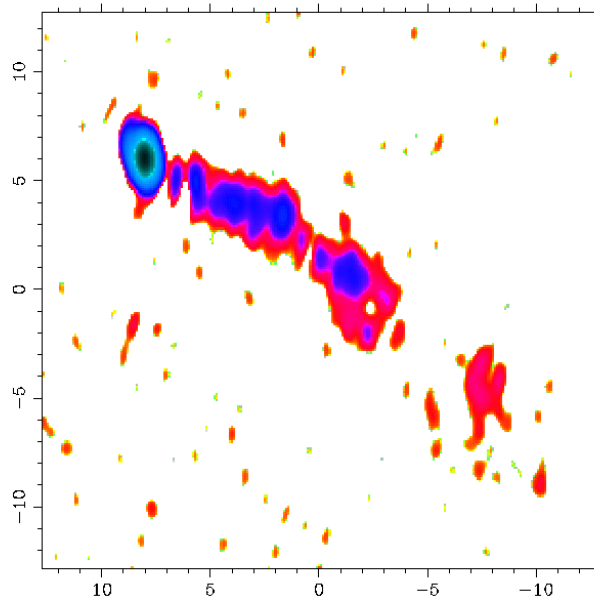
# 1156+295 (4C 29.45)



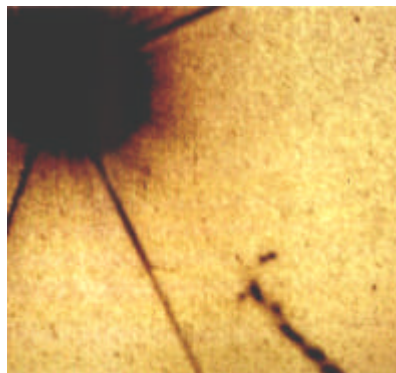
# 1219+285 (W Com) - 8 GHz



## 1226+023 (3C 273) - 8 GHz



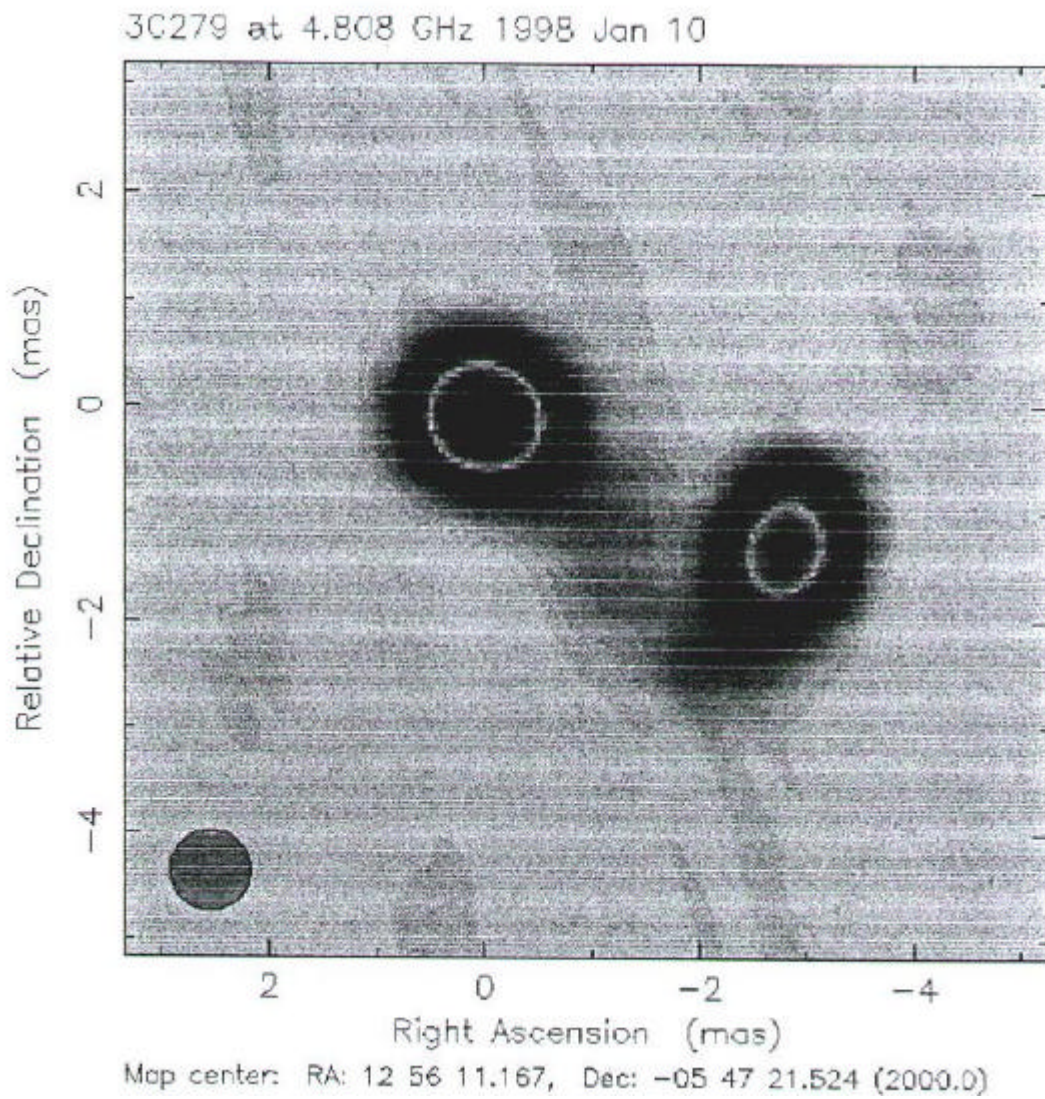
- Il quasar 3C 273 e il suo getto fotografati con il telescopio Canadese-Franco-Hawaiano (marzo 1983).



- Il getto del quasar 3C 273 ripreso dal Telescopio Spaziale Hubble.

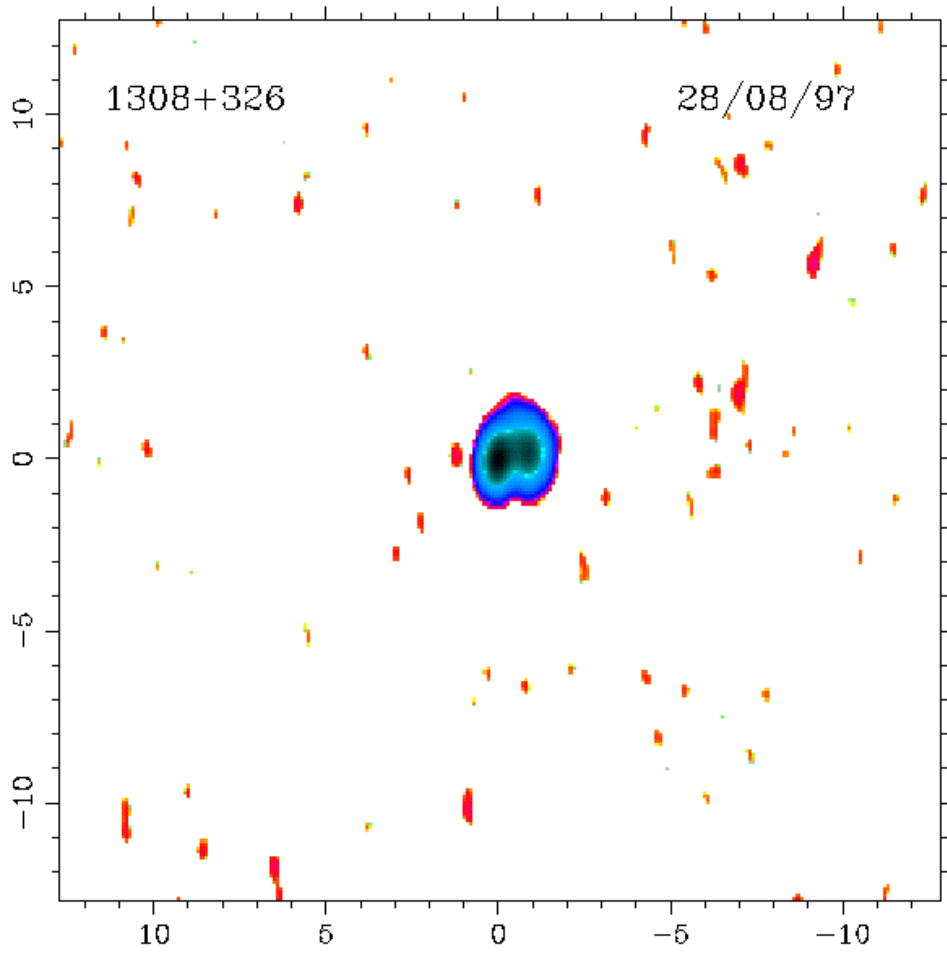


# 1253-050 (8 GHz)

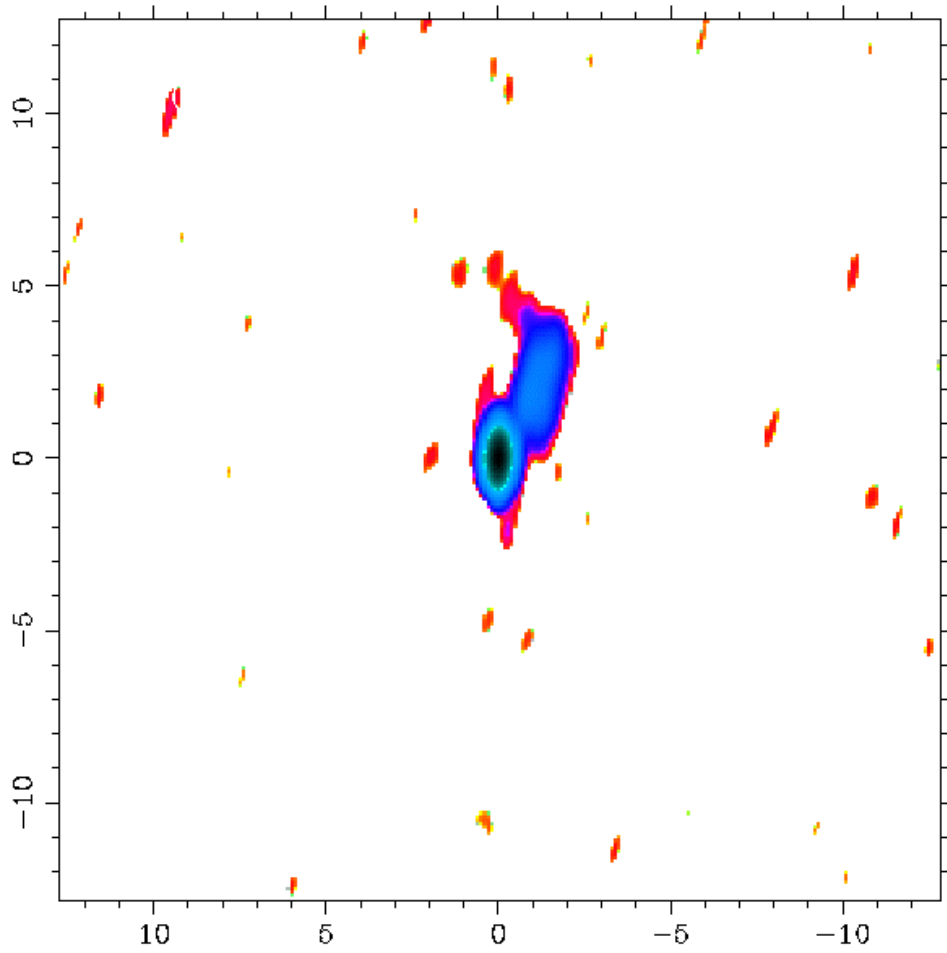




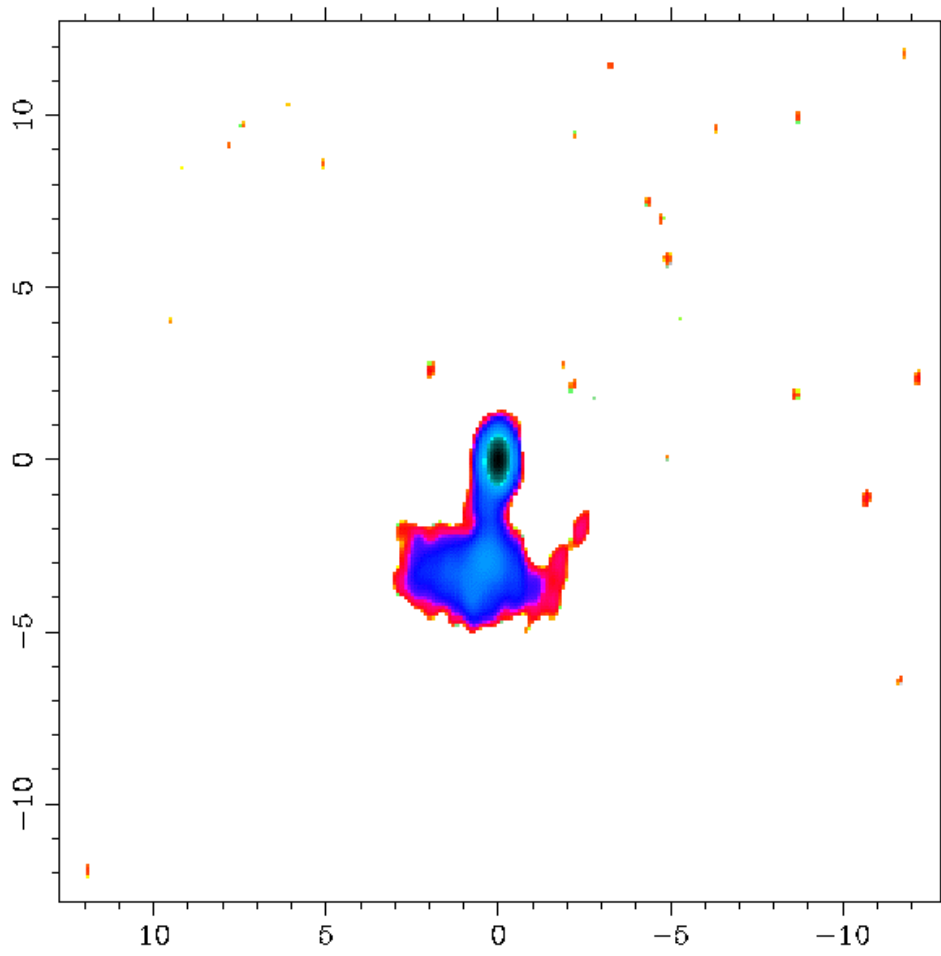
# 1308+320 (8 GHz)



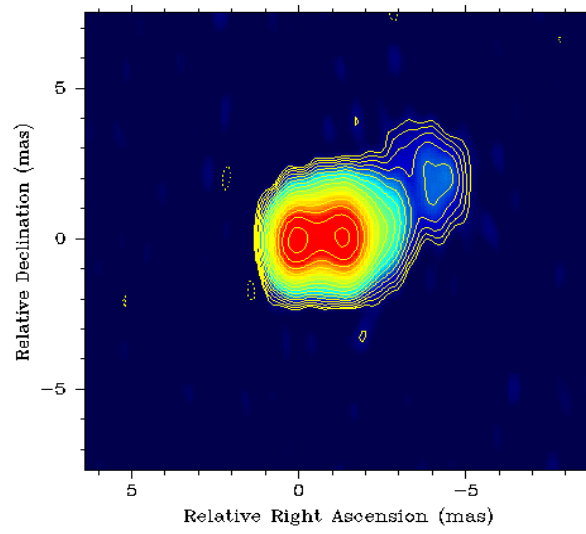
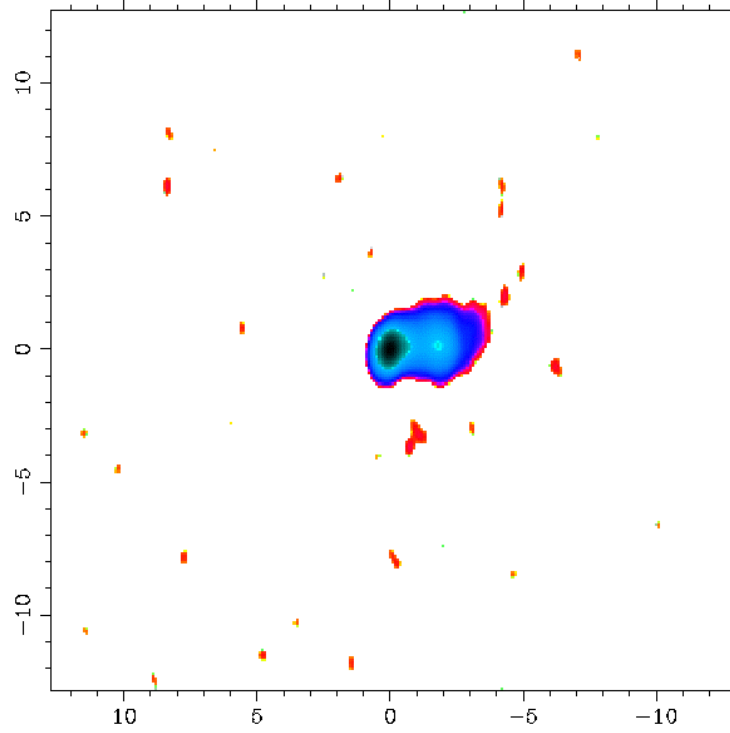
# 1510-089 (8 GHz)



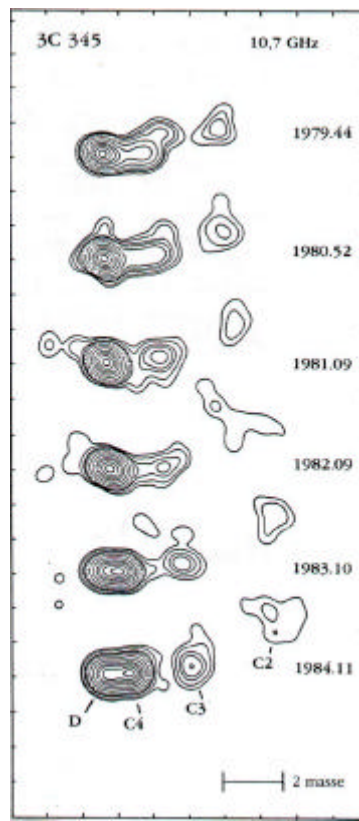
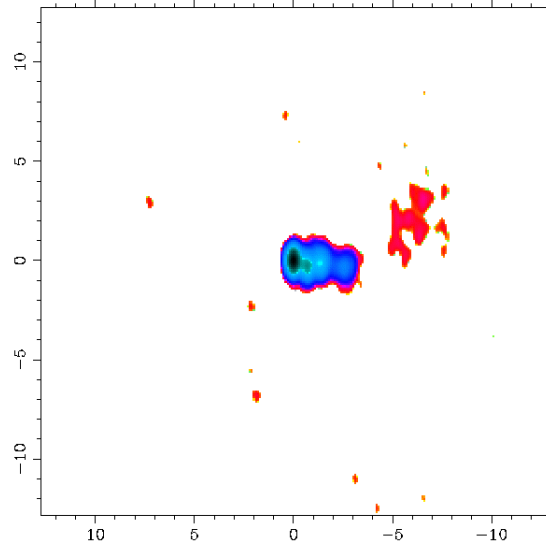
# 1611+340 (DA 406) - 8 GHz



# 1633+380 (8 GHz)

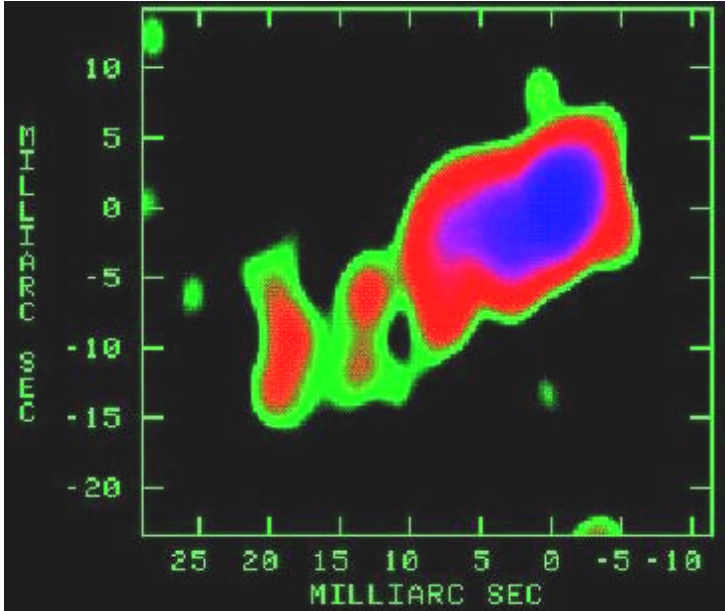
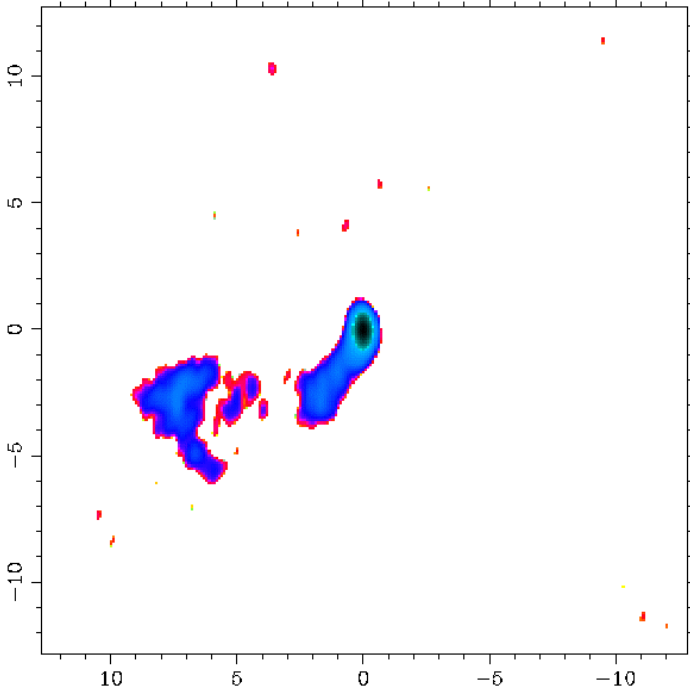


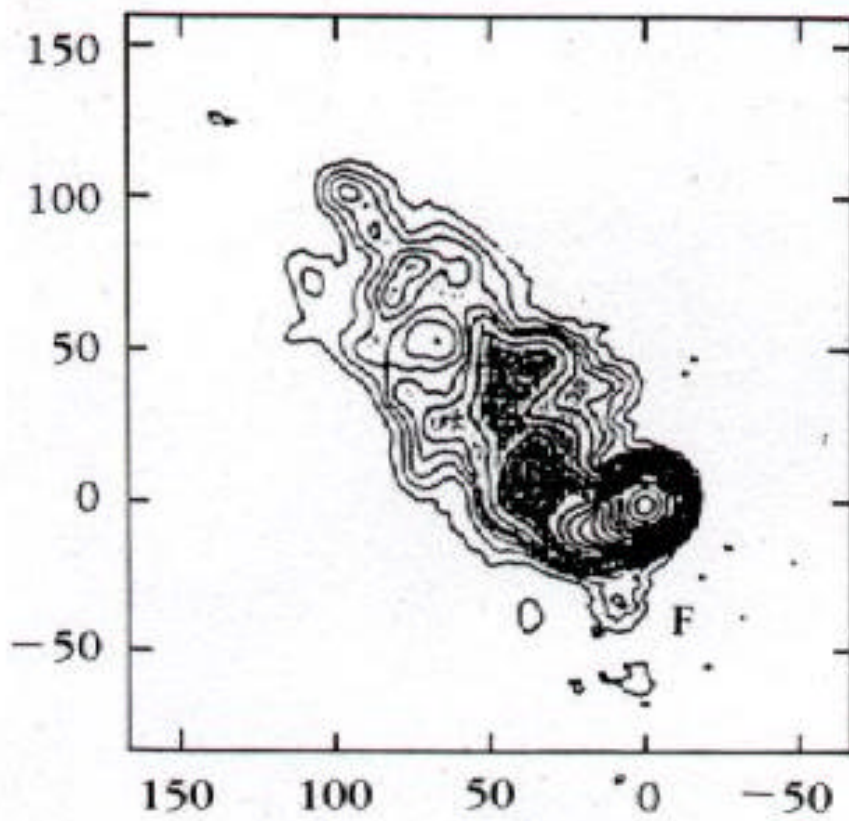
# 1641+399 (3C 345) - 8 GHz



-Il quasar 3C 345 in mappe radio VLBI; D è il nucleo stazionario, C2, C3 e C4 sono le componenti del getto radio che si allontanano a velocità costante.

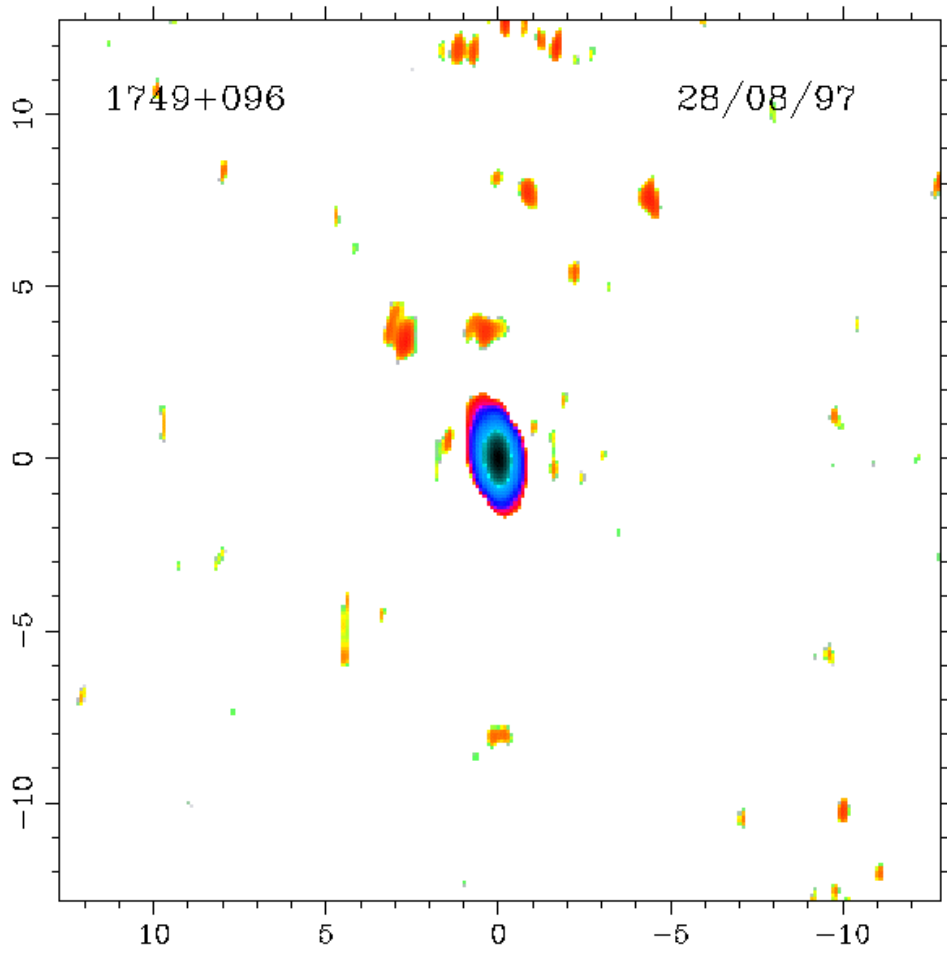
# 1652+398 (MRK 501) - 8 GHz





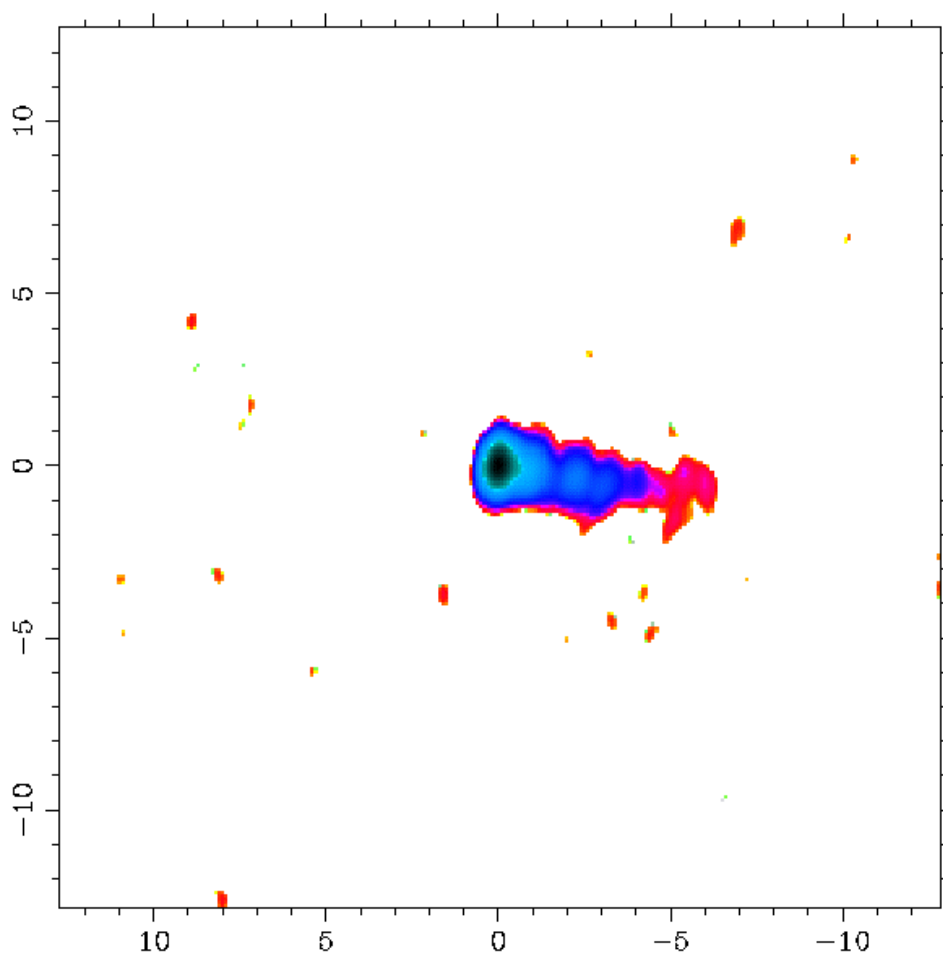
- Mappa radio del getto di MRK 501; la scala  $L$  indicata in millesimi di sec. d arco.

# 1749+096 (OT 081) - 8 GHz

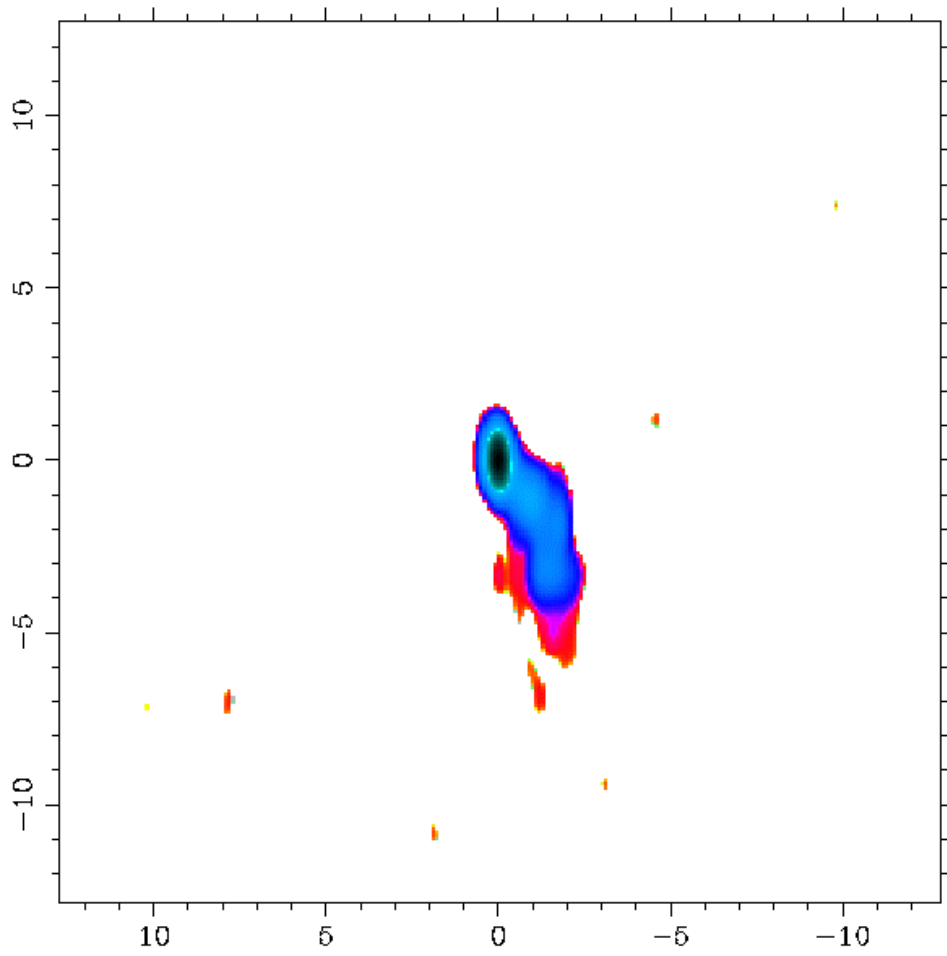




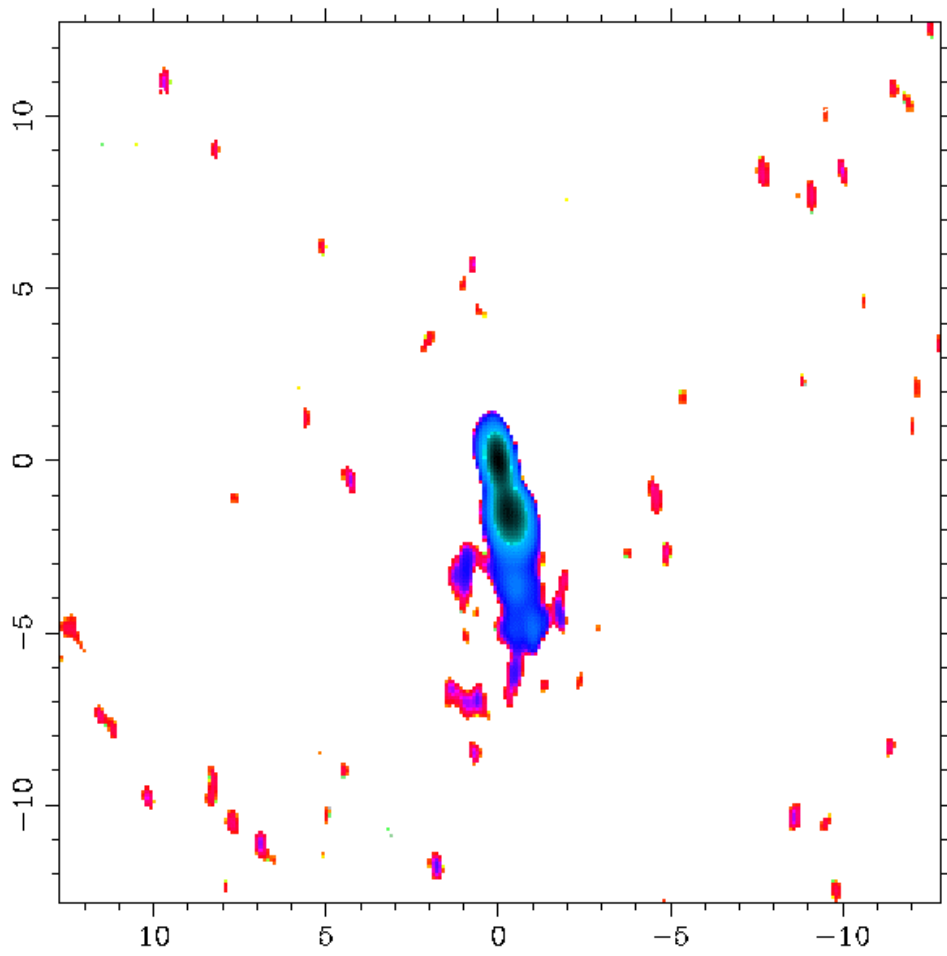
# 1807+698 (3C 371) - 8 GHz



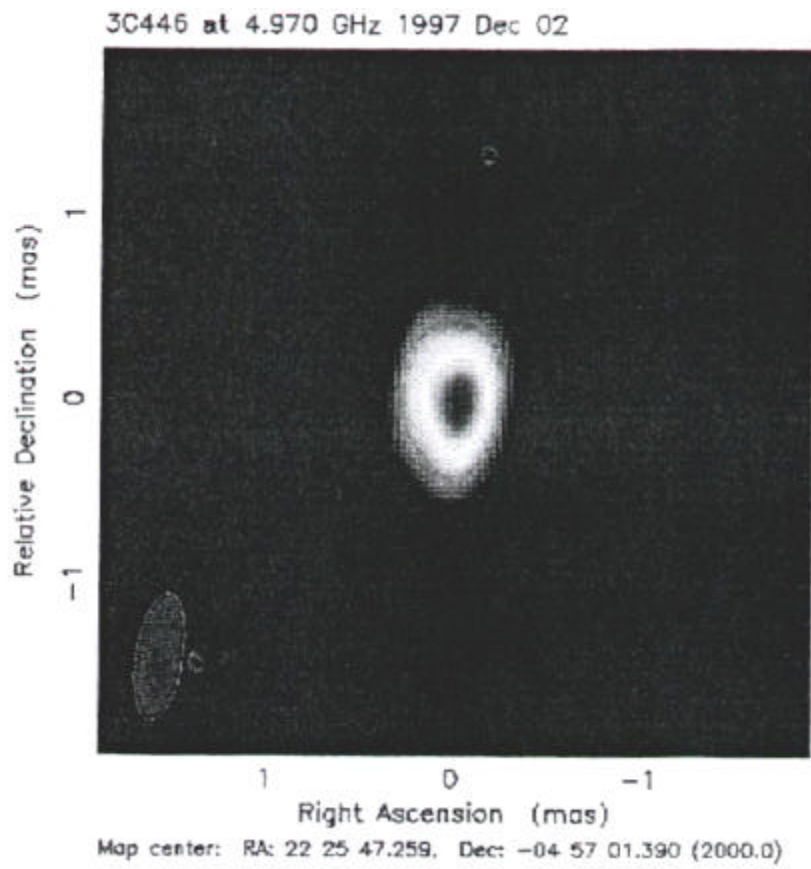
# 2155+152 (8 GHz)



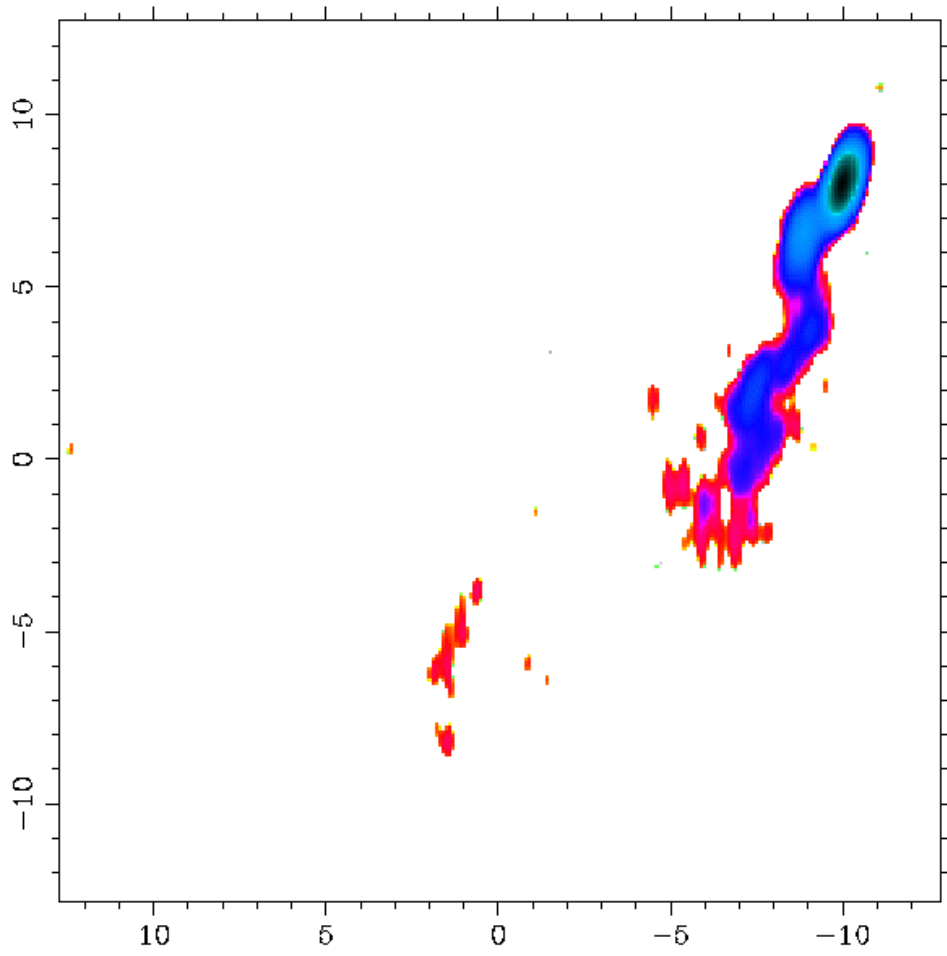
## 2200+420 (BL LAC) - 8 GHz



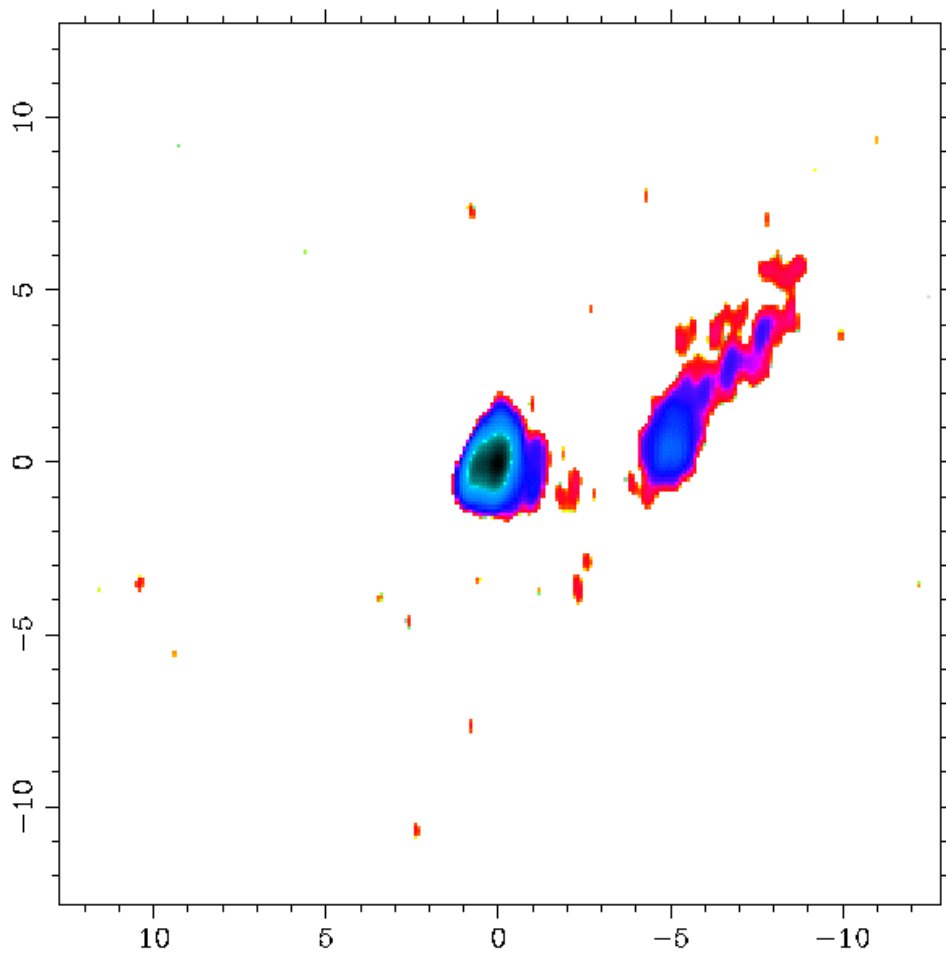
## 2223-052 (3C 446) - 5 GHz



# 2230+114 (CTA 102) - 8 GHz



## 2251+158 (3C 454.3) - 8 GHz



## **RIDUZIONE DEI DATI**

Per la determinazione dei dati fotometrici finali, utilizzando le bande V, R e I (con l'utilizzo di filtri nei quali il sistema fotometrico che si usa mostra la migliore efficienza), si fa in modo che nello stesso campo del CCD cadano, oltre al blazar da fotometrare, almeno 2 stelle brillanti non variabili da utilizzare come stelle di confronto (l'osservazione simultanea del blazar, delle stelle di confronto e del fondo-cielo permettono di eliminare quelle variazioni che possono essere dovute a fluttuazioni sia della trasparenza atmosferica, sia dell'estinzione interstellare).

Successivamente, da ogni immagine acquisita, corretta mediante sottrazione del rumore elettrico e della corrente termica (che possono essere ripresi direttamente dall'attrezzatura dando semplicemente un tempo di posa identico a quelli che seguiranno per ottenere le immagini degli oggetti da fotometrare, ottenendo così un'immagine termica che va sottratta a quella reale alla stessa temperatura e con lo stesso tempo di esposizione), una volta identificate le stelle di confronto presenti nel campo del blazar e lo stesso blazar, si passa alla lettura nell'immagine CCD delle magnitudini strumentali ( $m_{str}$ ) e degli errori relativi corrispondenti ( $\sigma_{str}$ ); questi valori devono corrispondere alla  $i$ -esima stella,  $(m_{str})_i \pm (\sigma_{str})_i$ , presente in ciascuna immagine e al blazar,  $(m_{str})_{ogg} \pm (\sigma_{str})_{ogg}$ .

Poiché le stelle presenti nello stesso campo dell'oggetto hanno i valori di magnitudine  $m$  ( $=V, R, I$ ) come indicati nel catalogo e sono osservate con la stessa massa d'aria dell'oggetto, si utilizza, per la determinazione della magnitudine apparente, la relazione seguente

$$(m)_{ogg,i} = (m)_i + (m_{str})_{ogg} - (m_{str})_i$$

dove  $(m)_{ogg,i}$  è la magnitudine apparente dell'oggetto determinato con i valori strumentali e standard della  $i$ -esima stella di confronto, mentre l'errore è dato da

$$(\sigma)_{ogg,i} = \sqrt{((\sigma_{str})_{ogg})^2 + ((\sigma_{str})_i)^2 + ((\sigma)_i)^2}$$

con  $(\sigma_{str})_i$  e  $(\sigma)_i$  le deviazioni standard strumentale e quella corrispondente alla magnitudine apparente della  $i$ -esima stella. Il risultato finale corrispondente ad ogni stella di confronto sarà perciò dato da

$$(m)_{ogg,i} \pm (\sigma)_{ogg,i}$$

La miglior stima per la magnitudine apparente dell'oggetto è data da

$$(m)_{ogg} = (\sum_i w_i (m)_{ogg,i}) / \sum_i w_i$$

con  $w_i = 1/(\sigma)_{ogg,i}^2$ , mentre l'errore  $\mathbb{L}$  dato da  $(\sigma)_{ogg} = 1/\sqrt{\sum_i w_i}$  e dove  $i=1\dots n$  ( $n$   $\mathbb{L}$  il numero di stelle di confronto); pertanto il risultato finale  $\mathbb{L}$  dato da  $(m)_{ogg} \pm (\sigma)_{ogg}$ .

Un lavoro di riduzione dei dati a parte deve essere svolto per ottenere i valori fotometrici relativi ai blazar per i quali vi  $\mathbb{L}$  mancanza di stelle di confronto nel campo del CCD in cui essi sono presenti e/o per i quali mancano i valori di magnitudine in una determinata banda. In questo caso si procede alla calibrazione fotometrica delle notti in cui sono osservati gli oggetti; questa operazione viene effettuata mediante l'osservazione di un campione di stelle standard.

Il catalogo include una tabella con stelle dell'ammasso aperto M67 (appendice-I), e stelle standard di Landolt (appendice-II), aventi una  $V < 9.695$  in modo tale da richiedere tempi di esposizione molto brevi e un indice di colore  $V-R < 0.352$  per evitare stelle molto rosse poichè la distribuzione di intensità spettrale  $\mathbb{L}$  diversa a seconda che la stella sia arrossata dall'assorbimento galattico oppure sia intrinsecamente rossa. Sono anche incluse le cartine d'identificazione per alcune stelle di Landolt del catalogo HD (appendice-III).

Mediante i valori strumentali e quelli già noti della magnitudine apparente delle stelle standard, si procede alla determinazione dei coefficienti delle equazioni di trasformazione utilizzate per ottenere i valori standard dalle magnitudini strumentali:

$$V = v + \alpha_v + k_v \cdot X$$

$$R = r + \alpha_r + \beta_r(v-r) + k_r \cdot X$$

$$I = i + \alpha_i + \beta_i(v-i) + k_i \cdot X$$

dove:  $V-R-I$  sono le magnitudini apparenti note delle stelle usate per la calibrazione,  $X$   $\mathbb{L}$  la massa d'aria,  $v-r-i$  sono le magnitudini strumentali nei 3 filtri. Mediante regressione lineare si determinano i coefficienti  $\alpha$  e  $k$  (i valori di  $\beta$  si possono considerare nulli ammettendo l'indipendenza della magnitudine apparente dall'indice di colore). Una volta noti i coefficienti delle relazioni sopra citate, si sostituiscono in esse i valori delle magnitudini strumentali di ciascun oggetto, ricavando così i valori delle loro magnitudini apparenti  $V$ ,  $R$  ed  $I$ .

Un altro importante parametro da studiare  $\mathbb{L}$  rappresentato dalla forma dello spettro in un certo stato di luminosità del blazar; uno spettro in generale lo si considera piatto se  $\alpha > -0.5$ .

Con immagini in cui sono disponibili le osservazioni nei 3 filtri, si può determinare l'indice spettrale,  $\alpha_{VRI}$ , a partire dal valore dei flussi che si ricavano dai valori di magnitudine  $V$ ,  $R$ ,  $I$ . Per passare dalle magnitudini apparenti ( $m = V, R, I$ ) ai flussi ( $F_v$ ) si usa la relazione seguente



$$F_v = F_{ov} \cdot 10^{-0.4(m-A_v)}$$

dove  $F_{ov}$  è il flusso noto alla frequenza  $v$  di un oggetto di  $m_v=0$  ed i cui valori per le bande spettrali considerate sono i seguenti

$$(F_{ov})_B = 4.26 \cdot 10^3 \text{ (Jy)},$$

$$(F_{ov})_V = 3.64 \cdot 10^3 \text{ (Jy)},$$

$$(F_{ov})_R = 3.08 \cdot 10^3 \text{ (Jy)},$$

$$(F_{ov})_I = 2.55 \cdot 10^3 \text{ (Jy)}, \quad 1 \text{ Jy} = 10^{-26} \text{ W m}^{-2} \text{ Hz}^{-1}$$

mentre i valori dei coefficienti di estinzione interstellare nelle altre bande sono calcolati a partire dai valori noti di  $A_V$ , mediante le seguenti formule :

$$A_B = 1.33 \cdot A_V,$$

$$A_R = 0.84 \cdot A_V,$$

$$A_I = 0.61 \cdot A_V.$$

Una volta noti i flussi  $F_v$ , si passa al  $\log_{10}$  della relazione  $F_v = kv^\alpha$ , cioè

$$\log_{10}(F_v) = \alpha \cdot \log_{10}(v) + \log_{10}(k),$$

e mediante regressione lineare (note le tre frequenze), si determinano  $\alpha$  e  $k$ .

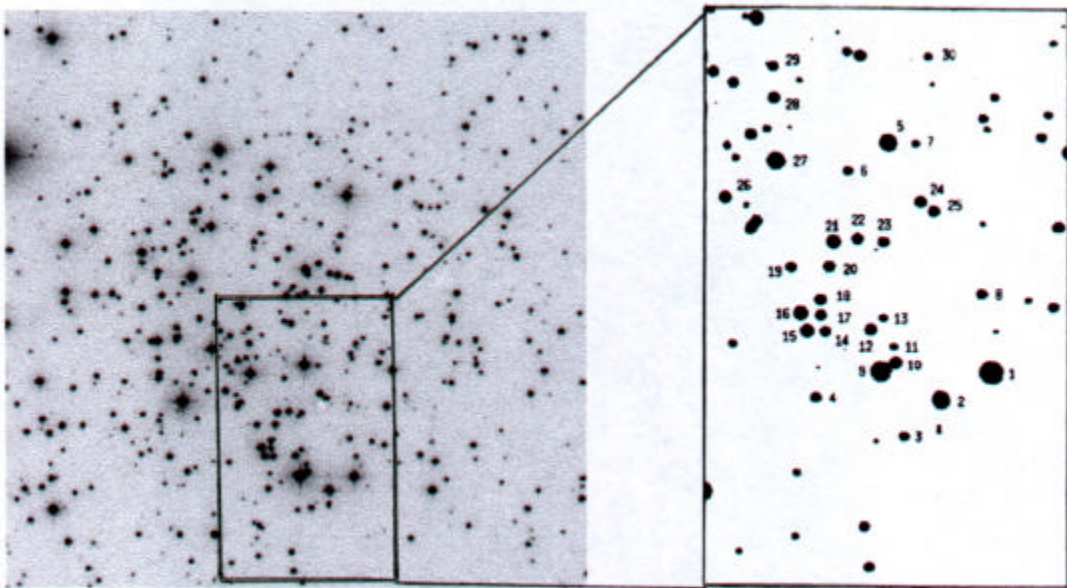
## APPENDICE I

- *Stelle dell'ammasso aperto M67 per la calibrazione fotometrica di immagini CCD.*

*Coordinate celesti (J2000.0):*

$$\alpha = 08^{\text{h}} 51^{\text{m}} 18^{\text{s}}$$

$$\delta = +11^{\circ} 48' 00''$$



<b>Stella</b>	<b>V</b>	<b>B-V</b>	<b>V-R</b>	<b>V-I</b>
2	10.022	-0.086	-0.034	-0.068
3	13.458	0.575	0.355	0.698
4	13.096	0.599	0.356	0.703
5	10.301	1.253	0.641	1.211
6	13.670	0.568	0.339	0.692
7	14.343	0.537	0.309	0.625
8	13.199	0.598	0.351	0.687
9	9.702	1.359	0.714	1.345
10	12.397	0.744	0.426	0.867
11	14.132	0.707	0.416	0.798
12	12.724	0.568	0.336	0.685
13	13.933	0.592	0.352	0.719
14	13.147	0.580	0.337	0.654
15	12.247	0.579	0.347	0.673
16	11.432	1.057	0.553	1.059
17	13.174	0.589	0.343	0.675
18	12.884	0.453	0.275	0.554
19	13.192	0.584	0.335	0.660
20	12.765	0.557	0.329	0.649
21	12.124	0.458	0.283	0.556
22	12.636	0.794	0.461	0.892
23	13.077	0.564	0.329	0.642
24	12.671	0.513	0.293	0.597
25	12.820	0.575	0.329	0.651
26	12.538	0.593	0.344	0.685
27	10.465	1.093	0.550	1.060
28	12.693	0.564	0.326	0.676
29	13.262	0.462	0.276	0.579
30	14.128	0.612	0.356	0.678

## **APPENDICE II**

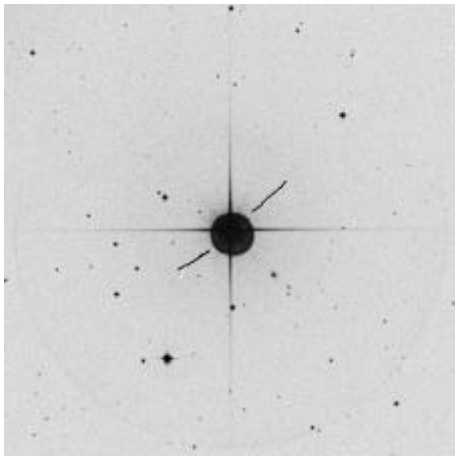
*- Stelle di Landolt:*



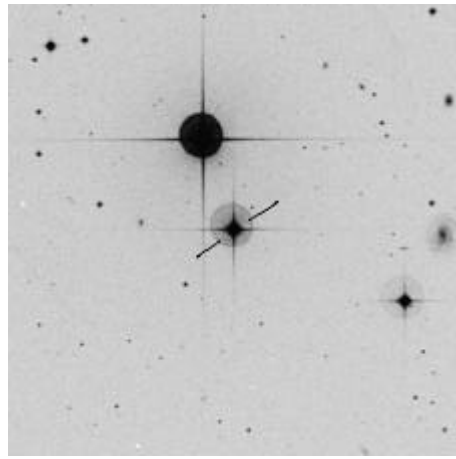
<i>Stella</i>	<i>Asc.retta</i>	<i>Declinazione</i>	<i>V</i>	<i>B-V</i>	<i>V-R</i>	<i>V-I</i>
HD 315	00 06 59	-02 37 52	6.440	-0.145	-0.037	-0.101
SA93326	01 54 04	+00 42 40	9.569	0.454	0.263	0.528
HD12021	01 57 10	-02 10 37	8.874	-0.082	-0.042	-0.098
HD16581	02 38 46	+01 17 26	8.195	-0.057	-0.025	-0.063
SA94308	02 55 28	+00 27 41	8.743	0.494	0.290	0.576
SA9552	03 53 28	-00 10 58	9.547	0.529	0.307	0.611
SA95206	03 53 30	+00 14 44	8.737	0.502	0.290	0.575
SA96393	04 51 44	+00 00 39	9.652	0.598	0.345	0.687
SA96406	04 52 04	+00 05 36	9.300	0.220	0.116	0.237
SA97346	05 56 41	+00 13 17	9.260	0.594	0.338	0.662
HD46056	06 30 33	+04 50 58	8.230	0.192	0.135	0.283
HD47761	06 39 17	-04 41 00	8.724	0.159	0.138	0.279
SA98653	06 51 19	-00 17 11	9.538	-0.004	0.007	0.014
SA98667	06 51 25	-00 16 34	8.378	0.028	0.071	0.149
HD52533	07 00 42	-03 05 28	7.702	-0.088	-0.011	-0.038
SA99418	07 54 41	-00 15 07	9.474	-0.041	-0.003	-0.016
SA99438	07 55 08	-00 14 26	9.399	-0.155	-0.060	-0.143
SA99447	07 55 21	-00 18 18	9.415	-0.071	-0.031	-0.074
HD65079	07 56 19	+03 00 09	7.832	-0.182	-0.055	-0.130
HD72055	08 29 50	-07 06 14	8.113	-0.137	-0.031	-0.089
SA100606	08 52 12	-00 06 04	8.641	0.052	0.026	0.048
HD84971	09 47 59	-02 38 29	8.636	-0.159	-0.063	-0.152
SA101311	09 53 49	-00 20 01	8.233	0.265	0.159	0.322
SA10258	10 54 32	-01 20 38	9.380	0.060	0.044	0.060
SA102625	10 54 39	-00 43 57	8.890	0.552	0.312	0.621
SA102381	10 55 55	-01 05 18	7.916	0.309	0.173	0.346
SA103483	11 54 15	-00 28 21	8.353	0.427	0.245	0.480
HD118246	13 34 56	-06 04 55	8.089	-0.141	-0.034	-0.081
SA105214	13 35 30	-00 51 10	7.062	0.528	0.313	0.624
SA105663	13 36 44	-00 08 41	8.760	0.342	0.211	0.429
SA105448	13 37 02	-00 32 57	9.176	0.249	0.149	0.311
SA106485	14 43 28	-00 33 20	9.484	0.380	0.232	0.463
SA107544	15 36 03	-00 12 14	9.037	0.401	0.233	0.457
SA107595	15 38 17	-00 15 40	7.500	0.543	0.312	0.608
HD149382	16 33 36	-03 58 59	8.944	-0.281	-0.126	-0.264
SA108702	16 35 12	-00 22 57	8.208	0.559	0.319	0.628
HD160233	17 37 56	+04 21 19	9.095	-0.054	-0.003	-0.026
SA109747	17 44 05	-00 07 45	8.477	0.305	0.187	0.369
HD161961	17 47 50	-02 11 27	7.782	0.224	0.143	0.306
HD173637	18 45 50	-07 56 56	9.375	0.236	0.168	0.354
HD175544	18 55 02	+00 14 49	7.395	0.107	0.074	0.151
SA111717	19 36 09	+00 05 29	8.529	0.425	0.236	0.483
SA111773	19 36 30	+00 08 56	8.963	0.206	0.118	0.261
HD191639	20 10 22	-08 53 10	6.223	-0.087	0.014	0.027
HD199280	20 55 31	-03 37 10	6.566	-0.076	-0.034	-0.078
HD200340	21 02 14	-00 59 44	6.498	-0.099	-0.037	-0.083
HD205556	21 35 11	+05 25 11	8.301	-0.054	-0.021	-0.053
SA113267	21 41 10	+00 16 37	7.653	0.488	0.291	0.582
SA113274	21 41 41	+00 22 38	8.831	0.480	0.284	0.555
SA114172	22 42 03	+00 09 10	6.969	0.311	0.187	0.376
SA115271	23 41 55	+00 40 10	9.695	0.619	0.352	0.700

### **APPENDICE III**

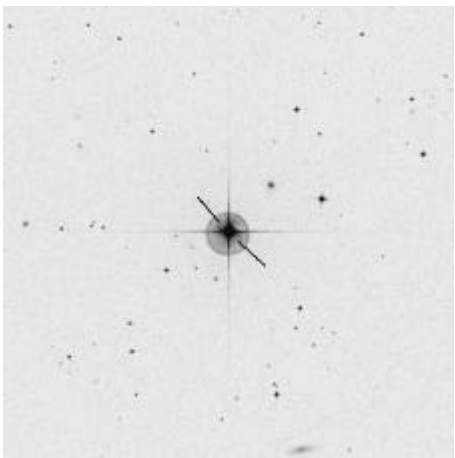
- Cartine d'identificazione per le stelle di Landolt del catalogo HD:



HD315



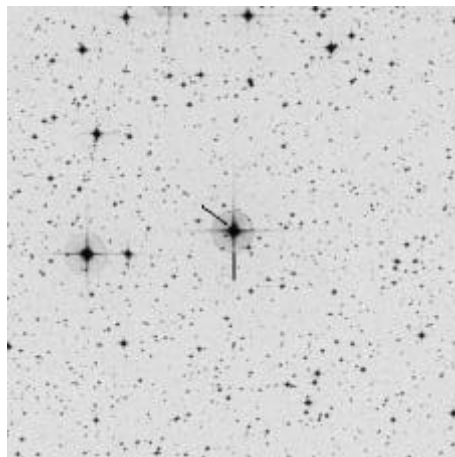
HD12021



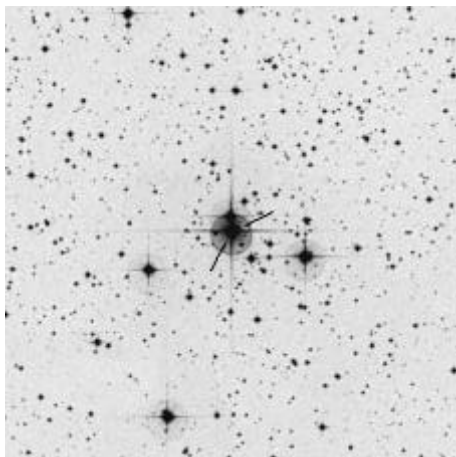
HD16581



HD46056

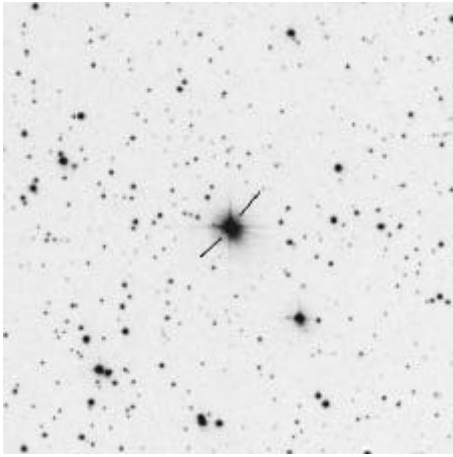


HD47761

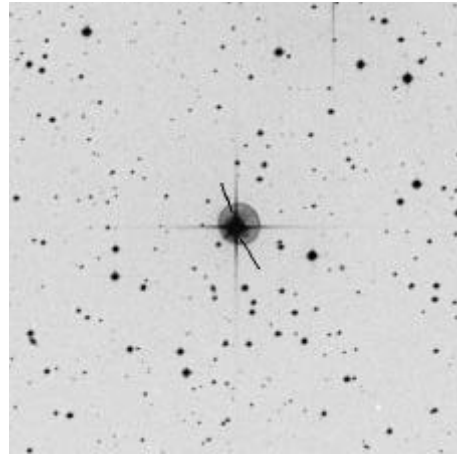


HD52533

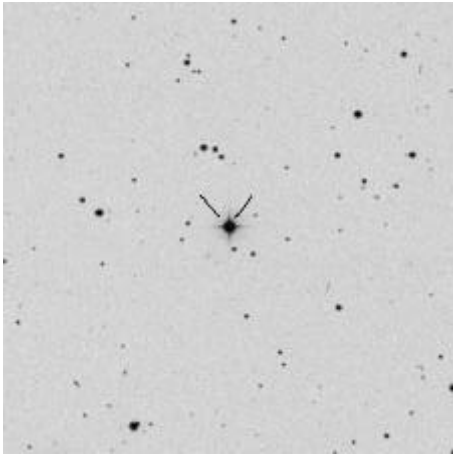




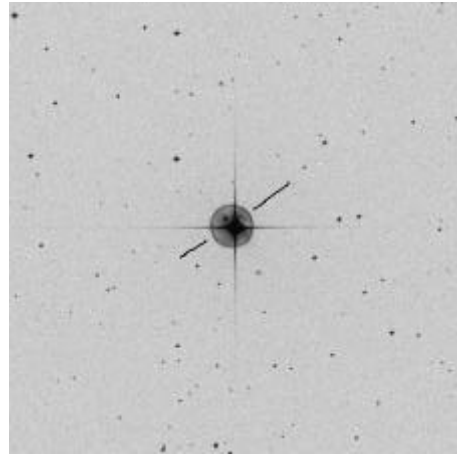
HD65079



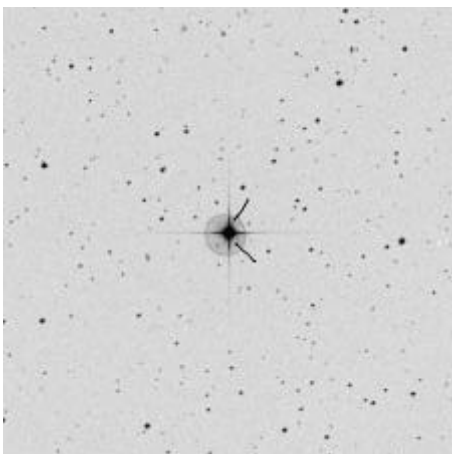
HD72055



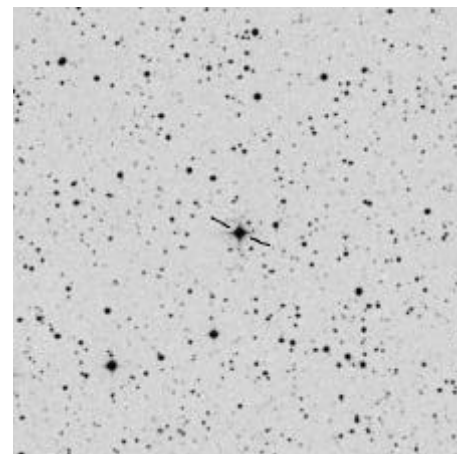
HD84971



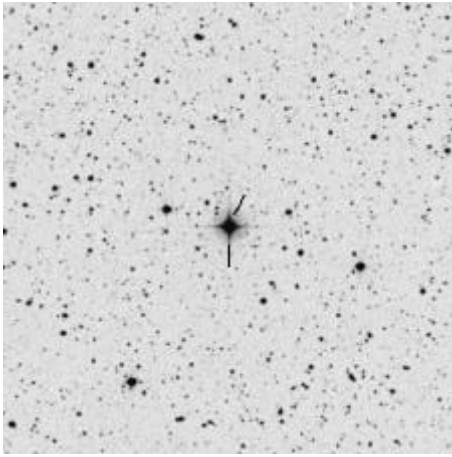
HD118246



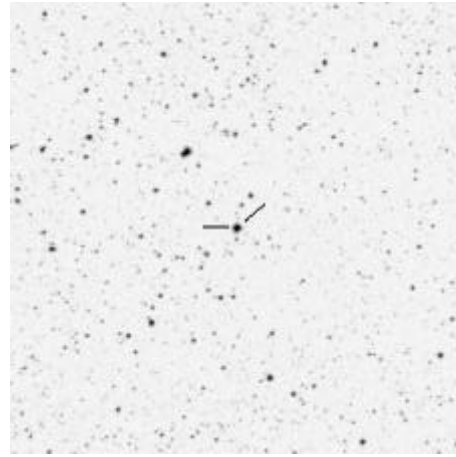
HD149382



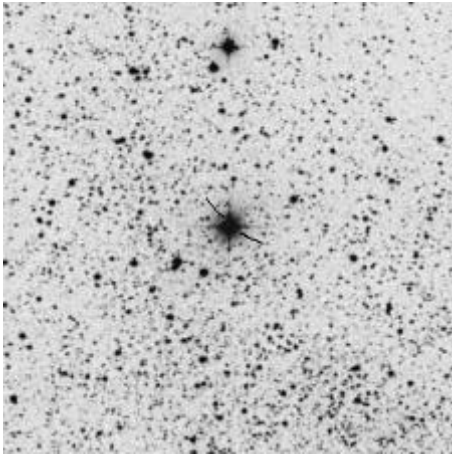
HD160233



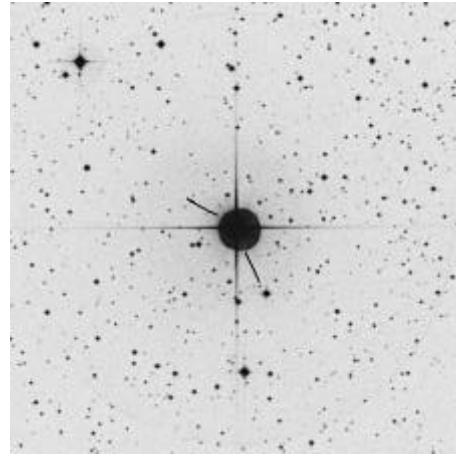
HD161961



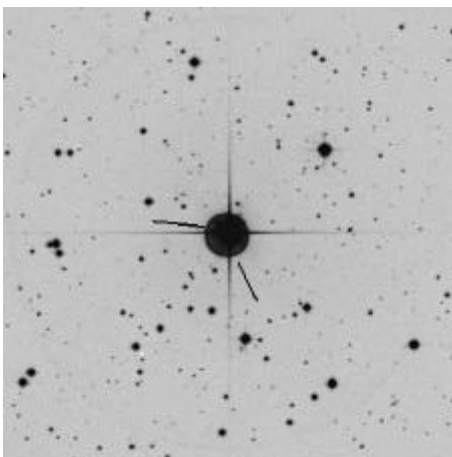
HD173637



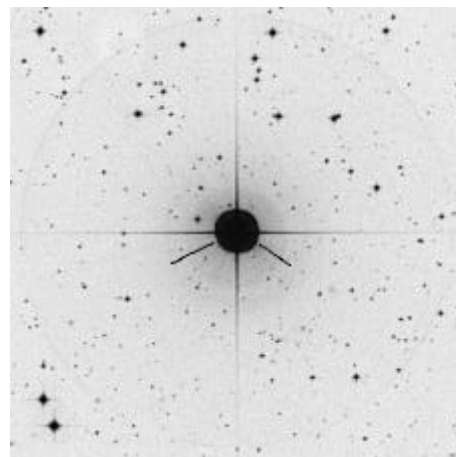
HD175544



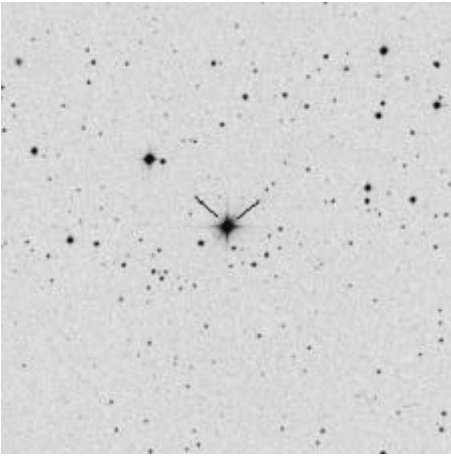
HD191639



HD199280



HD200340



HD205556

**BIBLIOGRAFIA**



- Biretta J.A., Cohen M.H., 1987, in *Superluminal radio sources*, Cambridge Univ. Press., p.40.
- Ciliegi P., Bassani L., Caroli E., 1993, ApJS, **85**, **111**.
- Comastri A., Molendi S., Ghisellini G., 1996, *ROSAT observations of radio-selected BL Lac objects*, MNRAS.
- Craine E. R., 1977, *A handbook of Quasistellar and BL Lac Objects*, (Pachart Publ. House, Tucson).
- Elvis M., Lockman F. J., Wilkes B. J., 1989, AJ, **97**, **777**.
- Falomo R., Bersanelli M., Bouchet P. & Tanzi E.G., 1993a, AJ, **106**, **11**.
- Fichtel et al., 1994, ApJS, **94**, **551**.
- Fiorucci M. & Tosti G., 1996a, A&AS, **116**, **403**.
- Fiorucci M. & Tosti G., 1996b, A&AS, **117**, **475**.
- Fiorucci M., Tosti G., Rizzi N., 1998, *VRI photometry of stars in the fields of 16 Blazars*, PASP, **110**, **105**.
- Fiorucci M., Tosti G., Rizzi N., Luciani M., *Optical monitoring of Tev blazars*, Perugia University Observatory Publications, Vol. **3**.
- Ghisellini G., Villata M., Raiteri C. M., et al., 1997, A&A, in press.
- Ghosh K. K., Soundararajaperumal S., 1995, ApJS, **100**, **37**.
- Giommi P., Barr P. et al., 1990, ApJ, **356**, **432**.
- Hammy M., Maza J., 1989, AJ, **97**, **720**.
- Kollgaard R.I. et al., 1992b.
- Koolgaard R.I., 1994, *Vistas in Astronomy*, Vol. **38**, 29.
- Lamer G. et al., 1996, *ROSAT observations of BL Lacertae Objects*, A&A.
- Maraschi L., Fossati G., Tagliaferri G., Treves A., 1996, *ROSAT observations of blazars from a polarized radio selected sample*, ApJ, in press.
- Massaro E., Nesci R., Maesano M. et al., 1996, A&A, **314**, **87**.
- McGimsey B.Q. et al., 1976, AJ, **81**, **750**.
- Miller H. R. et al., 1983, AJ, **88**, **301**.
- Miller H. R. et al., 1984, A&AS, **57**, **353**.
- Padovani P. & Giommi P., 1995, ApJ, **444**, **567**.
- Perlmann E. S., Stocke J. T. et al., 1996, ApJS, **104**, **251**.
- Raiteri C. M. et al., 1998, A&AS, **130**, **495**.
- Sambruna et al., 1994, ApJS, **95**, **371**.
- Smith P.S., Balonek T.J., Heckert P.A. et al., 1985, AJ, **90**, **184**.
- Smith P.S. et al, 1985, AJ, **90**, **1184**.
- Smith P.S. et al, 1991, ApJS, **77**, **67**.
- Stickel M., Urry C.M. et al., 1991, ApJ, **374**, **431**.
- Stickel M. et al., 1994, A&AS, **105**, **211**.
- Thompson J.R. et al., 1995, ApJS, **101**, **259**.
- Tosti G., Pascolini S., Fiorucci M., 1996, PASP, **108**, **706**.
- Villata M., Raiteri C. M., Ghisellini G. et al., 1997, A&AS, **121**, **119**.
- Villata M., Raiteri C. M., Ghisellini G. et al., 1998, A&AS, **130**, **305**.
- von Montigny et al., 1995, ApJ, **440**, **525**.
- Worrall D.M. & Wilkes B.J., 1990, ApJ, **360**, **396**.

