La SN1987a – Vent'anni dopo

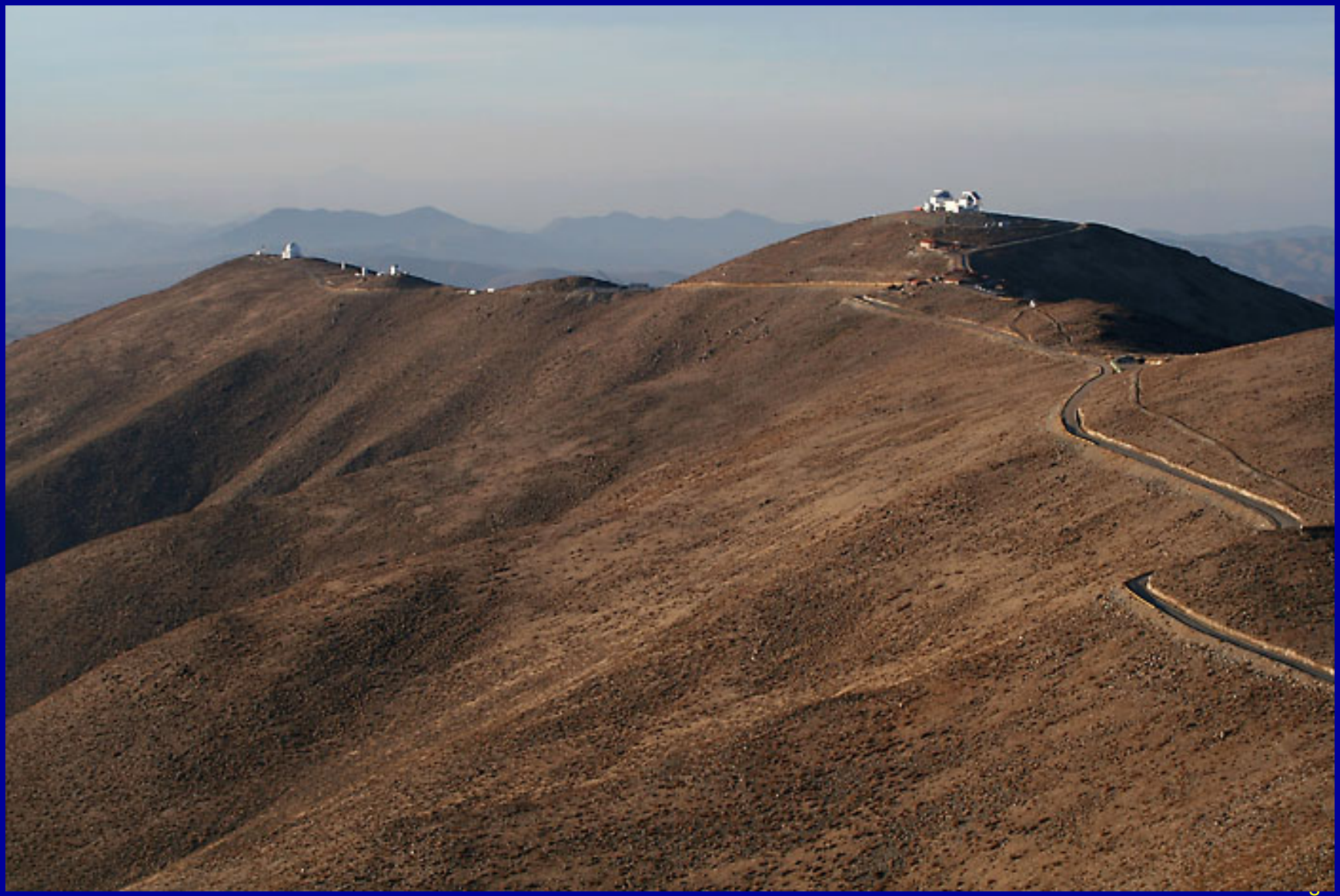
Stefano Cristiani - INAF Osservatorio di Trieste

23 – Feb - 1987

ESO
La Silla
(Chile)

Io c’ero!

Las Campanas



Ian Shelton (UTo) – LMC 10” astrograph

Una stella in piu`
5 mag!
Si vede ad occhio nudo!!
Non accadeva da 383 anni!!! (SN1572 Tycho)

Oscar Duhalde

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SUPERNOVA 1987A IN THE LARGE MAGELLANIC CLOUD

W. Kunkel and B. Madore, Las Campanas Observatory, report the discovery by Ian Shelton, University of Toronto Las Campanas Station, of a mag 5 object, ostensibly a supernova, in the Large Magellanic Cloud at R.A. = 5h35m.4, Decl. = -69 16' (equinox 1987.2), 18' west and 10' south of 30 Dor and possibly involved with the association NGC 2044. The discovery was made around Feb. 24.23 UT on a 3-hr exposure with a 0.25-m astrograph beginning on Feb. 24.06, and the object had evidently brightened by at least about 8 mag since the previous night. An independent suspected sighting was made visually by Oscar Duhalde, also at Las Campanas, around Feb. 24.2. The object had brightened to about mag 4.5 by Feb. 24.33.

F. M. Bateson, Royal Astronomical Society of New Zealand, informs us that the object was discovered independently by Albert Jones, Nelson, on Feb. 24.37 UT (position R.A. = 5h35m.8, Decl. = -69 18', equinox 1950.0) at mag 6.5-7.0 (in clouds); he estimated mv = 5.1 on Feb. 24.46. B. Moreno and S. Walker, Auckland Observatory, obtained V = 4.81, B-V = +0.085, U-B = -0.836 on Feb. 24.454 UT.

R. H. McNaught, Siding Spring Observatory, communicates the following visual magnitude estimates by G. Garradd (G) and himself (M): Feb. 24.455, 4.8 (M); 24.472, 4.8 (M); 24.635, 4.4 (G); 24.679, 4.5 (M); 24.717, 4.4 (M). McNaught obtained the following precise position with the University of Aston Hewitt Satellite Schmidt camera: R.A. = 5h35m50s.22, Decl. = -69 17'59".2 (equinox 1950.0, uncertainty 2"). The object appears on films from the previous night: Feb. 23.443, 6.0; 23.445, 6.2. He also notes the position of a blue star, of mv about 12 and not obviously variable during the past century (through Feb. 22.4): R.A. = 5h35m50s.12, Decl. = -69 17'58".0 (equinox 1950.0; x = 15447, y = 9261 in the Harvard LMC system). Films by Garradd confirm that the field was identical down to mag 14.5 on Jan. 24 and Feb. 22.

B. Warner, University of Texas, reports that a spectroscopic observation by J. Menzies on Feb. 24.9 UT with the 1.9-m reflector at the South African Astronomical Observatory shows the 615-nm dip, indicating that the object may be a supernova of type I.

1987 February 24 **(4316) Brian G. Marsden**

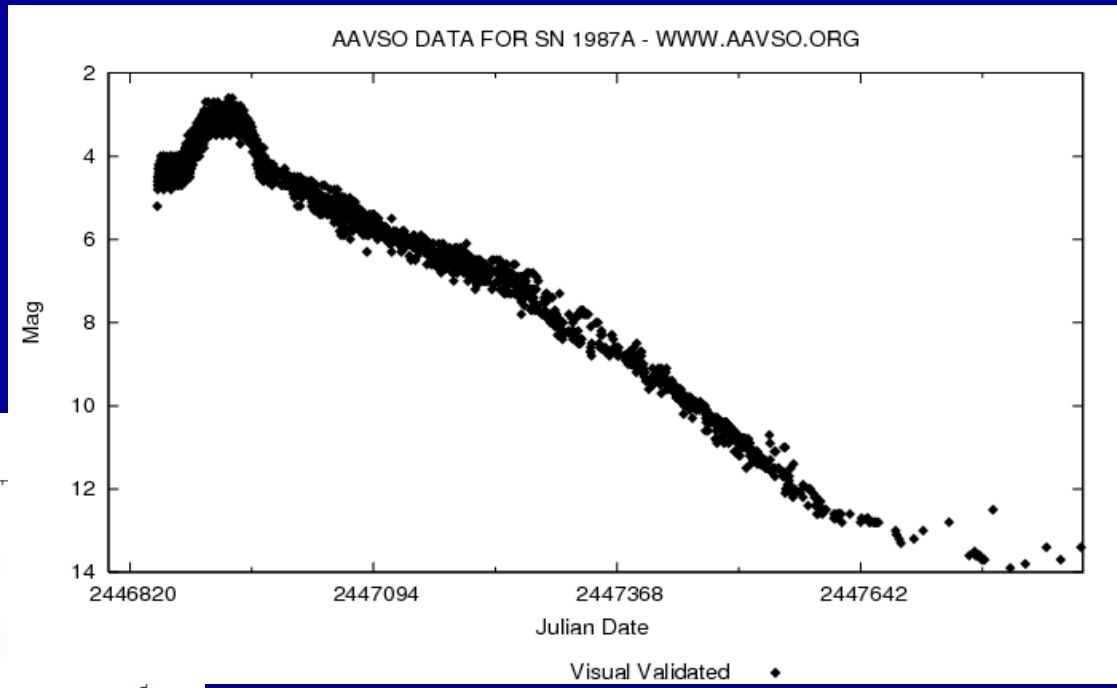
24 – Feb - 1987

ESO
La Silla
(Chile)

L.Woltjer
The lucky Admiral

Curve di luce

Trovare l'istante dell'esplosione (neutrini)



Cristiani et al. 1987

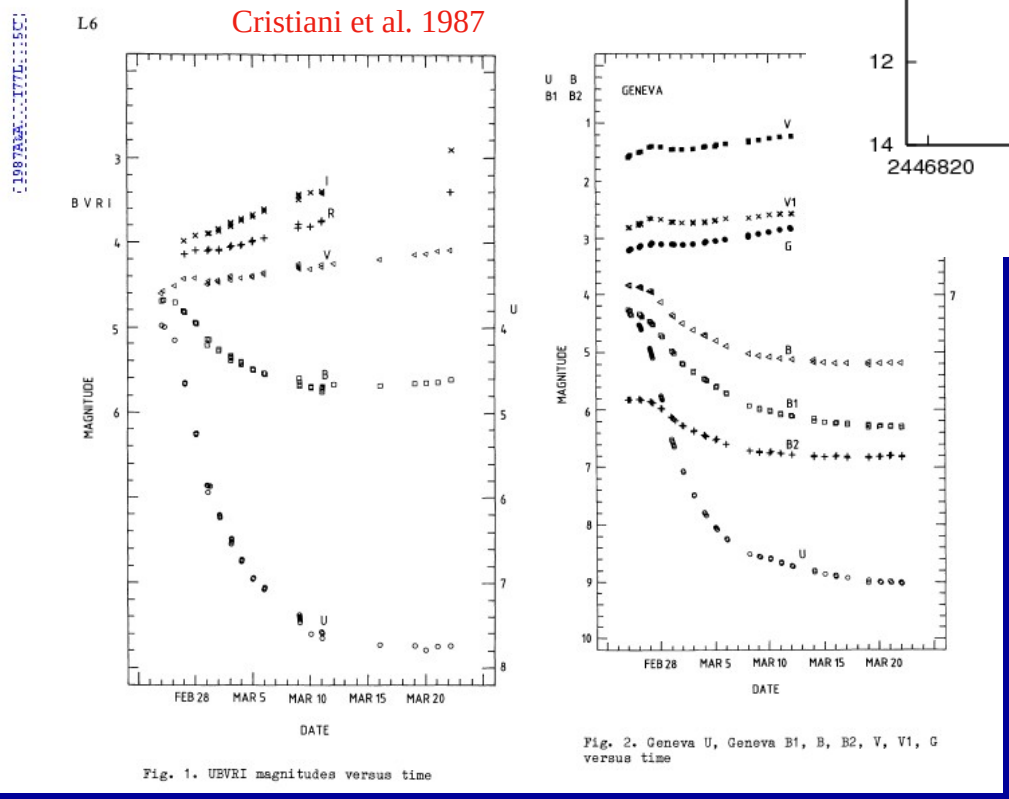
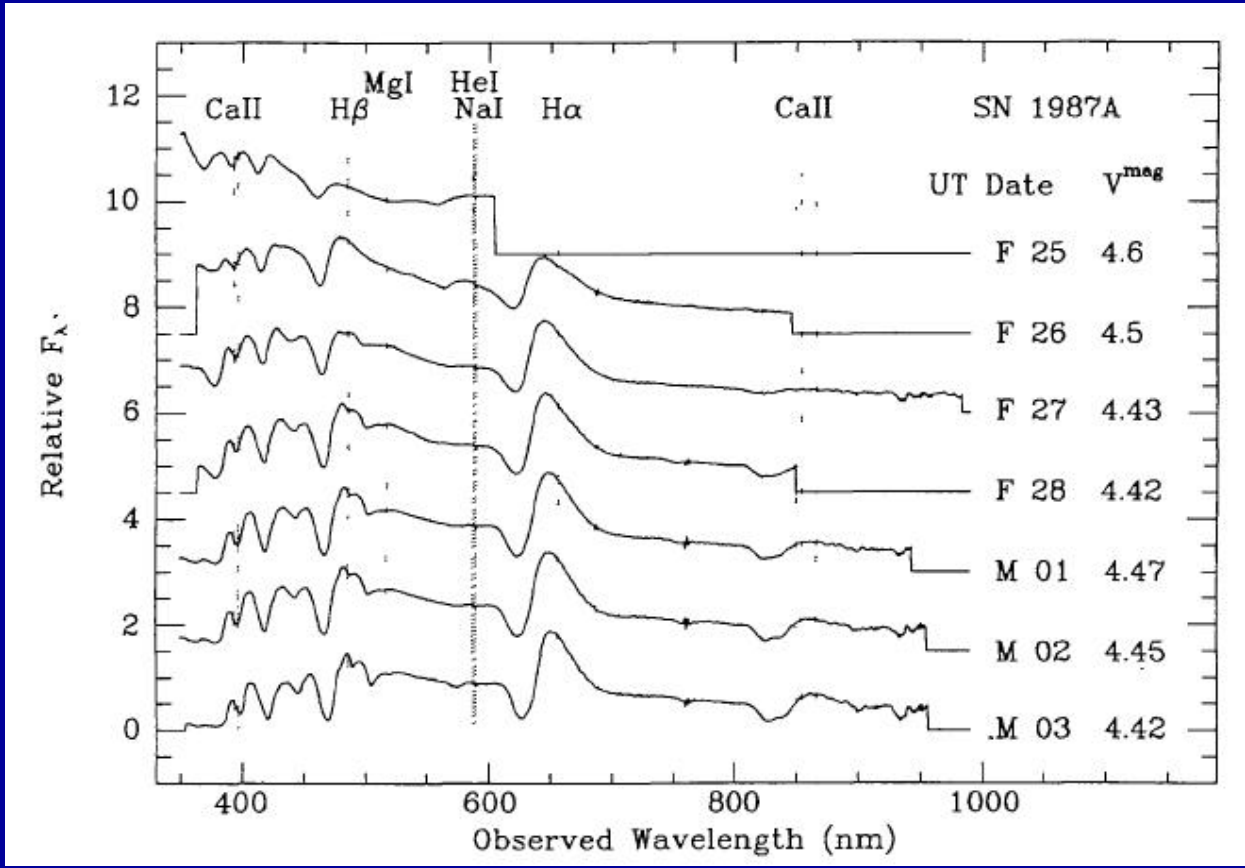


Fig. 1. UBVRI magnitudes versus time

Fig. 2. Geneva U, Geneva B1, B, B2, V, V1, G versus time

Spettroscopia – Type II SN



Danziger, Fosbury, Alloin, Cristiani, Dachs, Gouiffes, Jarvis, Sahu, 1987, A&A 177,L13

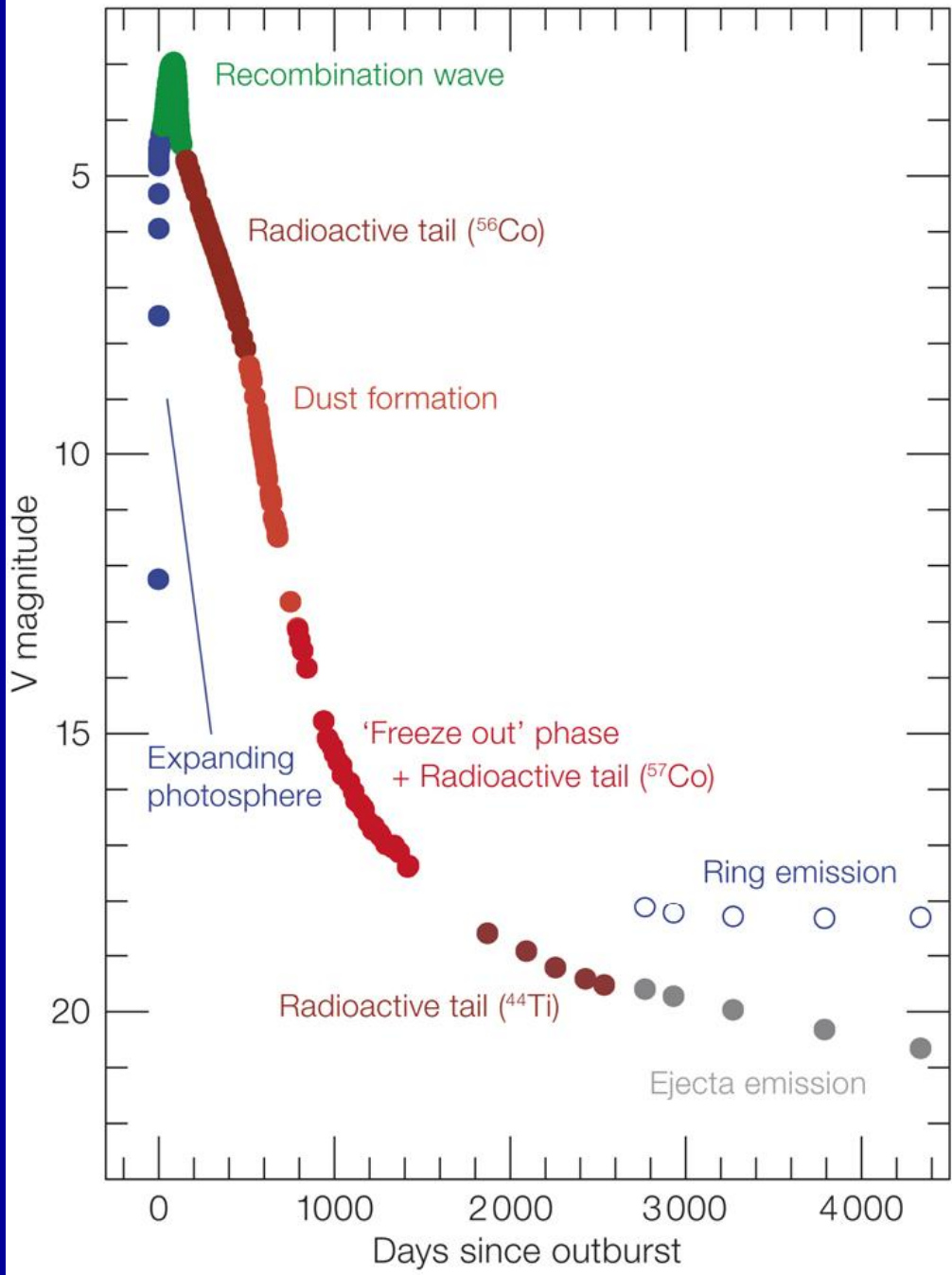
Il Progenitore?
Astrometria → Sanduleak -69 202

Il Progenitore? Sanduleak -69 202

SORPRESA! Non era una supergigante rossa, bensi` BLU ??????

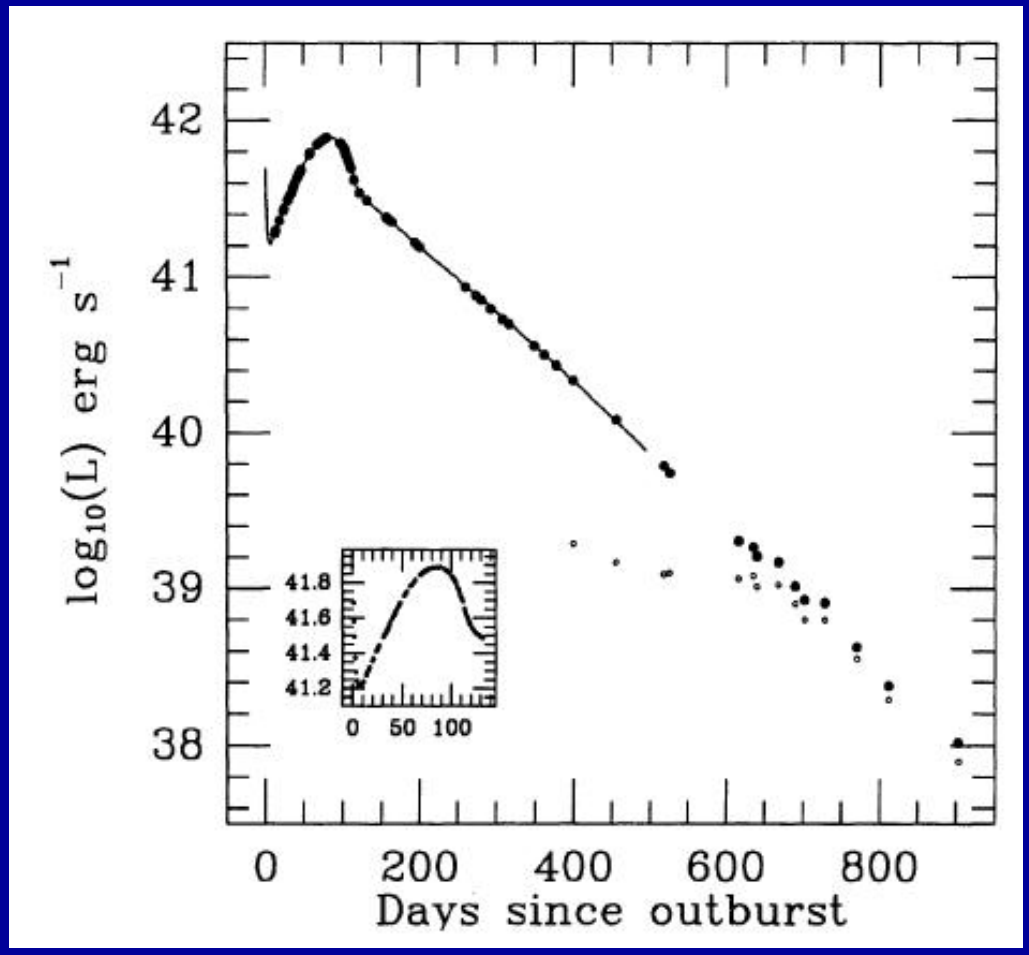
Tante sorprese

- Inizia blu e diventa la piu`rossa mai osservata. (compatta = cooling + importante)
- Meno luminosa di quanto ci si aspettasse
- Esplosione non sferica (polarizzazione, forma delle righe IR) turbulent mixing
- Formazione di polvere!

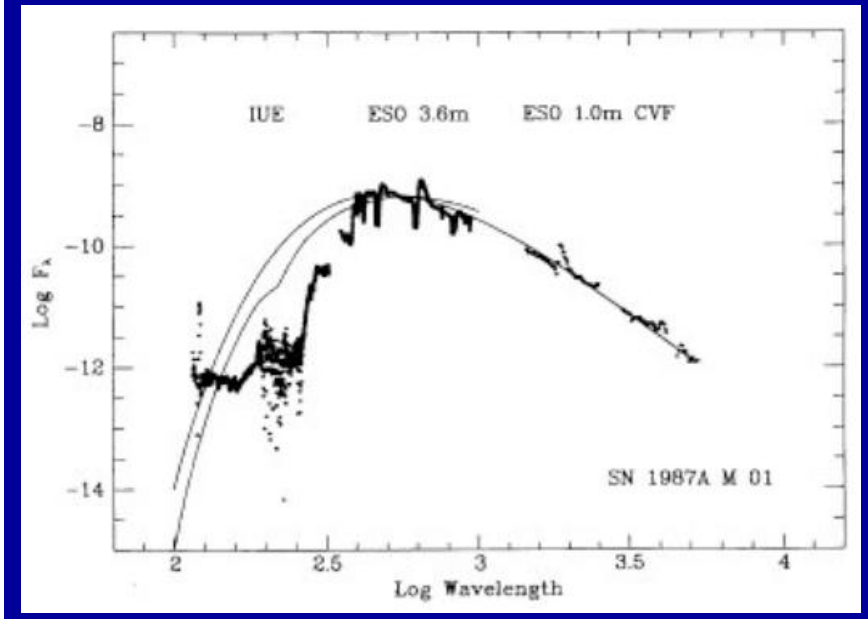


The Light Curve of SN1987A

La prima curve di luce bolometrica

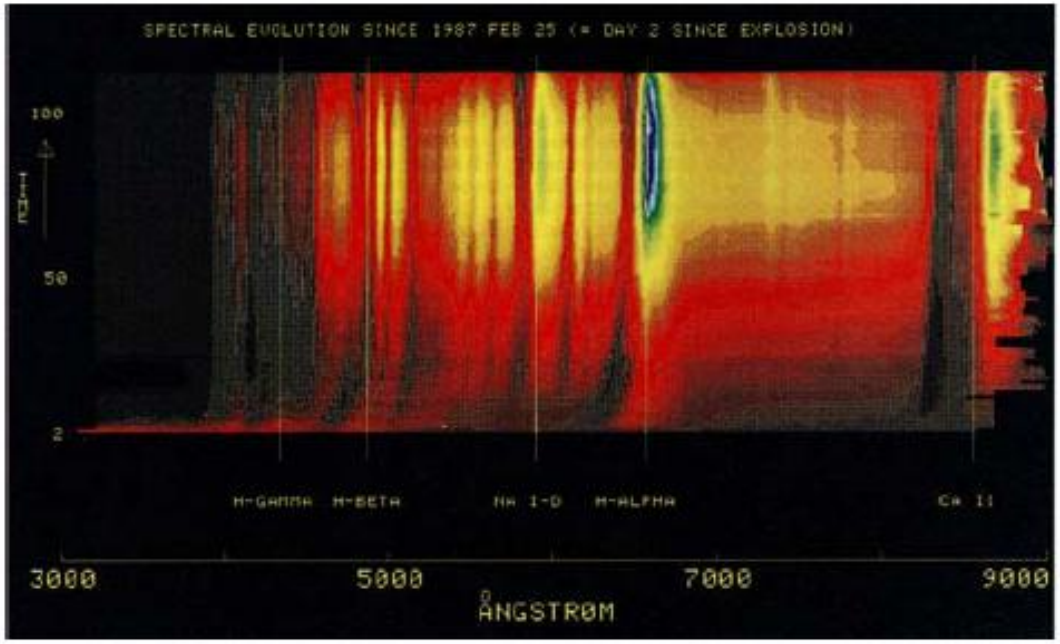


Suntzeff & Bouchet 1990



Danziger et al 1987

Evoluzione dello spettro



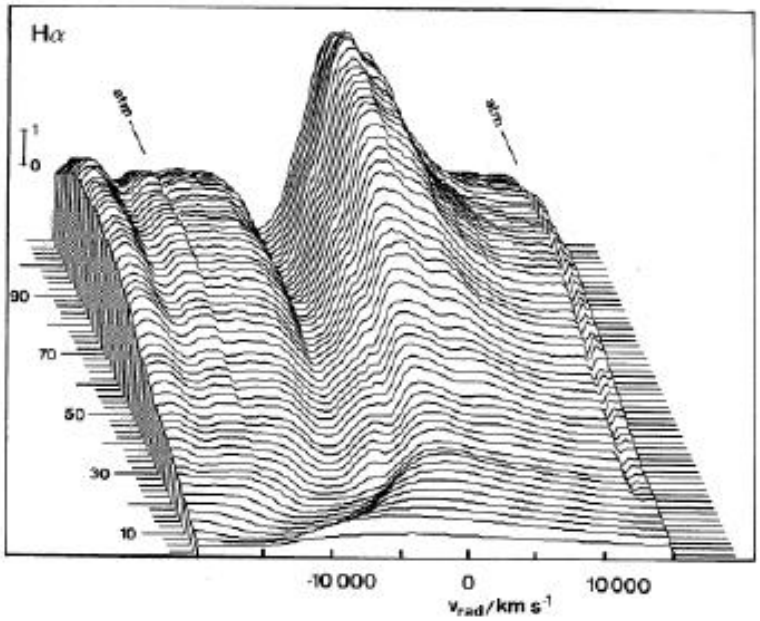


Figure 2: Spectral evolution of SN 1987A as observed with the Bochum telescope (Hanuschik and Thimm 1990). Important lines are marked at the bottom. The evolution covers the first 120 days and the redshifting of all lines is easily visible. The Bochum event is shown in the right panel displaying the Hα evolution as the blueshifted excess.

Vidal-Madjar, Andreani, Cristiani, Vladilo 1987

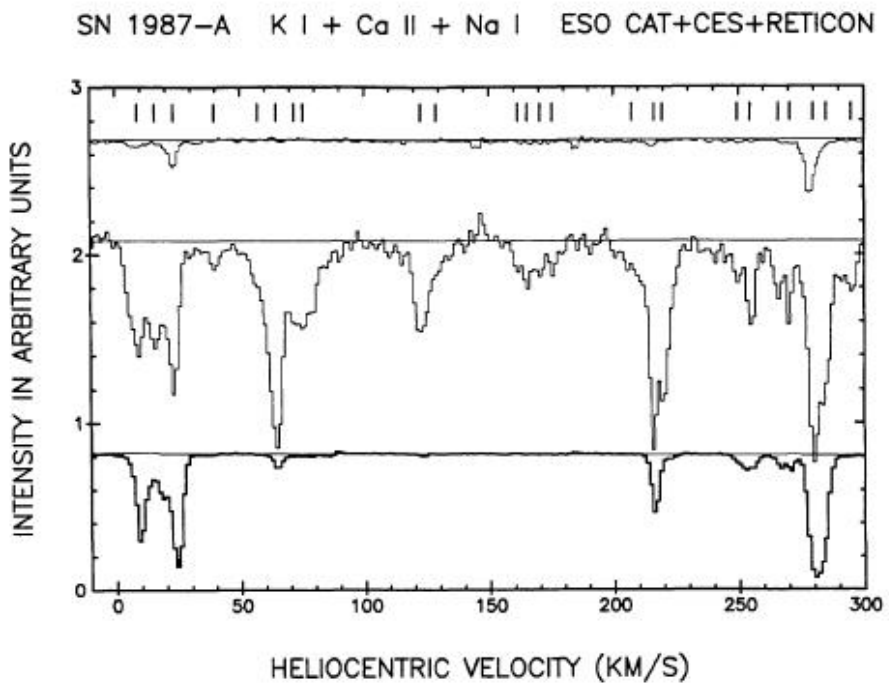


Fig. 1 : Reticon spectra of the supernova 1987 A recorded in the regions of neutral potassium at 7698 Å (top), ionized calcium k (middle) and neutral sodium (bottom) at the ESO–La Silla Observatory on March 3, February 25 and 26, 1987, respectively. For comparison, they have been superposed on a common heliocentric velocity scale. The K I and Na I spectra have been divided by template stars in order to release telluric features. At the top, tick marks show the locations of the 24 interstellar absorption components detected in Ca II and described in Table 2.

Spettri ad alta risoluzione: gas intervening tra LMC e Galassia

La pulsar?

Middleditch et al. (1989 IAUC 4735etc.), 1968 Hz???
2.14 ms???

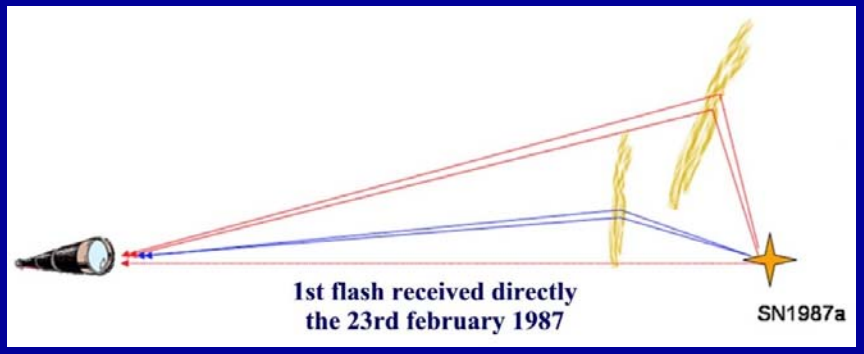
Mai confermata (es. Oegelman et al. 1990)

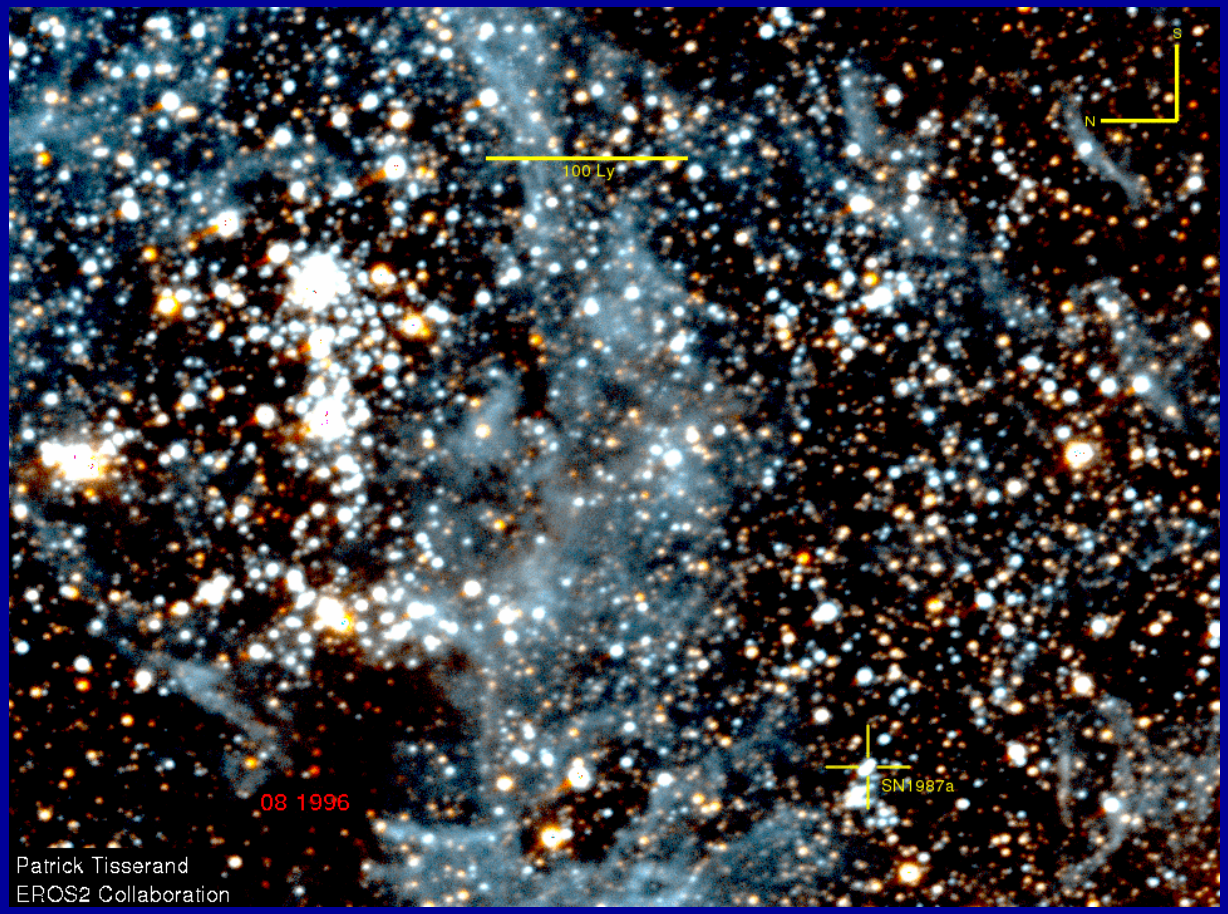
SN core-collapse → stella di neutroni (non vista)

Racchiusa in nubi dense? Ricollassata in buco nero??

I radioastronomi avevano rivelato la frequenza di una videocamera

Echi di luce


1st flash received directly
the 23rd february 1987
SN1987a

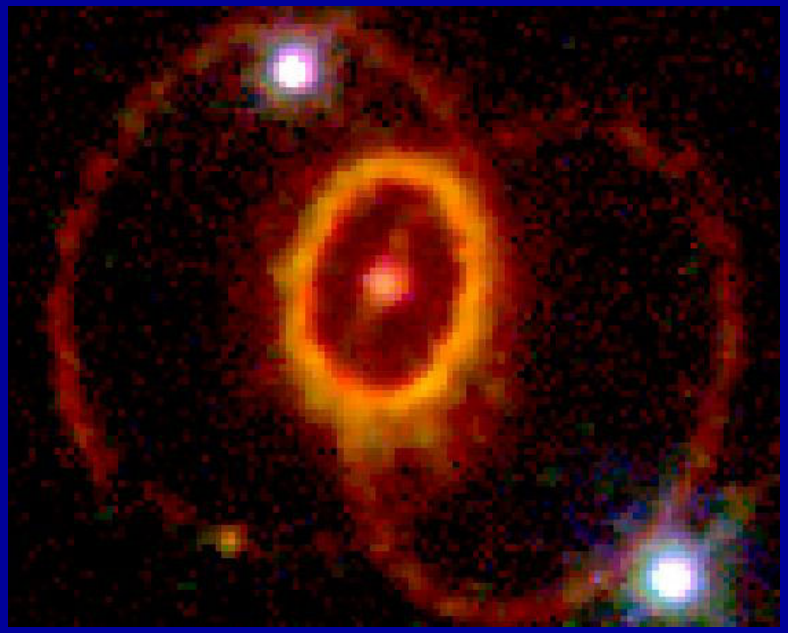

S
N
100 Ly
SN1987a
08 1996
Patrick Tisserand
EROS2 Collaboration

Determinazione della distanza della LMC

Disco circumstellare

Confronto della dimensione assoluta (data dal picco della emissione UV)

con la dimensione angolare osservata



D(LMC) = 52.0±1.3

Ho=60±6 km/s/Mpc

(Panagia 1998)

Scontro del SN remnant in espansione

Con un anello di materiale denso emesso dalla stella 20000 anni prima

SN 1987A Products

Barbara, Lorenzo & Beatrice (‘90, ‘93, ‘99).

Happy Birthday, SN1987A!