The Geneva Photometric Monitoring of SN 1987 A

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A systematic photometric monitoring of SN 1987 A has been carried out from the Swiss station at the ESO La Silla Observatory (Chile), by using a 70-cm telescope equipped with the P7 photometer (Burnet and Rufener, 1979), devoted to the Geneva 7-colour photometric system. The supernova has been measured 463 times from Feb. 24, 1987, to Jan. 17, 1989 (see Burki et al., 1989).

The variations of the Geneva V magnitude with time is shown in Figure 1. From HJD 2446980 to 2447285, the decline of the V curve was strictly linear, with a slope in good agreement with the thermalization of the γ radiation resulting from the ^{56}Co radioactivity.

From HJD 2447285 onwards, the expanding envelope began to become transparent to γ radiation which could thus escape without being thermalized. The decrease of the V luminosity became steeper than the former linear variation. From this point, however, the steadily increasing relative importance of the two close companion stars of SK −69°202, which are unavoidable with the present measurement technique, cannot be neglected. The later portions of the corrected V light curve is shown in Figure 2 on a larger scale. The corrections applied are respectively +0.001 mag for the first, and +0.065 mag for the last value in Figure 2. A good mathematical description of that portion of the corrected V light curve is obtained by fitting a parabola over the interval HJD 2447270 to 2447450 (see Fig. 2).

After HJD 2447450, the luminosity in the V band started to decrease more slowly than the parabolic description. This inflexion of the V light curve, approximately 600 days after core collapse, could be interpreted as the effect of an additional energy source, such as *the expected central pulsar* in interaction with the surrounding material ejected by the supernova progenitor (see Arnett, 1988, for the theoretical light curves of SN 1987 A with various pulsar luminosities). One must, however, bear in mind the possible contributions of other slower decaying radionuclides such as ^{57}Co, ^{44}Ti and ^{22}Na produced during the initial explosive nucleosynthesis (Nomoto et al., 1989; Woosley et al., 1989), and which would affect the light curves in a similar manner. According to the model calculated by these authors, the energy supplied by these radioisotopes exceeds that of ^{56}Co after about 1,200 days following core collapse.

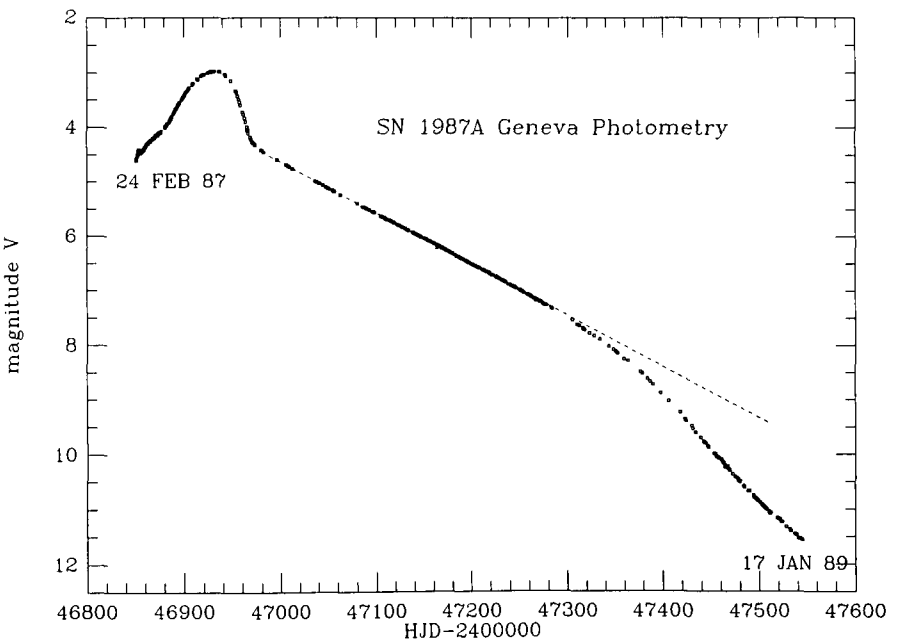

Figure 1: *The V magnitude curve, uncorrected for the contributions of the two faint companion stars of Sk −69°202. The dashed curve is the linear fit in the range HJD 2446980 to 2447285.*

References

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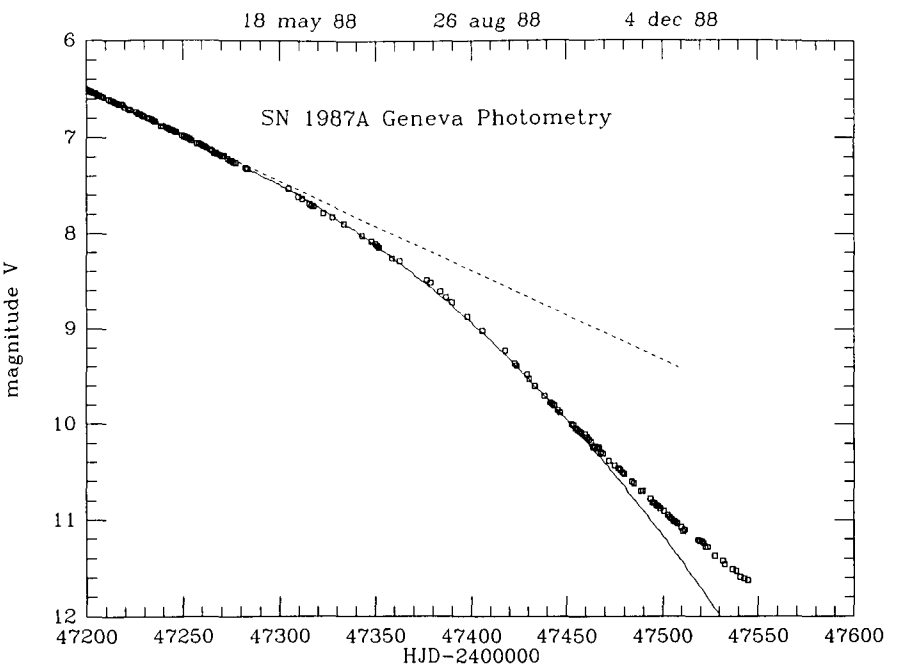

Figure 2: *Enlargement of the last portion of the V curve with magnitudes corrected for the two companion stars. The dashed line is the same linear fit as in Figure 1. The full line is the fit of a parabola calculated for the values within the range HJD 2447270 to 2447450.*