

# The statistical analysis of Supernovae

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## 1. Introduction

Due to the growing interest in the SN(supernovae) phenomenon in recent years, and to large amount of data which has been accumulating lately, there is now a need for a new publication in which to find all the essential data on SNe and their parent galaxies. A revised 568 supernova catalogue has published by Barbon et al (1984).

The paper supplements 65 SNe, discovered since 1984 up to update, and some statistical studies were completed.

## 2. The catalogue of SNe

The first two comprehensive lists of SNe were published by Zwicky(1958,1965) and included the 54 and 111 objects respectively reported up to 1956 and 1962. A more complete list was issued by Zwicky(1964), 154 SNe is included.

This list was kept updated by the Palomar SN search and published (Kowal et al 1971, Sargent et al 1974), the total number of reported SNe reached 378. The Palomar SNe Master List has been kept updated by Kowal.

A <<Preliminary catalogue of SNe>> was published by Karpowicz and Rudnicki(1968), and an improved and updated version, including later on (Flin et al 1979). Besides a large body of data on the 454 SNe known up to that time and a list of 69 suspected and false SNe, a complete bibliography for each object was given.

A revised SNe catalogue was published by Barbon et al (1984). We summarize a new catalogue.

## 3. Statistical Analysis

To quickly show some of information contained in the catalogue, and to present the kind of statistics which can be made with the data, some figures and tables have been prepared and discussed in the following.

The distribution of SNe according to type (table 2). Only 34% (219/633) of the discovered SNe have been classified. SNI (type I SN) outnumber the remaining objects in ratio 3:2. SNI/SNII in ratio 2:1. The observational result is biased by lower intrinsic luminosity and higher absorption present in SNII, besides the fact that these latter objects avoid elliptical and early spiral galaxies. All these effects must be taken into account in order to derive meaningful frequencies.

Table 1 Distribution of SNe according to type

type I	120	type II	61	type III	2
I:	8	II:	9	IV	1
Ipec	8	IIpec	2	V	3
				pec	5
all SN I	136	all SN II	72	other	11

The distribution of SNe with types, according to the class of their parent galaxies (table 2).

**table 2 distribution of SNe with type of their parent galaxies**

	E	So	Sa	Sab	Sb	Sbc	Sc	Scd	Sd	s	Io	Im	I	not	total
SNI	16	12	4	2	23	14	36	2	2	7	6	2	-	10	136
SnII	-	-	1	1	11	6	42	2	-	2	2	1	-	4	72
other	-	-	1	1	1	-	6	-	-	-	-	-	1	2	11

RC2 contain 4,364 galaxies, 423 galaxies from RC2 with  $V_0 < 1200$  km/s, (Ho adopted 55 km/s Mpc ) with 89 SNe \_ of which 33 are classified as SNI, and 37 as SNII. From the sample of galaxies and the sample of SNe, the relative frequency of the type of SNe vs. the type of galaxies is presented.

**table 3 SN type vs. galaxies type**

type	$N_{galaxies}$	%	SNI	SNII	other	$N_{SN}$	%	$N_{SN}/N_{gal}$
E	40	10.0	5	0	1	6	6.7	0.15
So	67	17.0	2	0	2	4	4.5	0.06
So/a,Sa	18	4.5	1	1	2	4	3.4	0.22
Sab,Sb	50	12.7	9	9	3	21	24.7	0.42
Sbc,Sc,Scd	112	28.5	11	27	11	49	55.1	0.44
Im	98	25.0	2	0	0	0	2.2	0.02
Io	8	2.0	3	0	0	3	3.4	0.38
all	393	100	33	37	19	89	100	0.23

The main conclusions from table 3 are foloowing:

- 1) the overall SN rate increases from E galaxy to spiral galaxies.
- 2) as is well known (Tammann 1982) SNI occur in all types of galaxies. They do belong to the old stellar population.
- 3) SNII occur only in Sab and later galaxies, if 1984e is abolished.

We also resarch the galaxies of mulifrequency supernovae, it be noted that the most of these galaxies are the spiral galaxies. The location of explosion is near spiral.

The active galaxies of explosion supernovae are explored, it is about 14 active galaxies that there are more 20 supernovae which were detected.

It must be noted that the discovery of the 1983 SNe in NGC 4753 is of interest for the solution of the problem of the nature of SNI. NGC 4753 became the second type Io galaxies, after NGC 5253 in which two SNI have been detected. This supports the conclusion that there is an increased frequency of SNI outbursts in type Io galaxies. The true Type Ib and Type Ipec tractions are likely to be significantly higher than the observed fractions because both Ib and Ipec are fainter and therefore less likely to be discovered than Ia. The possibility that type Ib and Type Ipec each may be as numerous as Type Ia, at least in spiral galaxies, can not be excluded.

**References**

Borbon, R., Capaccioli, M., West, R.M., Astron. Astrophys. Suppl. 49, 73 (1984)  
 Flin, et al, Acta Cosmologica. part. 8 (1979)  
 Zwicky, F., A list of SNe discovered since 1885, (1964)