A SURVEY AND RELATED OBSERVATIONS OF THE KISO ULTRAVIOLET-EXCESS GALAXIES

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ABSTRACT. We have detected 3,141 ultraviolet-excess galaxies in the sky area of some 1,500 square degrees by means of the UGR three-image photographs taken with the 105-cm Kiso Schmidt. For each of these galaxies which we call KUGs the morphological type and the degree of ultraviolet-excess are given in the catalogues. The frequency distribution for these characteristics of KUGs is shown in a form of histogram. The results of a spectroscopic study for the 57 selected KUGs are that 85% of the sample have emission-lines and most of them are situated in the domain of HII regions on the emission-line ratio diagram.

1. SURVEY

Our survey for ultraviolet-excess galaxies with the 105-cm Kiso Schmidt telescope is based on the three-image method which was first used by Haro. Our band system is, however, not UBV but UGR in which U and R are almost the same as Becker's while the G band is somewhat different from his(Noguchi et al. 1980).

The Kiso survey has so far been made for 50 sky areas covering some 1,500 square degrees. We detected 3,141 ultraviolet-excess galaxies, which we call Kiso ultraviolet-excess galaxies (abbreviated as KUGs). The limiting magnitude is somewhat different from each survey plate depending on observational conditions, ranging from 17 to 18 photographic magnitude. They are compiled into five catalogues(Takase and Miyauchi-Isobe, 1984, 1985a, 1985b, 1986a and 1986b).

As shown in Table 1, the KUG name is composed of its values of right ascension and declination. The morphological type is given according to the classification scheme explained in Takase et al.(1983). Fig. 1 indicates the representative examples for each type. The UVX DEG (abbreviation of the ultraviolet-excess degree) is divided into three steps, high (H), medium(M) and low(L), from the inspection of the three color images on the Kiso plates. According to Noguchi et al.(1980), these H, M and L roughly correspond to the U - B colors of <-0.5, ~-0.3 and ~ 0, respectively.

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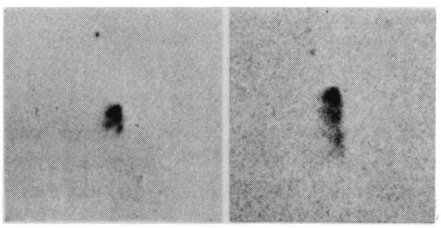
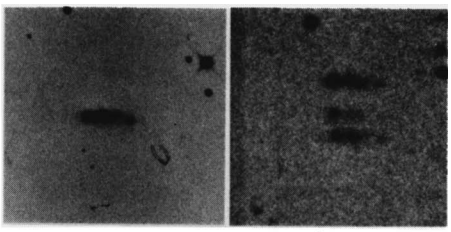
Table 1. Format of the KUG catalogue

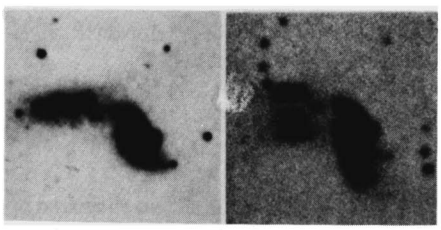
NO.	KUG-NAME	R.A. (1950.0)	DEC.	MOR. TYPE	APP. SIZE	APP. MAG.	UVX DEG.	OTHER NAME(S)
1	1128+564A	11 28 31.2	56 24 46	C	0.2X0.2	16.5	L	MK174
2	1128+564B	11 28 31.6	56 28 2	C	0.2X0.2	16.2	H	LB2033
3	1128+563	11 28 44.8	56 20 31	C:	0.2X0.2	16:	M	
4	1129+542	11 29 18.6	54 12 8	Sp	0.3X0.2	16:	L	
5	1129+541	11 29 34.9	54 10 48	Sp	0.9X0.4	14.8	M	U6518
6	1129+532	11 29 55.2	53 13 36	Pi	1.1X1.7	14.7	L	U6527,MK176,V150,A322
7	1130+553	11 30 37.8	55 20 56	Sp	0.3X0.2	16	M	MK177
8	1131+534	11 31 4.9	53 24 8	Sk	2.5X1.8	12.2	L	U6547,N3729,A214
9	1132+558	11 32 53.4	55 48 34	Sp:	0.6X0.3	15.3	L	Z268.059
10	1133+548	11 33 2.8	54 48 8	Ic	0.2X0.1	11.5	H	U6565,N3738,A234



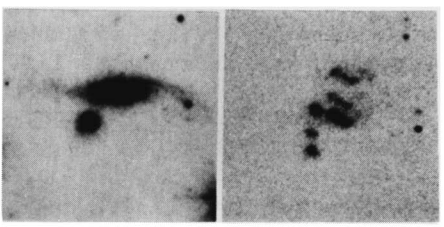
Type Ic : KUG 1626+413



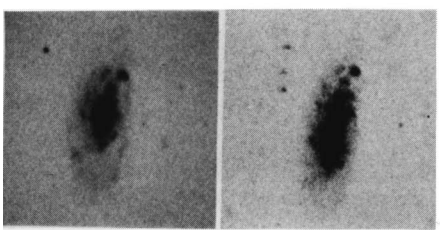
Type Ig : KUG 0225-103



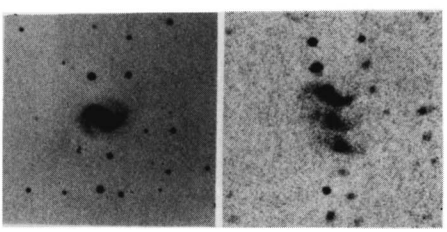
Type Pi : KUG 1047+332



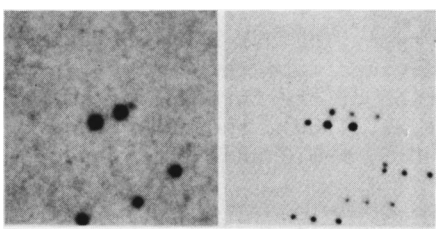
Type Pd : KUG 2259+157



Type Sk : KUG 2257+157



Type Sp : KUG 0239+345



Type C : KUG 0935+407

Figure 1. Representative objects of each classification type. In each pair the left one is a direct photograph while the right is that reproduced from the Kiso three color plate, where U,G and R images are lined up from top to bottom.

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2. STATISTICS

Fig.2 is the histogram which shows the frequency distribution in respects of the morphological type and UV-excess degree of all 3,141 KUGs. From the figure we see that Sp type galaxies occupy 36% of all the sample, Sk 21% and each of other types less than 3%. On the other hand the distribution in the UV-excess degree is different from type to type. Ig type KUGs have the highest fraction of H, that is 60%; for Ic type H and M are both 49%, for Pi, Pd, Sp and C types M is preferential, while for Sk type L is most abundant.

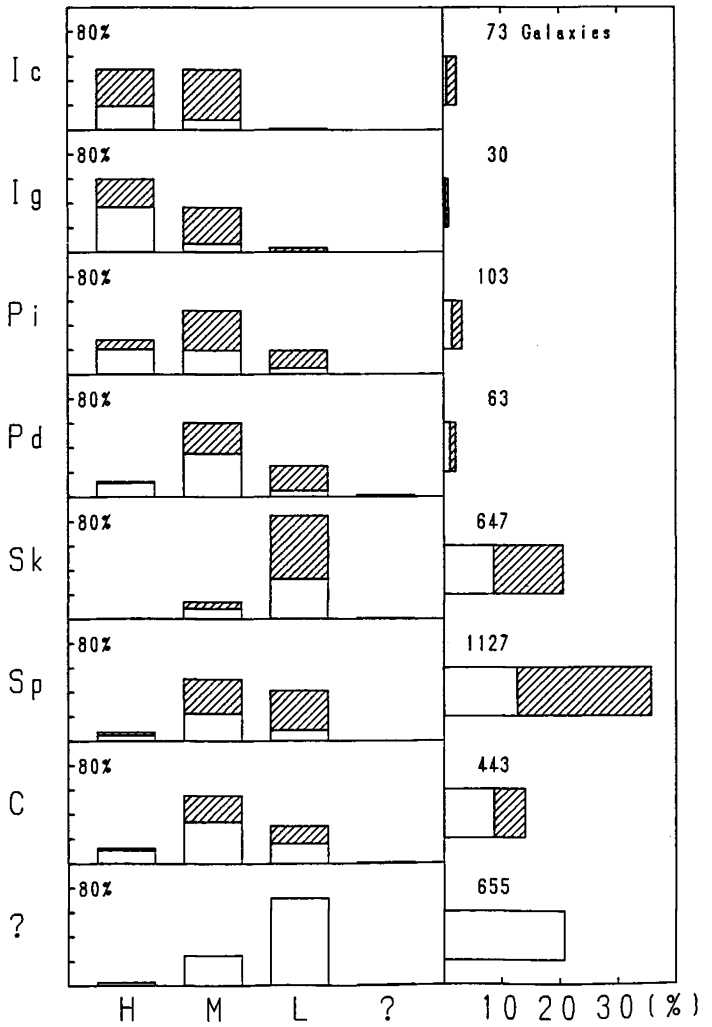

Figure 2. Frequency distribution in the morphological type and UV-excess degree of 3,141 KUGs. Hatched area shows a fraction of the number of galaxies for which the assigned morphological type is less certain.

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Comparing Sk and Sp types, most Sks are normal spiral (SAs) with knotty HII regions distributed in their peripheral disk portion, while most Sps are barred spirals (SBs) with peculiar bar and /or nucleus. This tendency agrees with Sérsic and Pastoriza's result(1967) that the morphologically peculiar nuclei show a preference to the barred spirals, taking into account that the peculiar nuclei have always ultraviolet-excesses.

3. SPECTROSCOPIC ANALYSIS

Several follow-up observations such as photometric, spectroscopic and radio ones for selected KUGs have been carried out. Spectroscopic study made for the 57 selected KUGs (Maehara et al.1986) will be here reported. The analysis is based on 120 or 240 Å mm^{-1} low resolution spectra taken with the Cassegrain image intensifier spectrograph of the Okayama 188-cm reflector. About 85% of the sample exhibits conspicuous emission lines.

Equivalent widths of these emission lines were measured against the local continuum, and a diagram of the line ratio $[OIII]_{\lambda 5007}/H\beta$ versus $[NII]_{\lambda 6584}/H\alpha$ was made (Fig. 3). According to Baldwin et al.(1981) this diagram is useful for classifying various emission line objects. Most KUGs in our sample are situated in or near the domain of HII regions as shown in Fig. 3. Two KUGs appearing in the Sy1 domain are KUG0275+393 = Mkn 382 and KUG0921+525 = Mkn 110, both of which are known as Sy1 galaxies.

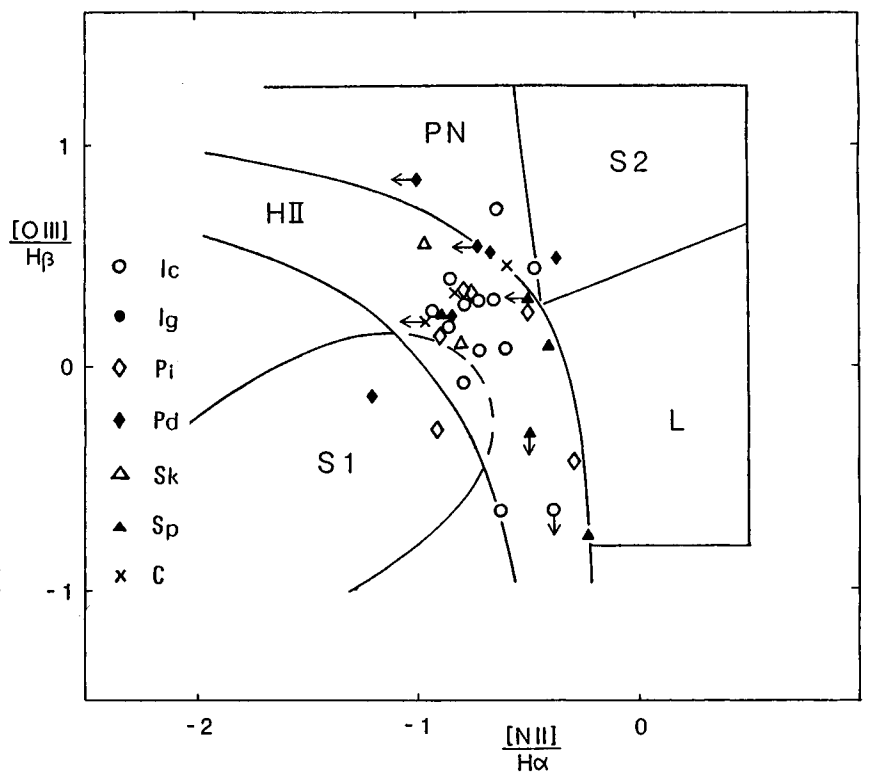

Figure 3. Emission-line ratio diagram of 35 KUGs for which spectroscopic data were obtained. PN and L are respectively planetary nebulae and LINERS.

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DISCUSSIONS

Alloin : Why among the 57 KUGs you observed in detail, don't you find any AGNs? Only HII region type galaxies? How does this relate to selection effects in your survey?

Takase : We have two Sy1 galaxies among our sample, but most are HII region type. Since our survey is not based on a spectroscopic method but on the comparison of direct images in UGR colors, there could be some selection effect which is not preferable for detecting AGNs.

Osterbrock : In the diagram of [OIII]/Hβ vs [NII]/Hα you showed, one object seems to lie in the Sy2 region. Do you know if the slit spectrum of this object shows other characteristics of a Seyfert 2 galaxy?

Takase : The object is KUG2259+157B, which is a compact, globular and high UV-excess one, being located near to the spiral galaxy 2259+157A. Since the [NII]λ6587 line is in some extent blended with Hα due to a considerable broadening of the spectrogram, the [NII]/Hα value of the object seems less certain with an expected error of about 0.3dex (see Maehara et al. 1985).

Pismis : I have two simple questions. (1) Where are there UV-excess regions located in the galaxies you discussed? Are they located anywhere or prefer to be at the center? (2) Do your data allow you to give the width of the emission lines quantitatively or only that they are either wide or narrow?

Takase : (1) C type and many of Sp type KUGs have their UV-excess regions at the center, while others in the peripheral portions of the galaxy.
(2) We cannot give the width of emission-lines quantitatively

for most objects, because the resolution of our spectrogram is not good enough to be able to recognize the broadened profile for lines narrower than ~1000 km s $^{-1}$.

Alloin (Comments) : A large number of active galaxies (or UV-excess) lists are now available. The result is that one object may be known with 5 to 6 different names! I suggest that new lists' producers cross-check their list of objects with previous ones.

Terlevich,R. (Comments) : Diagrams like the one you showed are not useful in segregating Sy1's from Sy2's because as both axes contain a ratio to a Balmer line, the presence of an excess luminosity in the form of a broad component in Hα would shift the point at 45° toward the lower right corner just because of the broad Hα component not present in [NII].

FILIPPENKO: Seyfert 1 galaxies are known to have narrow-line intensity ratios which are similar to those of Seyfert 2 galaxies. Yet, in your diagram based on Baldwin, Phillips, and Terlevich (1981), the Seyfert 1 and 2 galaxies fall in very different regions. This must be because you are including the broad components of Hα and Hβ as well as the narrow components. It would be more useful to make comparisons between only the narrow components, leaving out the broad components. Otherwise, some of the Seyfert 1 galaxies will appear to have line intensity ratios that are indistinguishable from those of HII regions. Other confusion will also arise.

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