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ON FIVE MIRA VARIABLES IN ORION AND CANIS MAJOR

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This study is a product of our large-scale work on the new versions of the General Catalogue of Variable Stars (GCVS) and the New Catalogue of Suspected Variable Stars (NSV) with accurate coordinates (cf. Samus et al., 2002, 2003). Even finding charts do not always guarantee easy identification of a faint variable star, and the situation becomes still more complicated for stars with no finding charts published. For Mira variables, searches are facilitated if an IRAS source, with high probability of variations indicated in the IRAS Point Source Catalogue, is present at a position close to that published for the variable. The final convincing solution is the recovery of an optically variable star using archive plates or images from electronic archives (the Digitized Sky Survey, Aladin Sky Atlas, the US Naval Observatory Image and Catalogue Archive – USNO ICA).

The stars discussed here (four stars in Orion and one, in Canis Major) are NSV stars recovered using images from the USNO ICA and then studied using all available material. We used plates taken with the old 9.7-cm and 16-cm astrographs of Moscow Observatory and with the 40-cm astrograph of the Sternberg Astronomical Institute's Crimean Laboratory. These plates reproduce B_{pg} magnitudes quite well; comparison stars were taken from GSC2.2 and the USNO A2.0 catalogue. The observations, obtainable from the authors upon request, were complemented with estimates from digitized sky images. All the five stars were found to belong to the Mira type, and light elements could be determined for the four Miras in Orion.

Our results for the four stars in Orion are summarized in Table 1. The column "N_1" contains the number of photographic plates estimated, and the column "N_2", the number of estimates using digitized surveys. The column "JD24..." presents the range of Julian dates covered by our estimates. Figure 1 displays the POSS-II R finding charts ($5' \times 5'$) for the variables in Orion. The light curves with the elements from Table 1. are shown in Figure 2.

Table 1. Summary of the results.

NSV	N_1	N_2	JD24...	Max B	Min B	Light elements Max JD =	Rem.
02904	81	4	14718–49341	12.7	≤18.2	$2446496 + 624^{d}.4 \cdot E$	1
02910	12	2	14718–49376	14.8	≤19.8	$2446328 + 133^{d}.4 \cdot E$	2
02911	66	3	33184–49353	15.2	≤20.0	$2445054 + 324^{d}.6 \cdot E$	3
02925	22	3	14343–49390	14.4	≤19.8	$2449001 + 402^{d}.8 \cdot E$	4

1. **NSV 02904** = Var Ross 156 = IRAS 06158+0206 (Var 99%)= GSC 0136.01416 (here and in the following, we indicate probability of infrared variations from the IRAS Point Source Catalogue after the IRAS number). It was suspected in variability by Ross (1927) who gave two photographic brightness estimates, 12^m and 15^m. R. Weber (private communication, 1956) could not confirm its variability. The coordinates of the variable from GSC2.2 are $06^h18^m24^s.85$, $+02°05'34''.2$ (J2000.0, epoch 1990.826).

2. **NSV 02910** = Kord E_2 = IRAS 06162+0919 (Var 2%) = GSC 0731.01604. This variable was discovered by J.&Z. Kordylewski to vary from $14^m.0$ to fainter than $19^m.5$ pg (S. Arend, private communication, 1958). Until now, the star was not studied in detail. Our estimates used a very limited material, however covering a long time span. The GSC2.2 coordinates are $06^h18^m56^s.13$, $+09°18'20''.0$ (J2000.0, epoch 1989.845).

3. **NSV 02911** = Var Ross 17 = IRAS 06165+1544 (Var 17%). It was suspected in variability by Ross (1925) from two photographic brightness estimates, 14^m and 17^m. Morgenroth (1935) and Hoffmeister (1944) could not confirm variability from their photographic plates. Bidelman and MacConnell (1998) report the spectral type M7 for NSV 02911. The GSC2.2 coordinates are $06^h19^m22^s.94$, $+15°43'04''.0$ (J2000.0, epoch 1997.102).

4. **NSV 02925** = Kord E_1 = IRAS 06182+0752 (Var 93%). This variable was discovered by J.&Z. Kordylewski and found to vary from $15^m.0$ to fainter than $19^m.5$ pg (S. Arend, private communication, 1958). Until now, the star remained unstudied in detail. Its GSC2.2 coordinates are $06^h20^m57^s.34$, $+07°51'26''.5$ (J2000.0, epoch 1989.845).

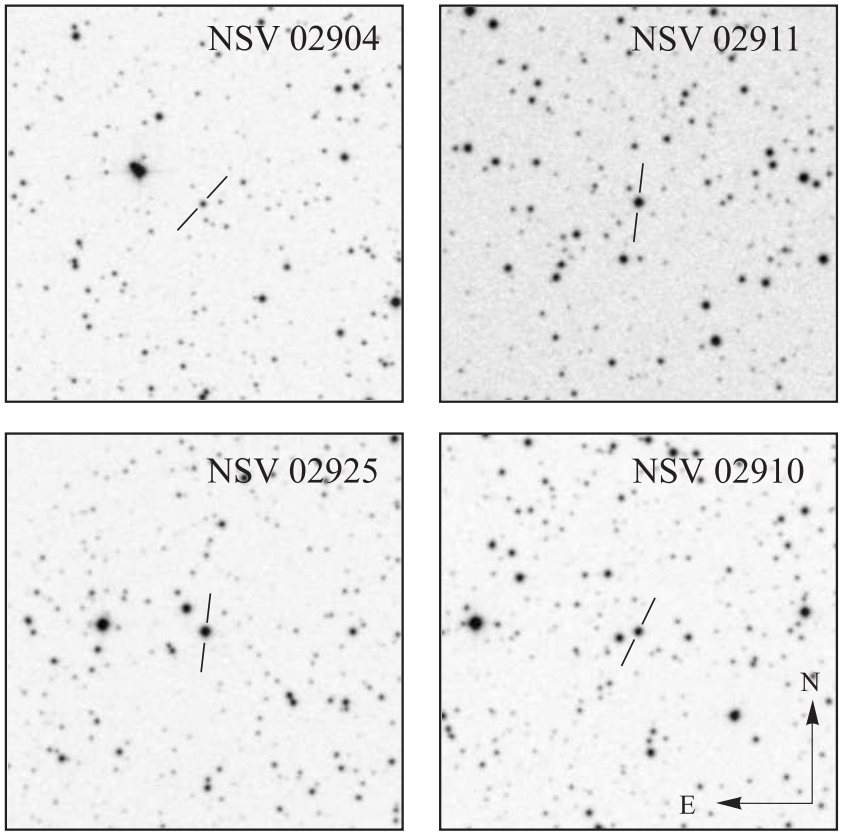

Figure 1. The finding charts for the Miras in Orion. Each chart shows a $5' \times 5'$ POSS-II field, in red light.

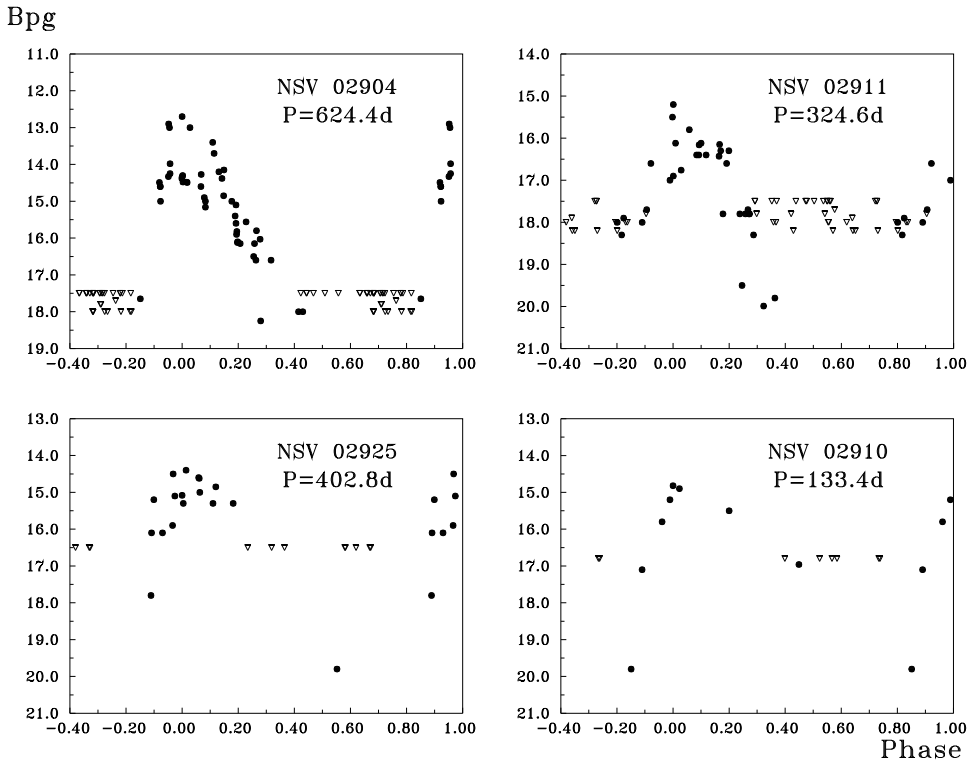

Figure 2. The light curves of the Miras in Orion, folded with the elements presented in the Table. Open triangles are plate limits.

We also recovered variability of **NSV 03025** (CMa) = IRAS 06308–2608 (Var 75%) = HV 8057 = CSS-II 229 = CoD–26°3109. This star was suspected in variability by Luyten (1937) who gave the photovisual range from $12\overset{m}{.}0$ to $14\overset{m}{.}0$. Stephenson (1976) lists NSV 03025 (CSV 777) as an S star. The variable's GSC2.2 position is $6^h32^m52\overset{s}{.}30$, $-26°10'24\overset{''}{.}0$ (J2000.0, epoch 1996.131). Its $5' \times 5'$ POSS-II R chart is shown in Fig. 3. Unfortunately there are no plates in our stacks for this unstudied variable. The USNO ICA provides two images in blue light and three, in red light. The corresponding magnitude ranges are $19\overset{m}{.}0$ to fainter than $19\overset{m}{.}5$ B, $13\overset{m}{.}8$ to $16\overset{m}{.}9$ R. The star is most probably a Mira.

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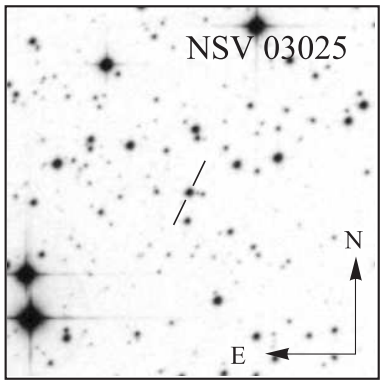

Figure 3. The finding chart for NSV 03025 (CMa) showing a $5' \times 5'$ POSS-II field, in red light.

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