TABLE 2. R-Band Photometry of Varuna

| Image[a] | UT Date [2001][b] | $JD_c$[c] | $m_R$[d] | $m_R(1,1,0)$[e] |
|---|---|---|---|---|
| 2019 | Feb 17.2447 | 1957.49983 | 19.913 | 3.450 |
| 2020 | Feb 17.2484 | 1957.50464 | 19.914 | 3.451 |
| 2021 | Feb 17.2547 | 1957.51099 | 19.898 | 3.435 |
| 2022 | Feb 17.2592 | 1957.51550 | 19.880 | 3.417 |
| 2023 | Feb 17.2627 | 1957.51904 | 19.860 | 3.397 |
| 2024 | Feb 17.2662 | 1957.52246 | 19.785 | 3.322 |
| 2025 | Feb 17.2698 | 1957.52600 | 19.776 | 3.313 |
| 2026 | Feb 17.2733 | 1957.52954 | 19.732 | 3.269 |
| 2027 | Feb 17.2769 | 1957.53320 | 19.689 | 3.226 |
| 2028 | Feb 17.2805 | 1957.53674 | 19.670 | 3.207 |
| 2029 | Feb 17.2840 | 1957.54028 | 19.659 | 3.196 |
| 2030 | Feb 17.2876 | 1957.54382 | 19.598 | 3.135 |
| 2032 | Feb 17.2998 | 1957.55603 | 19.562 | 3.099 |
| 2033 | Feb 17.3033 | 1957.55957 | 19.581 | 3.118 |
| 2034 | Feb 17.3068 | 1957.56311 | 19.553 | 3.090 |
| 2035 | Feb 17.3105 | 1957.56677 | 19.581 | 3.118 |
| 2036 | Feb 17.3140 | 1957.57019 | 19.599 | 3.136 |
| 2037 | Feb 17.3175 | 1957.57373 | 19.617 | 3.154 |
| 2038 | Feb 17.3211 | 1957.57739 | 19.658 | 3.195 |
| 2039 | Feb 17.3247 | 1957.58093 | 19.673 | 3.210 |
| 2040 | Feb 17.3282 | 1957.58447 | 19.705 | 3.242 |
| 2041 | Feb 17.3339 | 1957.59009 | 19.745 | 3.282 |
| 2042 | Feb 17.3374 | 1957.59363 | 19.820 | 3.357 |
| 2043 | Feb 17.3410 | 1957.59717 | 19.834 | 3.371 |
| 2044 | Feb 17.3445 | 1957.60083 | 19.878 | 3.415 |
| 2045 | Feb 17.3481 | 1957.60437 | 19.911 | 3.448 |
| 2046 | Feb 17.3517 | 1957.60791 | 19.909 | 3.446 |
| 2047 | Feb 17.3552 | 1957.61145 | 19.942 | 3.479 |
| 2048 | Feb 17.3588 | 1957.61499 | 19.922 | 3.459 |
| 2049 | Feb 17.3624 | 1957.61865 | 19.942 | 3.479 |
| 2051 | Feb 17.3736 | 1957.62976 | 19.888 | 3.425 |
| 2052 | Feb 17.3771 | 1957.63342 | 19.888 | 3.425 |
| 2053 | Feb 17.3807 | 1957.63696 | 19.872 | 3.409 |
| 2054 | Feb 17.3842 | 1957.64050 | 19.829 | 3.366 |
| 2055 | Feb 17.3878 | 1957.64404 | 19.824 | 3.361 |
| 2057 | Feb 17.3978 | 1957.65405 | 19.731 | 3.268 |
| 2058 | Feb 17.4014 | 1957.65759 | 19.679 | 3.217 |
| 2059 | Feb 17.4050 | 1957.66125 | 19.654 | 3.191 |
| 2060 | Feb 17.4085 | 1957.66479 | 19.614 | 3.151 |
| 2061 | Feb 17.4121 | 1957.66833 | 19.626 | 3.163 |
| 2062 | Feb 17.4157 | 1957.67200 | 19.615 | 3.152 |
| 2063 | Feb 17.4193 | 1957.67554 | 19.540 | 3.077 |
| 2064 | Feb 17.4228 | 1957.67908 | 19.610 | 3.147 |
| 2065 | Feb 17.4264 | 1957.68262 | 19.505 | 3.042 |
| 2066 | Feb 17.4300 | 1957.68628 | 19.506 | 3.043 |
| 2067 | Feb 17.4337 | 1957.68994 | 19.567 | 3.104 |
| 2068 | Feb 17.4373 | 1957.69360 | 19.569 | 3.106 |
| 2069 | Feb 17.4409 | 1957.69714 | 19.557 | 3.094 |

TABLE 2. (continued)

| Image[a] | UT Date [2001][b] | $JD_c$[c] | $m_R$[d] | $m_R(1,1,0)$[e] |
|---|---|---|---|---|
| 2070 | Feb 17.4445 | 1957.70081 | 19.583 | 3.120 |
| 2072 | Feb 17.4543 | 1957.71057 | 19.643 | 3.180 |
| 2073 | Feb 17.4579 | 1957.71411 | 19.687 | 3.224 |
| 2074 | Feb 17.4614 | 1957.71765 | 19.708 | 3.245 |
| 2075 | Feb 17.4650 | 1957.72131 | 19.753 | 3.290 |
| 3025 | Feb 18.2337 | 1958.48987 | 19.536 | 3.071 |
| 3026 | Feb 18.2396 | 1958.49585 | 19.603 | 3.138 |
| 3027 | Feb 18.2432 | 1958.49939 | 19.613 | 3.148 |
| 3028 | Feb 18.2468 | 1958.50305 | 19.634 | 3.169 |
| 3029 | Feb 18.2503 | 1958.50647 | 19.661 | 3.196 |
| 3031 | Feb 18.2575 | 1958.51367 | 19.758 | 3.293 |
| 3033 | Feb 18.2646 | 1958.52075 | 19.836 | 3.371 |
| 3035 | Feb 18.2718 | 1958.52795 | 19.909 | 3.444 |
| 3037 | Feb 18.2789 | 1958.53503 | 19.939 | 3.474 |
| 3039 | Feb 18.2861 | 1958.54224 | 19.969 | 3.504 |
| 3049 | Feb 18.3223 | 1958.57849 | 19.799 | 3.334 |
| 3051 | Feb 18.3295 | 1958.58569 | 19.731 | 3.265 |
| 3053 | Feb 18.3366 | 1958.59277 | 19.673 | 3.208 |
| 3055 | Feb 18.3439 | 1958.60010 | 19.632 | 3.167 |
| 3057 | Feb 18.3510 | 1958.60718 | 19.581 | 3.116 |
| 3059 | Feb 18.3582 | 1958.61438 | 19.573 | 3.108 |
| 3074 | Feb 18.4277 | 1958.68384 | 19.931 | 3.466 |
| 3075 | Feb 18.4314 | 1958.68762 | 19.955 | 3.490 |
| 3076 | Feb 18.4349 | 1958.69104 | 19.864 | 3.399 |
| 3077 | Feb 18.4385 | 1958.69470 | 19.852 | 3.387 |
| 3078 | Feb 18.4421 | 1958.69824 | 19.833 | 3.368 |
| 3079 | Feb 18.4457 | 1958.70178 | 19.801 | 3.336 |
| 3080 | Feb 18.4492 | 1958.70532 | 19.766 | 3.301 |
| 4025 | Feb 19.2381 | 1959.49414 | 19.835 | 3.367 |
| 4026 | Feb 19.2417 | 1959.49780 | 19.798 | 3.330 |
| 4027 | Feb 19.2452 | 1959.50134 | 19.771 | 3.303 |
| 4030 | Feb 19.2586 | 1959.51465 | 19.628 | 3.160 |
| 4033 | Feb 19.2753 | 1959.53137 | 19.537 | 3.069 |
| 4036 | Feb 19.2883 | 1959.54443 | 19.544 | 3.076 |
| 4039 | Feb 19.3016 | 1959.55774 | 19.625 | 3.157 |
| 4044 | Feb 19.3273 | 1959.58350 | 19.891 | 3.423 |
| 4047 | Feb 19.3405 | 1959.59656 | 19.928 | 3.460 |
| 4050 | Feb 19.3536 | 1959.60974 | 19.951 | 3.483 |
| 4062 | Feb 19.4036 | 1959.65967 | 19.592 | 3.124 |
| 4065 | Feb 19.4167 | 1959.67285 | 19.565 | 3.097 |
| 5024 | Feb 20.2402 | 1960.49622 | 19.754 | 3.283 |
| 5025 | Feb 20.2437 | 1960.49976 | 19.792 | 3.321 |
| 5026 | Feb 20.2473 | 1960.50330 | 19.841 | 3.370 |
| 5030 | Feb 20.2722 | 1960.52820 | 19.961 | 3.490 |
| 5031 | Feb 20.2758 | 1960.53186 | 19.965 | 3.494 |
| 5032 | Feb 20.2794 | 1960.53540 | 19.933 | 3.462 |
| 5033 | Feb 20.2830 | 1960.53906 | 19.915 | 3.444 |
| 5034 | Feb 20.2866 | 1960.54260 | 19.893 | 3.422 |

TABLE 2. (continued)

| Image[a] | UT Date [2001][b] | $JD_c$[c] | $m_R$[d] | $m_R(1,1,0)$[e] |
|---|---|---|---|---|
| 5035 | Feb 20.2902 | 1960.54614 | 19.849 | 3.378 |
| 5036 | Feb 20.2937 | 1960.54980 | 19.855 | 3.384 |
| 5041 | Feb 20.3273 | 1960.58337 | 19.574 | 3.103 |
| 5042 | Feb 20.3312 | 1960.58716 | 19.565 | 3.094 |
| 5044 | Feb 20.3430 | 1960.59900 | 19.548 | 3.077 |
| 5045 | Feb 20.3468 | 1960.60278 | 19.569 | 3.098 |
| 5046 | Feb 20.3506 | 1960.60669 | 19.583 | 3.112 |
| 5047 | Feb 20.3545 | 1960.61047 | 19.566 | 3.095 |
| 3022 | Apr 22.2417 | 2021.49219 | 19.776 | 3.224 |
| 3023 | Apr 22.2458 | 2021.49634 | 19.746 | 3.194 |
| 3036 | Apr 22.2861 | 2021.53699 | 19.655 | 3.103 |
| 3038 | Apr 22.2958 | 2021.54663 | 19.745 | 3.193 |
| 5015 | Apr 24.2523 | 2023.50269 | 19.615 | 3.064 |
| 5016 | Apr 24.2565 | 2023.50696 | 19.616 | 3.065 |
| 5021 | Apr 24.2853 | 2023.53564 | 19.807 | 3.256 |
| 5022 | Apr 24.2896 | 2023.53992 | 19.857 | 3.306 |
| 6018 | Apr 25.2382 | 2024.48853 | 20.005 | 3.455 |
| 6019 | Apr 25.2425 | 2024.49280 | 20.037 | 3.487 |
| 6026 | Apr 25.2863 | 2024.53662 | 19.718 | 3.168 |
| 6027 | Apr 25.2906 | 2024.54089 | 19.695 | 3.145 |

[a]Image number.

[b]Decimal Universal Date at the start of the integration.

[c]Julian Date corrected to the midpoint of each integration and for light travel time, less 245,0000.

[d]Apparent red magnitude, uncertainties are $\pm 0.02$.

[e]Absolute magnitude found using $m_R(1,1,0) = m_R - 5\log(R\Delta) - \beta_{opp}\alpha$ where $\beta_{opp} = 0.156$ magnitudes per degree (see Sheppard and Jewitt 2002).