# DEEP HUBBLE SPACE TELESCOPE IMAGING OF SEXTANS A. II. CEPHEIDS AND DISTANCE<sup>1</sup>

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### ABSTRACT

We have identified 82 short-period variable stars in Sextans A from deep Wide Field Planetary Camera 2 observations. All the periodic variables appear to be short-period Cepheids, with periods as small as 0.8 days for fundamental mode Cepheids and 0.5 days for first-overtone Cepheids. These objects have been used, along with measurements of the red giant branch (RGB) tip and red clump, to measure a true distance modulus to Sextans A of  $\mu_0 = 25.61 \pm 0.07$ , corresponding to a distance of  $d = 1.32 \pm 0.04$  Mpc. Comparing distances calculated by these techniques, we find that short-period Cepheids (P < 2 days) are accurate distance indicators for objects at or below the metallicity of the Small Magellanic Cloud. As these objects are quite numerous in low-metallicity star-forming galaxies, they have the potential for providing extremely precise distances throughout the Local Group. We have also compared the relative distances produced by other distance indicators. We conclude that calibrations of RR Lyrae stars, the RGB tip, and the red clump are self-consistent, but that there appears to be a small dependence of long-period Cepheid distances on metallicity. Finally, we present relative distances of Sextans A, Leo A, IC 1613, and the Magellanic Clouds. *Key words:* Cepheids — galaxies: distances and redshifts — galaxies: individual (Sextans A) —

Local Group

# 1. INTRODUCTION

Sextans A (DDO 75) is a dwarf irregular galaxy that lies in a small group of galaxies including NGC 3109, Sextans B, and the Antlia dwarf galaxy at a distance of approximately 1.4 Mpc. The group appears not to be bound to the Local Group (van den Bergh 1999), making it the nearest group of galaxies to us.

Cepheids were discovered in the galaxy by Sandage & Carlson (1982), who calculated a distance modulus of  $\mu_0 = 25.6 \pm 0.2$ . Later work (Sandage & Carlson 1985; Walker 1987) improved the photometry and adjusted the Cepheid magnitudes by over half a magnitude fainter, a change that was largely counteracted by revisions to the period-luminosity relation. Piotto, Capaccioli, & Pellegrini (1994) reobserved the five Sandage & Carlson Cepheids and added observations of five new Cepheids in Sextans A. They derived a distance modulus of  $\mu_0 = 25.71 \pm 0.20$  based on a

distance modulus of 18.5 for the Large Magellanic Cloud (LMC). Sakai, Madore, & Freedman (1996) added new single-epoch photometry of the six Cepheids with periods between 10 and 25 days and calculated a distance modulus of  $\mu_0 = 25.85 \pm 0.15$ , as well as a red giant branch (RGB) tip distance modulus of  $\mu_0 = 25.74 \pm 0.13$ .

The distance to Sextans A is important for three reasons. First, as noted above, the galaxy is part of the Antlia-Sextans Group, which may or may not be bound to the Local Group. Improved measurements of the distances of the four members should help to clarify this issue. Second, accurate distances to all the nearest galaxies are important for an accurate characterization of the local mass distribution and the degree to which galaxy distributions follow mass distributions (e.g., Peebles et al. 2001; Ekholm et al. 2001, and references therein). Perhaps of greatest interest is that Sextans A is one of the lowest-metallicity objects in which classical Cepheids have been discovered (with H II region abundances of  $12 + \log [O/H] \approx 7.6$  Skillman, Kennicutt, & Hodge 1989; Pilyugin 2001). Thus, observationally, studies of the variable stars in Sextans A can shed light on the question of the metallicity dependence of the Cepheid distance scale (e.g., Kennicutt et al. 1998).

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Hubble Space Telescope (HST) observations permit a more accurate measurement of the distance of Sextans A. Not only does the increased resolution permit more accurate photometry of the brighter distance indicators, such as the RGB tip, but the deeper photometry allows the red clump position to be measured for the first time. In addition, our study of Leo A (Dolphin et al. 2002) indicates that we should find large numbers of short-period Cepheids in lowmetallicity star-forming galaxies (such as Sextans A); accurate photometry of these objects is difficult from the ground but lies easily within the capabilities of HST and may provide a new distance measurement.

This paper is the second in our study of Sextans A, based on deep Wide Field Planetary Camera 2 (WFPC2) images. In Dohm-Palmer et al. 2002 (hereafter Paper I), we used the blue helium-burning (BHeB) stars to examine its recent star formation history. In this paper, we use the 3 day observation baseline to examine the variable star population. Section 2 describes our photometry and identification of variables. In § 3, we examine the short-period Cepheid population and determine the distance to Sextans A. Section 4 is a comparison of distance moduli to Sextans A and other dwarf galaxies, determined using a variety of standard candles.

# 2. DATA AND REDUCTION

# 2.1. Observations

The observations were described in detail in Paper I. Summarizing briefly, the data consist of 24 pairs of 1200 s images. Sixteen of the pairs were taken through the F814W filter; eight, through F555W. Data were taken with four dithering positions, with one quarter of the observations (four pair of F814W images and two pair of F555W images) made at each. A pair of F656N images was also taken but was not used for our variable star work and thus will not be referenced again in this paper. The total baseline of observations was slightly over 3 days.

# 2.2. Photometry

The data were obtained from the STScI archive by using on-the-fly calibration and thus were pipeline-calibrated using the best available calibration images at the time of retrieval. Reduction and photometry were made with the HSTphot package (Dolphin 2000a). For this variable star study, each pair of images was cosmic-ray cleaned and combined to give effective 2400 s images. In addition, a deep F555W frame at the first pointing was created to provide a reference image for alignment. The mosaic of this image is shown in Figure 1.

Photometry was obtained on the 24 images simultaneously, producing photometry for all epochs for a common list of stars. Calibration to the WFPC2 flight system was made using HSTphot-produced charge transfer efficiency corrections and calibrations (Dolphin 2000b). Figure 2 shows the color-magnitude diagram (CMD) for all wellphotometered stars (those with  $\chi \leq 2.0$  and |sharpness|  $\leq$ 0.3, total signal-to-noise ratio of at least 5, and observations in both filters).

# 2.3. Variable Star Identification

Variable star candidates were identified first by using a series of automated cuts, similar to those used in our study of IC 1613 (Dolphin et al. 2001a). The star had to meet each of the following five criteria, which tested the photometry, variability, and periodicity.

First, the object had to be a well-photometered star. While it is possible for a variable star to be part of a blend, our point-spread function–fitting photometry attempts to fit the profile to that of a single star and thus is unreliable for photometering blends.

Our next cuts were intended to eliminate nonvariable or weakly variable stars. The simplest requirement was that the rms magnitude scatter,

$$\sigma_{\text{mag}} = \left\{ \frac{1}{N_{\text{F555W}} + N_{\text{F814W}}} \times \left[ \sum_{i=1}^{N_{\text{F55W}}} (\text{F555W}_i - \overline{\text{F555W}})^2 + \sum_{i=1}^{N_{\text{F814W}}} (\text{F814W}_i - \overline{\text{F814W}})^2 \right] \right\}^{1/2}, \quad (1)$$

had to be 0.14 mag or greater. Next, the overall reduced  $\chi^2$ ,

$$\chi^{2} = \frac{1}{N_{\text{F555W}} + N_{\text{F814W}}} \times \left[ \sum_{i=1}^{N_{\text{F555W}}} \frac{(\text{F555W}_{i} - \overline{\text{F555W}})^{2}}{\sigma_{i}^{2}} + \sum_{i=1}^{N_{\text{F814W}}} \frac{(\text{F814W}_{i} - \overline{\text{F814W}})^{2}}{\sigma_{i}^{2}} \right], \quad (2)$$

had to be 3.0 or greater. These two cuts eliminate stars that are weakly variable and those for which the photometry signal-to-noise ratio is insufficient to discern variability. We also clipped 1/3 of the extreme points and required that the recalculated reduced  $\chi^2$  exceed 0.5; this was intended to eliminate nonvariable stars with a few bad points.

The final test was a modified Lafler-Kinman algorithm (Lafler & Kinman 1965), which tests for periodicity. This was implemented by computing  $\Theta$  for periods between 0.1 and 4.0 days. The  $\Theta$  parameter is calculated by determining the light curve for a trial period and using the equation

$$\Theta = \frac{\sum_{i=1}^{N} (m_i - m_{i+1})^2}{\sum_{i=1}^{N} (m_i - \bar{m})^2} , \qquad (3)$$

where N is the number of exposures for a given filter,  $m_i$  is the magnitude at phase *i*, and  $\bar{m}$  is the mean magnitude. If the trial period is the correct period, each magnitude  $m_i$  will be close to the adjacent magnitude  $m_{i+1}$ , giving a value of  $\Theta$ that decreases as  $1/N^2$ . If the trial period is incorrect, there will be less correlation and consequently larger values of  $\Theta$ . Because we had data in two filters, we combined the  $\Theta$ values with

$$\Theta = \frac{4}{(1/\sqrt{\Theta_{F555W}} + 1/\sqrt{\Theta_{F814W}})^2}.$$
 (4)

For a star to pass the periodicity test, its minimum value of  $\Theta$  had to be 0.85 or less.

Our photometry identified 39,947 total objects, of which 33,681 were well-photometered stars and 110 passed our automatic selection process. Upon manual examination of the images nine of these stars appeared not to be clean



FIG. 1.—Deep image of Sextans A

detections and were removed from the list. Each of the remaining stars was examined manually and subjectively graded based on its quality. A quality value of 4 means that the variable had clean light curves in both filters, the F555W and F814W light curves were in phase, and the period had no ambiguity. Lower quality values were assigned to variables that failed to meet one or more of these criteria. Only those variables with quality of 3 or 4 were kept; 82 passed this test.

To compute mean magnitudes we computed a phaseweighted average using

$$\langle m \rangle = -2.5 \log \sum_{i=1}^{N} \frac{\phi_{i+1} - \phi_{i-1}}{2} 10^{-0.4m_i} ,$$
 (5)

where  $\phi_i$  is the phase and  $m_i$  is the magnitude at each point along the light curve. These values, still in WFPC2 F555W and F814W magnitudes, were then transformed to standard *V* and *I* by application of color terms. Complete photometry for all variable stars is shown in Table 1 and summarized in Table 2; light curves are shown in Figure 3.

Although location on the CMD was not a criterion, all our variable stars were found near the expected location of short-period Cepheids—brighter and bluer than the red clump. Figure 4 shows the Sextans A CMD, with the variable stars highlighted. The apparent horizontal extensions of the Cepheid population at  $I \approx 23.9$  are artifacts of poor phase coverage in F555W, explained in the next section.

It should be emphasized that our detection efficiency was not 100%. Thus we cannot rule out the existence of Population II Cepheids, nor are we confident that the "nonvariable" stars falling within the instability strip are not, in fact, variables that were not detected. In addition, while the CMD from combined photometry is 50% complete to I = 27, the single-epoch signal-to-noise ratio of stars below I = 25 is such that detection of fainter periodic variables,



FIG. 2.—(V-I, I) color-magnitude diagram (33,681 stars), calculated from mean magnitudes in all epochs. Poorly fitted stars ( $\chi > 2$  or |sharpness| > 0.3) are not included. Absolute magnitudes (on the right-hand y-axis) are calculated assuming  $I-M_I = 25.67$ .

such as RR Lyrae stars, would have been extremely difficult. For example, the signal-to-noise ratio of our individual epoch photometry at the expected location of RR Lyrae stars is  $\sim 5$  in *I*; thus a variable at that magnitude would have to have an rms variability of  $\sim 0.5$  mag in *I* to pass all our variability tests.

# 2.4. Phase Coverage

Since the primary goal of these observations was to obtain deep photometry, the program was not carried out in a way that would maximize the phase coverage. Thus, a variable star with one period may have excellent coverage of its light curve while one with another period may have poor coverage. Figure 5 shows the maximum gap in our phase coverage as a function of period, assuming that the star was measured at every epoch. While the F814W observations consist of 16 epochs and thus give the better coverage, we will have poor phase coverage of any variable whose period is between 0.8 and 1.1 days. For such a star, all 16 F814W observations would cover only about 40% of the light curve, while the eight F555W observations cover about 50%. Thus our detection efficiency will suffer, since such a star may not show sufficient variability over the phase range included in our observations to raise our  $\chi^2$  flag. In addition, if such a variable is recovered the absence of half the light curve prevents an accurate mean magnitude determination and creates ambiguity between periods of a day and half a day. Fortunately, the color of such a star should be measured acceptably since both light curves would have their gaps at close to the same phases.

In addition to detection efficiency, poor phase coverage affects our period and mean magnitude determinations. Eight stars could have been fitted with either one-day or half-day light curves; fortunately all such stars could be identified using their locations in the period-luminosity dia-

gram. The mean magnitude errors are more problematic, since the lack of half the light curve can bias the calculation in either direction if the star is observed only near maximum or minimum brightness. For stars with periods of about 1 day, this affected the mean magnitudes in both filters similarly, since the same phases were observed in both filters. However, for stars with periods of about 1.2 days, the phase coverage in F814W was excellent (maximum phase gap of 0.1) while that in F555W was poor (maximum phase gap of 0.6). Five such stars were observed only near minimum in F555W; these are the five that appear to be on top of the red clump in Figure 4 ( $I \simeq 23.9$  and  $V-I \simeq 0.8$ ). Correcting for this measurement error, we find that the five are, on average, 0.4 mag brighter in V (and thus bluer) than our measurement. Similarly, four 1.2 day variables were observed exclusively near maximum in F555W, creating the apparent blue extension at the same I magnitude.

#### 3. ANALYSIS

#### 3.1. Cepheids

Figure 6 shows our period-luminosity (P-L) relations in V and I. The I relation is significantly sharper for two reasons—better phase coverage in F814W allows for a better measurement of the mean magnitude and the P-L relation has less scatter in redder bands. We note that one of the fundamental mode pulsators (C4-V24) has a period of only  $0.78 \pm 0.06$  days; such objects were also seen in our variable star study of Leo A (Dolphin et al. 2002). We note that the gap between C4-V24 and the one with the next-shortest period (C1-V07;  $P = 0.97 \pm 0.04$  days) is the result of our poor phase coverage in that period range as described in the previous section. As with the three ~0.8 day Cepheids in Leo A, we believe C4-V24 to be a bona fide classical Cepheid rather than an RR Lyrae star or anomalous Cepheid.

Because the P-L relations have steeper slopes at short periods than at long periods (Bauer et al. 1999), we calculated relations by using short-period (<2 day) Cepheids (638 fundamental mode and 611 first-overtone pulsators) from the OGLE Small Magellanic Cloud (SMC) Cepheid database:

$$M_V(\text{FM}) = -3.10 \log P - 1.04 \pm 0.01$$
, (6)

$$M_I(FM) = -3.31 \log P - 1.56 \pm 0.01 , \qquad (7)$$

$$M_V(\text{FO}) = -3.30 \log P - 1.70 \pm 0.01$$
, (8)

$$M_I(\text{FO}) = -3.41 \log P - 2.17 \pm 0.01$$
, (9)

(Udalski et al. 1999a), assuming an SMC distance modulus of  $\mu_0 = 18.88$  (Dolphin et al. 2001b).

Converting to the reddening-free parameter  $W \equiv 2.45I - 1.45V$ , the relations become

$$M_W(FM) = -3.61 \log P - 2.30 , \qquad (10)$$

$$M_W(\text{FO}) = -3.57 \log P - 2.86$$
. (11)

The true distance modulus is thus given by  $W-M_W$ , allowing us to measure a distance for each Sextans A Cepheid. Averaging the individual distances of our Cepheids, we measure true distance moduli of  $\mu_0 = \mu_0(\text{SMC}) + 6.76 \pm 0.05$  from 39 fundamental mode Cepheids and  $\mu_0 = \mu_0(\text{SMC}) + 6.70 \pm 0.03$  from 43 first-overtone

TABLE 1	PHOTOMETRY OF VARIABLE STARS
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HJD <sup>a</sup>	C1-V01	C1-V02	C1-V03	C1-V04	C1-V05	C1-V06	C1-V07	C1-V08	C1-V09	C1-V10	C1-V11
F555W: 273.6254 273.6900 274.5657 274.5657 274.5632 274.9691 275.0330 275.0330	$\begin{array}{c} 24.23 \pm 0.06\\ 24.24 \pm 0.03\\ 24.27 \pm 0.06\\ 24.22 \pm 0.04\\ 23.79 \pm 0.04\\ 23.59 \pm 0.02\\ 23.59 \pm 0.02\\ 23.73 \pm 0.02\\ 23.73 \pm 0.02\\ \end{array}$	$\begin{array}{c} 24.22\pm0.03\\ 24.30\pm0.03\\ 24.89\pm0.04\\ 24.89\pm0.04\\ 24.89\pm0.04\\ 24.59\pm0.04\\ 24.59\pm0.04\\ 24.59\pm0.04\\ 24.59\pm0.04\\ 24.93\pm0.05\end{array}$	$\begin{array}{c} 24.36\pm0.04\\ 24.41\pm0.03\\ 24.20\pm0.03\\ 24.21\pm0.03\\ 24.41\pm0.03\\ 24.41\pm0.03\\ 24.41\pm0.02\\ 23.77\pm0.02\\ 23.77\pm0.06\end{array}$	$\begin{array}{c} 24.20\pm0.03\\ 24.07\pm0.03\\ 24.43\pm0.03\\ 24.43\pm0.03\\ 24.57\pm0.03\\ 24.69\pm0.04\\ 24.57\pm0.06\\ 24.41\pm0.09\\ 24.41\pm0.09\\ 24.19\pm0.03\end{array}$	$\begin{array}{c} 24.75 \pm 0.04 \\ 24.74 \pm 0.04 \\ 24.23 \pm 0.05 \\ 24.47 \pm 0.03 \\ 24.71 \pm 0.03 \\ 24.71 \pm 0.03 \\ 24.71 \pm 0.03 \\ 24.70 \pm 0.03 \\ 24.50 \pm 0.03 \end{array}$	$\begin{array}{c} 24.66\pm0.04\\ 24.76\pm0.04\\ 24.98\pm0.04\\ 24.99\pm0.05\\ 24.99\pm0.05\\ 24.92\pm0.05\\ 24.73\pm0.05\\ 25.07\pm0.05\\ 24.73\pm0.04\\ 24.59\pm0.04\end{array}$	$\begin{array}{c} 24.91 \pm 0.04 \\ 24.80 \pm 0.05 \\ 24.84 \pm 0.05 \\ 24.94 \pm 0.04 \\ 24.55 \pm 0.04 \\ 24.61 \pm 0.03 \\ 24.61 \pm 0.03 \\ 24.61 \pm 0.03 \\ 24.84 \pm 0.03 \end{array}$	$\begin{array}{c} 25.17\pm0.05\\ 25.01\pm0.07\\ 25.27\pm0.07\\ 25.23\pm0.06\\ 24.19\pm0.03\\ 24.40\pm0.03\\ 25.03\pm0.05\\ 24.89\pm0.05\\ 24.89\pm0.05\end{array}$	$\begin{array}{c} 23.30\pm0.02\\ 23.55\pm0.02\\ 23.65\pm0.06\\ 23.64\pm0.02\\ 23.64\pm0.02\\ 23.64\pm0.02\\ 23.54\pm0.02\\ 23.30\pm0.02\\ 23.36\pm0.02\\ 23.36\pm0.02\\ \end{array}$	$\begin{array}{c} 25.15\pm0.06\\ 25.14\pm0.05\\ 24.61\pm0.05\\ 24.61\pm0.04\\ 25.15\pm0.04\\ 24.82\pm0.04\\ 24.89\pm0.06\\ 24.89\pm0.06\\ 25.02\pm0.06\end{array}$	$\begin{array}{c} 24.05 \pm 0.04 \\ 24.18 \pm 0.03 \\ 24.35 \pm 0.04 \\ 24.35 \pm 0.04 \\ 24.36 \pm 0.04 \\ 24.36 \pm 0.03 \\ 24.16 \pm 0.03 \\ 24.16 \pm 0.03 \\ 24.11 \pm 0.03 \end{array}$
F814W: 273.8268 273.8268 273.9587 273.9587 274.8316 274.8316 274.8316 274.8316 274.8316 274.8316 274.8316 274.8316 275.5373 275.5373 275.57719 275.548 275.6448 275.6448 275.67195 276.7795	$\begin{array}{c} 23.11 \pm 0.07 \\ 23.33 \pm 0.03 \\ 23.35 \pm 0.04 \\ 23.57 \pm 0.04 \\ 23.55 \pm 0.04 \\ 23.55 \pm 0.04 \\ 23.55 \pm 0.04 \\ 23.55 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.56 \pm 0.06 \\ 23.53 \pm 0.09 \\ 23.53 \pm 0.09 \\ 23.50 \pm 0.04 \\ 23.50 \pm 0.04 \\ 23.52 \pm 0.09 \\ 23.52 \pm 0.09 \\ 23.52 \pm 0.06 \\$	$\begin{array}{c} 23.87\pm0.05\\ 24.01\pm0.04\\ 24.01\pm0.04\\ 24.00\pm0.05\\ 24.16\pm0.06\\ 24.26\pm0.07\\ 24.26\pm0.07\\ 24.04\pm0.04\\ 23.85\pm0.04\\ 23.84\pm0.06\\ 24.17\pm0.08\\ 24.17\pm0.08\\ 24.17\pm0.08\\ 24.19\pm0.06\\ 24.05\pm0.06\\ 24.11\pm0.10\\ 24.11\pm0.10\\$	$23.42 \pm 0.04$ $23.17 \pm 0.03$ $22.17 \pm 0.03$ $22.99 \pm 0.02$ $23.08 \pm 0.04$ $23.64 \pm 0.04$ $23.64 \pm 0.04$ $23.64 \pm 0.04$ $23.64 \pm 0.03$ $23.04 \pm 0.03$ $23.05 \pm 0.04$ $23.55 \pm 0.04$ $23.56 \pm 0.04$ $23.56 \pm 0.04$ $23.56 \pm 0.04$	$\begin{array}{c} 24.05\pm0.07\\ 23.96\pm0.05\\ 24.06\pm0.05\\ 24.05\pm0.05\\ 24.01\pm0.05\\ 24.01\pm0.05\\ 24.01\pm0.05\\ 24.21\pm0.05\\ 24.22\pm0.06\\ 24.22\pm0.06\\ 24.22\pm0.06\\ 24.21\pm0.05\\ 24.22\pm0.06\\ 24.21\pm0.05\\ 24.21\pm0.06\\ 24.21\pm0.06\\$	$\begin{array}{c} 24.06\pm0.05\\ 24.17\pm0.05\\ 24.17\pm0.06\\ 24.11\pm0.06\\ 24.11\pm0.07\\ 23.85\pm0.04\\ 23.85\pm0.06\\ 23.80\pm0.06\\ 23.60\pm0.06\\ 23.66\pm0.04\\ 23.66\pm0.06\\ 23.60\pm0.06\\ 23.61\pm0.06\\ 23.19\pm0.06\\ 24.19\pm0.06\\ 24.19\pm0.06\\ 24.10\pm0.06\\ 24.10\pm0.06\\$	$\begin{array}{c} 24.40 \pm 0.07\\ 24.46 \pm 0.08\\ 24.47 \pm 0.06\\ 24.51 \pm 0.06\\ 24.51 \pm 0.07\\ 24.55 \pm 0.07\\ 24.48 \pm 0.06\\ 24.55 \pm 0.09\\ 24.55 \pm 0.09\\ 24.56 \pm 0.10\\ 24.55 \pm 0.09\\ 24.58 \pm 0.06\\ 24.58 \pm 0.06\\ 24.59 \pm 0.07\\ 24.8 \pm 0.06\\ 24.8 \pm 0.06\end{array}$	$\begin{array}{c} 24.24\pm0.05\\ 23.92\pm0.05\\ 24.15\pm0.05\\ 24.15\pm0.05\\ 24.15\pm0.06\\ 24.38\pm0.06\\ 24.38\pm0.06\\ 24.38\pm0.06\\ 24.43\pm0.06\\ 24.43\pm0.06\\ 24.43\pm0.06\\ 24.43\pm0.06\\ 24.31\pm0.06\\ 24.31\pm0.06\\ 24.31\pm0.06\\ 24.35\pm0.06\\ 24.32\pm0.06\end{array}$	$\begin{array}{c} 24.19\pm0.05\\ 23.86\pm0.04\\ 23.95\pm0.05\\ 24.08\pm0.05\\ 24.42\pm0.10\\ 24.42\pm0.10\\ 24.45\pm0.06\\ 24.47\pm0.06\\ 24.47\pm0.06\\ 24.55\pm0.07\\ 24.58\pm0.07\\ 24.28\pm0.07\\ 24.58\pm0.07\\ 24.58\pm0.07\\ 24.51\pm0.09\\ 24.55\pm0.11\\ 24.53\pm0.10\\ 24.53\pm0.11\\ 24.53\pm0.10\\ 24.53\pm0.11\\ 24.55\pm0.11\\ 24.55\pm0.11\\$	$\begin{array}{c} 22.78\pm0.02\\ 22.78\pm0.02\\ 22.74\pm0.02\\ 22.74\pm0.02\\ 22.98\pm0.02\\ 22.96\pm0.02\\ 22.96\pm0.02\\ 22.96\pm0.02\\ 22.96\pm0.02\\ 22.26\pm0.02\\ 22.29\pm0.02\\ 22.98\pm0.02\\ 22.98\pm0.02\\ 22.98\pm0.02\\ 22.98\pm0.02\\ 22.98\pm0.02\\ 22.95\pm0.03\\ 22.95\pm0.03\\$	$\begin{array}{c} 24.41\pm0.07\\ 24.31\pm0.07\\ 24.15\pm0.05\\ 24.15\pm0.06\\ 24.29\pm0.07\\ 24.48\pm0.07\\ 24.48\pm0.07\\ 24.48\pm0.07\\ 24.54\pm0.07\\ 24.54\pm0.07\\ 24.54\pm0.07\\ 24.55\pm0.07\\ 24.55\pm0.07\\$	$\begin{array}{c} 23.89 \pm 0.04 \\ 23.80 \pm 0.07 \\ 23.92 \pm 0.08 \\ 24.02 \pm 0.08 \\ 24.02 \pm 0.05 \\ 23.92 \pm 0.04 \\ 23.98 \pm 0.05 \\ 23.91 \pm 0.05 \\ 23.91 \pm 0.06 \\ 23.91 \pm 0.06 \\ 23.91 \pm 0.06 \\ 23.61 \pm 0.06 \\ 23.61 \pm 0.05 \\ 23.61 \pm 0.06 \\ 23.61 \pm 0.06 \\ 23.61 \pm 0.06 \\ 23.67 \pm 0.06 \\ 23.67 \pm 0.04 \\ 23.67 \pm 0.06 \\$
HJD <sup>a</sup> F555W:	C1-V12	C1-V13	C2-V01	C2-V02	C2-V03	C2-V04	C2-V05	C2-V06	C2-V07	C2-V08	C2-V09
273.6254 273.6900 274.657 274.6302 274.691 275.0330 275.9066 F814W:	$\begin{array}{c} 24.43 \pm 0.03 \\ 24.31 \pm 0.05 \\ \ldots \\ 24.16 \pm 0.03 \\ 24.46 \pm 0.03 \\ 24.43 \pm 0.04 \\ 23.82 \pm 0.03 \\ 23.89 \pm 0.02 \end{array}$	$\begin{array}{c} 24.56\pm0.06\\ 24.52\pm0.04\\ 24.52\pm0.03\\ 24.17\pm0.03\\ 24.51\pm0.03\\ 24.55\pm0.04\\ 24.55\pm0.06\\ 24.57\pm0.06\\ 24.07\pm0.03\\ 24.07\pm0.03\\$	$\begin{array}{c} 24.65\pm0.04\\ 24.73\pm0.05\\ 24.73\pm0.05\\ 24.58\pm0.04\\ 24.58\pm0.04\\ 24.55\pm0.10\\ 24.55\pm0.10\\ 24.75\pm0.05\\ 24.44\pm0.04\\ 24.55\pm0.06\\ 24.50\pm0.06\end{array}$	$\begin{array}{c} 24.07\pm0.03\\ 24.07\pm0.03\\ 24.46\pm0.04\\ 24.48\pm0.04\\ 24.55\pm0.04\\ 24.62\pm0.03\\ 24.52\pm0.03\\ 24.32\pm0.03\\ 24.10\pm0.03\\ 24.10\pm0.03\end{array}$	$\begin{array}{c} 24.22 \pm 0.05 \\ \cdots \\ 24.03 \pm 0.03 \\ 23.67 \pm 0.02 \\ 24.07 \pm 0.04 \\ \cdots \\ 24.36 \pm 0.07 \\ 24.37 \pm 0.04 \end{array}$	$\begin{array}{c} 24.14\pm0.03\\ 24.33\pm0.03\\ 24.72\pm0.04\\ 24.82\pm0.04\\ 24.32\pm0.04\\ 24.52\pm0.03\\ 24.46\pm0.03\\ 24.71\pm0.09\\ 24.71\pm0.09\\ 24.72\pm0.04\end{array}$	$\begin{array}{c} 23.84 \pm 0.02 \\ 24.05 \pm 0.02 \\ 25.03 \pm 0.05 \\ 25.64 \pm 0.03 \\ 24.57 \pm 0.04 \\ 24.77 \pm 0.04 \\ 24.72 \pm 0.04 \\ 24.12 \pm 0.02 \\ 24.23 \pm 0.03 \end{array}$	$\begin{array}{c} 24.79\pm0.05\\ 24.85\pm0.04\\ 24.78\pm0.05\\ \ldots\\ 24.40\pm0.03\\ 24.40\pm0.03\\ 24.53\pm0.03\\ 24.68\pm0.05\\ \ldots\\ \ldots\end{array}$	$23.33 \pm 0.02$ $23.38 \pm 0.02$ $23.38 \pm 0.03$ $23.78 \pm 0.03$ $23.77 \pm 0.03$ $23.37 \pm 0.02$ $23.40 \pm 0.02$ $23.40 \pm 0.02$ $23.85 \pm 0.03$	$\begin{array}{c} 24.42\pm0.03\\ 24.43\pm0.04\\ 23.82\pm0.03\\ 24.04\pm0.03\\ 24.53\pm0.03\\ 24.55\pm0.03\\ 24.55\pm0.03\\ 23.52\pm0.03\\ 23.53\pm0.03\\ 23.53\pm0.03\\ 23.93\pm0.02\\ 23.93\pm0.02\\$	$\begin{array}{c} 25.03 \pm 0.05\\ 25.00 \pm 0.04\\ 25.08 \pm 0.06\\ 25.08 \pm 0.06\\ 24.11 \pm 0.03\\ 24.11 \pm 0.03\\ 24.42 \pm 0.03\\ 24.79 \pm 0.06\\ 24.79 \pm 0.04\end{array}$
273.8268 273.8914 273.9587 274.0261 274.0261 274.7650 274.8316 274.8316 274.890 274.890 275.5733 275.6379 275.57045 275.6448 276.6448 276.6448 276.64795	$23.74 \pm 0.04$ $23.73 \pm 0.04$ $23.73 \pm 0.04$ $23.55 \pm 0.03$ $23.53 \pm 0.03$ $23.56 \pm 0.03$ $23.56 \pm 0.04$ $23.68 \pm 0.04$ $23.68 \pm 0.07$ $23.63 \pm 0.07$ $23.63 \pm 0.07$ $23.63 \pm 0.07$ $23.63 \pm 0.07$ $23.63 \pm 0.07$ $23.63 \pm 0.07$ $23.74 \pm 0.04$ $23.68 \pm 0.04$ $23.68 \pm 0.04$ $23.72 \pm 0.04$	$\begin{array}{c} 23.98 \pm 0.07\\ 23.88 \pm 0.06\\ 23.89 \pm 0.06\\ 23.59 \pm 0.05\\ 23.70 \pm 0.05\\ 23.70 \pm 0.05\\ 23.77 \pm 0.06\\ 23.37 \pm 0.06\\ 23.37 \pm 0.06\\ 23.31 \pm 0.03\\ 23.33 \pm 0$	$24.02 \pm 0.06$ $23.98 \pm 0.08$ $23.98 \pm 0.04$ $23.35 \pm 0.04$ $23.83 \pm 0.04$ $23.83 \pm 0.04$ $23.83 \pm 0.04$ $23.93 \pm 0.04$ $23.57 \pm 0.05$ $23.67 \pm 0.05$ $23.77 \pm 0.04$ $23.86 \pm 0.04$ $23.86 \pm 0.04$ $23.57 \pm 0.04$	$\begin{array}{c} 23, 39 \pm 0.04 \\ 23, 82 \pm 0.05 \\ 24, 08 \pm 0.04 \\ 24, 08 \pm 0.06 \\ 24, 08 \pm 0.06 \\ 23, 98 \pm 0.06 \\ 24, 11 \pm 0.05 \\ 24, 11 \pm 0.05 \\ 24, 19 \pm 0.05 \\ 24, 19 \pm 0.05 \\ 24, 19 \pm 0.07 \\ 23, 38 \pm 0.04 \\ 23, 39 \pm 0.07 \\ 23, 38 \pm 0.04 \\ 23, 38 \pm 0.04 \\ 23, 38 \pm 0.07 \\ 24, 07 \pm 0.07 \\ 23, 38 \pm 0.04 \\ 24, 07 \pm 0.07 \\ 23, 38 \pm 0.04 \\ 24, 07 \pm 0.07 \\ 24, 07 \pm 0.05 \\ 24, 07 $	$\begin{array}{c} 23.60\pm0.06\\ 23.62\pm0.06\\ 23.62\pm0.06\\ 23.55\pm0.07\\ 23.25\pm0.03\\ 23.25\pm0.03\\ 23.31\pm0.09\\ 23.41\pm0.06\\ 23.61\pm0.06\\ 23.65\pm0.05\\ 23.60\pm0.05\\ 23.55\pm0.05\\ 23.55\pm0.05\\$	$\begin{array}{c} 24.11\pm0.04\\ 24.15\pm0.05\\ 24.15\pm0.05\\ 24.11\pm0.04\\ 24.18\pm0.05\\ 24.12\pm0.10\\ 24.05\pm0.04\\ 23.99\pm0.04\\ 23.99\pm0.06\\ 23.89\pm0.05\\ 23.99\pm0.06\\ 23.89\pm0.05\\ 23.90\pm0.05\\ 24.10\pm0.06\\ 24.18\pm0.05\\ 24.16\pm0.05\\ 24.16\pm0.05\\$	$\begin{array}{c} 23.86 \pm 0.04 \\ 23.81 \pm 0.10 \\ 24.07 \pm 0.04 \\ 24.07 \pm 0.04 \\ 23.56 \pm 0.03 \\ 23.56 \pm 0.03 \\ 23.56 \pm 0.03 \\ 23.57 \pm 0.06 \\ 24.40 \pm 0.06 \\ 24.32 \pm 0.06 \\ 24.33 \pm 0.06 \\ 24.34 \pm 0.06 \\ 24.34 \pm 0.06 \\ 24.34 \pm 0.06 \end{array}$	$\begin{array}{c} 24.26\pm0.05\\ 24.17\pm0.05\\ \ldots\\ \ldots\\ 23.87\pm0.04\\ 23.88\pm0.04\\ 23.88\pm0.04\\ 23.89\pm0.04\\ 23.89\pm0.04\\ 23.39\pm0.04\\ 23.39\pm0.04\\ 23.39\pm0.04\\ 24.11\pm0.05\\ 24.11\pm0.05\\ 24.21\pm0.05\\ 24.21\pm0.05\end{array}$	$\begin{array}{c} 22.98 \pm 0.02\\ 23.02 \pm 0.02\\ 23.04 \pm 0.02\\ 23.05 \pm 0.05\\ 23.14 \pm 0.03\\ 23.14 \pm 0.03\\ 23.05 \pm 0.03\\ 23.03 \pm 0.02\\ 23.13 \pm 0.02\\ 23.11 \pm 0.03\\ 23.11 \pm 0$	$\begin{array}{c} 23.93 \pm 0.04 \\ 23.97 \pm 0.05 \\ 23.98 \pm 0.04 \\ 23.55 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.55 \pm 0.08 \\ 23.57 \pm 0.08 \\ 23.57 \pm 0.08 \\ 23.77 \pm 0.04 \\ 24.03 \pm 0.05 \\ 24.03 \pm 0.05 \\ 24.03 \pm 0.05 \\ 24.02 \pm 0.05 \\ 24.04 \pm 0.05 \\ 24.04 \pm 0.05 \end{array}$	$23.68 \pm 0.04$ $23.86 \pm 0.04$ $23.36 \pm 0.07$ $23.96 \pm 0.07$ $24.41 \pm 0.07$ $24.43 \pm 0.07$ $24.33 \pm 0.06$ $24.41 \pm 0.06$ $24.41 \pm 0.06$ $24.48 \pm 0.06$

HJD <sup>a</sup>	C2-V10	C2-V11	C2-V12	C2-V13	C2-V14	C2-V15	C2-V16	C2-V17	C2-V18	C2-V19	C3-V01
F555W: 273.6254 273.6900 274.6302 274.6302 274.691 275.0066 275.9066	$\begin{array}{c} 22.86\pm0.02\\ 22.89\pm0.01\\ 22.33\pm0.01\\ 22.19\pm0.01\\ 22.03\pm0.01\\ 22.03\pm0.01\\ 22.03\pm0.01\\ 22.017\pm0.01\\ 22.17\pm0.01\\ 22.12\pm0.01\end{array}$	$\begin{array}{c} 24.45 \pm 0.04 \\ 24.45 \pm 0.03 \\ 24.49 \pm 0.03 \\ 24.90 \pm 0.06 \\ 24.98 \pm 0.11 \\ 24.47 \pm 0.05 \\ 24.39 \pm 0.05 \\ 24.39 \pm 0.05 \\ 24.70 \pm 0.08 \\ 24.76 \pm 0.07 \end{array}$	$\begin{array}{c} 23.86\pm0.06\\ 24.09\pm0.03\\ 24.21\pm0.03\\ 24.21\pm0.03\\ 24.23\pm0.03\\ 23.55\pm0.02\\ 23.66\pm0.02\\ 23.66\pm0.02\\ 23.76\pm0.02\\ 23.76\pm0.02\\ 23.76\pm0.02\\ \end{array}$	$\begin{array}{c} 24.96\pm0.06\\ 25.11\pm0.05\\ 24.37\pm0.03\\ 24.59\pm0.04\\ 24.59\pm0.04\\ 25.00\pm0.04\\ 24.61\pm0.04\\ 24.61\pm0.04\\ 24.61\pm0.04\\ 24.81\pm0.04\end{array}$	$24.20 \pm 0.06$ $23.92 \pm 0.05$ $24.23 \pm 0.04$ $24.23 \pm 0.08$ $24.23 \pm 0.08$ $24.15 \pm 0.03$ $24.15 \pm 0.03$ $24.02 \pm 0.03$ $24.24 \pm 0.03$	$23.69 \pm 0.02$ $23.82 \pm 0.02$ $23.83 \pm 0.07$ $23.85 \pm 0.01$ $22.95 \pm 0.01$ $23.55 \pm 0.02$ $23.54 \pm 0.02$ $23.54 \pm 0.02$	$\begin{array}{c} 24.50\pm0.05\\ 24.52\pm0.06\\ 24.52\pm0.06\\ 24.01\pm0.08\\ 23.92\pm0.02\\ 24.40\pm0.04\\ 24.47\pm0.04\\ 24.47\pm0.04\\ 24.48\pm0.04\end{array}$	$\begin{array}{c} 24.69\pm0.04\\ 24.58\pm0.03\\ 24.58\pm0.03\\ 24.64\pm0.04\\ 24.58\pm0.03\\ 24.58\pm0.03\\ 24.58\pm0.03\\ 24.58\pm0.03\\ 24.58\pm0.03\\ 24.53\pm0.03\\ 24.53\pm0.03\end{array}$	$\begin{array}{c} 24.84 \pm 0.04 \\ 24.84 \pm 0.04 \\ 25.06 \pm 0.06 \\ 25.05 \pm 0.05 \\ 25.05 \pm 0.04 \\ 24.54 \pm 0.04 \\ 24.73 \pm 0.04 \\ 24.91 \pm 0.04 \\ 24.81 \pm 0.04 \end{array}$	$\begin{array}{c} 23.73 \pm 0.02 \\ 23.98 \pm 0.02 \\ 24.57 \pm 0.05 \\ 24.73 \pm 0.05 \\ 24.73 \pm 0.05 \\ 24.17 \pm 0.03 \\ 24.19 \pm 0.03 \\ 24.47 \pm 0.08 \\ 24.39 \pm 0.03 \end{array}$	$\begin{array}{c} 24.82 \pm 0.04 \\ 24.62 \pm 0.04 \\ 24.82 \pm 0.04 \\ 24.86 \pm 0.04 \\ 24.86 \pm 0.03 \\ 24.50 \pm 0.03 \\ \ldots \\ 24.82 \pm 0.04 \\ 24.93 \pm 0.05 \end{array}$
273.8268 273.8268 273.9587 274.0261 274.0261 274.7650 274.8990 275.5733 275.5719 275.5719 275.5719 275.5719 275.5719 275.5719 275.5719 275.7719 275.7719 276.7795	$\begin{array}{c} 22.02 \pm 0.01\\ 22.06 \pm 0.01\\ 21.97 \pm 0.01\\ 22.05 \pm 0.01\\ 22.05 \pm 0.01\\ 21.59 \pm 0.01\\ 21.54 \pm 0.01\\ 21.65 \pm 0.01\\ 21.65 \pm 0.01\\ 21.64 \pm 0.01\\ 21.74 \pm 0.01\\ 21.74 \pm 0.01\\ 21.75 \pm 0.01\\ 21.76 \pm 0$	$\begin{array}{c} 24.26\pm 0.06\\ 24.33\pm 0.06\\ 24.39\pm 0.07\\ 24.37\pm 0.06\\ 24.47\pm 0.06\\ 24.47\pm 0.06\\ 24.47\pm 0.06\\ 24.47\pm 0.06\\ 24.47\pm 0.06\\ 23.99\pm 0.07\\ 23.99\pm 0.07\\ 23.99\pm 0.07\\ 23.93\pm 0.07\\ 23.19\pm 0.01\\ 224.17\pm 0.09\\ 224.18\pm 0.09\\ 224.18\pm 0.09\end{array}$	$\begin{array}{c} 23.68\pm 0.04\\ 23.72\pm 0.04\\ 23.72\pm 0.04\\ 23.70\pm 0.04\\ 23.79\pm 0.04\\ 23.78\pm 0.04\\ 23.75\pm 0.04\\ 23.75\pm 0.04\\ 23.56\pm 0.06\\ 23.56\pm 0.06\\ 23.56\pm 0.03\\ 23.56\pm 0.03\\ 23.56\pm 0.03\\ 23.49\pm 0.03$	$\begin{array}{c} 24.35 \pm 0.06\\ 24.04 \pm 0.04\\ 24.02 \pm 0.04\\ 24.02 \pm 0.04\\ 24.14 \pm 0.05\\ 24.24 \pm 0.05\\ 24.36 \pm 0.06\\ 24.36 \pm 0.06\\ 24.35 \pm 0.06\\ 24.37 \pm 0.05\\ 24.07 \pm 0.05\\ 24.47 \pm 0.07\\ 24.47 \pm 0$	$23.78 \pm 0.04$ $23.85 \pm 0.04$ $23.85 \pm 0.04$ $23.387 \pm 0.04$ $23.387 \pm 0.04$ $23.73 \pm 0.06$ $24.11 \pm 0.07$ $23.99 \pm 0.04$ $23.81 \pm 0.04$ $23.81 \pm 0.04$ $23.65 \pm 0.04$ $23.65 \pm 0.04$ $23.65 \pm 0.04$ $23.81 \pm 0.04$	$\begin{array}{c} 22.97\pm0.02\\ 23.00\pm0.02\\ 23.00\pm0.02\\ 22.90\pm0.03\\ 23.16\pm0.03\\ 23.16\pm0.03\\ 23.11\pm0.03\\ 23.11\pm0.03\\ 23.11\pm0.03\\ 22.55\pm0.03\\ 22.55\pm0.03\\$	$\begin{array}{c} 23.71\pm0.04\\ 23.49\pm0.04\\ 23.45\pm0.04\\ 23.57\pm0.04\\ 23.57\pm0.04\\ 23.57\pm0.04\\ 23.58\pm0.04\\ 23.58\pm0.07\\ 23.73\pm0.05\\ 23.84\pm0.06\\ 23.84\pm0.06\\ 23.84\pm0.06\\ 23.84\pm0.06\\ 23.83\pm0.09\\ 23.72\pm0.09\end{array}$	$\begin{array}{c} 23.87\pm0.06\\ 24.09\pm0.05\\ 24.09\pm0.05\\ 24.30\pm0.05\\ 24.30\pm0.06\\ 23.93\pm0.04\\ 23.93\pm0.04\\ 23.93\pm0.04\\ 24.02\pm0.04\\ 24.17\pm0.07\\ 24.17\pm0.07\\ 24.17\pm0.07\\ 24.12\pm0.08\\ 24.12\pm0.08\\ 24.25\pm0.05\\ 24.25\pm0.05\\ 24.25\pm0.05\\ 24.25\pm0.05\\ 24.25\pm0.05\\ 24.25\pm0.06\\ 24.25\pm0.06\\$	$\begin{array}{c} 24.45\pm 0.06\\ 24.32\pm 0.05\\ 24.31\pm 0.05\\ 24.31\pm 0.06\\ 24.32\pm 0.06\\ 24.32\pm 0.06\\ 24.10\pm 0.06\\ 24.10\pm 0.03\\ 24.07\pm 0.06\\ 24.07\pm 0.06\\ 24.09\pm 0.05\\ 24.09\pm 0.06\\ 24.32\pm 0.09\\ 24.35\pm 0.09\\ 24.35\pm 0.09\\ 24.52\pm 0.14\\ \end{array}$	$\begin{array}{c} 23.70\pm0.04\\ 23.80\pm0.04\\ 23.83\pm0.05\\ 23.32\pm0.06\\ 23.72\pm0.06\\ 23.72\pm0.06\\ 23.72\pm0.06\\ 23.51\pm0.04\\ 23.36\pm0.05\\ 23.40\pm0.05\\ 23.94\pm0.05\\ 23.94\pm0.06\\ 23.94\pm0.06\\ 23.94\pm0.06\\ 23.94\pm0.06\\ 23.91\pm0.04\\ 23.91\pm0.04\\ 23.91\pm0.04\\ 23.91\pm0.04\\ 23.91\pm0.04\\ 23.91\pm0.06\\ 24.01\pm0.05\\ 24.01\pm0.05\\$	$\begin{array}{c} 24.18 \pm 0.05\\ 24.14 \pm 0.05\\ 24.33 \pm 0.10\\ 24.41 \pm 0.06\\ 24.41 \pm 0.06\\ 24.41 \pm 0.06\\ 24.42 \pm 0.07\\ 24.02 \pm 0.07\\ 24.02 \pm 0.07\\ 24.02 \pm 0.07\\ 24.03 \pm 0.05\\ 24.38 \pm 0.07\\ 24.38 \pm 0.07\\ 24.31 \pm 0.06\\ 24.31 \pm 0.05\\ 24.31 \pm 0.06\\ 24.21 \pm 0.05\\ 24.21 \pm 0$
HJD <sup>a</sup>	C3-V02	C3-V03	C3-V04	C3-V05	C3-V06	C3-V07	C3-V08	C3-V09	C3-V10	C3-V11	C3-V12
F555W: 273.624 273.6900 274.6302 274.6302 275.0330 275.9066 F814W:	$\begin{array}{c} 24.85 \pm 0.05 \\ 24.87 \pm 0.06 \\ 24.66 \pm 0.04 \\ 24.68 \pm 0.05 \\ 24.68 \pm 0.07 \\ 24.83 \pm 0.07 \\ 24.76 \pm 0.04 \\ 24.75 \pm 0.04 \end{array}$	$\begin{array}{c} 24.30\pm0.07\\ 24.75\pm0.04\\ 24.78\pm0.05\\ 24.78\pm0.09\\ 24.47\pm0.04\\ 24.47\pm0.04\\ 24.47\pm0.04\\ 24.59\pm0.05\\ 24.76\pm0.05\\ 24.76\pm0.05\\ \end{array}$	$\begin{array}{c} 25.22\pm0.05\\ 25.08\pm0.08\\ 25.17\pm0.07\\ 25.25\pm0.06\\ 24.85\pm0.04\\ 24.93\pm0.04\\ 24.93\pm0.04\\ 24.93\pm0.04\end{array}$	$\begin{array}{c} 23.86\pm0.02\\ 24.02\pm0.02\\ 24.55\pm0.04\\ 23.84\pm0.02\\ 24.55\pm0.04\\ 24.72\pm0.04\\ 24.71\pm0.04\\ 24.41\pm0.04\\ 24.41\pm0.04\\ 24.61\pm0.04\end{array}$	$\begin{array}{c} 24.45\pm0.03\\ 24.35\pm0.03\\ 24.35\pm0.03\\ 24.31\pm0.03\\ 24.31\pm0.03\\ 24.31\pm0.04\\ 24.10\pm0.04\\ 24.10\pm0.04\\ 24.16\pm0.04\\ 24.18\pm0.04\end{array}$	$\begin{array}{c} 23.72\pm0.03\\ 24.01\pm0.08\\ 24.93\pm0.05\\ 24.99\pm0.05\\ 24.50\pm0.03\\ 24.50\pm0.03\\ 24.50\pm0.03\\ 24.50\pm0.03\\ 24.50\pm0.03\\ 24.50\pm0.05\\ 24.26\pm0.05\end{array}$	$\begin{array}{c} 24.23 \pm 0.03 \\ 24.41 \pm 0.03 \\ 24.09 \pm 0.03 \\ 23.71 \pm 0.02 \\ 23.71 \pm 0.02 \\ 24.59 \pm 0.03 \\ 24.59 \pm 0.04 \\ 23.68 \pm 0.02 \\ 23.88 \pm 0.02 \end{array}$	$\begin{array}{c} 24.87\pm0.05\\ 24.29\pm0.03\\ 24.29\pm0.04\\ 24.64\pm0.06\\ 24.67\pm0.06\\ 24.37\pm0.03\\ 23.87\pm0.03\\ 23.87\pm0.02\\ 23.09\pm0.03\end{array}$	$\begin{array}{c} 24.73 \pm 0.04 \\ 24.82 \pm 0.05 \\ 24.69 \pm 0.04 \\ 24.58 \pm 0.04 \\ 24.58 \pm 0.04 \\ 24.58 \pm 0.04 \\ 24.73 \pm 0.04 \\ 24.73 \pm 0.04 \\ 24.71 \pm 0.06 \end{array}$	$\begin{array}{c} 24.20 \pm 0.03 \\ 24.27 \pm 0.03 \\ 24.51 \pm 0.05 \\ 24.61 \pm 0.05 \\ 24.61 \pm 0.05 \\ 24.10 \pm 0.04 \\ 24.25 \pm 0.05 \\ 24.40 \pm 0.08 \\ 24.54 \pm 0.06 \end{array}$	$\begin{array}{c} 24.86 \pm 0.04 \\ 24.99 \pm 0.05 \\ 24.48 \pm 0.04 \\ 24.20 \pm 0.03 \\ 24.20 \pm 0.03 \\ 24.92 \pm 0.05 \\ 24.98 \pm 0.05 \\ 24.98 \pm 0.05 \\ 24.64 \pm 0.04 \\ 24.53 \pm 0.03 \end{array}$
273.8268	$\begin{array}{c} 24.21 \pm 0.0\\ 24.13 \pm 0.08\\ 24.13 \pm 0.06\\ 24.02 \pm 0.06\\ 24.08 \pm 0.06\\ 24.18 \pm 0.11\\ 24.18 \pm 0.11\\ 24.18 \pm 0.11\\ 23.84 \pm 0.05\\ 23.84 \pm 0.05\\ 23.56 \pm 0.05\\ 23.573 \pm 0.05\\ 23.574 \pm 0.06\\ 23.575 \pm 0.06\\ 23.575 \pm 0.05\\ 23.575 \pm 0.$	$\begin{array}{c} 24.34\pm0.06\\ 24.34\pm0.08\\ 24.19\pm0.06\\ 24.19\pm0.05\\ 24.19\pm0.05\\ 24.13\pm0.01\\ 24.02\pm0.04\\ 23.84\pm0.04\\ 23.94\pm0.06\\ 23.94\pm0.06\\ 23.94\pm0.06\\ 24.04\pm0.06\\ 24.04\pm0.06\\ 24.03\pm0.06\\ 24.21\pm0.09\\ 24.21\pm0.09\\ 24.21\pm0.09\\ 24.21\pm0.06\\ 24.21\pm0.06\\$	$\begin{array}{c} 24.18 \pm 0.05\\ 24.34 \pm 0.06\\ 24.34 \pm 0.06\\ 24.49 \pm 0.06\\ 24.49 \pm 0.06\\ 24.49 \pm 0.06\\ 24.12 \pm 0.06\\ 24.12 \pm 0.05\\ 24.12 \pm 0.05\\ 24.61 \pm 0.07\\ 24.61 \pm 0$	$\begin{array}{c} 23.95 \pm 0.04 \\ 24.03 \pm 0.04 \\ 24.05 \pm 0.04 \\ 24.26 \pm 0.03 \\ 23.56 \pm 0.03 \\ 23.56 \pm 0.03 \\ 23.51 \pm 0.04 \\ 24.02 \pm 0.04 \\ 24.11 \pm 0.05 \\ 23.41 \pm 0.05 \\ 23.41 \pm 0.05 \\ 23.61 \pm 0.05 \\ 23.61 \pm 0.06 \\ 23.56 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.57 \pm 0.05 \\ 23.57 \pm 0.04 \\ 23.57 \pm 0.04 \\ 23.50 \pm 0.04 \\$	$23.53 \pm 0.03$ $23.57 \pm 0.03$ $23.57 \pm 0.04$ $23.75 \pm 0.04$ $23.75 \pm 0.04$ $23.75 \pm 0.04$ $23.82 \pm 0.04$ $23.82 \pm 0.04$ $23.78 \pm 0.06$ $23.78 \pm 0.06$ $23.78 \pm 0.06$ $23.57 \pm 0.04$ $23.58 \pm 0.06$ $23.55 \pm 0.03$ $23.55 \pm 0.03$ $23.88 \pm 0.06$ $23.39 \pm 0.06$ $23.39 \pm 0.06$ $23.39 \pm 0.06$	$\begin{array}{c} 23.96 \pm 0.10\\ 23.90 \pm 0.09\\ 23.91 \pm 0.11\\ 24.13 \pm 0.05\\ 24.36 \pm 0.06\\ 23.77 \pm 0.04\\ 23.57 \pm 0.06\\ 23.57 \pm 0.06\\ 24.30 \pm 0.11\\ 24.31 \pm 0.12\\ 24.31 \pm 0.12\\ 24.31 \pm 0.06\\ 24.30 \pm 0.06\\ 24.32 \pm 0.06\\ 24.32 \pm 0.06\end{array}$	$\begin{array}{c} 24.01 \pm 0.04 \\ 24.07 \pm 0.05 \\ 24.07 \pm 0.05 \\ 24.05 \pm 0.04 \\ 23.59 \pm 0.04 \\ 23.57 \pm 0.04 \\ 23.77 \pm 0.04 \\ 23.77 \pm 0.04 \\ 23.58 \pm 0.10 \\ 23.58 \pm 0.10 \\ 23.59 \pm 0.10 \\ 23.59 \pm 0.10 \\ 23.59 \pm 0.07 \\ 24.17 \pm 0.07 \\ 24.17 \pm 0.07 \\ 24.12 \pm 0.05 \\ 24.04 \pm 0.15 \\$	$23.70 \pm 0.04$ $23.85 \pm 0.04$ $23.85 \pm 0.04$ $23.95 \pm 0.04$ $24.07 \pm 0.05$ $24.03 \pm 0.04$ $23.59 \pm 0.04$ $23.59 \pm 0.06$ $24.32 \pm 0.06$ $24.32 \pm 0.06$ $24.32 \pm 0.06$ $24.32 \pm 0.06$ $23.56 \pm 0.06$ $23.56 \pm 0.06$ $23.54 \pm 0.06$ $23.54 \pm 0.06$ $23.53 \pm 0.06$ $23.54 \pm 0.06$ $23.53 \pm 0.06$ $23.55 \pm 0.06$ $23.55 \pm 0.06$ $23.55 \pm 0.06$	$\begin{array}{c} 24.12 \pm 0.05\\ 24.12 \pm 0.05\\ 23.89 \pm 0.04\\ 23.83 \pm 0.04\\ 23.85 \pm 0.04\\ 23.85 \pm 0.04\\ 23.385 \pm 0.04\\ 23.385 \pm 0.06\\ 24.07 \pm 0.06\\ 24.11 \pm 0.06\\ 24.11 \pm 0.06\\ 24.11 \pm 0.06\\ 24.27 \pm 0.06\\ 24.12 \pm 0.06\\ 24.12 \pm 0.07\\ 24.14 \pm 0.06\\ 24.14 \pm$	$\begin{array}{c} 24.05\pm0.05\\ 24.06\pm0.05\\ 24.18\pm0.06\\ 24.11\pm0.05\\ 24.11\pm0.05\\ 24.12\pm0.06\\ 24.25\pm0.06\\ 23.87\pm0.06\\ 23.87\pm0.06\\ 23.87\pm0.06\\ 23.87\pm0.06\\ 23.87\pm0.06\\ 23.87\pm0.06\\ 23.41\pm0.06\\ 23.41\pm0.06\\ 23.41\pm0.06\\ 23.41\pm0.06\\ 24.10\pm0.05\\ 24.05\pm0.05\\ 24.05\pm0.05\\$	$\begin{array}{c} 24.32 \pm 0.09\\ 24.12 \pm 0.06\\ 23.88 \pm 0.04\\ 23.88 \pm 0.04\\ 23.88 \pm 0.07\\ 24.16 \pm 0.05\\ 24.36 \pm 0.05\\ 24.34 \pm 0.06\\ 24.38 \pm 0.06\\ 24.46 \pm 0.07\\ 23.92 \pm 0.05\\ 24.09 \pm 0.05\end{array}$

TABLE 1—Continued

HJD <sup>a</sup>	C3-V13	C3-V14	C3-V15	C3-V16	C3-V17	C3-V18	C3-V19	C3-V20	C3-V21	C3-V22	C3-V23
F555W: 273.6254 273.690 274.6302 274.6302 274.9691 275.0330 275.8420 275.8420	$\begin{array}{c} 23.82 \pm 0.02 \\ 23.88 \pm 0.02 \\ 24.22 \pm 0.03 \\ 24.27 \pm 0.03 \\ 24.44 \pm 0.03 \\ 24.44 \pm 0.03 \\ 23.68 \pm 0.02 \\ 23.70 \pm 0.02 \end{array}$	$\begin{array}{c} 24.75 \pm 0.04 \\ 24.90 \pm 0.04 \\ 24.90 \pm 0.04 \\ 24.58 \pm 0.03 \\ 24.61 \pm 0.04 \\ 24.51 \pm 0.04 \\ 24.71 \pm 0.04 \\ 24.71 \pm 0.06 \\ 24.83 \pm 0.06 \\ 24.89 \pm 0.07 \end{array}$	$\begin{array}{c} 24.93 \pm 0.05\\ 24.94 \pm 0.04\\ 24.71 \pm 0.04\\ 24.56 \pm 0.07\\ 24.90 \pm 0.04\\ 24.53 \pm 0.04\\ 24.54 \pm 0.04\\ 24.54 \pm 0.04\\ 24.55 \pm 0.05\\ 24.75 \pm 0.05\\ \end{array}$	$\begin{array}{c} 24.02\pm0.03\\ 24.40\pm0.03\\ 24.59\pm0.05\\ 24.79\pm0.05\\ 24.76\pm0.04\\ 24.56\pm0.04\\ 24.56\pm0.04\\ 24.36\pm0.04\\ 24.20\pm0.03\\ 24.24\pm0.03\end{array}$	$\begin{array}{c} 24.57\pm0.04\\ 24.55\pm0.03\\ 24.55\pm0.03\\ 24.44\pm0.04\\ 24.29\pm0.03\\ 24.31\pm0.03\\ 24.31\pm0.03\\ 24.38\pm0.04\\ 24.53\pm0.03\\ 24.53\pm0.07\end{array}$	$\begin{array}{c} 23.81 \pm 0.02 \\ 23.86 \pm 0.03 \\ 23.86 \pm 0.01 \\ 23.03 \pm 0.04 \\ 23.31 \pm 0.02 \\ 23.37 \pm 0.02 \\ 23.37 \pm 0.02 \\ 23.56 \pm 0.03 \end{array}$	$\begin{array}{c} 24.72 \pm 0.04 \\ 24.45 \pm 0.03 \\ 24.52 \pm 0.05 \\ 24.52 \pm 0.04 \\ 24.52 \pm 0.04 \\ 24.61 \pm 0.04 \\ 24.61 \pm 0.04 \\ 24.50 \pm 0.06 \\ 24.60 \pm 0.05 \end{array}$	$\begin{array}{c} 24,09\pm0.03\\ 24,26\pm0.03\\ 24,52\pm0.04\\ 24,52\pm0.06\\ 24,48\pm0.05\\ 24,41\pm0.03\\ 24,11\pm0.03\\ 24,13\pm0.03\\ 24,13\pm0.03\\ 24,13\pm0.03\end{array}$	$25.07 \pm 0.05$ $24.92 \pm 0.04$ $25.02 \pm 0.101$ $25.02 \pm 0.101$ $25.24 \pm 0.06$ $24.87 \pm 0.06$ $24.35 \pm 0.06$ $24.35 \pm 0.06$ $24.85 \pm 0.04$	$\begin{array}{c} 25.15\pm0.06\\ 24.44\pm0.04\\ 25.11\pm0.05\\ 25.11\pm0.05\\ 25.16\pm0.05\\ 24.93\pm0.04\\ 25.16\pm0.06\\ 24.59\pm0.04\\ 224.56\pm0.04\\ 224.76\pm0.04\end{array}$	$\begin{array}{c} 23.70\pm0.02\\ 23.82\pm0.02\\ 24.44\pm0.03\\ 24.48\pm0.03\\ 24.46\pm0.03\\ 24.10\pm0.03\\ 24.10\pm0.03\\ 24.10\pm0.03\\ 24.25\pm0.04\end{array}$
P.814W: 273.804 273.804 273.9587 274.0561 274.0561 274.7650 274.8316 274.890 275.5733 275.5733 275.5733 275.573 275.573 275.5748 275.573 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5748 275.5779 275.57719 276.5779 276.5779 276.5779 276.5779 276.5779 276.5779 276.5779 276.5779 276.5779	$\begin{array}{c} 23.24 \pm 0.03\\ 23.32 \pm 0.03\\ 23.35 \pm 0.03\\ 23.55 \pm 0.03\\ 23.55 \pm 0.03\\ 23.55 \pm 0.04\\ 23.55 \pm 0.04\\ 23.62 \pm 0.04\\ 23.62 \pm 0.03\\ 23.63 \pm 0.03\\ 23.30 \pm 0.05\\ 23.31 \pm 0.03\\ 23.31 \pm 0$	$\begin{array}{c} 24.12 \pm 0.05\\ 23.86 \pm 0.04\\ 23.83 \pm 0.04\\ 23.81 \pm 0.04\\ 23.81 \pm 0.04\\ 23.95 \pm 0.04\\ 23.95 \pm 0.04\\ 23.95 \pm 0.04\\ 23.90 \pm 0.04\\ 24.03 \pm 0.14\\ 24.03 \pm 0.05\\ 24.108 \pm 0.05\\ 24.121 \pm 0.05\\ 24.21 \pm 0.06\\ 24.21 \pm$	$\begin{array}{c} 24.18 \pm 0.06\\ 24.27 \pm 0.11\\ 24.27 \pm 0.11\\ 24.20 \pm 0.05\\ 23.62 \pm 0.04\\ 224.05 \pm 0.08\\ 24.11 \pm 0.05\\ 24.19 \pm 0.06\\ 23.56 \pm 0.10\\ 23.395 \pm 0.04\\ 23.395 \pm 0.04\\ 23.395 \pm 0.04\\ 23.51 \pm 0.03\\ 23.51 \pm 0.03\\ 23.50 \pm 0.04\\ 23.80 \pm 0.04\\ 23.80$	$\begin{array}{c} 24.05\pm0.05\\ 23.97\pm0.05\\ 24.25\pm0.07\\ 24.25\pm0.05\\ 24.25\pm0.05\\ 24.24\pm0.06\\ 24.24\pm0.06\\ 24.24\pm0.06\\ 24.22\pm0.07\\ 24.18\pm0.06\\ 24.22\pm0.07\\ 23.397\pm0.05\\ 23.397\pm0.05\\ 23.397\pm0.05\\ 23.397\pm0.05\\ 23.397\pm0.05\\ 24.11\pm0.06\end{array}$	$\begin{array}{c} 23.90\pm0.04\\ & \ldots\\ 23.59\pm0.03\\ 23.61\pm0.03\\ 23.61\pm0.03\\ 23.61\pm0.03\\ 23.61\pm0.04\\ 23.60\pm0.04\\ 23.50\pm0.04\\ 23.86\pm0.04\\ 23.86\pm0.04\\ 23.86\pm0.04\\ 23.84\pm0.04\\ 23.84\pm0.06\\ 23.84\pm0.06\\ 23.84\pm0.06\end{array}$	$23.07 \pm 0.02$ $23.06 \pm 0.02$ $23.06 \pm 0.03$ $22.88 \pm 0.02$ $22.64 \pm 0.02$ $22.64 \pm 0.02$ $22.64 \pm 0.02$ $22.87 \pm 0.02$ $22.87 \pm 0.02$ $22.91 \pm 0.02$ $22.91 \pm 0.02$ $22.91 \pm 0.02$ $22.91 \pm 0.02$ $22.93 \pm 0.02$ $22.95 \pm 0.02$	$\begin{array}{c} 24.07\pm0.06\\ 24.11\pm0.05\\ 24.11\pm0.05\\ 24.27\pm0.10\\ \cdots\\ 24.39\pm0.06\\ 23.39\pm0.06\\ 24.33\pm0.06\\ 24.33\pm0.08\\ 24.34\pm0.08\\ 24.35\pm0.06\\ 23.91\pm0.04\\ 23.91\pm0.04\\ 23.91\pm0.06\\ 24.15\pm0.05\\ 24.13\pm0.08\\ 24.13\pm0.07\\ 24.13\pm0.$	$\begin{array}{c} 24,02\pm0.05\\ 23,96\pm0.04\\ 23,84\pm0.11\\ 24,10\pm0.06\\ 24,03\pm0.05\\ 24,03\pm0.05\\ 24,03\pm0.05\\ 24,00\pm0.05\\ 23,84\pm0.06\\ 23,84\pm0.06\\ 23,54\pm0.04\\ 23,55\pm0.04\\ 23,52\pm0.04\\ 23,92\pm0.04\end{array}$	$\begin{array}{c} 24.19\pm0.05\\ 24.02\pm0.07\\ 24.31\pm0.06\\ 24.42\pm0.07\\ 24.42\pm0.07\\ 24.42\pm0.07\\ 24.04\pm0.07\\ 24.04\pm0.07\\ 24.18\pm0.07\\ 24.18\pm0.07\\ 24.18\pm0.07\\ 24.18\pm0.07\\ 24.18\pm0.07\\ 24.12\pm0.06\\ 24.35\pm0.06\\ 24.31\pm0.06\\ 24.32\pm0.06\end{array}$	$\begin{array}{c} 24.07\pm0.07\\ 24.09\pm0.11\\ 24.05\pm0.05\\ 224.25\pm0.05\\ 224.42\pm0.06\\ 224.51\pm0.06\\ 224.53\pm0.07\\ 24.53\pm0.07\\ 24.53\pm0.07\\ 24.01\pm0.08\\ 24.01\pm0.08\\ 24.01\pm0.08\\ 24.01\pm0.08\\ 24.01\pm0.08\\ 24.04\pm0.05\\ 24.05\pm0.05\\ 24.05\pm0$	$\begin{array}{c} 23.32 \pm 0.04 \\ 23.45 \pm 0.03 \\ 23.45 \pm 0.03 \\ 23.39 \pm 0.03 \\ 23.72 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.56 \pm 0.04 \\ 23.57 \pm 0.04 \\ 23.54 \pm 0.04 \\ 23.54 \pm 0.03 \\ 23.54 \pm 0.03 \\ 23.47 \pm 0.03 \\ 23.45 \pm 0.05 \\ 23.58 \pm 0.06 \\ 100 \\$
HJD <sup>a</sup>	C3-V24	C4-V01	C4-V02	C4-V03	C4-V04	C4-V05	C4-V06	C4-V07	C4-V08	C4-V09	C4-V10
F555W: 273.6254 273.6267 273.6900 274.661 275.632 275.8320 275.8420 275.8420 275.8420 275.8420	$\begin{array}{c} 24.82 \pm 0.04 \\ 24.87 \pm 0.05 \\ 24.87 \pm 0.04 \\ 24.76 \pm 0.04 \\ 24.76 \pm 0.04 \\ 24.70 \pm 0.04 \\ 24.70 \pm 0.04 \\ 24.62 \pm 0.04 \\ 24.83 \pm 0.04 \end{array}$	$\begin{array}{c} 24.44 \pm 0.03 \\ 24.56 \pm 0.03 \\ \ldots \\ 24.47 \pm 0.03 \\ \ldots \\ 23.97 \pm 0.03 \\ 23.97 \pm 0.03 \\ 24.12 \pm 0.03 \\ 24.112 \pm 0.03 \\ 24.13 \pm 0.03 \end{array}$	$\begin{array}{c} 24.08 \pm 0.07\\ 24.44 \pm 0.03\\ 24.44 \pm 0.03\\ 24.55 \pm 0.04\\ 24.59 \pm 0.04\\ 24.11 \pm 0.03\\ 23.97 \pm 0.07\\ 23.97 \pm 0.03\\ 24.40 \pm 0.03\\ 24.40 \pm 0.03\end{array}$	$\begin{array}{c} 24.51 \pm 0.04 \\ 24.75 \pm 0.04 \\ 24.75 \pm 0.03 \\ 24.34 \pm 0.03 \\ 24.50 \pm 0.04 \\ 24.82 \pm 0.05 \\ 24.83 \pm 0.06 \\ 24.64 \pm 0.04 \\ 24.64 \pm 0.04 \end{array}$	$\begin{array}{c} 23.77\pm0.02\\ 23.26\pm0.02\\ 23.64\pm0.05\\ 23.93\pm0.03\\ 23.93\pm0.03\\ \cdots\\ 24.10\pm0.03\\ 23.02\pm0.02\\ 23.16\pm0.02\\ 23.16\pm0.02\\ \end{array}$	$\begin{array}{c} 24.72\pm0.05\\ 24.68\pm0.04\\ 24.68\pm0.06\\ 24.68\pm0.06\\ 24.48\pm0.05\\ 24.44\pm0.03\\ 24.60\pm0.04\\ 24.61\pm0.04\\ 24.71\pm0.05\end{array}$	$\begin{array}{c} 23.48 \pm 0.02 \\ 23.48 \pm 0.02 \\ 23.48 \pm 0.03 \\ 23.55 \pm 0.02 \\ 23.66 \pm 0.02 \\ 23.66 \pm 0.02 \\ 23.53 \pm 0.02 \\ 23.54 \pm 0.02 \\ 23.48 \pm 0.02 \end{array}$	$\begin{array}{c} 24.25\pm0.03\\ 24.38\pm0.03\\ 23.52\pm0.02\\ 23.57\pm0.02\\ 23.67\pm0.02\\ 24.18\pm0.03\\ 24.21\pm0.03\\ 24.21\pm0.03\\ 23.69\pm0.03\\ 23.21\pm0.03\\ 23.21\pm0.02\\ \end{array}$	$\begin{array}{c} 24.66\pm 0.06\\ 24.51\pm 0.03\\ 25.04\pm 0.06\\ 25.07\pm 0.05\\ 25.07\pm 0.03\\ 24.49\pm 0.03\\ 24.68\pm 0.04\\ 25.11\pm 0.03\\ 25.15\pm 0.06\end{array}$	$\begin{array}{c} 24.07\pm0.04\\ 24.14\pm0.05\\ 23.65\pm0.03\\ 23.36\pm0.02\\ 23.36\pm0.04\\ 23.86\pm0.04\\ 23.414\pm0.04\\ 24.14\pm0.05\\ 24.17\pm0.04\end{array}$	$\begin{array}{c} 24.52 \pm 0.03 \\ 24.52 \pm 0.03 \\ 24.28 \pm 0.03 \\ 24.36 \pm 0.03 \\ 24.39 \pm 0.03 \\ 24.73 \pm 0.07 \\ 24.76 \pm 0.04 \\ 24.84 \pm 0.09 \\ 24.74 \pm 0.09 \end{array}$
273.8268 273.8914 273.9587 274.0261	$\begin{array}{c} 24.20 \pm 0.05 \\ 24.22 \pm 0.05 \\ 23.89 \pm 0.04 \\ 23.37 \pm 0.03 \end{array}$	$\begin{array}{c} 23.83 \pm 0.04 \\ 23.82 \pm 0.04 \\ 23.55 \pm 0.03 \\ 23.43 \pm 0.03 \end{array}$	$\begin{array}{c} 24.06 \pm 0.06 \\ 24.18 \pm 0.05 \\ 24.14 \pm 0.05 \\ 23.97 \pm 0.08 \end{array}$	$\begin{array}{c} 24.13 \pm 0.06\\ 24.14 \pm 0.06\\ 24.22 \pm 0.06\\ 24.13 \pm 0.06\\ \end{array}$	$\begin{array}{c} 22.65 \pm 0.02 \\ 22.68 \pm 0.02 \\ 22.80 \pm 0.02 \\ 22.81 \pm 0.02 \end{array}$	$\begin{array}{c} 24.19 \pm 0.07 \\ 24.02 \pm 0.05 \\ 23.87 \pm 0.06 \\ 23.76 \pm 0.04 \end{array}$	$\begin{array}{c} 23.12 \pm 0.03 \\ 23.16 \pm 0.05 \\ 23.30 \pm 0.03 \\ 23.35 \pm 0.03 \end{array}$	$\begin{array}{c} 23.67 \pm 0.04 \\ 23.69 \pm 0.04 \\ 23.71 \pm 0.04 \\ 23.71 \pm 0.08 \end{array}$	$\begin{array}{c} 24.22 \pm 0.05 \\ 24.30 \pm 0.06 \\ 24.43 \pm 0.06 \\ 24.45 \pm 0.06 \end{array}$	$\begin{array}{c} 23.51 \pm 0.04 \\ 23.49 \pm 0.03 \\ 23.46 \pm 0.05 \\ 23.49 \pm 0.04 \end{array}$	$\begin{array}{c} 23.81 \pm 0.04 \\ 23.97 \pm 0.04 \\ 24.03 \pm 0.05 \\ 23.80 \pm 0.06 \end{array}$
274,7004 274,7690 274,8990 275,5733 275,5733 275,7045 275,719 275,719 276,5802 276,7122	$\begin{array}{c} 24.02 \pm 0.05\\ 24.02 \pm 0.05\\ 24.23 \pm 0.06\\ 22.4.23 \pm 0.06\\ 23.85 \pm 0.04\\ 23.80 \pm 0.03\\ 23.90 \pm 0.05\\ 23.45 \pm 0.04\\ 23.62 \pm 0.04\\ 23.52 \pm$	$\begin{array}{c} 23.86\pm0.05\\ 23.76\pm0.04\\ 23.50\pm0.03\\ 23.40\pm0.07\\ 23.84\pm0.04\\ 23.71\pm0.04\\ 23.77\pm0.06\\ 23.49\pm0.03\\ 23.49\pm0.03\\ 23.49\pm0.03\\ 23.51\pm0.04\\ \ldots\end{array}$	$\begin{array}{c} 24.06\pm0.09\\ 24.18\pm0.07\\ 24.18\pm0.07\\ 24.02\pm0.05\\ 24.11\pm0.05\\ 24.01\pm0.07\\ 23.86\pm0.07\\ 23.86\pm0.04\\ 23.77\pm0.04\\ 23.77\pm0.04\\ 23.77\pm0.04\\ 23.77\pm0.04\\ 23.77\pm0.06\\ 23.57\pm0.05\\ 23.57\pm0.05\\ 23.57\pm0.05\\ 23.55\pm0.05\\ 23.55\pm0.05\\$	$23.99 \pm 0.05$ $24.05 \pm 0.05$ $\cdots$ $24.04 \pm 0.10$ $23.73 \pm 0.04$ $23.73 \pm 0.04$ $23.73 \pm 0.04$ $23.84 \pm 0.04$ $\cdots$ $23.84 \pm 0.04$ $23.84 \pm 0.04$	$23.25 \pm 0.03$ $23.30 \pm 0.03$ $23.30 \pm 0.03$ $23.32 \pm 0.03$ $23.32 \pm 0.03$ $23.23 \pm 0.03$ $22.57 \pm 0.02$ $22.56 \pm 0.02$ $22.55 \pm 0.03$ $23.26 \pm 0.03$ $23.26 \pm 0.03$ $23.26 \pm 0.03$	$23.69 \pm 0.08$ $23.77 \pm 0.04$ $23.77 \pm 0.04$ $23.57 \pm 0.04$ $23.57 \pm 0.04$ $23.53 \pm 0.04$ $23.53 \pm 0.04$ $23.53 \pm 0.06$ $23.95 \pm 0.06$ $23.95 \pm 0.06$ $23.95 \pm 0.06$ $23.95 \pm 0.06$ $23.95 \pm 0.06$	$\begin{array}{c} 23.15\pm0.03\\ 23.12\pm0.03\\ 23.12\pm0.03\\ 23.06\pm0.02\\ \ldots\\ 23.39\pm0.03\\ 23.39\pm0.03\\ 23.31\pm0.04\\ 23.11\pm0.04\\ 23.11\pm0.04\\ 23.42\pm0.03\\ 23.42\pm0.03$	$23.21 \pm 0.03$ $23.29 \pm 0.03$ $23.47 \pm 0.03$ $23.47 \pm 0.03$ $23.77 \pm 0.04$ $23.77 \pm 0.04$ $23.73 \pm 0.04$ $23.73 \pm 0.04$ $23.56 \pm 0.04$ $23.56 \pm 0.04$ $23.55 \pm 0.04$	$24.37 \pm 0.06$ $24.57 \pm 0.07$ $24.54 \pm 0.07$ $24.16 \pm 0.05$ $24.16 \pm 0.05$ $24.14 \pm 0.06$ $24.20 \pm 0.06$ $24.30 \pm 0.06$ $24.44 \pm 0.07$ $24.48 \pm 0.07$ $24.48 \pm 0.07$ $24.48 \pm 0.07$	$23.03 \pm 0.02$ $22.89 \pm 0.03$ $22.89 \pm 0.03$ $23.24 \pm 0.03$ $23.54 \pm 0.03$ $23.54 \pm 0.03$ $23.54 \pm 0.03$ $23.54 \pm 0.03$ $23.51 \pm 0.03$ $23.21 \pm 0.03$ $23.21 \pm 0.03$ $23.27 \pm 0.03$ $23.27 \pm 0.03$	$\begin{array}{c} 23.99\pm0.04\\ 23.90\pm0.12\\ 24.04\pm0.05\\ 24.08\pm0.05\\ 23.98\pm0.05\\ 24.08\pm0.05\\ 24.01\pm0.05\\ 24.21\pm0.05\\ 24.21\pm0.06\\ 24.17\pm0.06\\ 24.17\pm0.06\\ 24.17\pm0.06\\ 24.07\pm0.05\\ 24.07\pm0.05\\$

TABLE 1—Continued

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HJD <sup>a</sup>	C4-V11	C4-V12	C4-V13	C4-V14	C4-V15	C4-V16	C4-V17	C4-V18	C4-V19	C4-V20	C4-V21
F555W: F555W: 273.6567 273.690 274.6302 274.6302 274.9691 275.9066 F814W: 275.9066 275.904 275.914 275.8420 275.814 273.821 274.760 274.760 274.760 274.760 275.573 277.553 277.553 277.5555	$\begin{array}{c} 23.92\pm0.06\\ 24.35\pm0.08\\ 25.15\pm0.15\\ 25.16\pm0.11\\ 25.16\pm0.11\\ 24.55\pm0.04\\ 24.59\pm0.06\\ 25.33\pm0.10\\ 25.33\pm0.10\\ 25.33\pm0.10\\ 24.14\pm0.07\\ 24.24\pm0.09\\ 24.34\pm0.09\\ 24.34\pm0.09\\ 24.36\pm0.06\\ 24.56\pm0.06\\ 24.56\pm0.06\\$	$\begin{array}{c} 24.18 \pm 0.03 \\ 24.32 \pm 0.04 \\ 24.96 \pm 0.05 \\ 24.53 \pm 0.04 \\ 24.61 \pm 0.04 \\ 24.61 \pm 0.04 \\ 24.61 \pm 0.04 \\ 24.53 \pm 0.07 \\ 24.43 \pm 0.04 \\ 24.53 \pm 0.07 \\ 23.89 \pm 0.04 \\ 23.39 \pm 0.04 \\ 23.30 \pm 0.06 \\ 23.30 \pm 0.06 \\ 23.31 \pm 0.05 \\ 24.19 \pm 0.05 \\ 24.19 \pm 0.05 \\ 24.13 \pm 0.05 \\ 24.23 \pm 0.09 \\ 24.23 \pm 0.00 \\ 24.24 \pm 0.00 \\$	$\begin{array}{c} 24.42 \pm 0.10\\\\ 24.80 \pm 0.04\\\\ 24.83 \pm 0.04\\ 24.83 \pm 0.04\\ 24.55 \pm 0.03\\ 24.41 \pm 0.03\\ 24.55 \pm 0.04\\ 24.55 \pm 0.04\\ 24.11 \pm 0.05\\ 24.13 \pm 0.05\\ 24.12 \pm 0.05\\ 24.12 \pm 0.06\\ 23.81 \pm 0.06\\ 23.83 \pm 0.04\\ 23.83 \pm 0.04\\ 23.79 \pm 0.04\end{array}$	$\begin{array}{c} 23.59 \pm 0.02 \\ 23.56 \pm 0.03 \\ 24.02 \pm 0.03 \\ 23.54 \pm 0.02 \\ 23.54 \pm 0.02 \\ 23.54 \pm 0.03 \\$	$\begin{array}{c} 24.01\pm 0.06\\ 24.12\pm 0.06\\ 24.44\pm 0.10\\ 24.44\pm 0.10\\ 23.99\pm 0.06\\ 24.32\pm 0.07\\ 24.33\pm 0.07\\ 24.33\pm 0.07\\ 24.32\pm 0.07\\ 23.92\pm 0.07\\ 23.92\pm 0.06\\ 23.91\pm 0.06\\ 23.85\pm 0.10\\ 23.85\pm 0.10\\ 23.85\pm 0.06\\ 24.85\pm 0.06$	$\begin{array}{c} 23.79\pm0.02\\ 23.85\pm0.02\\ 23.85\pm0.02\\ 23.85\pm0.02\\ 23.84\pm0.02\\ 23.84\pm0.02\\ 23.84\pm0.02\\ 23.84\pm0.02\\ 23.54\pm0.02\\ 23.52\pm0.03\\ 23.17\pm0.03\\ 23.17\pm0.03\\ 23.11\pm0.03\\ 23.07\pm0.04\\ 23.07\pm0.04\\ 23.07\pm0.04\\ 23.11\pm0.03\\ 23.11\pm0.03$	$\begin{array}{c} 23.66\pm0.03\\ 23.66\pm0.07\\ 24.77\pm0.07\\ 24.77\pm0.05\\ 24.01\pm0.05\\ 24.01\pm0.05\\ 24.71\pm0.03\\ 24.71\pm0.06\\ 24.71\pm0.06\\ 23.64\pm0.04\\ 24.17\pm0.06\\ 23.73\pm0.06\\ 23.73\pm0.06\\ 23.41\pm0.06\\ 23.41\pm0.06\\ 23.42\pm0.01\\ 24.02\pm0.03\\ 23.42\pm0.01\\ 24.02\pm0.03\\ 24.02\pm0.03\\ 24.04\pm0.05\\ 24.04\pm0.05\\$	$\begin{array}{c} 23.34\pm0.02\\ 23.45\pm0.04\\ 24.43\pm0.04\\ 24.41\pm0.04\\ 24.41\pm0.04\\ 24.40\pm0.03\\ 24.35\pm0.04\\ 24.25\pm0.03\\ 24.25\pm0.03\\ 23.38\pm0.03\\ 23.38\pm0.03\\ 23.59\pm0.04\\ 23.58\pm0.03\\ 23.59\pm0.04\\ 23.58\pm0.03\\ 23.58\pm0.03\\$	$\begin{array}{c} 24.36\pm0.03\\ 24.38\pm0.03\\ 24.38\pm0.03\\ 24.29\pm0.03\\ 24.29\pm0.03\\ 24.29\pm0.03\\ 23.39\pm0.02\\ 23.39\pm0.02\\ 23.70\pm0.04\\ 23.47\pm0.04\\ 23.47\pm0.04\\ 23.57\pm0.00\\ 23.55\pm0.00\\ 23.55\pm0.00\\$	$\begin{array}{c} 24.49\pm0.03\\ 24.71\pm0.04\\ 24.71\pm0.04\\ 24.77\pm0.04\\ 24.77\pm0.04\\ 24.14\pm0.03\\ 24.14\pm0.03\\ 24.14\pm0.03\\ 24.14\pm0.03\\ 24.13\pm0.05\\ 24.19\pm0.07\\ 24.17\pm0.05\\ 24.19\pm0.07\\ 24.08\pm0.07\\ 24.08\pm0.08\\ 24.08\pm0.08\\$	$\begin{array}{c} 24.41 \pm 0.03 \\ 24.57 \pm 0.03 \\ 24.57 \pm 0.03 \\ 24.27 \pm 0.03 \\ 24.27 \pm 0.03 \\ 24.90 \pm 0.04 \\ 24.52 \pm 0.08 \\ 24.46 \pm 0.04 \\ 24.52 \pm 0.08 \\ 24.11 \pm 0.05 \\ 24.11 \pm 0.05 \\ 24.11 \pm 0.05 \\ 23.91 \pm 0.09 \\ 23.91 \pm 0.09 \\ 23.91 \pm 0.05 \\ 23.40 \pm 0.05 \\ 23.40 \pm 0.05 \\ 23.40 \pm 0.05 \\ 23.50 \pm 0.06 \\$
275.7045 275.7719 276.5802 276.6448 276.7122	$\begin{array}{c} 24.62 \pm 0.11\\ 24.76 \pm 0.12\\ 24.48 \pm 0.09\\ 24.55 \pm 0.11\\ 24.55 \pm 0.00\\ 24.65 \pm 0.02\\ 24.60 \pm 0.12\end{array}$	$\begin{array}{c} 23.85 \pm 0.06\\ 23.76 \pm 0.09\\ 24.13 \pm 0.06\\ 24.12 \pm 0.06\\ 24.09 \pm 0.07\\ 23.71 \pm 0.05\end{array}$	$\begin{array}{c} 23.85 \pm 0.04 \\ 23.98 \pm 0.06 \\ 23.98 \pm 0.05 \\ 24.02 \pm 0.05 \\ 24.12 \pm 0.05 \\ 24.18 \pm 0.05 \end{array}$	$\begin{array}{c} 23.23 \pm 0.03 \\ 23.22 \pm 0.03 \\ 23.35 \pm 0.03 \\ 23.36 \pm 0.03 \\ 23.26 \pm 0.03 \\ 23.22 \pm 0.03 \\ 23.23 \pm 0.03 \end{array}$	$\begin{array}{c} 23.57\pm0.05\\ 23.65\pm0.06\\ 23.82\pm0.08\\ 23.85\pm0.07\\ 23.84\pm0.07\\ 23.84\pm0.07\\ 23.90\pm0.07\end{array}$	$\begin{array}{c} 22.91 \pm 0.02 \\ 22.94 \pm 0.02 \\ 23.16 \pm 0.03 \\ 23.06 \pm 0.03 \\ 23.05 \pm 0.03 \\ 22.97 \pm 0.02 \end{array}$	$\begin{array}{c} 24.13 \pm 0.06\\ 24.11 \pm 0.05\\ 23.92 \pm 0.05\\ 23.98 \pm 0.05\\ 24.10 \pm 0.05\\ 24.01 \pm 0.08\end{array}$	$\begin{array}{c} 23.42 \pm 0.03 \\ 23.45 \pm 0.03 \\ 23.66 \pm 0.04 \\ 23.29 \pm 0.03 \\ 23.01 \pm 0.03 \\ 23.03 \pm 0.03 \end{array}$	$\begin{array}{c} 22.99 \pm 0.02 \\ 23.15 \pm 0.03 \\ 23.67 \pm 0.04 \\ 23.66 \pm 0.04 \\ 23.65 \pm 0.04 \\ 23.68 \pm 0.04 \end{array}$	$\begin{array}{c} 23.97 \pm 0.04 \\ 23.72 \pm 0.04 \\ 23.77 \pm 0.04 \\ 23.81 \pm 0.04 \\ 23.90 \pm 0.04 \\ 24.01 \pm 0.05 \end{array}$	$\begin{array}{c} 23.71 \pm 0.04 \\ 23.80 \pm 0.08 \\ 24.29 \pm 0.09 \\ 23.79 \pm 0.04 \\ 23.59 \pm 0.04 \\ 23.72 \pm 0.05 \end{array}$
			F555W: 273.6254. 273.6567. 274.5657. 274.5657. 274.5657. 274.5091. 275.8420. 275.8420. 275.8420. 275.8420. 274.7004. 277.873. 274.7004. 277.561. 277.57045. 277.57045. 277.57045. 277.57045. 276.719. 276.719. 276.719. 276.719. 276.719. 276.719. 276.719. 276.719.	$24.38 \pm 0.03$ $24.55 \pm 0.03$ $24.55 \pm 0.003$ $24.49 \pm 0.003$ $24.75 \pm 0.003$ $24.75 \pm 0.004$ $24.13 \pm 0.003$ $24.62 \pm 0.004$ $24.62 \pm 0.004$ $24.09 \pm 0.05$ $24.20 \pm 0.05$ $24.16 \pm 0.005$ $24.19 \pm 0.05$ $24.19 \pm 0.05$ $24.118 \pm 0.014$ $23.83 \pm 0.04$ $23.83 \pm 0.04$ $23.81 \pm 0.025$ $24.117 \pm 0.05$ $24.117 \pm 0.05$ $24.118 \pm 0.014$	$\begin{array}{c} 24.49 \pm 0.07\\ 24.75 \pm 0.04\\ 24.51 \pm 0.04\\ 24.51 \pm 0.04\\ 24.51 \pm 0.04\\ 24.51 \pm 0.05\\ 24.84 \pm 0.07\\ 24.87 \pm 0.07\\ 24.82 \pm 0.06\\ 24.03 \pm 0.05\\ 24.10 \pm 0.05\\ 24.10 \pm 0.05\\ 24.10 \pm 0.05\\ 24.03 \pm 0.05\\ 24.03 \pm 0.05\\ 24.04 \pm 0.06\\ 23.39 \pm 0.06\\ 23.55 \pm 0.06\\ 24.04 \pm 0.10\\ 25.55 \pm 0.06\\ 24.04 \pm 0.10\\ 25.55 \pm 0.06\\ 24.04 \pm 0$	$25.32 \pm 0.07$ $25.32 \pm 0.07$ $25.03 \pm 0.06$ $25.03 \pm 0.05$ $24.46 \pm 0.04$ $25.52 \pm 0.06$ $25.53 \pm 0.07$ $25.53 \pm 0.07$ $25.53 \pm 0.07$ $24.41 \pm 0.06$ $24.25 \pm 0.06$ $24.25 \pm 0.06$ $24.22 \pm 0.06$ $24.39 \pm 0.07$ $24.39 \pm 0.07$ $24.58 \pm 0.07$	$\begin{array}{c} 24.70 \pm 0.04 \\ 24.48 \pm 0.04 \\ 24.48 \pm 0.04 \\ 24.46 \pm 0.04 \\ 24.75 \pm 0.04 \\ 24.77 \pm 0.04 \\ 24.77 \pm 0.04 \\ 24.77 \pm 0.04 \\ 23.53 \pm 0.04 \\ 23.53 \pm 0.04 \\ 23.53 \pm 0.04 \\ 23.53 \pm 0.04 \\ 23.55 \pm 0.04 \\$	$23.64 \pm 0.03$ $23.79 \pm 0.03$ $23.79 \pm 0.03$ $23.46 \pm 0.02$ $23.54 \pm 0.02$ $23.53 \pm 0.04$ $23.53 \pm 0.02$ $23.53 \pm 0.02$ $23.53 \pm 0.03$ $23.24 \pm 0.03$ $23.25 \pm 0.03$ $23.07 \pm 0.03$ $23.07 \pm 0.03$ $23.06 \pm 0.03$ $23.07 \pm 0.03$ $23.03 \pm 0.03$	1		
			a HJD - 2	24.1 <sup>3</sup> ± 0.00.	+0.0 H /0.07	24.74 日 U.U7	+0.0 ± 00.62	70.0 王 61.77	I		

# TABLE 1—Continued

TABLE 2Sextans A Variable Stars

ID	С	X	Y	$\langle V \rangle^{\rm a}$	$\langle I  angle^{ m a}$	$\langle V-I\rangle^a$	Р	M <sup>b</sup>	$Q^{c}$
C1-V01	1	73.62	639.62	$23.95\pm0.10$	$23.50\pm0.05$	$0.45\pm0.11$	$0.99\pm0.04$	FO	3
C1-V02	1	96.66	130.15	$24.52\pm0.08$	$24.04\pm0.05$	$0.48\pm0.09$	$1.24\pm0.12$	FM	3
C1-V03	1	203.36	660.19	$24.10\pm0.11$	$23.37\pm0.06$	$0.73\pm0.13$	$1.64\pm0.07$	FM	4
C1-V04	1	209.99	464.54	$24.45\pm0.09$	$24.02\pm0.06$	$0.43\pm0.11$	$0.76\pm0.04$	FO	3
C1-V05	1	309.49	569.75	$24.48\pm0.11$	$23.90\pm0.06$	$0.58\pm0.13$	$1.24\pm0.08$	FM	4
C1-V06	1	372.77	143.40	$24.83\pm0.07$	$24.30\pm0.05$	$0.53\pm0.09$	$0.58\pm0.03$	FO	4
C1-V07	1	496.71	156.81	$24.65\pm0.11$	$24.22\pm0.07$	$0.43\pm0.13$	$0.97\pm0.04$	FM	3
C1-V08	1	582.38	578.70	$24.73\pm0.21$	$24.18\pm0.06$	$0.55\pm0.22$	$1.08\pm0.07$	FM	3
C1-V09	1	605.56	473.61	$23.42 \pm 0.06$	$22.83 \pm 0.04$	$0.59 \pm 0.07$	$1.79 \pm 0.20$	FO	4
C1-V10	1	648.19	652.08	$24.91 \pm 0.08$	$24.37 \pm 0.04$	$0.54 \pm 0.09$	$0.59 \pm 0.03$	FO	3
CI-VII	1	692.79	510.27	$24.24 \pm 0.05$	$23.82 \pm 0.05$	$0.42 \pm 0.07$	$0.80 \pm 0.04$	FO	3
CI-V12	1	/11.11	542.36	$24.13 \pm 0.09$	$23.48 \pm 0.06$	$0.65 \pm 0.11$	$1.62 \pm 0.06$	FM	4
C1-V13	1	/ 59.95	722.04	$24.29 \pm 0.10$	$23.72 \pm 0.06$	$0.5/\pm 0.12$	$1.37 \pm 0.15$	FM	3
C2-V01	2	242.00	732.04 556.25	$24.36 \pm 0.07$	$23.76 \pm 0.03$	$0.80 \pm 0.09$	$1.27 \pm 0.03$	F M FO	4
C2-V02	2	245.00	305.23	$24.34 \pm 0.10$ $24.10 \pm 0.09$	$23.93 \pm 0.03$ $23.45 \pm 0.06$	$0.41 \pm 0.11$ 0.65 ± 0.11	$0.74 \pm 0.03$ $1.54 \pm 0.14$	FU FM	2 1
C2-V04	2	371.47	388 72	$24.10 \pm 0.09$ $24.47 \pm 0.13$	$23.43 \pm 0.00$ $24.02 \pm 0.03$	$0.05 \pm 0.11$ $0.45 \pm 0.13$	$1.54 \pm 0.14$ 0.66 ± 0.02	FO	4
C2-V04	2	375.02	250.65	$24.47 \pm 0.15$ $24.57 \pm 0.16$	$24.02 \pm 0.03$ $23.97 \pm 0.11$	$0.49 \pm 0.19$ $0.60 \pm 0.19$	$1.08 \pm 0.02$	FM	3
C2-V06	2	376.68	634.09	$24.61 \pm 0.09$	$23.97 \pm 0.011$ $24.03 \pm 0.06$	$0.00 \pm 0.19$ $0.58 \pm 0.11$	$0.76 \pm 0.06$	FO	4
C2-V07	2	380.55	770.32	$23.56 \pm 0.12$	$23.05 \pm 0.03$	$0.50 \pm 0.11$ $0.51 \pm 0.12$	$1.32 \pm 0.09$	FO	4
C2-V08	2	386.92	742.21	$24.14 \pm 0.17$	$23.84 \pm 0.05$	$0.30 \pm 0.18$	$1.29 \pm 0.12$	FM	4
C2-V09	2	473.40	54.97	$24.68 \pm 0.16$	$24.11\pm0.07$	$0.57\pm0.17$	$1.05\pm0.04$	FM	4
C2-V10	2	502.50	443.37	$22.37\pm0.17$	$21.75\pm0.08$	$0.62\pm0.19$	$5.52\pm2.22$	FM	4
C2-V11	2	507.62	734.49	$24.66\pm0.11$	$24.16\pm0.05$	$0.50\pm0.12$	$0.71\pm0.02$	FO	3
C2-V12	2	532.55	672.84	$23.94\pm0.09$	$23.56\pm0.04$	$0.38\pm0.10$	$0.80\pm0.04$	FO	4
C2-V13	2	546.20	677.24	$24.74\pm0.10$	$24.20\pm0.04$	$0.54\pm0.11$	$0.59\pm0.02$	FO	4
C2-V14	2	547.04	102.75	$24.12\pm0.05$	$23.86\pm0.04$	$0.26\pm0.06$	$0.67\pm0.03$	FO	3
C2-V15	2	603.17	77.77	$23.46 \pm 0.13$	$22.89\pm0.05$	$0.57\pm0.14$	$2.53\pm0.30$	FM	3
C2-V16	2	614.52	705.74	$24.19 \pm 0.11$	$23.71 \pm 0.04$	$0.48 \pm 0.12$	$0.74 \pm 0.02$	FO	3
C2-V17	2	645.55	484.12	$24.53 \pm 0.05$	$24.16 \pm 0.05$	$0.37 \pm 0.07$	$1.01 \pm 0.04$	FM	3
C2-V18	2	667.75	329.73	$24.84 \pm 0.08$	$24.20 \pm 0.06$	$0.64 \pm 0.10$	$0.70 \pm 0.06$	FO	3
C2-V19	2	/30.53	/64.28	$24.23 \pm 0.12$	$23.75 \pm 0.06$	$0.48 \pm 0.13$	$1.29 \pm 0.10$	FM	4
C3-V01	3	57.83	/0.29 777-21	$24.73 \pm 0.07$ $24.74 \pm 0.04$	$24.21 \pm 0.04$ $23.02 \pm 0.06$	$0.52 \pm 0.08$ 0.81 ± 0.07	$0.62 \pm 0.03$ 1.24 ± 0.14	FO	3
C3 V02	3	126.57	140.36	$24.74 \pm 0.04$ $24.64 \pm 0.09$	$23.93 \pm 0.00$ $24.11 \pm 0.05$	$0.81 \pm 0.07$ $0.53 \pm 0.10$	$1.24 \pm 0.14$ 0.69 ± 0.05	FO	3
C3-V04	3	120.57	436.87	$24.04 \pm 0.09$ $25.01 \pm 0.06$	$24.11 \pm 0.05$ $24.34 \pm 0.05$	$0.53 \pm 0.10$ $0.67 \pm 0.08$	$0.09 \pm 0.03$ 0.54 ± 0.03	FO	3
C3-V05	3	207.49	104.05	$25.01 \pm 0.00$ $24.48 \pm 0.13$	$24.04 \pm 0.03$ $24.00 \pm 0.07$	$0.07 \pm 0.00$ $0.48 \pm 0.15$	$1.02 \pm 0.03$	FM	3
C3-V06	3	240.96	550.42	$24.25 \pm 0.05$	$23.71 \pm 0.04$	$0.54 \pm 0.06$	$0.63 \pm 0.03$	FO	3
C3-V07	3	301.33	457.70	$24.52 \pm 0.16$	$24.06 \pm 0.07$	$0.46 \pm 0.17$	$1.16 \pm 0.07$	FM	3
C3-V08	3	308.08	230.54	$24.22\pm0.15$	$23.89 \pm 0.07$	$0.33\pm0.17$	$1.22\pm0.04$	FM	4
C3-V09	3	345.83	506.79	$24.43\pm0.15$	$24.01\pm0.08$	$0.42\pm0.17$	$1.03\pm0.03$	FM	3
C3-V10	3	405.74	578.37	$24.65\pm0.04$	$24.06\pm0.04$	$0.59\pm0.06$	$0.73\pm0.04$	FO	4
C3-V11	3	407.87	383.48	$24.35\pm0.09$	$23.97\pm0.05$	$0.38\pm0.10$	$0.66\pm0.04$	FO	4
C3-V12	3	411.01	472.96	$24.56\pm0.15$	$24.15\pm0.06$	$0.41\pm0.16$	$0.66\pm0.02$	FO	4
C3-V13	3	587.52	70.08	$24.01\pm0.12$	$23.32\pm0.06$	$0.69 \pm 0.13$	$2.51 \pm 0.28$	FM	4
C3-V14	3	606.25	190.50	$24.55 \pm 0.09$	$24.02 \pm 0.05$	$0.53 \pm 0.10$	$0.75 \pm 0.03$	FO	4
C3-V15	3	625.86	320.08	$24.79 \pm 0.07$	$23.86 \pm 0.08$	$0.93 \pm 0.11$	$1.24 \pm 0.08$	FM	4
C3-V16	3	667.95	480.94	$24.49 \pm 0.12$	$24.07 \pm 0.04$	$0.42 \pm 0.13$	$0.72 \pm 0.05$	FO	3
C3-V1/	3	688.98	105.47	$24.35 \pm 0.05$	$23.74 \pm 0.04$	$0.61 \pm 0.06$	$0.74 \pm 0.06$	FO	3
C3-V18	3	702.02	330.47	$23.40 \pm 0.13$	$22.76 \pm 0.06$	$0.64 \pm 0.14$	$2.65 \pm 0.05$	FM	4
C3 V20	3	708.03	107.09	$24.02 \pm 0.07$ $24.32 \pm 0.06$	$24.11 \pm 0.04$ 23.86 ± 0.04	$0.31 \pm 0.08$ $0.46 \pm 0.07$	$0.07 \pm 0.04$ $0.76 \pm 0.03$	FO	5 4
C3-V21	3	723.40	127.10	$24.32 \pm 0.00$ $24.74 \pm 0.15$	$23.80 \pm 0.04$ $24.22 \pm 0.06$	$0.40 \pm 0.07$ $0.52 \pm 0.16$	$0.70 \pm 0.03$ $0.49 \pm 0.02$	FO	3
C3-V22	3	746 77	116 36	$24.74 \pm 0.13$ $24.71 \pm 0.13$	$24.22 \pm 0.00$ $24.23 \pm 0.07$	$0.32 \pm 0.10$ $0.48 \pm 0.15$	$0.49 \pm 0.02$ $0.49 \pm 0.02$	FO	3
C3-V23	3	780.90	523.31	$24.13 \pm 0.10$	$23.46 \pm 0.09$	$0.67 \pm 0.13$	$1.60 \pm 0.02$	FM	4
C3-V24	3	792.95	351.94	$24.70 \pm 0.03$	$23.83 \pm 0.10$	$0.87 \pm 0.10$	$1.21 \pm 0.06$	FM	3
C4-V01	4	63.43	269.25	$24.23 \pm 0.10$	$23.61 \pm 0.09$	$0.62 \pm 0.13$	$0.85 \pm 0.03$	FO	3
C4-V02	4	68.57	552.50	$24.30\pm0.10$	$23.96\pm0.04$	$0.34\pm0.11$	$0.76\pm0.02$	FO	3
C4-V03	4	71.01	611.00	$24.56\pm0.11$	$23.95\pm0.07$	$0.61\pm0.13$	$1.07\pm0.08$	FM	3
C4-V04	4	85.65	769.21	$23.59\pm0.19$	$23.03\pm0.10$	$0.56\pm0.21$	$2.02\pm0.26$	FM	4
C4-V05	4	91.20	60.77	$24.58\pm0.05$	$23.89\pm0.08$	$0.69\pm0.09$	$0.76\pm0.06$	FO	3
C4-V06	4	103.05	216.02	$23.67\pm0.07$	$23.25\pm0.05$	$0.42\pm0.09$	$1.12\pm0.06$	FO	4
C4-V07	4	114.63	96.66	$23.86\pm0.17$	$23.50\pm0.06$	$0.36\pm0.18$	$1.47\pm0.20$	FM	4
C4-V08	4	152.53	163.77	$24.79\pm0.10$	$24.31\pm0.04$	$0.48\pm0.11$	$0.62\pm0.02$	FO	4
C4-V09	4	164.39	171.87	$23.86 \pm 0.11$	$23.23 \pm 0.07$	$0.63 \pm 0.13$	$1.62 \pm 0.20$	$\mathbf{F}\mathbf{M}$	4

TABLE 2—Continued

ID	С	Х	Y	$\langle V \rangle^{\rm a}$	$\langle I  angle^{ m a}$	$\langle V-I\rangle^{a}$	Р	$M^{\mathrm{b}}$	$Q^{c}$
C4-V10	4	220.34	593.50	$24.51\pm0.08$	$23.97\pm0.06$	$0.54\pm0.10$	$0.78\pm0.05$	FO	3
C4-V11	4	256.12	403.00	$24.72\pm0.17$	$24.31\pm0.06$	$0.41\pm0.18$	$1.17\pm0.06$	FM	4
C4-V12	4	261.40	758.07	$24.62\pm0.11$	$23.95\pm0.05$	$0.67\pm0.12$	$1.03\pm0.05$	FM	4
C4-V13	4	262.59	332.79	$24.53\pm0.12$	$23.96\pm0.04$	$0.57\pm0.13$	$0.71\pm0.03$	FO	4
C4-V14	4	267.56	423.24	$23.79\pm0.09$	$23.34\pm0.04$	$0.45\pm0.10$	$1.04\pm0.09$	FO	3
C4-V15	4	314.08	649.13	$24.18\pm0.10$	$23.77\pm0.04$	$0.41\pm0.11$	$0.69\pm0.06$	FO	4
C4-V16	4	315.01	471.71	$23.63\pm0.09$	$23.03\pm0.03$	$0.60\pm0.09$	$1.26\pm0.12$	FO	4
C4-V17	4	361.28	716.98	$24.29\pm0.18$	$23.81\pm0.07$	$0.48\pm0.19$	$1.22\pm0.09$	FM	4
C4-V18	4	382.07	636.84	$23.99\pm0.16$	$23.33\pm0.09$	$0.66\pm0.18$	$1.71\pm0.11$	FM	4
C4-V19	4	394.44	492.62	$23.98 \pm 0.15$	$23.40\pm0.07$	$0.58\pm0.17$	$1.52\pm0.14$	FM	4
C4-V20	4	408.67	177.04	$24.38\pm0.13$	$24.01\pm0.06$	$0.37\pm0.14$	$0.82\pm0.03$	FO	4
C4-V21	4	411.83	552.47	$24.40\pm0.20$	$23.98\pm0.13$	$0.42\pm0.24$	$1.09\pm0.08$	FM	4
C4-V22	4	413.35	183.36	$24.42\pm0.12$	$24.00\pm0.05$	$0.42\pm0.13$	$0.73\pm0.03$	FO	4
C4-V23	4	422.66	370.62	$24.62\pm0.07$	$24.01\pm0.07$	$0.61\pm0.10$	$1.18\pm0.10$	FM	3
C4-V24	4	491.70	692.99	$24.93\pm0.16$	$24.48\pm0.07$	$0.45\pm0.17$	$0.78\pm0.06$	FM	4
C4-V25	4	492.14	232.06	$24.60\pm0.06$	$23.77\pm0.09$	$0.83\pm0.11$	$1.17\pm0.12$	FM	4
C4-V26	4	617.07	538.33	$23.61\pm0.09$	$23.07\pm0.04$	$0.54\pm0.10$	$1.25\pm0.11$	FO	3

<sup>a</sup> Mean magnitudes are phase-averaged magnitudes. Uncertainties are formal errors only and thus do not account for uncertainties caused by limited phase coverage.

<sup>b</sup> (FM) fundamental mode; (FO) first-overtone mode.

<sup>c</sup> Variable star quality is based on the cleanness of the light curves, uniqueness of the period, and coherence between F555W and F814W light curves, where 4 is the maximum.

Cepheids. For the complete sample of 82 Cepheids, we measure a true distance modulus of  $\mu_0 = \mu_0(\text{SMC}) + 6.72 \pm 0.03 = 25.60 \pm 0.09$ .

In addition, we measure a mean extinction of  $A_V = \mu_V - \mu_0 = 0.12 \pm 0.04$  ( $A_I = 0.07 \pm 0.03$ ). The agreement with the value of  $A_V = 0.14$  measured from the maps of Schlegel, Finkbeiner, & Davis (1998) supports our estimate of the extinction necessary for the distance measurement. Fitting P-L relations (slopes and zero points) to the Sextans A data, we find that the slopes are consistent with those of the SMC data; this also provides confirmation of the reliability of our application of the SMC relation to Sextans A. We will discuss this more in § 4.

The lines in Figure 6 are the above relations, shifted to our measured apparent distance moduli of  $\mu_V = 25.72$  and  $\mu_I = 25.67$ .

#### 3.2. Distance to Sextans A

Our data contain two other distance indicators, the RGB tip and red clump, which can be used to provide independent checks of our Cepheid distance. Figure 7 shows the *I*-band luminosity function in the region of the RGB tip. We measure the tip position to fall at  $I = 21.76 \pm 0.05$ , which is consistent with the measurements of  $21.73 \pm 0.09$  by Sakai et al. (1996) and  $21.8 \pm 0.1$  by Dohm-Palmer et al. (1997). Correcting for extinction and adopting  $M_I = -4.00 \pm 0.1$  computed from the Z = 0.001 and Z = 0.0004 Padova models (Girardi et al. 2000), we calculate the true distance modulus to be  $\mu_0 = 25.69 \pm 0.12$ .

Another independent distance can be determined from the position of the red clump. Figure 8 shows the *I*-band luminosity function in the region of the red clump. Our best fit to the luminosity function was obtained with a Gaussian centered at  $I = 24.91 \pm 0.01$  with a width of  $\sigma_I = 0.30 \pm$ 0.02. Using the semiempirical red clump calibration described by Dolphin et al. (2001a), we calculate an absolute magnitude of  $M_I = -0.67 \pm 0.15$  for Sextans A; this produces a true distance modulus of  $\mu_0 = 25.51 \pm 0.15$ . Combining our three distance determinations, we calculate the true distance modulus to Sextans A to be  $\mu_0 = 25.61 \pm 0.07$ , corresponding to a distance of  $d = 1.32 \pm 0.04$  Mpc. We note that this distance is significantly closer than the value of 1.44 Mpc assumed in Paper I (adopted from Dohm-Palmer et al. 1997). We also note that, while we do not explicitly include calibration uncertainties, these are ~0.02 mag and thus do not add to our reported uncertainties.

Our distance is consistent with the Piotto et al. (1994) Cepheid distance ( $\mu_0 = 25.71 \pm 0.20$ ), but is inconsistent at the 1  $\sigma$  level with the Sakai et al. (1996) Cepheid distance ( $\mu_0 = 25.85 \pm 0.15$ ). We note, however, that the Sakai et al. (1996) Cepheid distance is based on single-epoch photometry and thus is more uncertain than is indicated by their error bars. In addition, Sakai et al. (1996) present an RGB tip distance modulus of  $\mu_0 = 25.74 \pm 0.13$ , which is consistent with our distance at the 1  $\sigma$  level.

#### 4. DISCUSSION

#### 4.1. Short-Period Cepheids as Distance Indicators

Distance measurements using Cepheids typically rely on longer period Cepheids with P > 10 days. As we have observed in Sextans A and previously in Leo A, large numbers of short-period Cepheids are present in low-metallicity star-forming galaxies, because of the passage of the BHeB sequence through the instability strip at fainter magnitudes (Dolphin et al. 2002). This allows for the determination of the distance using 82 Cepheids, which is potentially much more accurate than that using the five longer period Cepheids of Sandage & Carlson (1982). However, one must first examine the question of whether or not these objects serve as reliable standard candles.

To address this question, we present distance moduli to five nearby galaxies in Table 3 as determined by a variety of distance indicators. Because of its relative insensitivity to age and metallicity, we will adopt the RGB tip distance as



FIG. 3.—Light curves of 82 variable stars in Sextans A



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued



FIG. 3.—Continued

the comparison standard. Comparing the short-period Cepheid distances with the RGB tip distances, we see no significant systematic differences for the low-metallicity galaxies (all but the LMC). We do note that the first-overtone distances are shorter by an average of 0.08 mag for the lowest-metallicity galaxies (Sextans A and Leo A). This may be the



FIG. 4.—CMD of Sextans A field, showing detected variable stars (*circles*). The detection efficiency was not 100%, and thus there are many additional stars in the instability strip that are likely variable but were not classified as such. The excess color spread of short-period variables is artificially broad because of our limited phase coverage in V (see text). Absolute magnitudes (on the right-hand y-axis) are calculated assuming  $I-M_I = 25.67$ .

sign of a real effect, but we also note that the data are consistent with no metallicity dependence of the distance. At the 1  $\sigma$  level, we can conclude only that any dependence of the short-period Cepheid P-L relations on metallicity is no more than 0.1 mag per dex.

However, the LMC distance from short-period Cepheids is inconsistent at the 2  $\sigma$  level with that from the RGB tip (as well as from all other distance indicators) in that they are roughly 0.2 mag closer. We interpret this as resulting from the metallicity dependence of the position of the BHeB



FIG. 5.—Maximum gap in phase coverage as a function of period. *Top*, Gap in F555W; *middle*, F814W; *bottom*, lesser of the two.



FIG. 6.—Period-luminosity relations in V and I for short-period Cepheids in Sextans A. Slopes are calculated from the OGLE SMC Cepheid database (Udalski et al. 1999a). In both plots the first-overtone P-L relation is the upper line and the fundamental mode relation is the lower line.

sequence as mentioned above. At sufficiently low metallicities, the heavily populated BHeB sequence passes through the instability strip at a luminosity that produces large numbers of Cepheids with periods of  $\sim 1$  day. At higher metallicity, the BHeB sequence passes through the instability strip at a brighter magnitude, and thus 1 day Cepheids are



FIG. 7.—*I* luminosity function of the RGB tip. To minimize confusion from red supergiants, color limits of 1.2 < V - I < 1.6 were used to select stars for this measurement. We measure the RGB tip at  $I = 21.76 \pm 0.05$  (*dotted line*).



FIG. 8.—*I* luminosity function of the red clump. Color cuts were 0.65 < V-I < 1.0. The curve indicates our best fit to the luminosity function, using the sum of a quadratic (to fit the underlying RGB stars) and a Gaussian (to fit the red clump). The Gaussian is centered at  $I = 24.91 \pm 0.01$ , with a 1  $\sigma$  width of  $0.30 \pm 0.02$ .

produced only by stars passing through the instability strip as they evolve off the main sequence. Based on these data, it appears that the dividing line is between the metallicities of the SMC and LMC. The EROS P-L relations (Bauer et al. 1999) strengthen the argument that there is a fundamental difference between the LMC and SMC Cepheid populations, as they found a significant slope change at 2 days in their SMC Cepheids but not their LMC ones.

### 4.2. Comparisons of Other Distance Indicators

Table 3 also gives the distances as calculated using RR Lyrae stars, long-period Cepheids, and the red clump. This allows us to expand on the comparison we made in an earlier paper (Dolphin et al. 2001a), which considered only IC 1613 and the Magellanic Clouds.

The four RR Lyrae samples are all taken from objects with -1.9 < [Fe/H] < -1.3, thus providing an insufficient baseline for an examination of the effects of metallicity on the RR Lyrae calibration. However, we can compare the zero point of the calibration with that of the RGB tip, and we find that the values we assumed are consistent at much better than the 1  $\sigma$  level.

A comparison of the four long-period Cepheid distances with the RGB tip distances shows a hint of a metallicity dependence in the Cepheid distances. Making a least  $\chi^2$  fit, we measure a slope of  $-0.12 \pm 0.12$  mag per dex, in the sense that low-metallicity galaxies are measured to be more distant by Cepheids than by the RGB tip. This slope is consistent with those predicted theoretically by Sandage, Bell, & Tripicco (1999) and measured by Kennicutt et al. (1998). While this is a 1  $\sigma$  result, improved data on the Sextans A long-period Cepheids (or those in similarly metal-poor galaxies) are needed to improve the measurement. It is clear that the P-L relation does not have a large (~0.5 mag per

TABLE	3
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Method	Sex A	Leo A	IC 1613	SMC	LMC	Reference
RR Lyrae <sup>a</sup>		$24.52\pm0.09$	$24.30\pm0.05$	$18.86\pm0.07$	$18.47\pm0.07$	1, 2, 3, 4, 13
LP Cepheid <sup>b</sup>	$25.78\pm0.15$		$24.42\pm0.13$	$18.91\pm0.04$	$18.50\pm0.00$	5, 6, 11, 14
SP Cepheid (FM) <sup>c</sup>	$25.64\pm0.05$	$24.61\pm0.04$	$24.42\pm0.12$	$18.88\pm0.01$	$18.30\pm0.04$	1, 2, 7, 8, 9
SP Cepheid (FO) <sup>c</sup>	$25.58 \pm 0.03$	$24.49 \pm 0.03$	$24.38\pm0.08$	$18.88\pm0.01$	$18.32\pm0.01$	1, 2, 7, 8, 9
RGB Tip <sup>d</sup>	$25.69\pm0.06$	$24.53\pm0.06^{\rm e}$	$24.28\pm0.05^{\rm f}$	$18.88\pm0.04^{\rm g}$	$18.52\pm0.09$	7, 10, 11
Red Clump <sup>h</sup>	$25.51\pm0.15$	$24.43\pm0.15^{e}$	$24.27\pm0.08^{\rm f}$	$18.85\pm0.06$	$18.46\pm0.11$	7,12

<sup>a</sup> Adopting  $M_V(RR) = 0.57 + (0.25 \pm 0.10)([Fe/H] + 1.5)$ . The zero-point uncertainty of  $\pm 0.07$  is not included in the values listed above. The metallicities of the RR Lyrae stars in the samples are  $[Fe/H] = -1.7 \pm 0.3$  for Leo A,  $[Fe/H] = -1.3 \pm 0.2$  for IC 1613, [Fe/H] = -1.4 for the SMC cluster (NGC 121), and [Fe/H] = -1.9 for the LMC clusters.

<sup>b</sup> Distances calculated from Madore & Freedman 1991 P-L relations, which assume an LMC distance modulus of  $\mu_0(LMC) = 18.50$ .

<sup>c</sup> Distances calculated from data contained in the cited references, using the P-L relations presented in this paper. As described in the text, these are based on an assumed SMC distance modulus of  $\mu_0(SMC) = 18.88$ .

<sup>d</sup> All distances are set to a scale assuming  $M_I = -4.00$  for the tip of the red giant branch; an uncertainty in this value of  $\pm 0.1$  is not included in the values above.

<sup>e</sup> RGB tip and red clump positions calculated using new reductions of WFPC2 images of two Leo A fields (GO-5915 and GO-8575). <sup>f</sup> RGB tip and red clump positions calculated using new reductions of WFPC2 images of two IC 1613 fields (GO-6865 and GO-7496).

<sup>g</sup> Adopting  $A_I = 0.07$ , based on Schlegel et al. 1998.

<sup>h</sup> Absolute magnitudes for the Sex A, Leo A, and IC 1613 clumps calculated as described by Dolphin et al. 2001a; the zero-point uncertainty of  $\pm$  0.06 mag is not included in the values above. Because of similarities in the CMD, Leo A was assumed to have the same red clump absolute magnitude as Sextans A ( $-0.67 \pm 0.15$ ).

REFERENCES.—(1) Dolphin et al. 2002; (2) Dolphin et al. 2001a; (3) Walker & Mack 1988; (4) Walker 1992; (5) Madore & Freedman 1991; (6) Laney & Stobie 1994; (7) present work; (8) Udalski et al. 1999a; (9) Udalski et al. 1999b; (10) Cioni et al. 2000; (11) Sakai, Zaritsky, & Kennicutt 2000; (12) Girardi & Salaris 2001; (13) Saha et al. 1992; (14) Piotto et al. 1994.

dex; Beaulieu et al. 1997; Gould 1994) dependence on metallicity.

We find no evidence of a correlation between metallicity and the red clump-RGB tip distance difference, which is comforting since metallicity is accounted for in our semiempirical red clump calibration. The zero points are also consistent at the 1  $\sigma$  level, providing additional evidence that the red clump is an accurate distance indicator, provided that population effects are properly accounted for.

Finally, we present distance moduli relative to the SMC for all galaxies in Table 4. Although the LMC is generally the standard for such comparisons, we chose to use the SMC for the comparison because it has accurate distances determined with all five distance indicators.

#### 5. SUMMARY

We have presented photometry of deep WFPC2 observations of Sextans A. Observations were made over 16 epochs in F814W and eight epochs in F555W, permitting a search for variable stars. We identified 82 periodic variables with clean light curves in both bands; all 82 appear to be shortperiod Cepheids. We found fundamental mode Cepheids

TABLE 4
DISTANCE MODULI RELATIVE TO THE SMC

Galaxy	$(m-M)_0 - (m-M)_{0,SMC}$
Sex A Leo A	$6.75 \pm 0.04$ $5.65 \pm 0.04$ $5.44 \pm 0.04$
LMC	$-0.37 \pm 0.05$

with periods as short as 0.8 days and first-overtone Cepheids with periods of 0.5 days.

Using these Cepheids, we measured a distance to Sextans A by using a P-L relation computed using SMC shortperiod ( $\sim$ 1 day) Cepheids. We compared this distance with that obtained with other means and find that short-period Cepheids are indeed a viable standard candle for objects at or below the metallicity of the SMC. Given the large numbers of these that should be found in low-metallicity star-forming galaxies, these objects can provide much more accurate distance measurements than those obtained using other distance indicators.

Combining the short-period Cepheids with distances obtained from the RGB tip and red clump, we determined the distance modulus to Sextans A to be  $\mu_0 = 25.61 \pm 0.07$ , corresponding to a distance of  $d = 1.32 \pm 0.04$  Mpc.

We also examined relative distances produced by five distance indicators for five galaxies in and near the Local Group: Sextans A, Leo A, IC 1613, and the Magellanic Clouds. We find that relative distances calculated using the RGB tip, red clump, and RR Lyrae stars are consistent for the sample. However, we find a metallicity dependence of  $-0.12 \pm 0.12$  mag per dex in distances calculated using reddening-free Cepheid techniques. The relative distances for the five galaxies are calculated using these distance measurements.

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