Physical Studies of Asteroid 1998 SF36 (25143) – Target of the MUSES–C Sample Return Mission

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Asteroid 1998 SF36 (25143) is the target of the Japanese/NASA MUSES–C sample return mission, set for launch in November, 2002. The preparation and planning for this mission requires prior knowledge of the physical parameters of the intended target. Such knowledge is valuable in planning the mission trajectory and science scenarios. This near–Earth asteroid was fortuitously placed for observations in 2001 when it approached to within 0.038 AU of the Earth. We present results of a ground–based observational study of 1998 SF36, consisting of multi–filter CCD photometry and low resolution CCD spectroscopy, from which the asteroid's rotation period, axial ratio, broadband colors, and taxonomic classification are derived. Photometry data was obtained in February, 2001 with the Steward Observatory 61" telescope on Mt. Bigelow, in March, 2001 using the 24" telescope at Table Mountain Observatory and in August and September, 2001 using the 60" telescope at Palomar Observatory. Analysis of the lightcurve data reveals a rotation period of 12.12 ± 0.02 hours, with a maximum observed peak–to–peak amplitude of 1.05 magnitudes, implying a minimum axial ratio of 2.64. Slight color variations were also observed. The averaged color indices are: (B–V) = 0.91 ± 0.07, (V–R) = 0.39 ± 0.05, and (R–I) = 0.38 ± 0.22. Complimentary, low resolution, spectroscopic observations between 0.35 and 1.0 microns were obtained with the 200" Hale telescope at Palomar Mountain on March 17 and 18, 2001. The spectra indicate that this object is most likely of QRS–type, similar to ordinary chondrite meteorites. This work was supported by the NASA Planetary Astronomy Program and the National Research Council.