the comet with the Mars Reconnaissance Orbiter's High Resolution Imaging Science Experiment (HiRISE) camera on 2014 October 7. In particular, these HiRISE observations were decisive in securing the trajectory and revealed that out-of-plane nongravitational perturbations were larger than previously assumed. Though the resulting ephemeris predictions for the Mars encounter allowed observations of the comet from the Mars orbiting spacecrafts, post-encounter observations show a discrepancy with the pre-encounter trajectory. We reconcile this discrepancy by employing the Rotating Jet Model, which is a higher fidelity model for nongravitational perturbations and provides an estimate of C/2013 A1's spin pole.
Keywords: Comets, Comets, dynamics, Data reduction techniques, Orbit determination

1. Introduction

On 2014 October 19 long-period comet C/2013 A1 (Siding Spring) experienced an exceptionally close encounter with Mars at 140496.6 ± 4.0 km and a relative velocity of 55.963249 ± 0.000028 km/s (1σ formal uncertainties). While an impact between the nucleus of C/2013 A1 and Mars had been ruled out by earlier observational data, early predictions by Vaubaillon et al. (2014) and Moorhead et al. (2014) suggested that the dust in the comet's tail could have posed a significant hazard to the spacecrafts orbiting Mars. Later studies (Farnocchia et al., 2014; Kelley et al., 2014; Tricarico et al., 2014; Ye and Hui, 2014) used observations of C/2013 A1 to estimate the dust produc-