Spectroscopic orbit of IGR J17014-4306

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IGR J17014-4306

IGR J17014-4306 is an intermediate polar with an orbital period of P_{orb}=0.5340263 ± 5E-7 days (Potter & Buckley 2018). It is famous for its classical nova outburst recorded by Korean astronomers in 1437 AD, making it the oldest nova known (Fig. 1). Moreover, classical novae in intermediate polars are rarely observed. Hence, studying the system orbital parameters is important due to the uniqueness of the system.

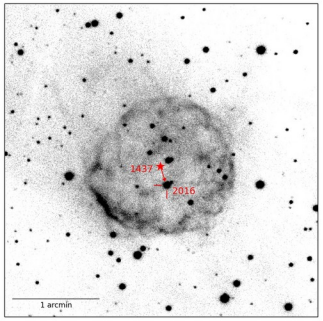

Fig. 1: The nova shell around IGR J17014-4306 that allowed to date the nova outburst to 1437 AD (Shara et al. 2017).

Previous work

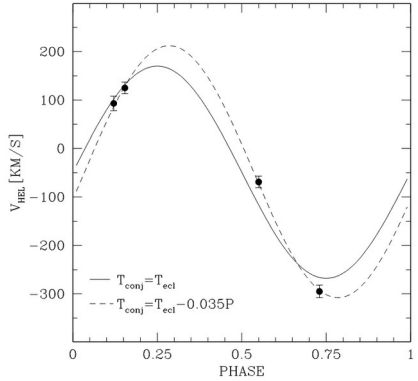

Fig. 2: Previously published radial velocity data as well as best fit to the spectroscopic orbit (Shara et al. 2017).

Observations

We observed IGR J17014-4306 with VLT Xschooter for three nights and with SALT RSS for a three nights. This gives a total of six nights of monitoring.

Results

Radial velocities were calculated using a synthetic spectrum and a cross-correlation method. The measurements and fit to the spectroscopic orbit of the mass donor are presented in Fig. 3.

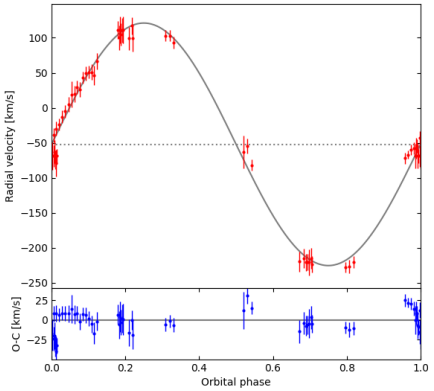

Fig. 3: Top panel: Radial velocity measurements (red points) as well as fit to the orbit (black line). Bottom panel: Residuals to the fit.

Thanks to the fit we obtained the orbital parameters:

P_{orb} = 0.53398 ± 3e-05 d
K = 173 ± 4 km/s
$f(m) = M_{WD}^3/(M_{WD}+M_{MS})^2$ = 0.287 ± 0.020 $M_\odot$

Assuming the white dwarf mass of M_{WD} ~ 1.2 $M_\odot$ (Bernardini et al. 2017) and the edge-on system we estimate the mass of the main sequence mass donor: M_{MS}=1.25 ± 0.10 $M_\odot$

References

Bernardini et al., 2017, MNRAS, 470, 4815
Shara et al., 2017, Nature, 548, 558
Potter & Buckley, 2018, MNRAS, 473, 4692

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