Evolutionary Timescales for V605 Aql

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The parameters used to calculate stellar evolution become crucial when we consider such subtleties as born-again PNe helium-flash objects like V605 Aql or its younger twin Sakurai's Object (V4334 Sgr). Hence the physical properties of born-agains in all stages provide a hard constraint on valid evolution theories. With the aid of photoionizing models of the old surrounding PN A58 of V605 Aql, calculated with CLOUDY90, the properties of V605 Aql before its final helium flash can be determined. A distance of 3.1 ± 0.2 kpc outgoing from radio observations was used. The placement of the derived central star of the PN (CSPN) luminosity and temperature together with the theory of stellar post-AGB evolution by Blöcker (1995) yields a mass of the final white dwarf of 0.6 $M_\odot$ (corresponding also extremely well to the dynamic age of the old PN) as well as a transition time t since leaving the post-AGB of 8200 years. The underlying observations were taken in 2002 – about 85 years after the bright Nova burst of V605 Aql in the 1920's. Based on recombination timescales it can be concluded that the time between the end of the UV radiation of the central star (= the time of the late helium flash) and the moment of the observations has to be around 100 years. Therefore the transition time between the final flash and either point H or E has to be very short: below 20 years if taking into account all types of uncertainties. This clearly excludes a late thermal pulse (LTP) and favors a very late thermal pulse (VLTP) where the CSPN was already on the white dwarf cooling track, after the cessation of the H burning. This VLTP is discussed very controversially concerning the timescales of the first decrease from the flash position to a very low luminosity. The timescales and properties presented here support very well the theory by Herwig (2003), where this transition is undergone in less than 1 year for a 0.604 $M_\odot$ CSPN, whilst the theory by Lawlor & MacDonald (2003) reaches transition timescales of up to several thousand years, depending on the metallicity.

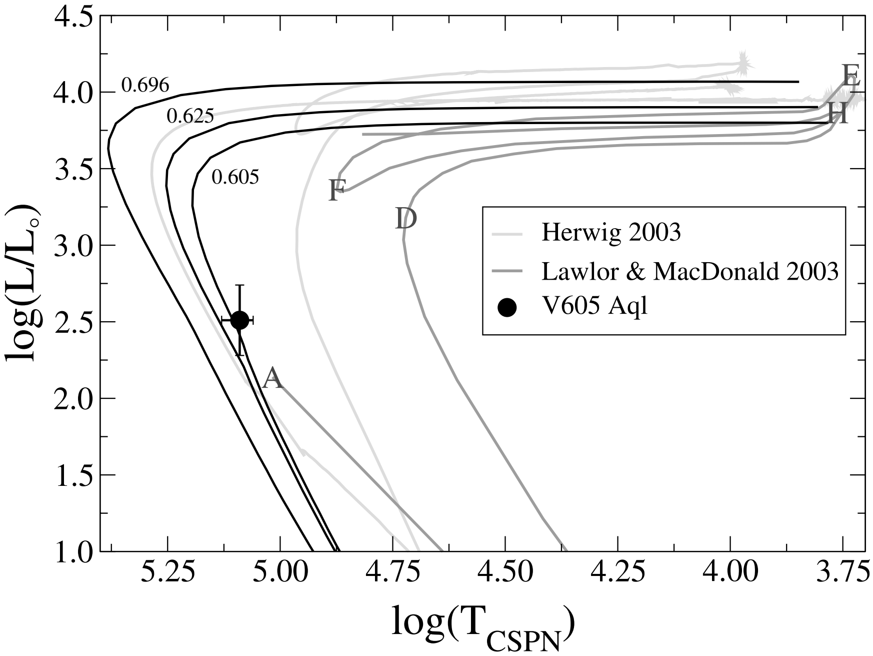

Fig. P 17. The position of the CSPN in the Hertzsprung-Russell diagram at the moment of the helium flash with the evolutionary tracks by Blöcker (1995) underneath. The grey lines represent the evolutionary models of Lawlor & MacDonald (2003) and of Herwig (2003).

References:
Blöcker, T. 1995, A&A 299, 755
Herwig, F. 2003, IAU Symp. 209, 111
Lawlor, T. M., & MacDonald, J. 2003, AJ 583, 913