

Optical spectroscopy of AM CVn stars

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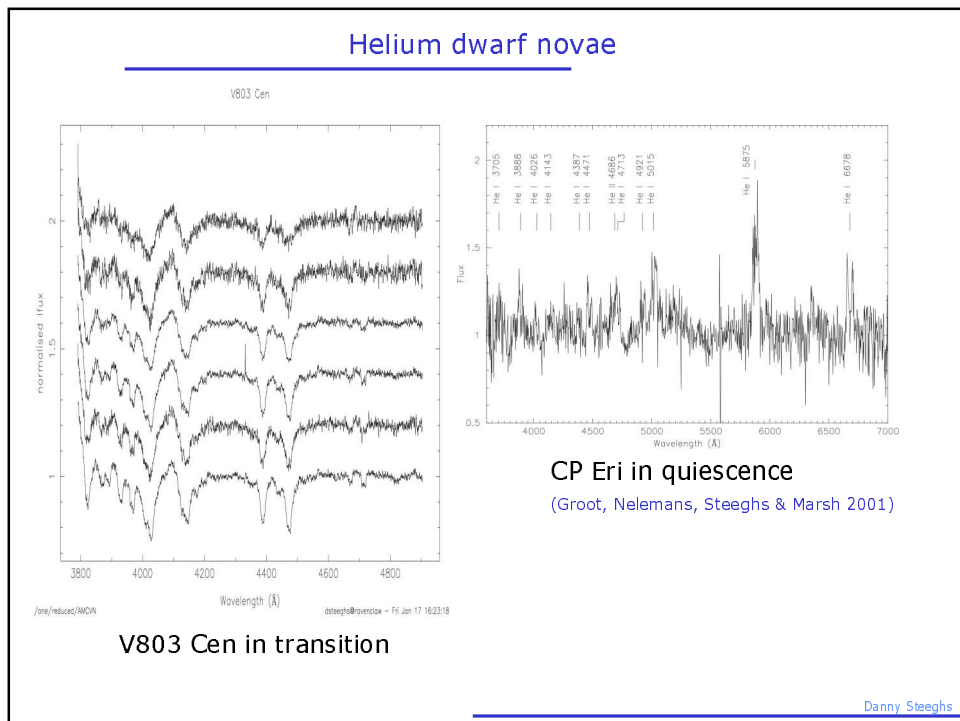
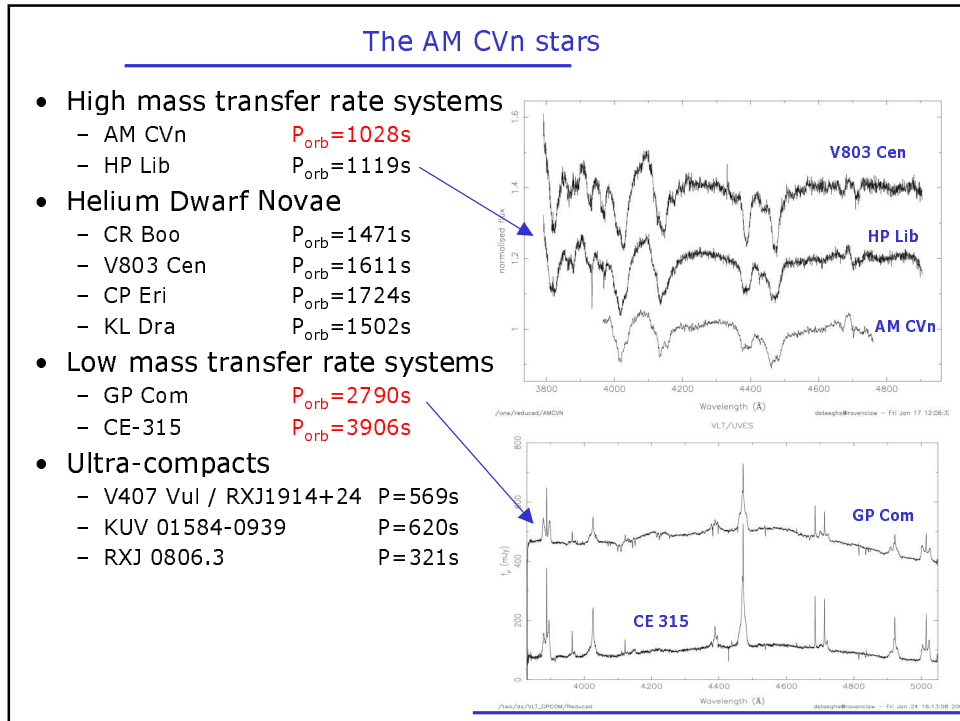
Tom Marsh, Gijs Nelemans, Paul Groot, Gijs Roelofs,
Gavin Ramsay, Mark Cropper, Luisa Morales

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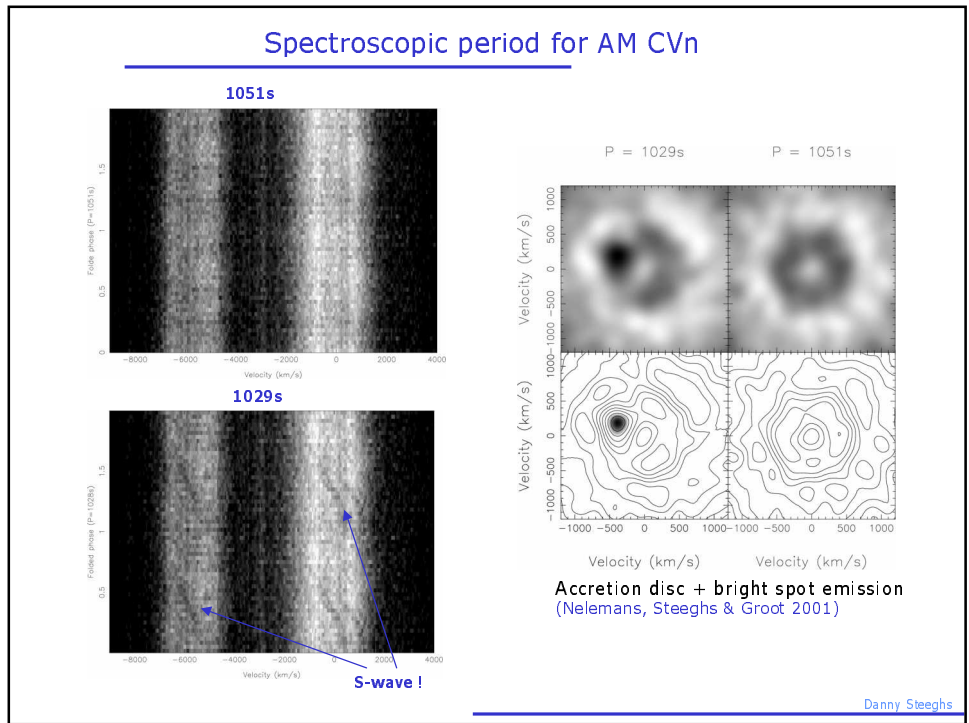
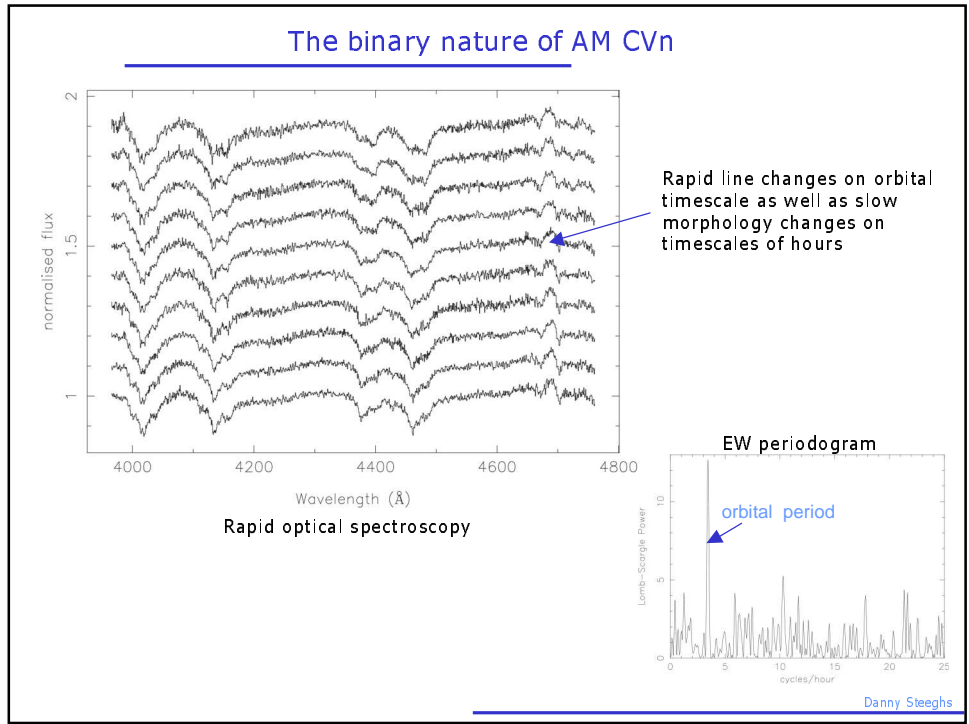
Time resolved spectroscopy

- Spectroscopy as a diagnostic of the accretion flow
 - Helium accretion discs ; outbursts/superhumps
 - Novel accretion geometries
- The nature of their stellar components
 - Spectral features from the primary and/or donor
 - Abundances
- Establishing system parameters
 - Direct determination through radial velocities
 - Doppler mapping of accretion flow ; hot-spot
 - Spectroscopic orbital periods

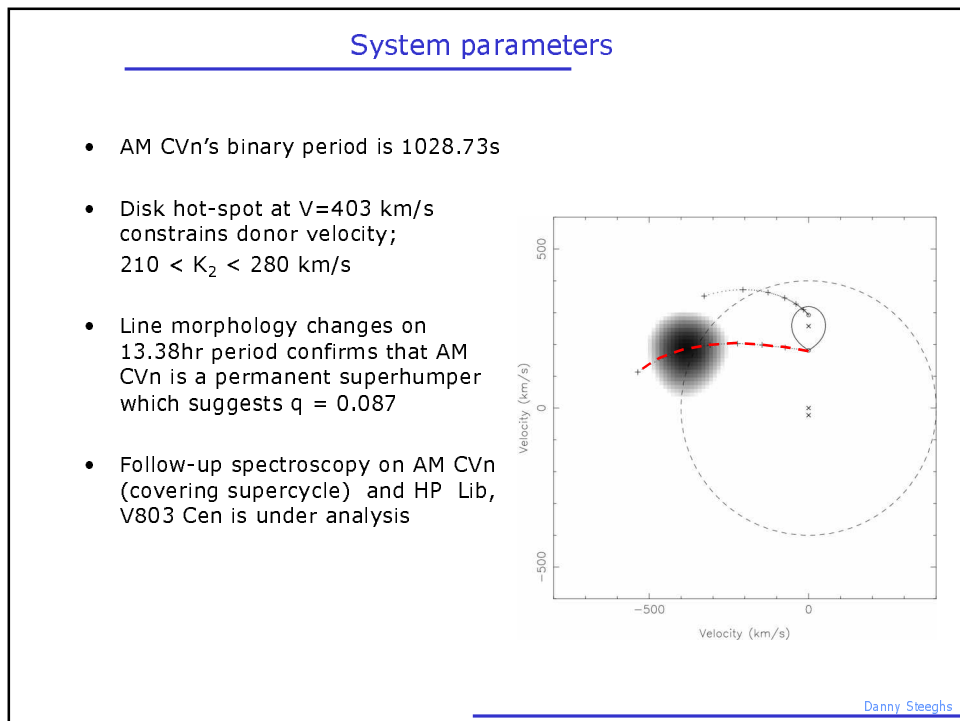
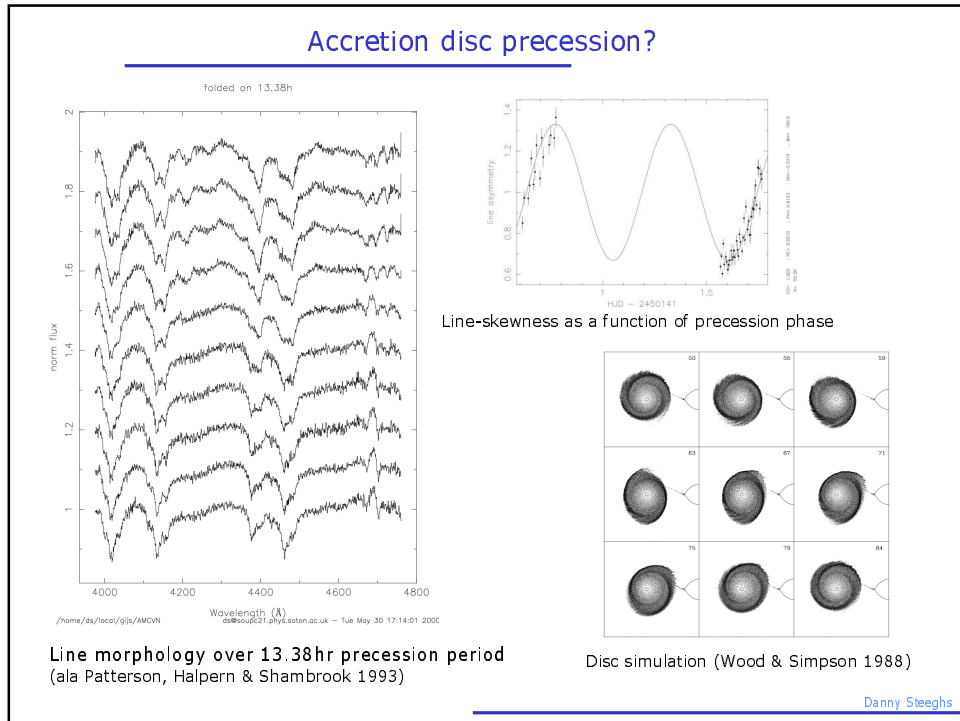
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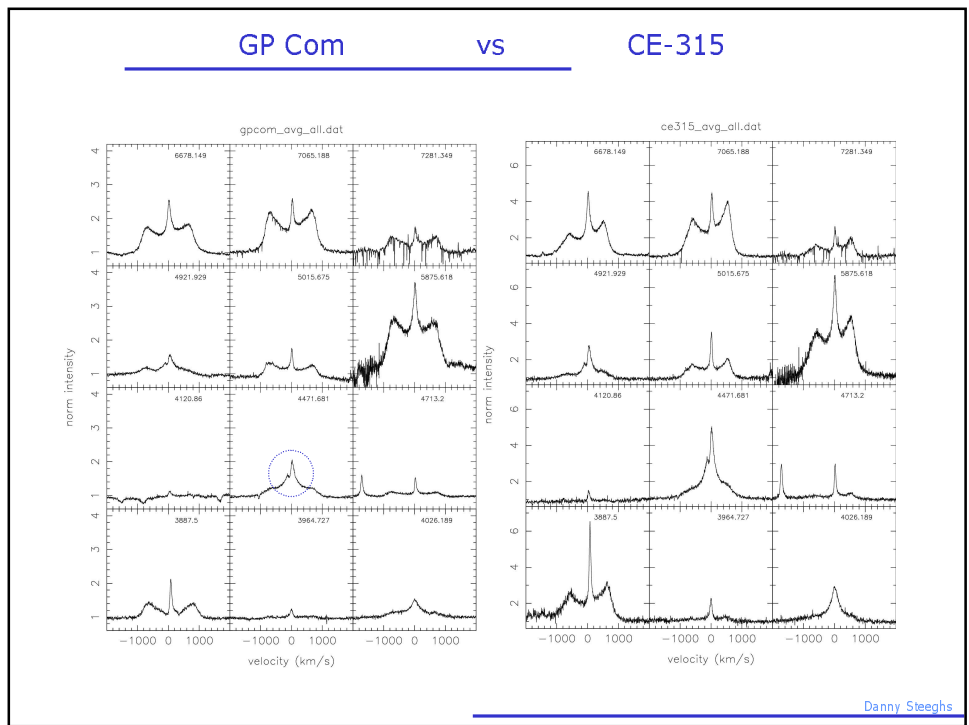
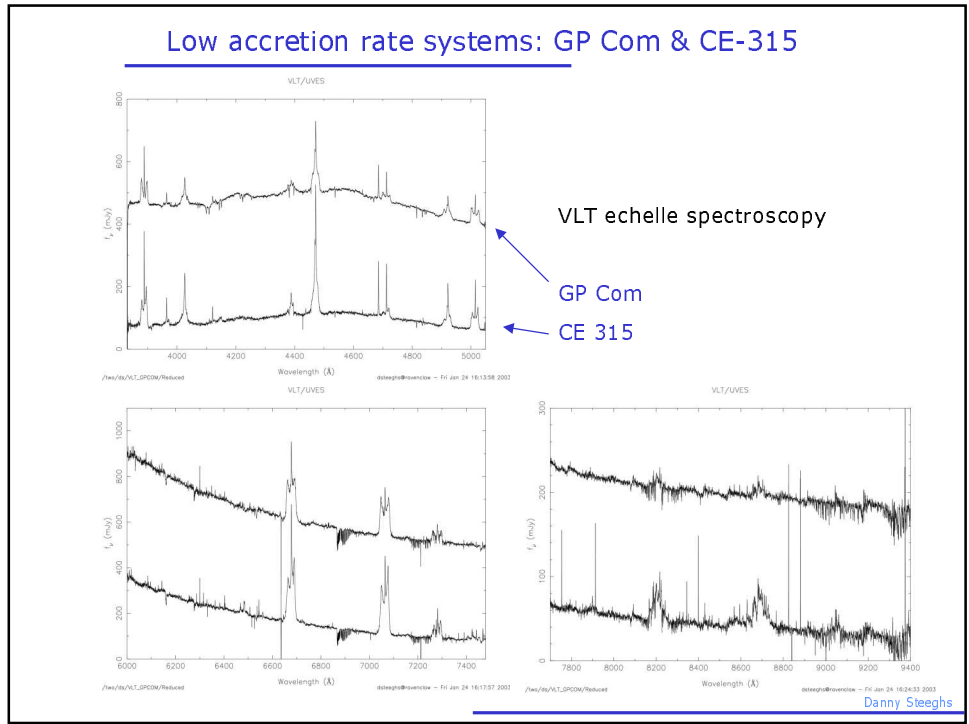
Optical Spectroscopy of AM CVn Binaries



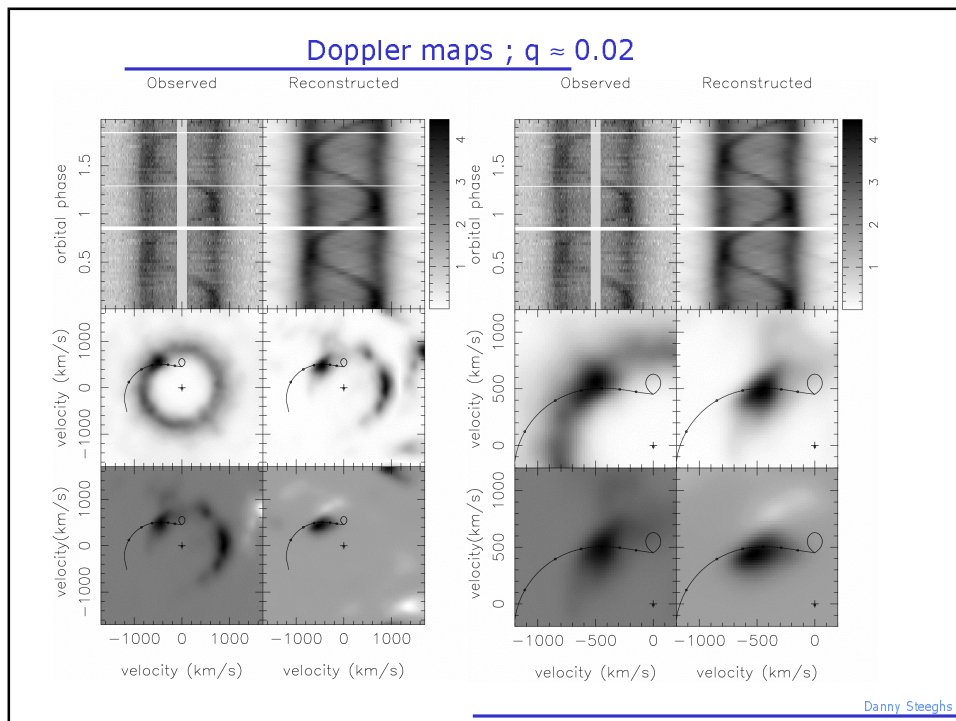
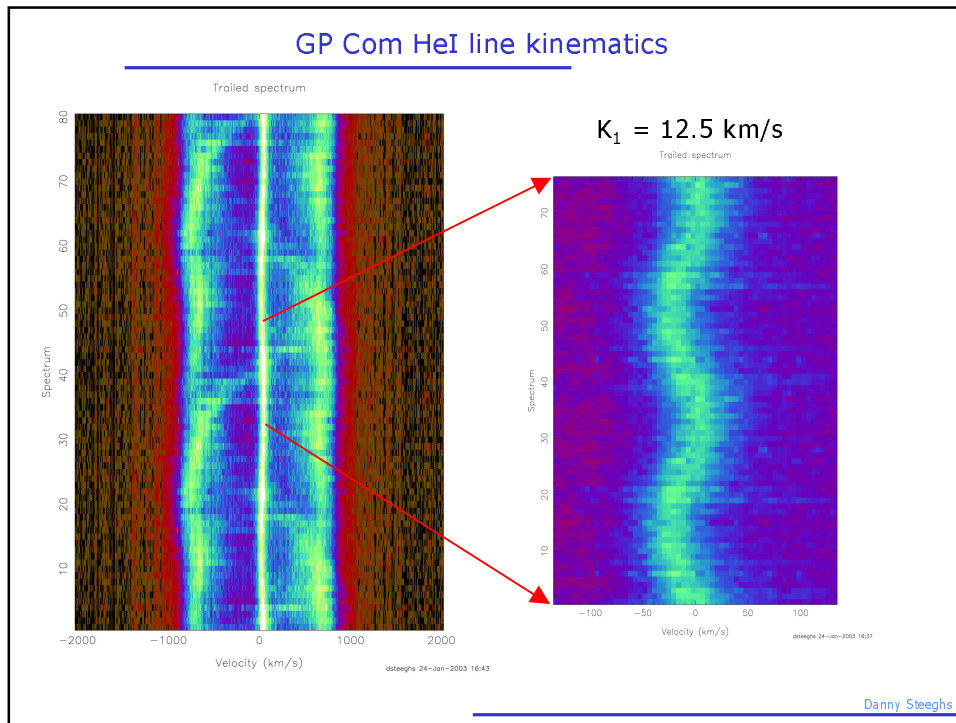
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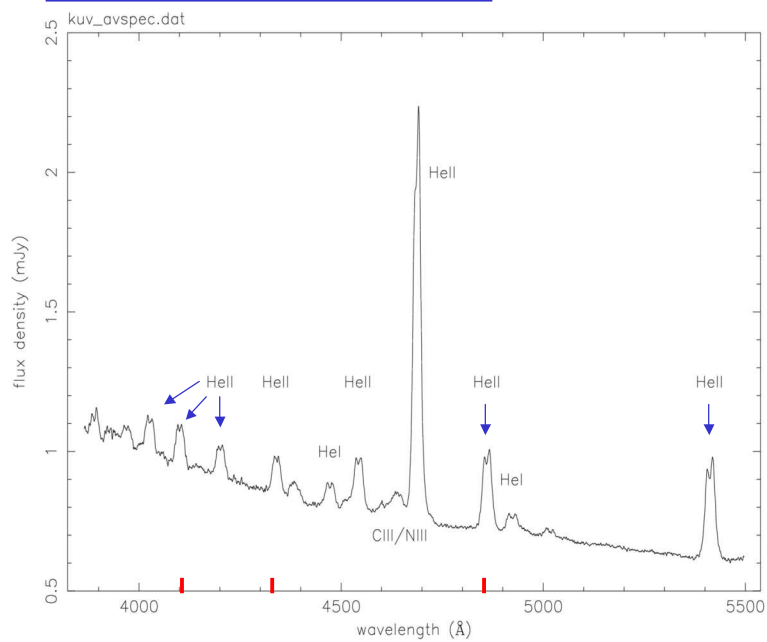


Ultra-compact

- Three new AM CVns?
 - V407 Vul / RXJ1914 ; 569s X-ray + optical period
 - RXJ0806.3 ; 321s X-ray + optical period
 - KUV 01584-0939 ; 620s optical period
- Spectroscopy is crucial in order to determine the true nature of these extreme binaries

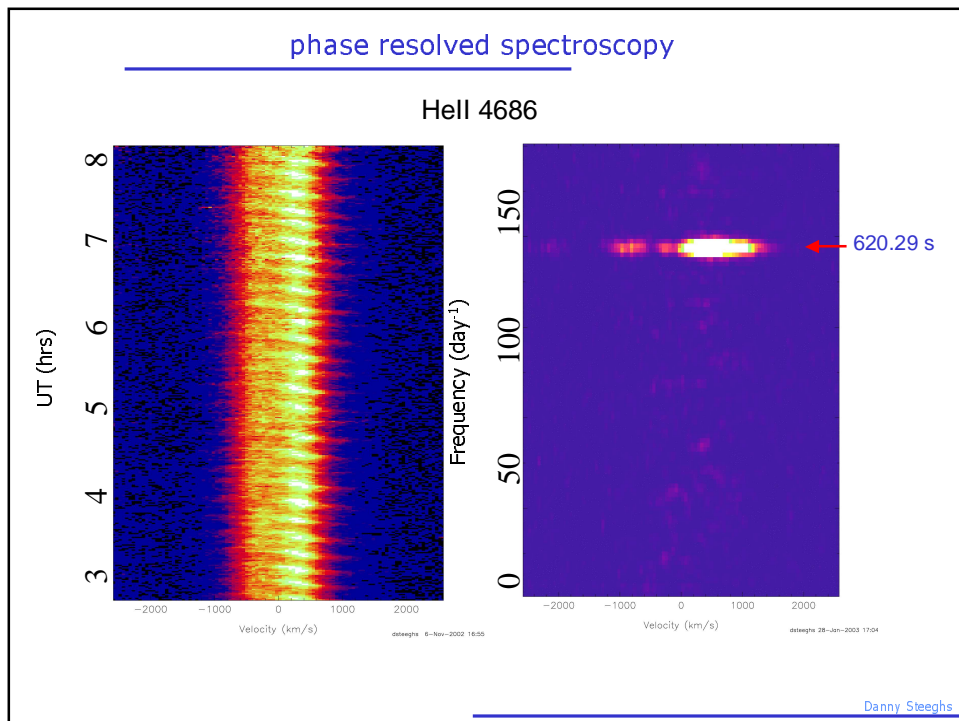
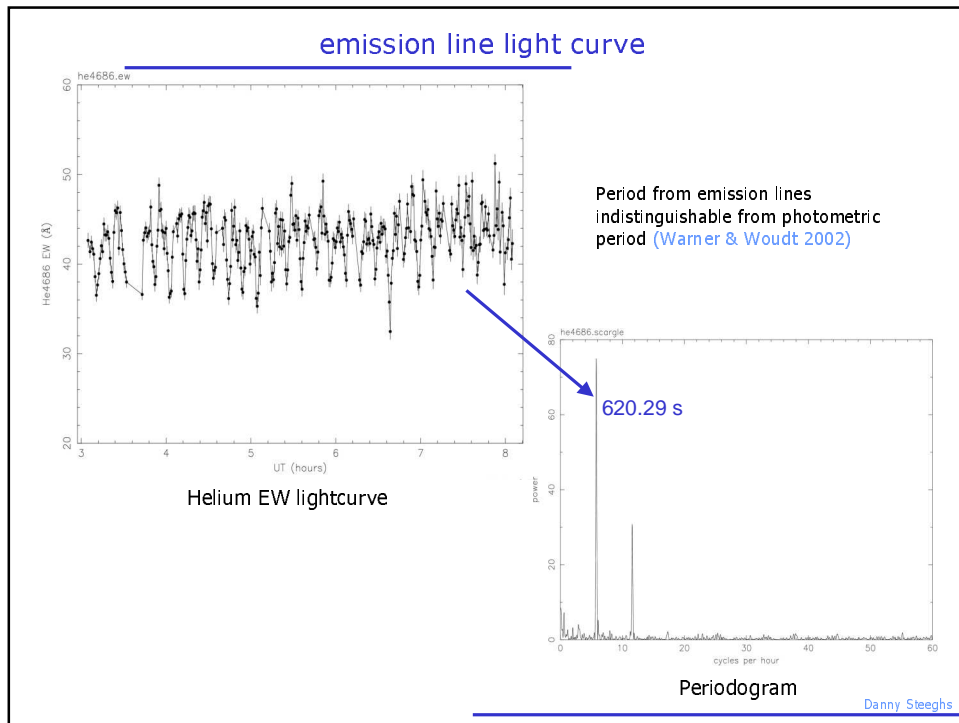
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KUV01584-0939 Magellan spectroscopy

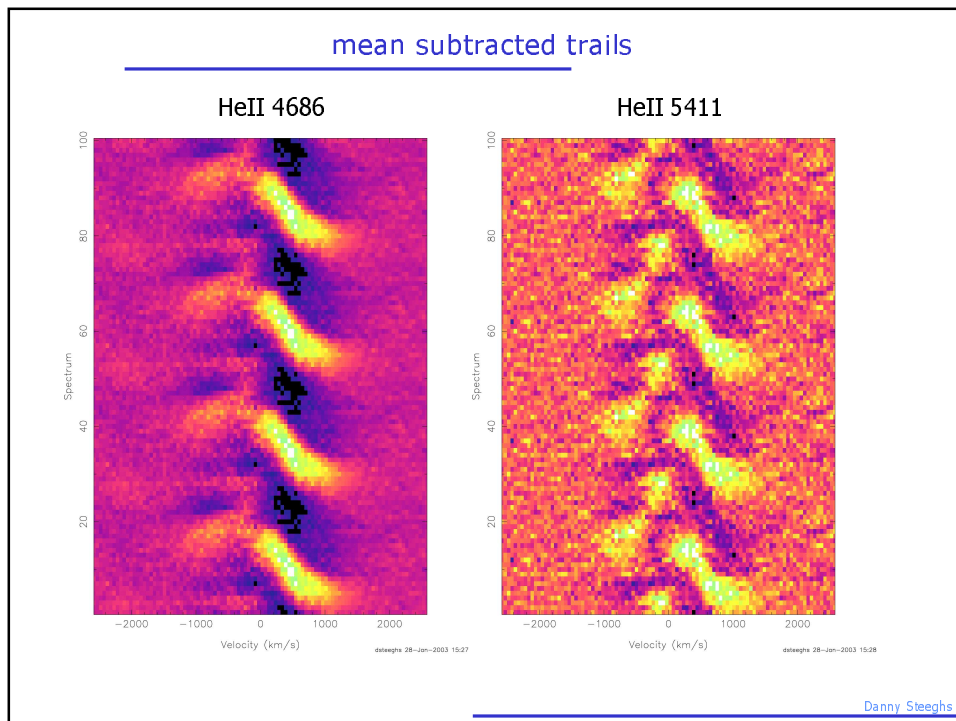
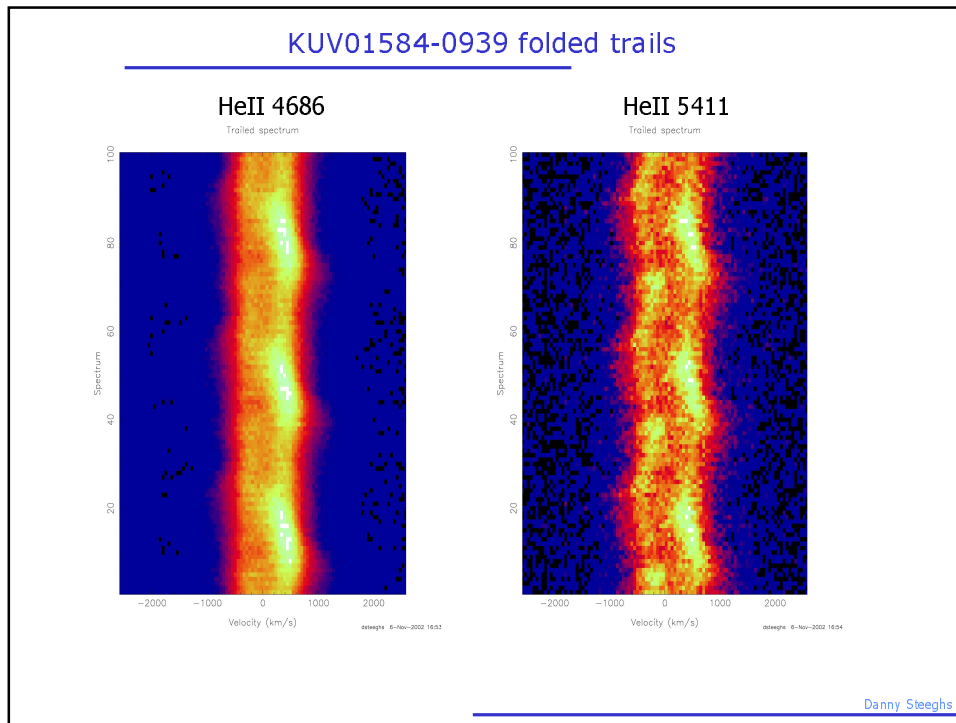


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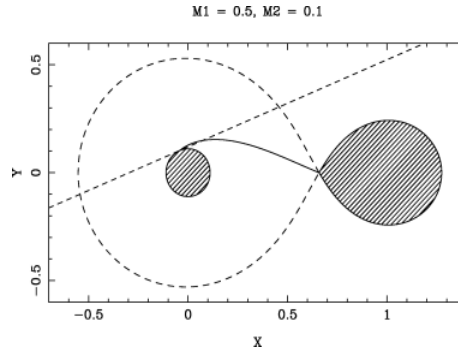
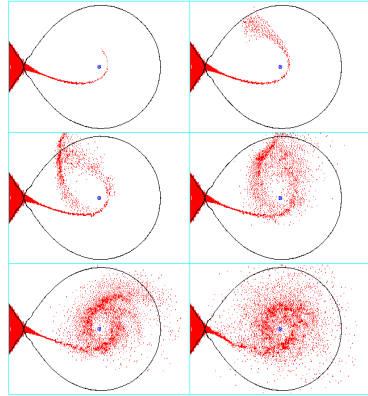
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Accretion disc structure or direct-impact accretion ?



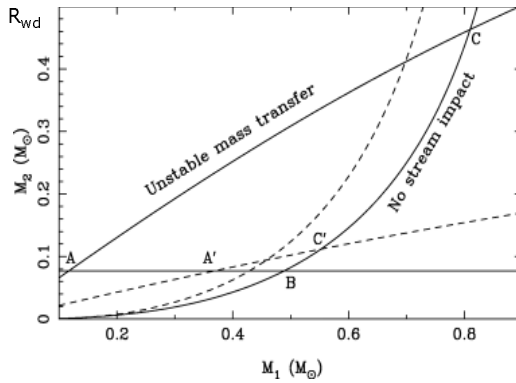
Marsh & Steeghs (2002)

- Lindblad resonances in extreme q discs ; tidal density waves / precession
- Non-disc accretion modes ; stream overflow / direct impact / magnetic

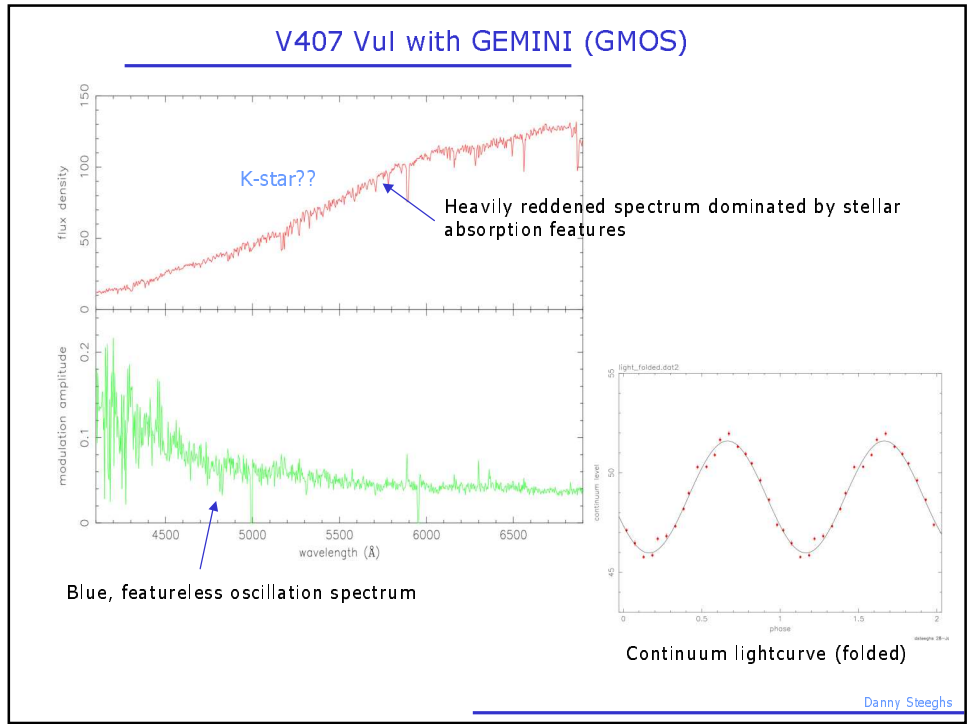
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KUV01584-0939 as an ultra-short period binary

- Primary white dwarf ($M_1 \sim 0.7 M_\odot$)
- Degenerate, hydrogen deficient donor star ($M \sim 0.066 M_\odot$ for Roche lobe filling white dwarf)
- \dot{M} driven by gravitational wave losses ($\dot{M} \sim 10^{-8} M_\odot/\text{yr} \sim 10^{18} \text{ g/s}$)
- Accretion luminosity $L \sim 5 L_\odot \sim 2 \cdot 10^{34} \text{ erg/s}$
- Binary separation $\sim 10^{10} \text{ cm} \sim 10 R_{\text{wd}}$

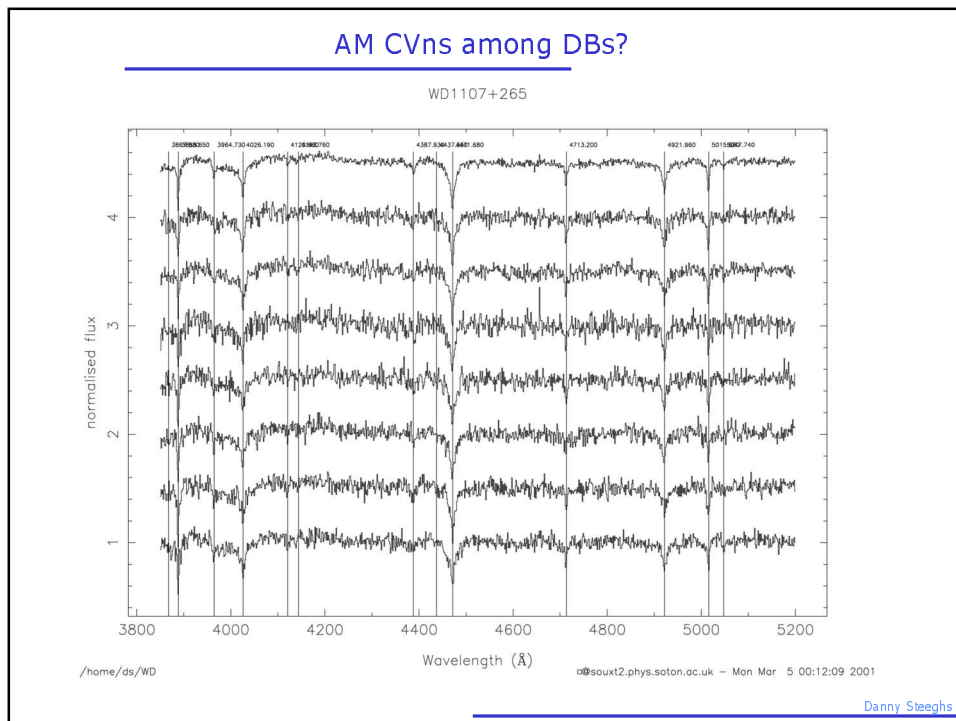
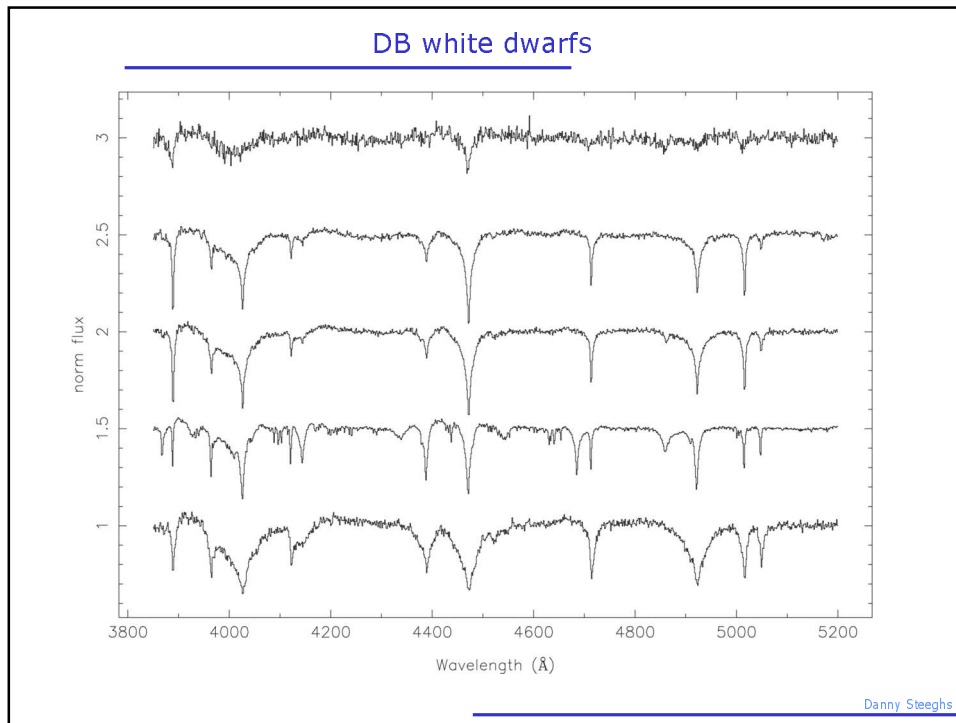


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- Conclusions & Outlook
- Phase resolved spectroscopy is a powerful tool for system parameter determination
 - Doppler tomography, like in hydrogen-rich CVs, can map the dynamics of the accretion flow in detail;
 - Hot-spot dynamics for system parameters
 - Accretion disc properties
 - Novel accretion geometries can be tested
 - Optical should be complemented by IR and UV spectroscopy in order to determine their evolutionary path
- Danny Steeghs

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