Changes in the structure of the accretion disc of EX Dra

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abstract We report on the analysis of high-speed photometry of the dwarf nova EX Dra through its outburst cycle with eclipse mapping techniques. The eclipse maps show evidence of the formation of a one-armed spiral structure in the disc at the early stages of the outburst and reveal how the disc expands during the rise until it fills most of the primary Roche lobe at maximum light. During the decline phase the disc becomes progressively fainter until only a small bright region around the white dwarf is left at minimum light. The eclipse maps also suggest the presence of an inward and an outward-moving heating wave during the rise and an inward-moving cooling wave in the decline. The inferred speed of the outward-moving heating wave is of the order of 1 km s$^{-1}$, while the speed of the cooling wave is a fraction of that. Our results suggest a systematic deceleration of both the heating and the cooling waves as they travel across the disc, in agreement with predictions of the disc instability model. The analysis of the brightness temperature profiles indicates that most of the disc appears to be in steady-state during quiescence and at outburst maximum, but not during the intermediate stages. As a general trend, the mass accretion rate in the outer regions is larger than in the inner disc on the rising branch, while the opposite holds during the decline branch. We estimate a mass accretion rate of $\dot{M}=10^{-8} M_\odot yr^{-1}$ at outburst maximum and $\dot{M}=10^{-9.1} M_\odot yr^{-1}$ in quiescence. The brightness temperature profile in quiescence also suggests that the viscosity parameter is high at this stage, $\alpha_{cool} \gtrsim 0.25$, which favours the mass-transfer instability model. The uneclipsed light has a steady component, understood in terms of emission from the red secondary star, and a variable component that is proportional to the out of eclipse flux and corresponds to about 3 per cent of the total brightness of the system. The variable component is interpreted as arising in a disc wind.