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TITLE: A radical transition in the post-AGB system U Equ

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ABSTRACT: Context. U Equ is an unusual maser-hosting infrared source discovered in the 1990s. It was tentatively classified as a post-AGB star with a unique optical spectrum displaying rare emission and absorption features from molecular gas at a temperature of about 500 K. In 2022, we serendipitously discovered that its optical spectrum has drastically changed since the last observations in the 1990s. Aims. We aim to characterize the drastic change in the spectrum and analyze the photometric behavior of the object since 1989. Methods. Optical high-resolution spectra of UEqu from the Southern African Large Telescope are supplemented by archival data and near-infrared photometry from the Nordic Optical Telescope. New spectral line observations with the Eelsberg 100m radio telescope and ALMA are presented. Radiative transfer modeling of multiple epoch spectral energy distributions is performed. Results. No circumstellar molecular features are present in the contemporary optical spectra of UEqu. Non-photospheric absorption and emission from neutral and ionized species dominate the current spectrum. Some of the observed features indicate an outflow with a projected terminal velocity of 215 km s?1. Broad H&K lines of [Ca ii] indicate a photosphere of spectral type F or similar. For the first time, we find SiO J =1−0 3=1 maser emission in UEqu. Our collected photometric measurements show that the source has been monotonically increasing its optical and near-IR fluxes since about the beginning of this century and continues to do so. The current rise in the optical regime is about 1 mag. Spectral energy distributions at dierent epochs show the presence of dusty circumstellar material that is very likely arranged in a highly-inclined disk. Adopting a distance of 4 kpc, informed by the Gaia parallax of Uequ, we find that the source's luminosity is on the order of 104 L. This luminosity has likely increased by a factor of a few in the last decades, which is most probably related to the drastic change in the optical circumstellar spectrum of the object. Conclusions. The object has changed considerably in the last three decades either due to geometrical reconfiguration of the circumstellar medium, evolutionary changes in the central star, or owing to an accretion event that has started in the system very recently. Observationally, UEqu appears to resemble the Category 0 of disk-hosting post-AGB stars of Kluska et al. (2022), especially the postcommon envelope binary HD101584. It is uncertain if the drastic spectral change and the associated optical/mid-IR rise in brightness witnessed in UEqu are common in post-AGB stars but such a radical change may be related to the real-time onset of the evolution of the system into a planetary nebula. We find that the post-AGB star V576 Car has undergone a similar transformation as UEqu in the last few decades, so the phenomenon is not extremely rare.