The spectral evolution of AT 2018DYB and the presence of metal lines in tidal disruption events - DTU Orbit (07/10/2019)

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We present light curves and spectra of the tidal disruption event (TDE) ASASSN-18pg / AT 2018dyb spanning a period of seven months. The event shows a plethora of strong emission lines, including the Balmer series, He II, He I and metal lines of O III λ3760 and N III λλ 4100 and 4640. The latter lines are consistent with originating from the Bowen fluorescence mechanism. By analyzing literature spectra of past events, we conclude that these lines are common in TDEs. The spectral diversity of optical TDEs is thus larger than previously thought and includes N-rich besides H- and He-rich events. We study how the spectral lines evolve with time, by means of their width, relative strength and velocity offsets. The velocity width of the lines starts at ~ 12,000 km s⁻¹ and decreases with time. The ratio of Hα to Hβ remains close to three, while the ratio of He II over N III increases with time. The same is true for ASASSN-14li, which has a very similar spectrum to AT 2018dyb but its lines are narrower by a factor of >2. High-resolution spectroscopy at maximum light does not reveal any narrow features that can be attributed to the TDE. By fitting the light curves of AT 2018dyb we estimate a mass of 4.0_{-2.0}^{+5.0} M⊙ for the black hole and of 0.7_{-0.6}^{+4.0} M⊙ for the disrupted star. The detection of strong Bowen lines in the optical spectrum is an indirect proof for extreme ultraviolet and (re-processed) X-ray radiation and favors an accretion origin for the TDE optical luminosity. A model where photons escape after multiple scatterings through a super-Eddington thick disk and its optically-thick wind, viewed at an angle close to the disk plane, is consistent with the observations. (Abridged)

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