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The WST view of the TDE population

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An unfortunate star passing too close to a Super Massive Black Hole (SMBH) can be destroyed by the strong tidal forces at play, giving rise to a Tidal Disruption Event (TDE). These transient phenomena manifest themselves as a luminous, short-lived, UV/optical/Xray flares coming from the nuclei of otherwise quiescent galaxies and have been heralded as a unique laboratory for studying SMBHs. TDEs reveal the presence of dormant low-mass SMBHs and they can unveil intermediate mass black holes (IMBH) in the local universe. They are powerful tool to study accretion-related phenomena on human-friendly time scales few months at all wavelengths and they can be used to probe the SMBH occupation fraction in different types of galaxies. Their rate and its evolution over cosmic time can give important information on the existence of SMBHs at high redshift (z>7). Finally, TDEs are exquisite multi-messenger phenomena, being candidate sources of high-energy neutrinos and gravitational wave (GW) sources potentially detectable by the future space-based interferometers such as LISA and the LGWA.

In the last decade, thanks to the availability of increasingly efficient wide-field optical surveys, the sample of TDEs has rapidly grown from a few candidates to tens of confirmed TDEs. The optical band has become the primary discovery channel and it became clear that the most important physics is encoded in the TDE spectra. A heterogeneous population of transients have been thus revealed, with some well established key observational features but also characterized by a broad range of properties, with each event still providing new clues but raising new questions. Indeed it is still a puzzle how TDE prompt emission is produced as well as the properties of the emission region itself, with many scenarios being proposed so far, but still under debate.

We are now in a TDE golden age, with a discovering rate reaching ~10/yr thanks to the ZTF survey. However, the upcoming advent of the Vera Rubin Observatory Legacy Survey of Space and Time (VRO-LSST) will greatly increase the TDEs discovery rate up to ~1000/yr, bringing TDE science into a new era. A WST spectroscopic survey would thus be transformational both for TDE and for SMBH physics.

I will present the new results from multi-wavelength follow-up campaigns performed with high quality photometric and spectroscopic observations, which have allowed to deeply investigate on the TDE spectroscopic features and their evolution with time. The implication on the underlying UV/Optical emission mechanism and on the properties of the emitting region will be discussed together with the invaluable impact that a WST survey targeting TDEs will have.

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