

Superluminous supernovae and their host galaxies

Ting-Wan Chen¹

¹*Max Planck Institute for extraterrestrial Physics*

A new class of supernovae, called superluminous supernovae, has been discovered in the past few years. They are 100 times brighter (with absolute mag -21) than normal core-collapse supernovae. This means that the standard paradigm of iron-core collapse cannot account for the origin of superluminous supernovae. An alternative mechanism is needed to power such high luminosities, such as magnetar spin down, pair-instability explosions or shell collisions. In this talk, I will present our work on superluminous supernovae, from their discovery using all-sky surveys (e.g. PanSTARRS1), to their classification with the Public ESO Spectroscopic Survey for Transient Objects (PESSTO), and their follow-up with large facilities such as the 8m VLT. We found superluminous supernovae appear to occur exclusively in metal-poor dwarf galaxies, indicating that a sub-solar metallicity is required to produce them. We also found a possible relation that, if magnetar powering is the source of the extreme luminosity, the initial magnetar spin is correlated with the metallicity of the host galaxy. If this correlation is found to hold, it represents a major step forward in our understanding of superluminous supernovae. Finally, I will discuss the ongoing and future science projects related to these explosions, in particular utilising JWST and LSST in the next era of high-redshift observations.