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Type Ia supernova spectral features and applications to dust reddening and light-curve standardisation

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In this talk, we present preliminary measurements of type Ia supernova spectral features such as equivalent widths and flux ratios and how such measurements are applied to the derivation of dust reddening in galaxies in which type Ia supernovae are discovered and the way they can be used to standardise type Ia supernova light curves in a more accurate manner than the traditional photometric method of standardising the light curves. While such studies have been conducted within the local Universe (i.e. at low redshifts, $z < 0.1$) by some authors, this has not been done extensively at intermediate and high redshifts ($z > 0.1$). Our understanding of whether or not the conclusions drawn at $z < 0.1$ also hold at $z > 0.1$ is therefore limited. It is for this reason that our type Ia supernova data sample for this study - part of which was taken with the Southern African Large Telescope and the rest from the literature - is from within the redshift range $0.1 < z < 0.4$ (which we refer to herein as intermediate redshifts). Our preliminary measurements of equivalent widths of two spectral features show no change in values compared to the same measurements obtained at low redshifts, i.e. we see no redshift evolution. As a result there is currently no evidence that the dust reddening law in galaxies, as derived from type Ia supernova spectral studies, evolves significantly with redshift, at least out to $z = 0.3$, something that can be better checked with more data. Further, our goal is to demonstrate whether or not flux ratio measurements at intermediate redshifts result in improved light-curve standardisation of type Ia supernovae at intermediate redshifts, a result also obtained by some authors at $z < 0.1$.

Presenter: KASAI, Eli (University of Namibia)

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