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NaCl : Nouveaux algorithmes de Courbes de lumière

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One main approach to constrain the dark energy equation of state is to construct a Hubble diagram, the evolution of luminosity distance with respect to the redshift using Type Ia Supernovae (SN Ia) used as luminosity distance indicators.
Measuring distances to SNe Ia requires a model of the SN spectrophotometric evolution, taking into account the intrinsic diversity of SNe Ia.

The model currently in use in the community is called Spectral Adaptive Lightcurve Template 2 (SALT2), developed between 2007 (Guy \& al. 2007) and 2010 (Guy \& al. 2010).
The state of the art is called SALT2.4 and was trained for the Joint Light Curve Analysis (Betoule \& al. 2014).
Recently a model update has been published, called SALT3 (Kenworthy \& al 2021), with a new training set.

I am currently developing a re-implementation of SALT2 intending to improve the general methodology and overall training speed. It is called NaCl, for Nouveaux algorithmes de Courbes de lumière.

My model follows SALT2 parametrization. The goal was to overcome SALT2 limitations identified within the SALT2 framework. The first advantage of the new code is a simplification of the training procedure. The five steps
of the previous SALT2 fit (training, intrinsic error modeling, retraining accounting for error model, re-evaluation of the error model, and finally light-curve fitting) have been implemented into a single-step comprehensive fit. As a result, error propagation is exact and straightforward.

In particular, the propagation of calibration systematic uncertainties is now taken into account, while it was propagated through several trainings.

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