Renewal of Associate Status

Report

Since 2017, I've focused my work on providing products and tools to the entire collaboration:

SEDM | My main contribution is the complete development of the now fully automated pipeline for the SEDM. The SEDM is now able to type more than a dozen transients per night and up to twenty on the clearest nights. The spectra are automatically extracted, flux calibrated, typed, and pushed to the marshal within 5 minutes following the end of acquisition. With joint hardware and software efforts, SEDM is now able to acquire ~19 mag in 40 minutes with good enough signal-to-noise for unambiguous typing under reasonable weather conditions.

Calibration | I am an active member of the ZTF calibration work, where I, together with Philippe Rosnet have dene a quantitative analysis on dome flat light leakage and impact of scattered light in reconstruction of dome flats. We are currently supporting Matteo Giomi in the creation of a full ZTF flat fielding solution, which will incorporate our findings.

Tools | I have created a python package, ztfquery, used by a significant fraction of the collaboration to easily query and download IPAC ZTF products and marshal data. I am also a core developper of the AMPEL broker: I've for instance created the T2-lightcurve fitter.

Short and medium term project

With my affiliate status, I would this year bring one PostDoc and two students. I hereafter briefly present our work plan. Our core motivation is to extract accurate distance measurements from ZTF SNeIa observations. We are highly integrated within the rest of the ZTF SN Cosmology group. Our tasks and scientific projects are:

PostDoc, R. Graziani (2018-2020) | His expertise is on building accurate Bayesian hierarchy modelling to mitigate potential systematics on derivation of cosmological parameters with distance measurements. His core activities will be: (1) helping extract photometric lightcurves and understand systematic uncertainties affecting our photometry. He will set the first stepping stone for implemented the "scene modelling" in ZTF; (2) Build a forward modelling Bayesian framework to accurately account for systematic effects in building the Hubble Diagram with ZTF and (3) Participate in measuring cosmological parameters with ZTF Type Ia Supernova data.

PhDs on Host biases, M. Briday (2018-2021) & E. Martel (2019-2022) | I have shown in several papers (Rigault et al. 2013, 2015, 2018) that standardised SNIa magnitudes depend on properties of their local environments. This observation has been confirmed by numerous studies. However it is unclear how to accurately account for this effect in cosmological analyses. M. Briday has started an overview analysis of all known effects to understand their underlying root causes. The expected size of ZTF's sample as well as our handle on its selection functions are key to this work. E. Martel will build an entire forward modelling pipeline to account for SN intrinsic variabilities in cosmological studies with ZTF's sample.

PhD on SNIa photo-typing, M. Amenouche (2019-2022) | Melissa will work on photo-typing for SN cosmology. She will use ZTF supernova lightcurves that have been typed by the SEDM. Our core motivation is to understand what the key features that could enable us to use photometric data only for SN cosmology are, and what could be the consequence of mis-classification on the derivation of cosmological parameters. Don Neill is interested in helping on this project.

My own project | Beside supervising all the aforementioned projects, I will focus my own work on ZTF on photometric calibration and accurate ligthcurve extraction. I will also continue adding more functionalities to pysedm ; e.g. host background continuum modelling from photometric data.

Mickael Rigault