

Type Ia Supernova forecast with Zwicky Transient Facility phase III

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The Zwicky Transient Facility (ZTF) at Mont Palomar Observatory (California, United States) has started its survey in early 2018, for six years. The ZTF project consists of a new camera of about 600 million-pixels mounted on the Samuel Oschin 48-inch Schmidt telescope. The design offers a large field-of-view of 47 square-degrees which, combined with a high cadence of observation, allows to scan the full observable sky in one night. ZTF is able to achieve a complete photometric survey of the northern sky in three nights using three optical filters (gri bands). All those features make this instrument a transient detection machine.

The ZTF survey entered operation phase II in 2021. About 6,000 well-measured Type Ia Supernovae (SNe Ia) will be observed by the ZTF-I+II surveys in the redshift range $0.01 \leq z \leq 0.1$ in 2024. These SNe Ia will be used in a Hubble diagram to perform accurate cosmological measurements. So the question now is : would it make sense to achieve an additional ZTF survey (that would start late 2025) to enrich the core-cosmological SNe Ia sample? Which survey features (cadence of observation, filter allocation, scanned area) would lead to a real scientific added value (cosmological parameter accuracy)?

The goal of the internship is to answer those questions using SNe Ia as cosmological probe. An important part of the work is to develop a set of tools (python scripts) for simulating SNe Ia light curves using realistic ZTF observing strategy inputs, fitting these light curves to assess SNe Ia parameters, and estimating cosmological metrics. This pipeline should be flexible and fast enough to test a wide range of observing strategies.