

# Photometric follow-up of young candidate planets

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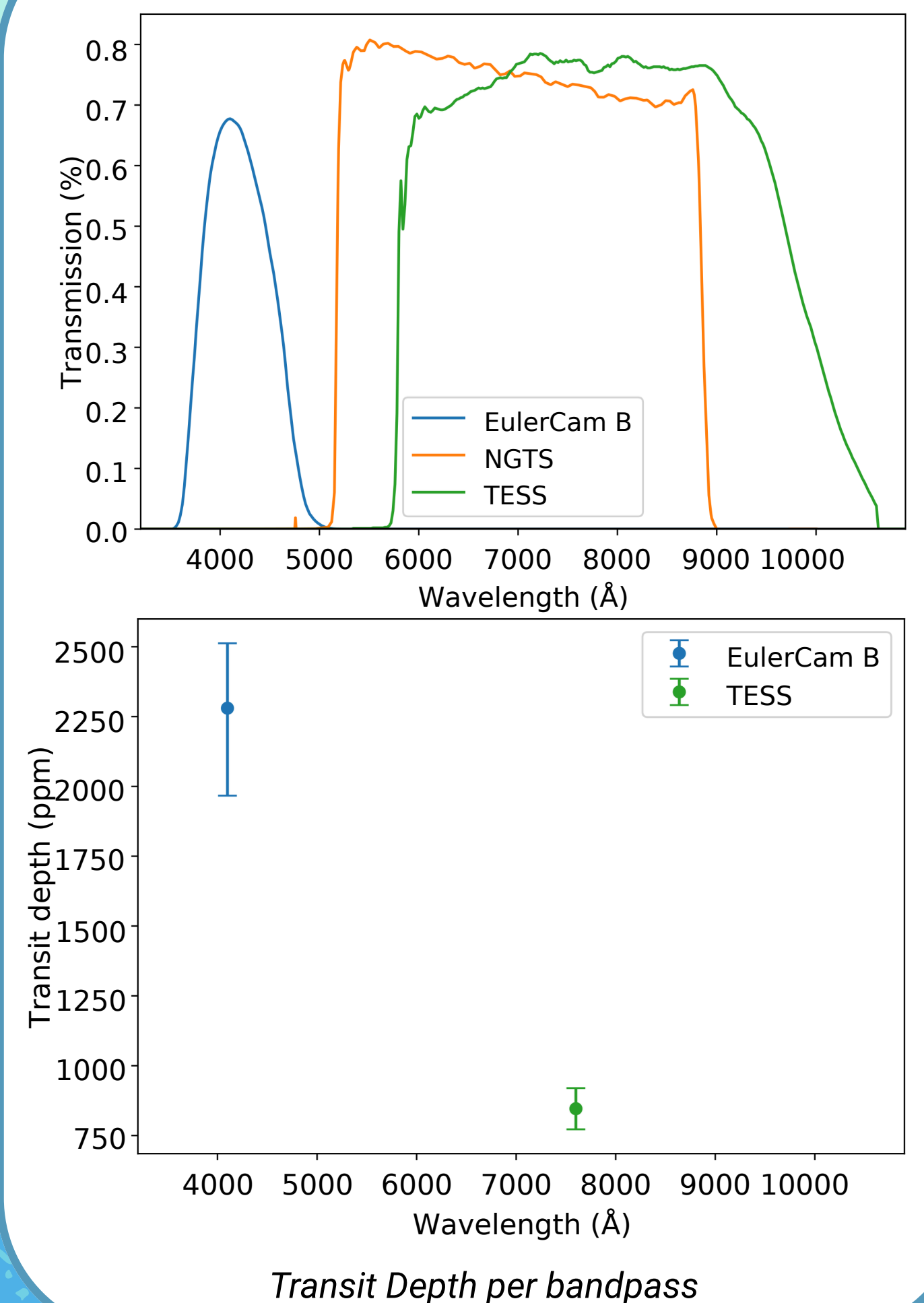
## Summary

We present photometric observations of a **young, transiting planet candidate**. The **transit depth varies** greatly with **colour**: 2280 ppm for EulerCam Blue and 846 ppm for TESS. This discrepancy could possibly be explained by a **false-positive detection**, contamination by a **background star**, or **stellar activity** of the host star.

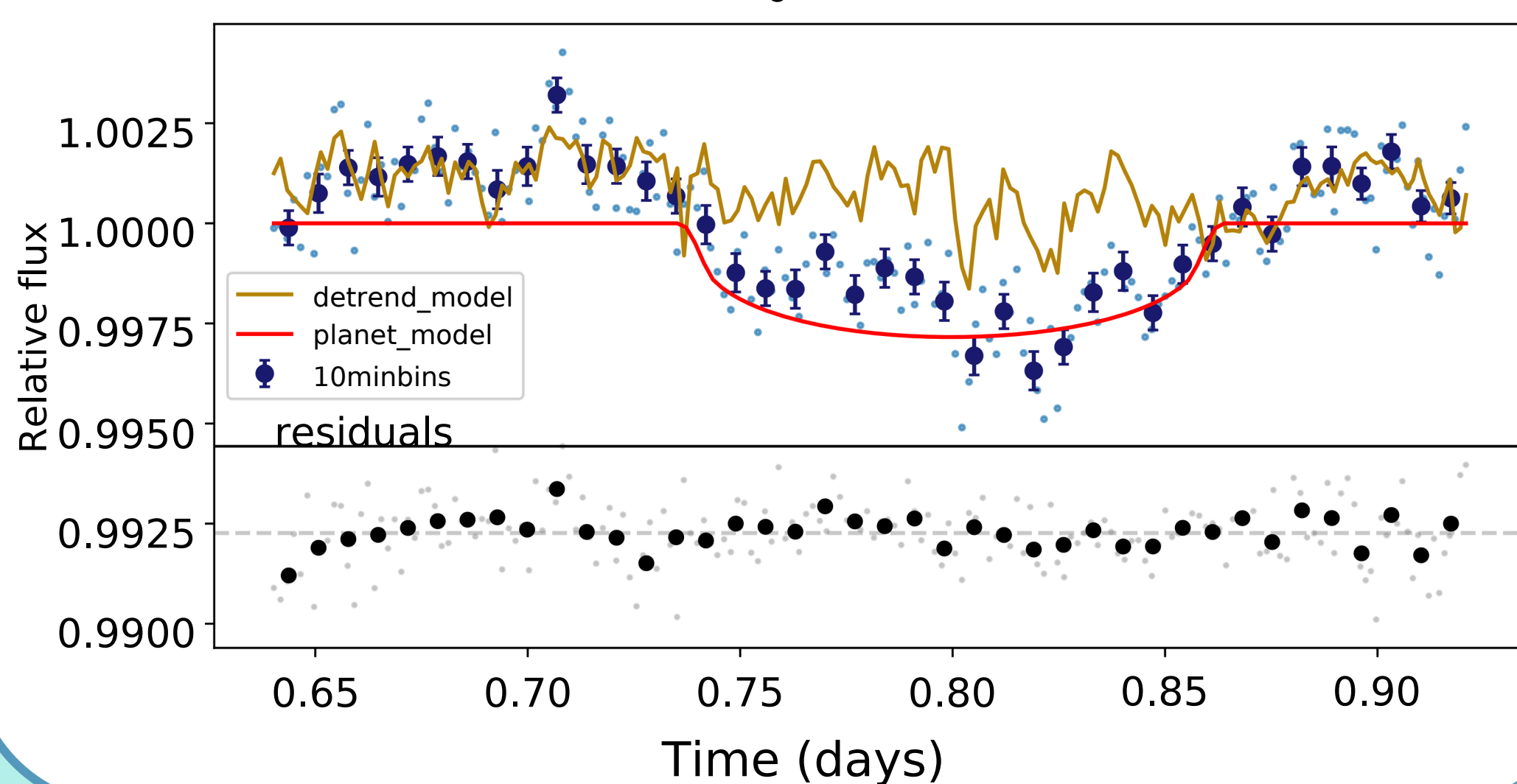
## Introduction

**Young planets** are useful objects to study the early stages of **planetary evolution**, as their properties are expected to change significantly during their early lifetime. For example, transit observations can reveal inflated planetary radii [1], indicating that the young object is surrounded by a large hydrogen envelope which may be lost over time [2]. Only a few objects with ages below 100 Myr are known at this point, as these planets are **difficult to detect and confirm** due to their strongly active host stars. In particular, RV-measurements of young stars suffer from extremely strong stellar noise [3]. However, **multi-colour photometry** can be used to distinguish a planetary from a stellar companion. Since a stellar companion emits light, its transit depth will vary more with colour compared to a planet. We are conducting multi-colour observations with ground- and space-based facilities to validate young planet candidates. Here, we present a transit of a **11-20 Myr old TOI** observed with **EulerCam**[4], mounted on the Swiss 1.2m Euler Telescope at La Silla.

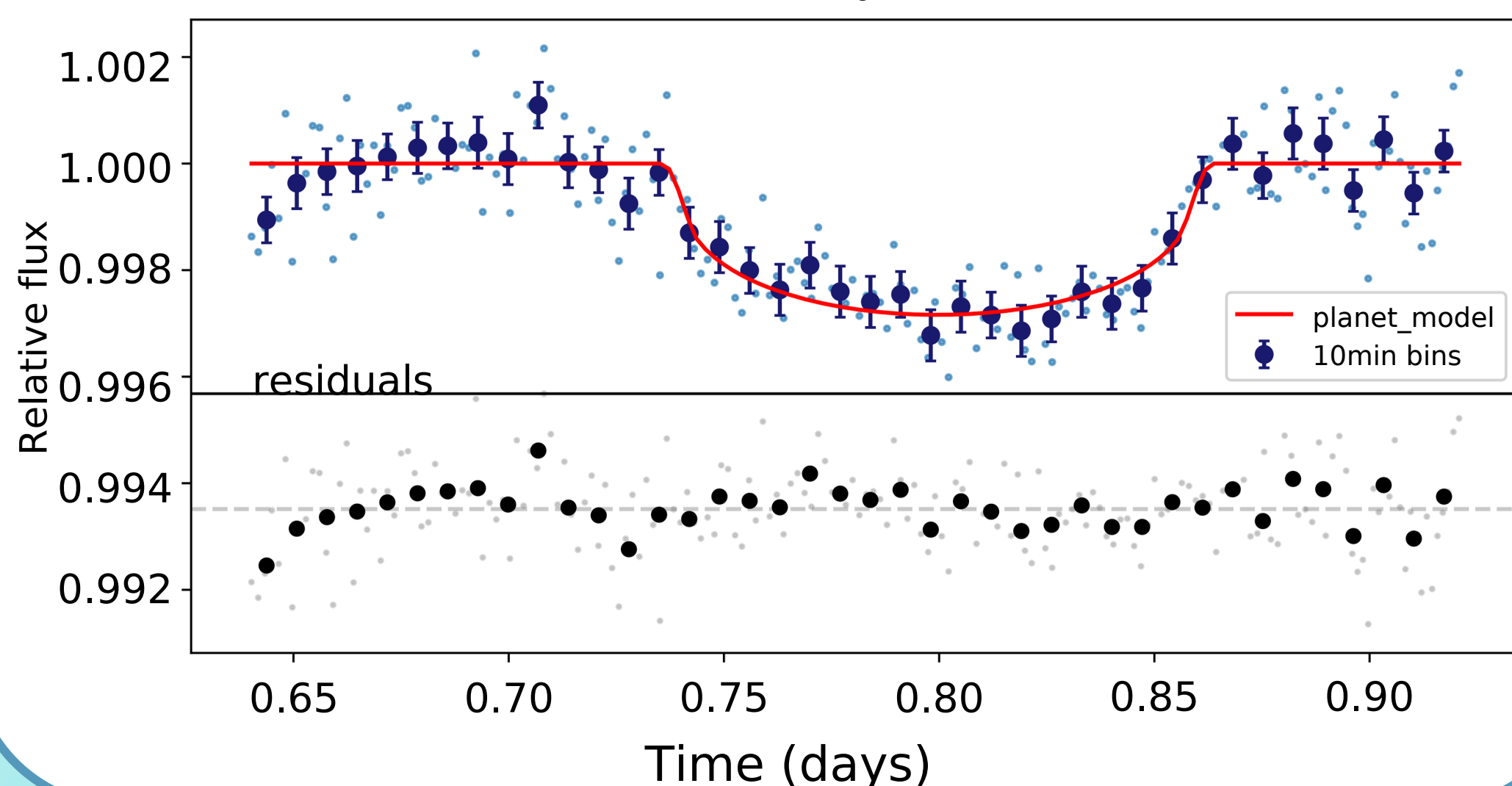
Bandpasses



Raw lightcurve



Detrended lightcurve



## Results & Discussion

The **transit depth** measured with the **EulerCam** blue filter is **2280 ppm**, **2.7 times larger** than the transit depth found with **TESS**, which is **846 ppm**. The large difference could indicate a **false positive**, meaning that the companion is actually a star instead of a planet. However, calculations show that a typical small dwarf star would be too large to cause these transit depths. More likely, a **background star** could be diluting the host star, causing the transit to appear shallower, or strong **stellar activity** could be causing the colour-variation of the transit depth.

## Methods

The **EulerCam** observations were taken in the **Geneva Blue filter**, which were compared with observations by **TESS**[5] and **NGTS**[6]. The analysis was carried out using **CONAN**[7]. The transit was fitted together with a parametric baseline model to account for instrumental or weather effects, the parameters and complexity of which were selected via BIC comparison. We found a model of 1st-order polynomials in pixel-shift in x-direction and stellar FWHM to best fit the correlated noise in the data set.