

EGU23-1965, updated on 03 Dec 2023

<https://doi.org/10.5194/egusphere-egu23-1965>

EGU General Assembly 2023

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Digital zenith camera VESTA and vertical deflection test site measurement results

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Digital zenith camera (DZC) VESTA (VERTical by STARs) was developed at the University of Latvia and has achieved an accuracy of 0.1 arcseconds.

Currently, a detailed analysis of optimal measurement conditions and potential error sources of DZC VESTA is performed. This study focuses on:

- testing various parameters of DZC VESTA measurement session: session length, image binning, exposure time;
- effect of external conditions: average number of observed stars, temperature, humidity, pressure, wind speed, sky, microseismic;
- a significant error source is atmospheric anomalous refraction at the zenith - the amplitudes of the observed zenith coordinate fluctuations reach several arcseconds, and the final vertical deflection (VD) values have amplitudes of approximately 0.2-0.5 arcseconds during the overnight session.

For measurement purpose, a test site with 4 points at a 50x50 meter distance was established and measurements there were started in May 2021. Moreover, it is planned to continue measurements at least for 2 years (till May 2023) to obtain vertical deflection time series at all 4 points of the test site, 1.9 years of regular measurements are completed so far. Several overnight measurement sessions were performed with two adjacent DZCs to investigate anomalous refraction. Preliminary analysis results of VD test site measurements will be presented.

This research has been supported by the European Regional Development Fund activity "Post-doctoral Research Aid", project No.1.1.1.2/VIAA/4/20/666