Star Verification Manual Results Report

DIFFERENCE CALCULATION

To compare the results, angular differences were used between three sources: the expected Excel/JPL-Stellarium values, the values calculated by the script, and the values checked manually in Stellarium Web.

The altitude difference is calculated as a simple absolute difference:

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abs(compared_altitude - reference_altitude)
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The azimuth difference is also treated as an angular difference, but taking into account that azimuth is circular and runs from 0° to 360°. This avoids artificial errors when one value is close to 0° and the other is close to 360°. Conceptually, the formula used is:

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abs(((compared_azimuth - reference_azimuth + 180) %% 360) - 180)
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The differences are mainly expressed in arcseconds. To convert them to degrees, they are divided by 3600. The tolerance used by the star script is 0.1°, equivalent to 360 arcseconds. Therefore, differences of 10", 30", or even 100" are still within tolerance. A difference greater than 360" exceeds the 0.1° tolerance.

SUMMARY OF MANUAL RESULTS

The manual review with Stellarium Web confirms that most of the star cases are consistent with the Excel/JPL-Stellarium values and with the script. In the passing cases, the differences are usually well below 0.1°. In several examples, the differences are only a few arcseconds in azimuth and between 5" and 40" in altitude, which is acceptable for the defined tolerance.

Cases 1 to 7 show good agreement. Sirius, Polaris, Vega, and Canopus remain within tolerance with small differences. In case 6, Vega in Chicago, two slightly different times were tested in Stellarium Web. The first time is closer to both the Excel and the script; the second is farther away in azimuth, but still remains within the 0.1° tolerance. This shows that small differences of a few seconds in the entered time can noticeably shift the azimuth, especially for high-altitude stars.

Case 8, Polaris in Sydney, confirms a real failure against the Excel. Stellarium Web is very close to the script, but far from the expected Excel value in altitude. The difference against the Excel is approximately 0.413° in altitude, while the difference against the script is much smaller. This indicates that the problem is probably in the Excel reference value, not in the script calculation.

Cases 9 to 18, except for specific notes, pass correctly. Canopus, Achernar, Sigma Octantis, Polaris, Vega, and Pollux show differences compatible with the defined tolerance. At high latitudes, such as Reykjavik, Tromsø, Fairbanks, and Alert Canada, the differences remain within the acceptable margin. This is important because those scenarios are more sensitive due to the observing geometry near the celestial pole.

Case 19, Sigma Octantis in McMurdo, cannot be evaluated as a direct astronomical discrepancy because the coordinates used in Stellarium Web do not match the coordinates in the Excel file. The Excel uses latitude -77.85 and longitude 166.72, while Stellarium was configured with latitude -77.52665 and longitude 164.98549. The latitude difference is approximately 0.323°, and the observed altitude error is approximately 0.338°. That correspondence indicates that the difference is mainly explained by the different location, not by an error in the script.

Case 20, Polaris in Quito, initially appeared as a failure, but after correcting the elevation handling in the calculation, it became PASS/PASS2. The manual comparison shows that Stellarium is close to both the Excel and the script. The previous failure came from how Quito's elevation was being applied in astrolibR, not from an underlying astronomical discrepancy.

Case 21, Canopus in Singapore, confirms another relevant failure in the Excel or expected reference value. Stellarium Web is much closer to the script than to the Excel: against the Excel, the altitude difference is approximately 1369", while against the script the difference drops to about 42". This supports the script calculation and suggests that the expected Excel value does not match an external reference.

Cases 22 and 23 pass. In Greenwich for 1572 and Flagstaff for 1930, the differences with Stellarium Web remain below the 0.1° tolerance. The historical Greenwich case shows an azimuth difference of about 36", which is still acceptable.

Case 24, Vega in Bethlehem with a negative year, could not be manually verified in Stellarium Web because the system did not allow the BCE year to be entered correctly. Therefore, there is no valid manual comparison for that case. The script keeps it as FAIL/FAIL2 against the Excel, but the external manual validation remains pending or requires another tool that correctly handles BCE years.

Cases 25 and 26 show relevant issues. In case 25, Canopus in Samoa, Stellarium Web is much closer to the script than to the Excel in altitude, although there is still a noticeable difference. Against the Excel, the altitude difference is approximately 1704.5", while against the script it drops to about 140.3". This suggests that the Excel/expected reference may be offset. In case 26, Canopus in Tonga, there is also an important difference between the case coordinates and the coordinates used in Stellarium Web. For that reason, the comparison should not be interpreted as a clean test until the exact location is confirmed.

Case 27, Sirius in New York City, passes. The manual comparison is close to the expected value and within tolerance.

GENERAL CONCLUSION

The manual verification supports most of the results from the star script. In the PASS cases, the differences with Stellarium Web are small and well below the 0.1° tolerance. In several failed cases, Stellarium Web aligns better with the script than with the Excel, especially in cases 8, 21, and 25. This suggests that some FAIL results do not necessarily come from the script calculation, but from expected Excel values or configuration differences in Stellarium Web.

In addition, there are two FAIL cases whose differences can be explained by limited precision in the coordinate configuration in Stellarium Web, since it only accepts city names and not exact coordinate entry.