TIME
Calculating Besselian Epoch

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Visit: Boyce Astro @ http://www.boyce-astro.org
Calculating Besselian Epoch

Overview

This lesson will show you how to convert your image date to Besselian, which is the recognized standard for Double Stars.
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Method

Per Argyle (Measuring Double Stars), there are two standards: Besselian and Julian with Besselian as a “best” method is used for doubles.

To calculate: You need to know the Julian Date of your observation: http://aa.usno.navy.mil/data/docs/JulianDate.php
Also, click on the next slide for an alternative way to find the Julian Date
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To Find Julian Date: Open your image in Maxim. Select “VIEW, FITS HEADER”. The following window will appear.

JD is here:

\[ \text{JD} = 2457681.5985648148 \] / Julian Date at start of exposure
Method

Next, the Besselian Epoch can be found by:

\[
\text{Besselian epoch} = 1900 + \frac{(\text{Julian Date} - 2415020.31352)/365.242198781}{365.242198781}
\]

The Besselian epoch at 1900 is 2415020.31352.

The divisor above is the “true” length of the year in days.

Therefore, the equation is linear from 1900 (midnight 1899) using the Julian epoch for that date (2415020.31352).
Method

Let’s do an example:

1. Image date: November 7, 2016 at 4:00 PM UTC. (Note, you need to convert observatory time to UTC)
2. Go to the USNO website (http://aa.usno.navy.mil/data/docs/JulianDate.php)
3. Enter the date / time of your observations – it will calculate the Julian Date (JD) and provide this result
   • The Julian date for CE 2016 November 7 04:00:00.0 UT is JD 2457699.666667
4. Plug this value into the equation below:
   • Besselian epoch = 1900 + (2457699.666667 - 2415020.31352)/ 365.242198781, therefore
   • Besselian epoch = 1900 + 116.85111 = 2016.85111

5. NOTE: Computing the date by counting the days in the year, November 7, 2016 would be 2016.85205. Not very different but not recognized as correct.
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NOTE: On the Boyce-Astro Forums, there is an Excel calculator for this action.

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<td>Enter the Julian date of your image from the FITS Header:</td>
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<td>Input this Besselian Epoch into your paper as the observation date:</td>
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Questions?