Methods for light curve preparation: the case of long-period variables

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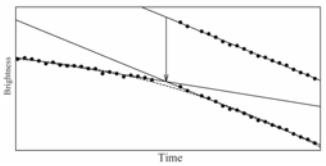
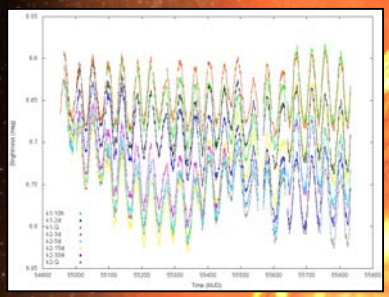
We present two methods to prepare of M giant's raw data for analysis. The corrected light curves are very sensitive to the specific methods we choose. The results of the methods are mainly influenced by the ratio of the oscillation periods and the length of the gaps between the quarters. Here we demonstrate the effects of the methods with different parameters, both in the cases of real stars and simulated data series.
Most importantly, stitching together separate quarters for M giant light curves can be a complex task, mostly because the time-scale of variability is compatible with the time-span of the quarters.
We conclude that it is difficult to choose the best merging method, and it depends on the character of the light curve. Therefore we cannot offer a total automation of light curve preparation. In many cases some different methods give similarly good solutions, but with different trends.

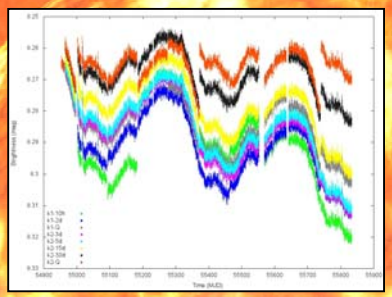
We processed Q0 – Q10 data series.
The two method that we used to merge the quarters are the following:

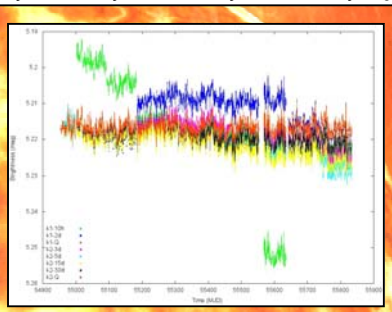
k1-L: line fitting of a segment at the end of a quarter (L: the length of this segment) and at the begining of the next quarter, and then shifting the next quarter in such way that the two lines intersect each other in the gap of the two quarters.
L = 10h: 10 hours, 2d: 2 days, Q: full quarter

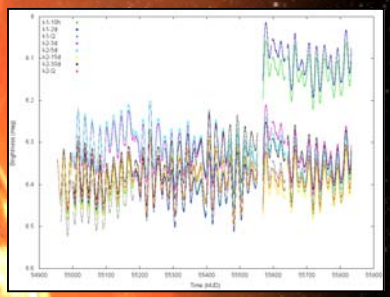


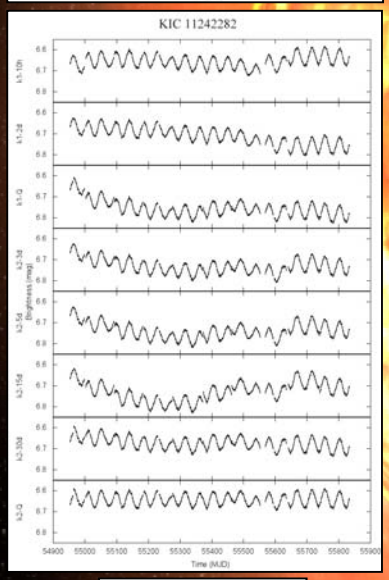
k2-L: calculating mean values at the end of a quarter (L: the length of this segment) and at the begining of the next quarter, and then shifting the next quarter by equalizing the mean values.
L = 3d: 3 days, 5d: 5 days, 15d: 15 days, 30d: 30 days, Q: full quarter



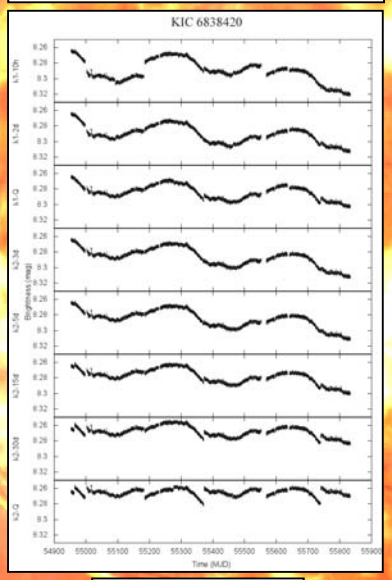




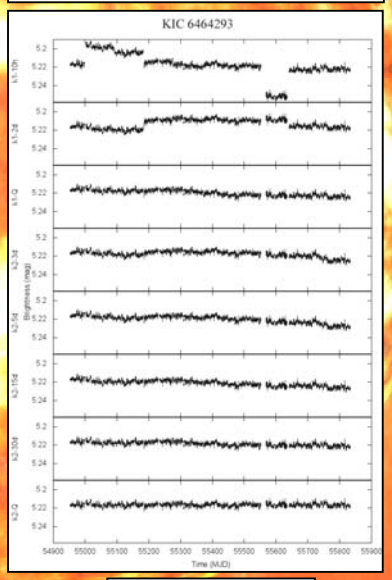




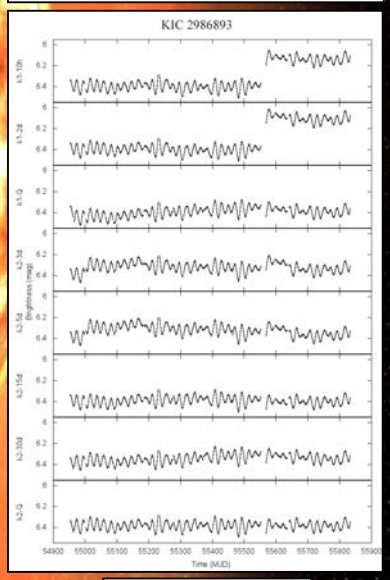
The best method: k2-Q



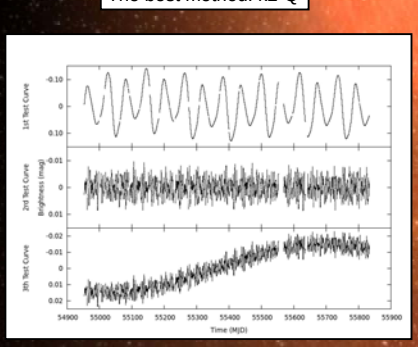
The best method: k2-3d



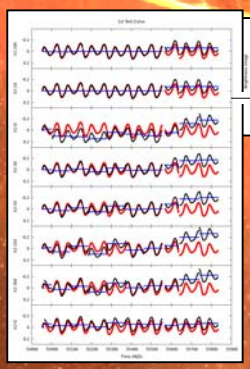
The best method: k2-Q

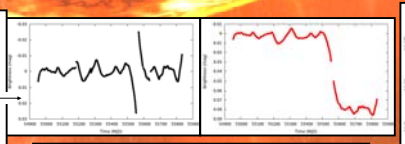


The best method: k2-Q

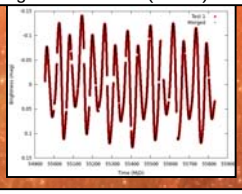


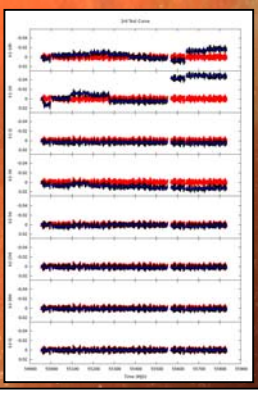
Three simulated test light curves. We calculated synthetic magnitudes at the same times as real stars were observed. The model consists of 10 frequencies of two real stars. The second and third case differ only in a long period trend.
We shifted the quarters randomly and then we used the two methods described above to merge the unified data series.

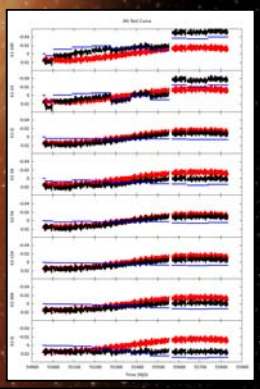




1st test curve merged with k1-2d and then prewhitened with 10 frequencies (top left black), and after merged again (right red). Using the parameters of this merging for the shifted light curve we obtain total agreement with the original test curve (below).







Comparison of the original (red) and the merged (black) datasets; the averages of the quarters are signed with blue. The best solution is k1-2d or k2-Q in the first case, while in the second case k2-30d or k2-Q, but in the third case k1-Q or k2-5d.

Acknowledgements:
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References:
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