

“THE WORLD OF DELTA SCUTI STARS”, A COMPUTER ANIMATED MOVIE ABOUT NONRADIAL PULSATION AND DELTA SCUTI STARS

A. W. Schmalwieser

Institut für Astronomie, Türkenschanzstrasse 17, A-1180 Wien, Austria

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Abstract. A movie “The World of Delta Scuti Stars” was made to give a clear idea of the basic properties of nonradially pulsating stars and the progress in asteroseismology by multisite campaigns.

Key words: stars: variables: δ Scuti type, individual: FG Vir – animation movie

1. INTRODUCTION

One of the advantages of computer animation is to give a clear idea of complex geometric objects or of geometric effects by three dimensional construction and moving the objects in three dimensions like in the case of a rotating nonradial pulsator. Another advantage is to show several (time dependent) properties such as the positions of the different kinds of pulsating stars in the Hertzsprung-Russell diagram together with their pulsation frequencies. Computer animation can also show how multisite campaigns by WET or DSN work. These are three of the topics covered by this computer animated movie.

2. CONTENTS OF THE MOVIE

The movie deals with the following themes:

1. Why is the group of stars called “ δ Scuti Stars”?
2. How long do we know them?
3. What is the position of δ Scuti Stars inside the HR diagram?
4. How long are their periods?
5. What other kinds of pulsating stars do we know?

6. Where is their place in the HR diagram?
7. Comparison of pulsation frequencies, radii and amplitudes of different kinds of pulsating stars.
8. How do pulsating stars change their surface?
9. Shaded surfaces of low degree modes ($\ell = 1, \dots, 4$ and different m) to give a three-dimensional effect.
10. Surfaces colored according to radial displacement to emphasize the deviation from radial symmetry.
11. Changes of surface, temperature and brightness of single modes.
12. What is m -splitting?
13. FG Virginis, an object of interest for many years and all over the world.
14. How do multisite campaigns such as WET work, shown by FG Vir?
15. Handling the large amount of photometric data, frequency-analysis and signal to noise relation.
16. Comparison of observational and theoretical mode identifications.
17. The surface of the multimodal pulsating star FG Vir.

3. TECHNICAL DETAILS

The programming language was IDL. 18200 single frames of 780×550 pixels were calculated and stored as GIF-files of 420 kB size each. To reduce the huge amount of data (7465 MB) these GIF-files were converted into the movie file format FLIC with a playback speed of 20 frames per second. So the resulting playback time is a little more than 15 minutes and the amount of data is reduced to 290 MB without data loss (compression factor 25). We use the FLIC format because of the missing data and quality loss compared to other movie file formats. The frames are encoded with RLE (run length encoding) and delta encoding. The decoding is very fast and only a simple PC is necessary to play a fullscreen movie. It is very simple to add or extract sound files or to change playback speed without changing the movie file. Public domain FLIC players are available for almost every operating system. The soundtrack was composed with Csound (public domain) using the Accci (Amsterdam Catalogue of Csound Computer Instruments, also public domain) and edited using WavLab.

The movie is available on CD-ROM and VHS-Video. For movie request and further information feel free to contact the author.