

SPHERICAL OSCILLATION PATTERNS

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ABSTRACT

Spherical harmonics are an integral part of the study of stellar pulsations. To gain an understanding of how the star is affected by non-radial pulsations, the radial part of the oscillation is plotted, with an assumed sinusoidal time variation. The amplitude of the motion is arbitrarily set at 20% of the radius.

The actual quantity plotted is:

$$R = R_0 + a \sin(\omega t) p_{\ell}^m(\cos\theta) \cos m\phi$$

for $\ell = 0, 1, 2, 3$

$m = 0, 1 \dots \ell$

$R_0 = 1.5$

$a = 0.3$

$\omega = 2\pi \text{ rad/sec.}$

The motion in the film is from the $\theta = \pi/2, \phi = 0$ to the $\theta = 0$ point (i.e. the North Pole). The shrinkage at the sphere is unintentional and is a result of routines called in the generating program.

The movie demonstrates that the number of mode lines (great circles of zero motion) is always equal to ℓ . The pattern displayed is a standing wave, traveling waves can be formed as well, using linear combinations of the displayed modes.

The movie "Stellar Oscillation Patterns is available as "Spherical Oscillation Patterns." To obtain this film, please order Los Alamos Film X-331 from:

Cinesound
915 North Highland Avenue
Hollywood, CA 90038 USA
PH: 213-464-1155

Please include this title, number and time (6 minutes) with your request. If you have any questions, please contact Dean Pesnell at the address given or telephone 904-392-0507, 0521.

REFERENCES

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