Comm. in Asteroseismology
Vol. 150, 2007

Microsatellites

W. W. Weiss

Institute of Astronomy, University of Vienna, 1180 Vienna, Austria

Abstract

Asteroseismology is the most efficient method for investigating the interiors of stars and for testing current theories of stellar structure and evolution. One of the most important ingredients for this research field are pulsation eigenfrequencies of the target stars. The determination of such frequency spectra poses a challenge to observers, as the amplitudes can be extremely small and the frequencies need to be known to high accuracy. These requirements call for long and uninterrupted photometric data sets with a high duty cycle, and a reduction of all noise sources to achieve the photon noise limit in the optimum case.

Already since the early days of asteroseismology two strategies were followed to pursue this goal: establishment of observatory networks on ground, and photometry from space.

While various observatory networks are working successfully since 20 years and more, attempts to launch a dedicated space photometer were unsuccessful until June 2003, when MOST was brought into orbit. The potential of the stable space environment for photometry, however, was demonstrated already by, e.g., HST, WIRE, the IUE star tracker, but no large continuous photon noise limited data sets with a large duty cycle could be obtained with these satellites.

With MOST already in orbit, COROT, due for launch end of December 2006, and Kepler in 2008, the situation has recently improved dramatically. Largely unnoticed by the asteroseismological community another technical development boosted the potential for space photometry: 3-axes stabilized nanosatellites. These satellites with less than 10 kg mass and typically a shape of a cube with not more than 30 cm in size basically can be built by students, launched and operated from rather small University institutes. The total budget needed is comparable to the costs of a smaller auxiliary instrument of one of the larger observatories.

We in Austria have embarked together with our colleagues from Canada (Universities of Montreal, Toronto, and Vancouver) on the development of a network of up to four nanosatellites, called BRITE-Constellation. The two Austrian components are already funded. This ensemble of satellites will be launched in 2008 and will allow high precision two-colour photometry of bright and luminous stars. This group of objects is particularly interesting as it determines largely the ecology of our Universe.