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DIVISION V VARIABLE STARS

ÉTOILES VARIABLES

Division V deals with all aspects of stellar variability, either intrinsic or due to eclipses by its companion in a binary system. In the case of intrinsic stellar variability the analysis of pulsating stars, surface inhomogeneities, stellar activity and oscillations are considered. For close binaries, classical detached eclipsing binaries are studied as well as more interacting systems, like contact and semi-detached binaries, or those with compact components, like cataclysmic variables and X-ray binaries, including the physics of accretion processes.

DIVISION V COMMISSIONS

Commission 27 **Variable Stars**
Commission 42 **Close Binary Stars**

DIVISION V WORKING GROUP

Division V WG **Spectroscopic Data Archiving**

INTER-DIVISION WORKING GROUPS

Division IV-V WG **Active B-type Stars**
Division IV-V WG **Ap and Related Stars**

TRIENNIAL REPORT 2006 - 2009

1. Introduction

Division V on *Variable Stars* consists of Commission 27, also called *Variable Stars*, and Commission 42 *Close Binaries*. Thus the former deals with stars whose variations are intrinsic, whereas in the latter the variations are caused by the interactions between the components in the binary. It is evident that the definition of the Division is predominantly observational, and there may be cases where the assignment of an object to one of the two commissions may be in doubt. For example, the observation of pulsating stars in eclipsing binaries within nearby galaxies, or the relation between some types of oscillation modes and membership to binary systems, have been widely discussed.

The report of the Division for the triennium is obviously documented in the reports of each of the two Commissions, as well as the associated Working Groups, and reference to them has to be made here. The preparation of the report of the only Working Group

of Division V proper, on Spectroscopic Data Archiving, has not been produced in time due to ongoing discussions about its orientation and future, which will be the subject of decisions to be taken in the coming IAU XXVII General Assembly.

2. Variability

The progress of studies on variable stars has been reviewed in a series of international meetings in almost all the domains of interest for Division V. Particular attention has been paid to the launch and operation of the French-led space observatory *CoRoT*, especially designed for the study of asteroseismology as well as the search for extra-solar planets. Of course, in addition to the core programme targets, a good number of pulsating stars and eclipsing binaries of different types have been discovered and are now the subject of in-depth analysis. The literature of close binary stars, like that of other variables, suffers from a multiplicity of names for the objects of study. Discussions on nomenclature and different possible classification schemes have triggered a lot of interest, no doubt at least partly due to the wealth of data provided by surveys of different type, like the Sloan Digital Sky Survey but also MACHO, OGLE or ASAS. They are providing excellent new data for astronomers working in the field of variable stars, both intrinsic variables or binary stars, requiring adequate tags to help data mining.

Among the most interesting activities, the study of solar-like oscillations, now including sub-giant and giant, has found important new applications in the analysis of stars hosting planets. Main sequence pulsators are showing a growing number of 'hybrid' cases blurring the usually adopted classifications, while new interferometry results complement traditional sources of information. In particular, new data cast light on the possible mechanisms for energy deposition on magnetic waves in roAp stars. The study of the Cepheids *P*eriod-*L*uminosity relation has also focus the attention of researchers. Stellar activity continues to develop thanks to space missions like *MOST* and large X-ray observatories. Equally, during the triennium there was a continued growth in the study of pulsating subdwarf B-type stars.

3. Close binaries

Concerning close binaries, there has also been important new advances. Most short-period double-lined eclipsing binaries with M-type components continue to indicate that the sizes of M-type dwarfs are larger than predicted by theory, and their temperatures are lower. The discrepancies with models are no longer confined to low-mass systems. Both heavy spot coverage and reduced convective efficiency due to strong magnetic fields may play a role. For W UMa binaries we know now that almost certainly they have companions. The list of cataclysmic white dwarf pulsators has grown and are being probed with asteroseismological techniques to address the extent to which accretion affects the white dwarf parameters. A likely classical nova shell has been detected around the prototype dwarf nova. This would be one of the first direct links between classical and dwarf novae. The large ratio of short- to long-period CVs predicted by standard CV evolution theory with observed data can only be reconciled if the rate of angular momentum loss below the period gap is increased. A mechanism of angular momentum loss in addition to gravitational radiation is required.

Important analyses of Algol systems has continued. Evolutionary models suggest that a circumbinary disk could extract angular momentum from the binary, thereby causing the orbit to shrink. This disk may explain the low mass ratio systems undergoing rapid

mass transfer. Synthetic spectra of cool Algol secondaries can now be calculated. In active binaries, Doppler maps show low latitude spots with a temperature contrast and some weak polar features. Weak solar-type differential rotation is derived. Observational evidence of interacting coronae of the two components of a young binary system has been reported giving the first evidence that even if the flare origin is magnetic reconnection due to inter-binary collision, both stars independently emit in the radio range with structures of their own.

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