Invited lecture

3D SPECTROSCOPY OF EMISSION LINE SPECTRA OF PLANETARY NEBULAE: DIAGNOSTIC TOOLS FROM THE MILKY WAY TO NEARBY GALAXIES AND BEYOND

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Planetary nebulae (PN) have been introduced to study stellar populations and the chemical evolution of galaxies based on individual objects, rather than on integrated light properties of a galaxy under study. The comparison of predicted spectra from photoionization models with observed PN spectra allows us to derive physical parameters and the chemical composition of the nebula. The high emission line luminosity at the post-AGB stage is practically the only way to access individual intermediate mass stars spectroscopically at the distance of local group galaxies and beyond, e.g. the intracluster medium of the Virgo cluster. We discuss an ongoing programme to test the validity of extragalactic planetary nebulae as tracers of intermediate mass stellar populations, using modern observing techniques like integral field ("3D") spectroscopy, and theoretical tests with time-dependent radiation-hydrodynamical simulations, and the effects of departure from the assumption of spherical symmetry, constant density, and thermal and ionization equilibrium on the conventional PN diagnostics.

Invited lecture

PULSATIONS IN THE ATMOSPHERES OF Ap STARS

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We present recent results of the observational study of rapidly oscillating Ap (roAp) stars. Spectacular progress in this field has been achieved by considering high time resolution spectroscopy in addition to the classical high-speed photometric measurements. Spectroscopic observations of roAp pulsations led to the discovery of a multitude of unexpected phenomena, generally pointing to an extreme vertical chemical nonuniformity of the atmospheres of magnetic CP stars. Detailed analysis of spectroscopic pulsational behaviour allows us to establish relashionship between pulsations and vertical stratification of chemical elements.