New Horizons in Time-Domain Astronomy
Proceedings IAU Symposium No. 285, 2011
R.E.M. Griffin, R.J. Hanisch & R. Seaman, eds.
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doi:10.1017/S1743921312000464

Towards a New Generation of Multi-Dimensional Stellar Models: Can Our Models Meet the Challenges?

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Invited Talk

Summary. The talk described the first steps of development of a new multi-dimensional time-implicit code devoted to the study of hydrodynamical processes in stellar interiors. The main motivation stemmed from the fact that our physical understanding of stellar interiors and evolution still largely relies on one-dimensional calculations. The description of complex physical processes like time-dependent turbulent convection, rotation or MHD processes mostly relies on simplified, phenomenological approaches, with a predictive power hampered by the use of several free parameters. These approaches have now reached their limits in the understanding of stellar structure and evolution. The development of multi-dimensional hydrodynamical simulations becomes crucial to progress in the field of stellar physics and to meet the enormous observational efforts aimed at producing data of unprecedented quality (COROT, Kepler GAIA). The code we are developing solves the hydrodynamical equations in spherical geometry and is based on the finite volume method. The talk presented a global simulation of turbulent convective motions in a cold giant envelope, covering 80% in radius of the stellar structure. Our first developments show that the use of an implicit scheme applied to a stellar evolution context is perfectly thinkable.

Echo Mapping of AGNs

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Summary. Time delays can be used to dissect on micro-arcsecond scales the structure of photoionised gas in active galactic nuclei. This talk discussed methods used for this type of indirect imaging, and presented some recent results.

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https://doi.org/10.1017/S1743921312000464 Published online by Cambridge University Press