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The Future of Neutrino Astronomy: Prospects with Hyper-Kamiokande

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Neutrinos, elusive and abundant particles, play a pivotal role in understanding some of the most extreme astrophysical events, including supernovae. This presentation explores the role of neutrinos in stellar evolution, with a particular focus on their importance in the mechanisms of supernova explosions. We will introduce the Hyper-Kamiokande experiment, a next-generation water Cherenkov detector, which is poised to revolutionize neutrino astronomy through its unprecedented sensitivity and technological advancements over its predecessor, Super-Kamiokande.

The discussion will cover the detection of supernova neutrinos, highlighting the expected signals from supernovae and how Hyper-Kamiokande's capabilities will improve upon past observations, such as the iconic detection of SN 1987A. We will also explore the exciting prospects for detecting pre-supernova neutrinos, which may offer early warning signals of impending supernovae, and how simulations like WCSim and GHOST are being adapted to model these early neutrino signals.

Furthermore, the presentation will look beyond supernovae, examining other potential applications of Hyper-Kamiokande in neutrino physics, including solar neutrinos and neutrino oscillations. The future of neutrino research is vast, and Hyper-Kamiokande's advancements promise to answer critical questions, pushing the boundaries of our understanding of the universe's most energetic phenomena.

Abstract Category

Astrophysics & Cosmology

Author: EL KAFTAOUI, Assia (The Scientific Program of ASP2021)

Presenter: EL KAFTAOUI, Assia (The Scientific Program of ASP2021)

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