

Title : [Neutrino physics and astrophysics using neutrino observatories in Japan](#)

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Research Area:

High Energy Physics – Neutrino physics and multi-messenger astrophysics

Methods:

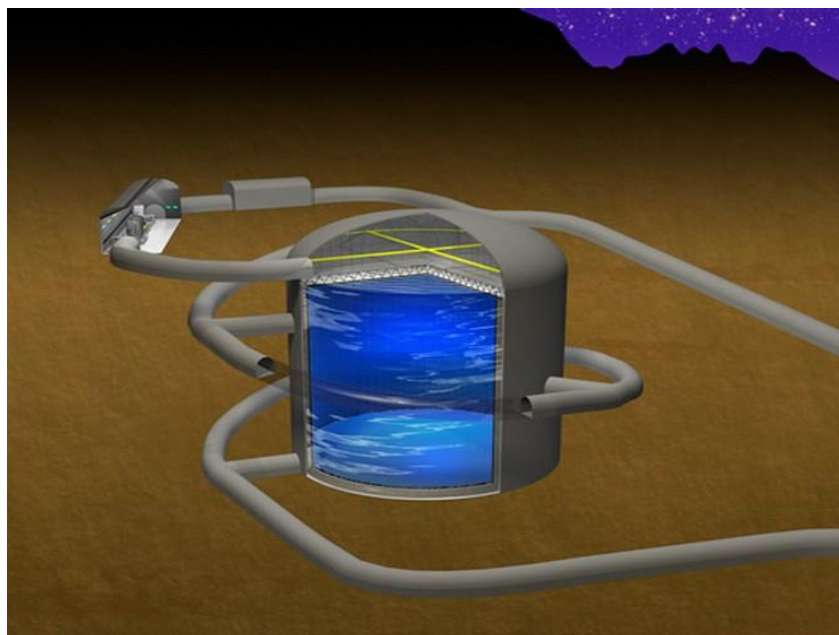
T2K and Super-Kamiokande Neutrino data analysis.

Hyper-Kamiokande detector R&D and construction.

Neutrino physics phenomenology.

PhD track subject :

The oscillations of neutrinos were first observed only 20 years ago, when the Super-Kamiokande collaboration observed the disappearance of atmospheric neutrinos. In less than two decades, the physics of neutrino oscillations has been the fertile field for tremendous progresses and opened a new era: it would allow to measure the CP asymmetry in the leptonic sector through neutrino oscillations, and with it, to possibly explain the asymmetry between matter and antimatter that is currently observed in our Universe. This PhD topic proposes to use the world-leading Super-Kamiokande and T2K experiments to search for CP symmetry violation, explore supernovae physics or the history of the Universe using the neutrinos as a unique probe. The candidate will also be able to contribute to the design of the future world-leading neutrino observatory, Hyper-Kamiokande. This PhD track subject covers a broad area of neutrino physics. Depending on the student's aspiration, the precise subject can be refined. Consequently, several PhD track students can contribute to this physics. Our group is large enough to supervise up to four students with dedicated supervisors.



References :

T2K Nature paper: K. Abe et al, *Nature* **580**, 339–344 (2020). [arXiv: https://arxiv.org/pdf/1910.03887.pdf](https://arxiv.org/pdf/1910.03887.pdf)

Super-Kamiokande detector: Fukuda, S., et al. "The super-kamiokande detector." *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 501.2-3 (2003): 418-462,

Hyper-Kamiokande Design report: <https://arxiv.org/pdf/1805.04163.pdf>