

PiAI Seminar Series: Physics informed AI in Plasma Science
9:30-10:30, 02 November 2020 (CET)
17:30-18:30, 02 November 2020 (JST)
Web Seminar

Statistical Modelling of the thermal transport of fusion plasmas based on the transport analysis database

Masayuki Yokoyama

*National Institute for Fusion Science (NIFS),
National Institutes of Natural Sciences (NINS),
The Graduate University of Advanced Studies (SOKENDAI)
Toki, Gifu, Japan*

A statistical approach has been proposed and tried to describe the thermal diffusivity profiles as a transport “model” of fusion plasmas. It can provide regression expressions for the ion and electron heat diffusivities (χ_i and χ_e), separately, to construct their radial profiles. *This approach does not rely on any physics models, based on (my concern) “none of physics models have not succeeded to accurately and properly describe actual magnetically-confined plasmas”. It is rather “Let the data speak!” approach.*

This approach has become possible with the analysis database accumulated by the extensive application of the integrated transport analysis suite, TASK3D-a [1], to LHD [2] experiment data, and can be tried in other devices as well with a combination of integrated suite and experiment.

Two aspects will be discussed: (1) placing a priority on reproducing the thermal diffusivities with high accuracy for better reproduction of temperature profiles, and (2) extracting important parameters through the application of information criterion. The contents are summarized in recently published NUCLEAR FUSION paper [3].

This progress will foster the study of a “practical” model and the provision for a guidance to the parameter dependence to be pursued by large-scale cutting-edge simulations.

[1] M. Yokoyama et al., Nucl. Fusion 57 (2017) 126016.

[2] Y. Takeiri et al., Nucl. Fusion 57 (2017) 102023.

[3] M. Yokoyama and H. Yamaguchi, Nucl. Fusion (2020) 106024.