卓越した大学院

「流動ダイナミクス知の融合教育研究世界拠点」

平成 29 年度　博士課程後期学生国際会議派遣　参加報告書

氏名／専攻・学年 Name / Department	LE DINH ANH / Mechanical Systems Engineering
学会名 Conference's name	17th International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC17)
開催地 Venue (Name of the facility, city & country)	Hotel Hyatt Regency, Maui,Hawaii, USA
日程 Conference period	December 16 – 21, 2017
発表タイトル Presentation Title	Simplified Modeling of Cavitating Flow with Thermodynamic Effects for Homogeneous Model

【発表概要　Brief summary of your presentation】

It is well known that the thermodynamic effect has significant influence on the suppression of cavity volume. The thermodynamic effects appear in cryogenic fluid, water at high temperature and thermal sensitive liquid. In those liquids, when cavitation occurs, latent heat of evaporation is deprived, local temperature decreases, saturated vapor pressure decreases and then cavitation is suppressed. Hence, the energy transport need to be included for simulating those fluids. In numerical simulation, the homogeneous model is widely used for modeling cavitating flow with the advantages: simple, low computational cost where the two-phases are treated as single-fluid. However, this model assumes that the two-phases are in mechanical and thermodynamic equilibrium. Furthermore, the vapor-liquid interface is coarse-grained, hence, the temperature difference in the vicinity of vapor-liquid interface cannot reproduce. Up to date, several efforts have been done to include the thermodynamic effects on numerical simulation of cavitation. That can be classified into two categories. The first category is the modification of energy transport equation. This method was applied to 2D quarter hydrofoil with cryogenic liquid such as liquid nitrogen and liquid hydrogen, however, the inconsistency of temperature distribution compared with the experimental data was reproduced. The second category is simple method, in that the modification of saturated vapor pressure without solving the additional energy equation. However, the temperature distribution cannot reproduce. Hence, this presentation talked about the method that clarify the characteristics of thermodynamic effects on numerical simulation of cavitating flow. The present method belongs to the first category. In that, the energy transport equation is modified in term of transport equation for the mixture temperature. As the results, the combining of present model and our cavitation model shows the improvement in estimation of temperature and pressure compare to the other models.

【他の講演等から得られた知見、感想等。What you learned from other presentations, general impression you had, etc.】

Beside my presentation, I attended the presentations that relates to my research. One presentation is “Numerical Simulation of the Rotating Instability in an Annular Compressor Cascade Test Rigs” by Matthias Teich for unsteady flow in turbomachinery. In this study, he talked about the numerical simulation in cascade with turbulent effect. I had learned the method how to set the boundary condition for turbulent properties for RANS and DES models that directly relates to my current study. I also attended the lecture of Prof. Chris. Brennen. His talk was about “Fluid Mechanical Challenges in High-Speed Liquid Turbomachines”. This talk gave me the basic knowledge about cavitation in turbomachines such as: the inducers, pumps,…,. In this lecture, he mentioned about what engineer should consider for the situation of cavitation behavior in real systems other than the ground environment, it also talked about the current progress and the ideal for future research in this problem. Those are very good information for me.
Furthermore, I had a good chance to talk with many researcher from many countries. Specially, I had very good opportunity to meet and take a photo with Prof. Chris. Brennen, who is the most famous professor in the cavitation research. That make me very happy!

【写真 Pictures】