



# Center for Research on Innovative Simulation Software

[Research and Development of Large-Scale Simulation used in Industry]

<http://www.ciss.iis.u-tokyo.ac.jp/english/>

## Aiming at Innovation in MO-NO-DU-KU-RI

### High performance simulation software drastically changes engineering

Center for Research on Innovative Simulation Software (CISS) was found to conduct R&D on the advanced and practical computational science simulation software utilizing hyper-large-scale simulations represented by “Fugaku” for the next hyper-simulation era. We aim at

- ◆ Conducting world-leading advanced research on hyper-large-scale simulation software
- ◆ Strengthening the educational foundation to educate how to make and use hyper-simulation software for industrial application
- ◆ Putting R&D results in common industrial use to enhance global competitiveness of domestic engineering

Center Director



KATO,  
Chisachi  
Professor

Center Vice Director



YOSHIKAWA,  
Nobuhiro  
Professor



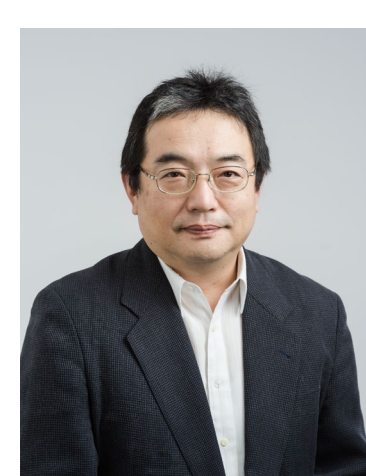
HAMBA,  
Fujihiro  
Professor\*



UMENO,  
Yoshitaka  
Professor



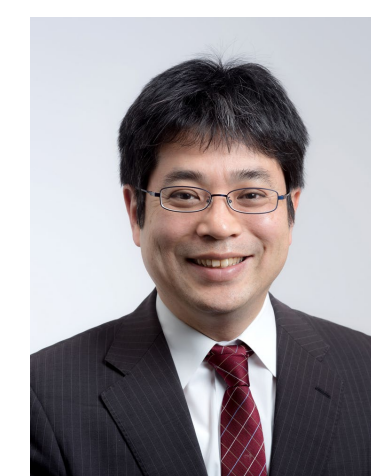
OSHIMA,  
Marie  
Professor\*



SATO,  
Fumitoshi  
Professor



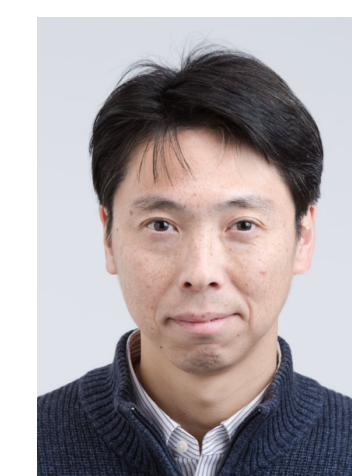
MIZOGUCHI,  
Teruyasu  
Professor\*



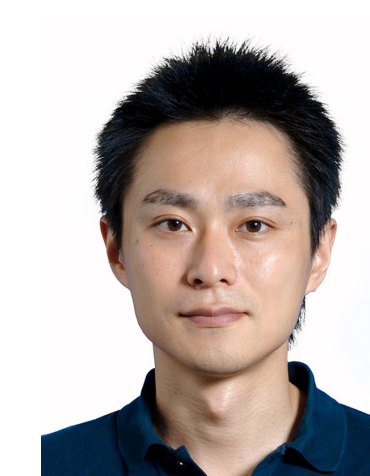
OOKA,  
Ryoza  
Professor\*



ONO,  
Kenji  
Visiting Prof.



HASEGAWA,  
Yosuke  
Associate Prof.

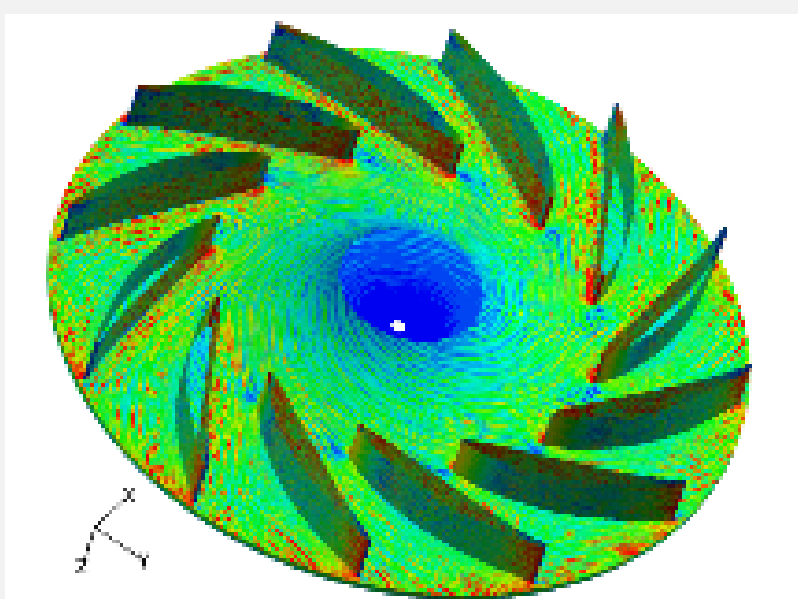


NAGAI,  
Kohei  
Associate Prof.\*

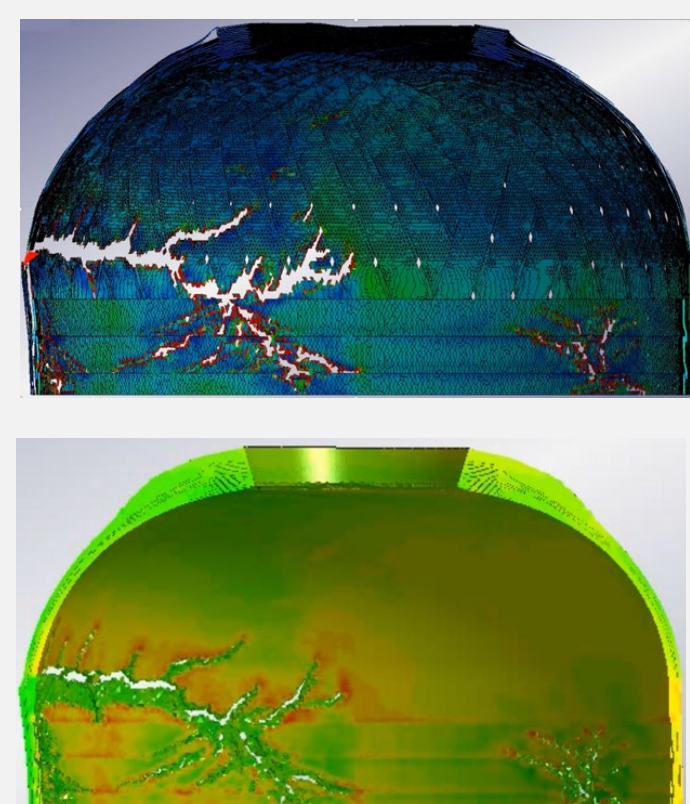
\* Cooperating Member

### Introduction of the Research

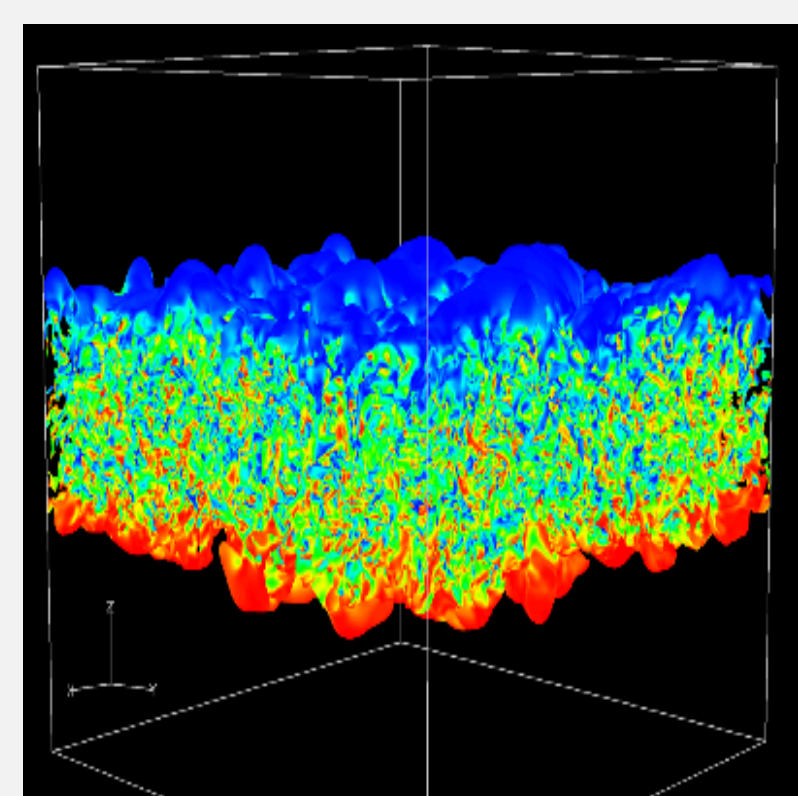
#### Manufacturing



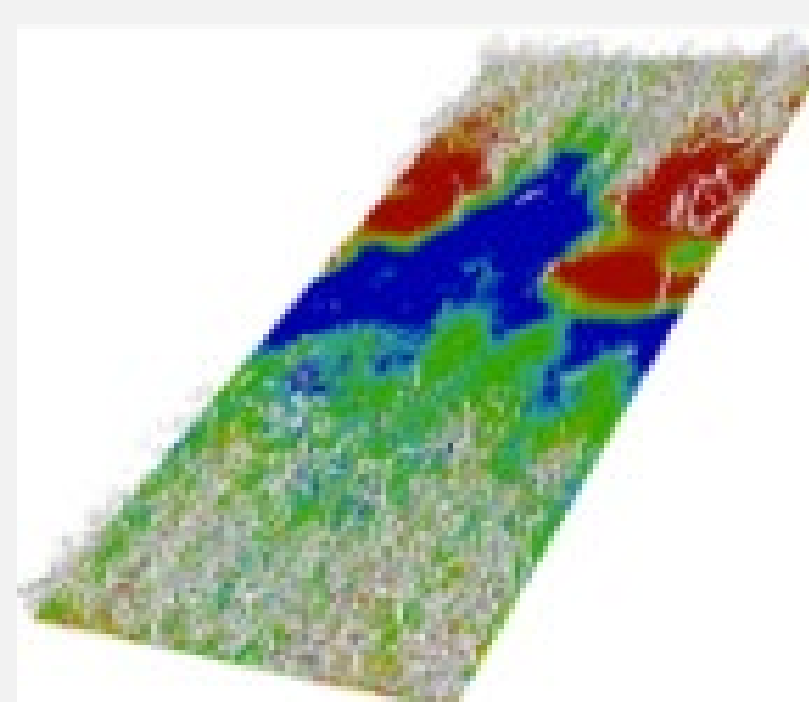
C. Kato  
Absolute vorticity in  
a centrifugal blower



N. Yoshikawa  
Developing high pressure  
hydrogen tank supported by  
meso-scale simulation

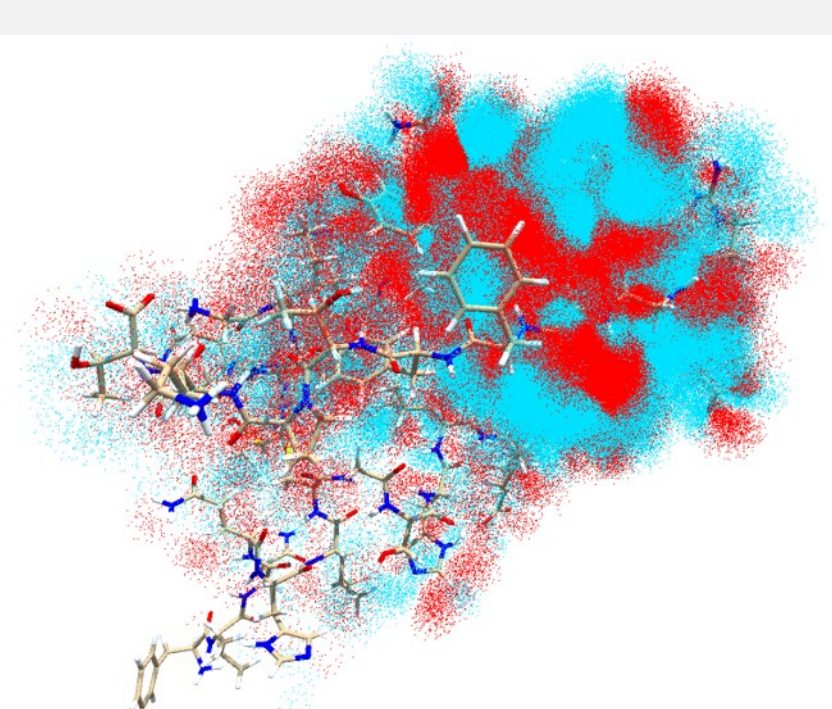


F. Hamba  
Contours of kinetic energy of  
turbulent diffusion in rotating  
system. Red denotes right-  
handed helical motion and blue  
denotes left-handed helical  
motion

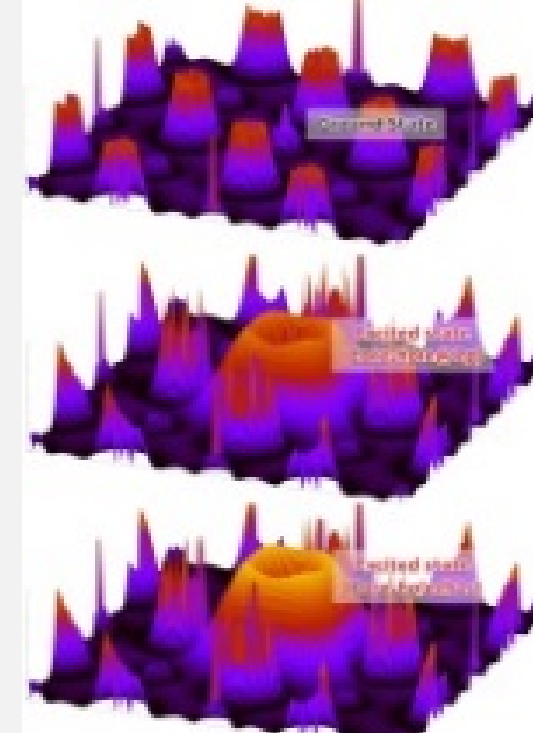


Y. Hasegawa  
Instantaneous turbulent  
flow over a flat plate under  
optimal control for heat  
transfer enhancement and  
friction drag suppression

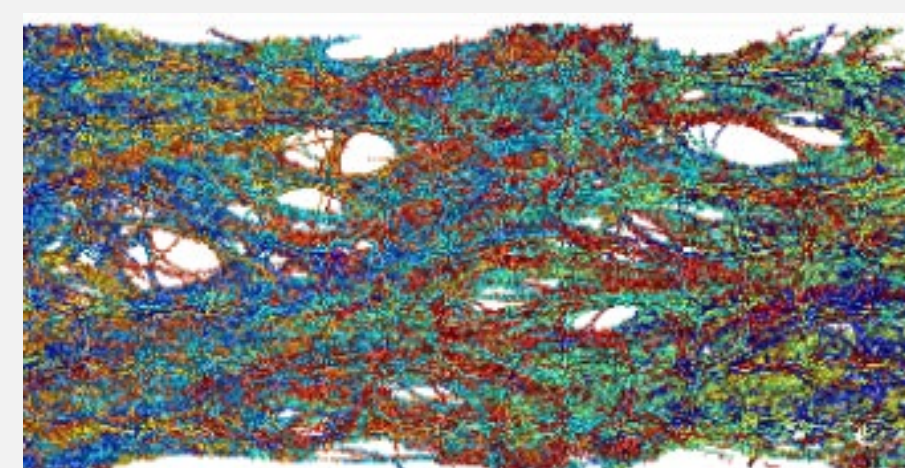
#### Design of Molecular and Nanoscale Materials and Devices



F. Sato  
Highest occupied molecular  
orbital of insulin drawn by  
cloud-like model

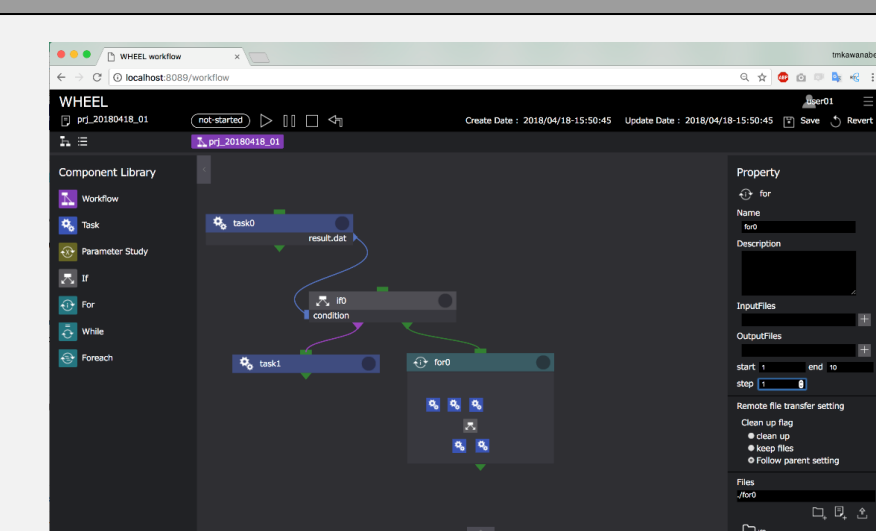


T. Mizoguchi  
Wave function at the bottom  
of the conduction band of  
MgO at (top) ground state,  
(middle) core-hole state at  
Mg2p orbital, and (bottom)  
core-hole state at Mg1s orbital



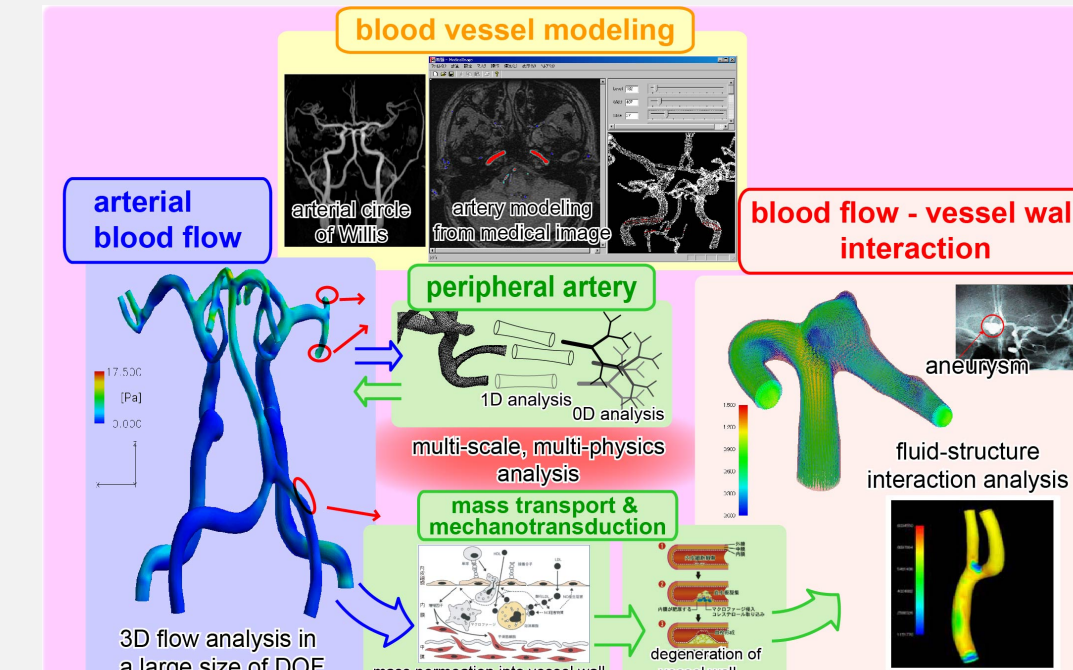
Y. Umeno  
Deformation of Polycarbonate  
by Coarse-Grained Particle  
Model Simulation

#### Large-Scale Data Analysis

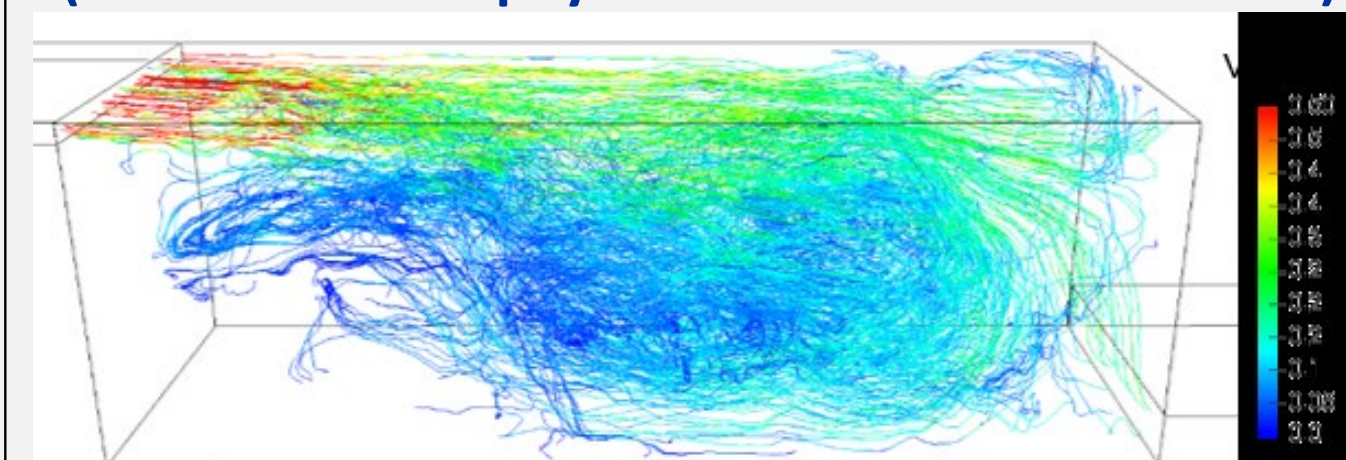


K. Ono  
Web-based workflow system  
WHEEL

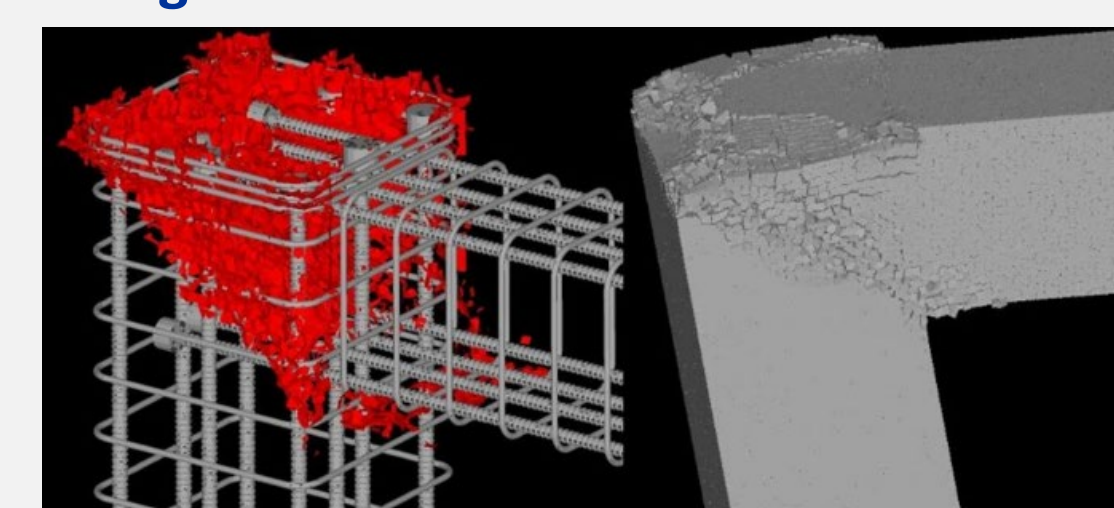
#### Medical engineering and Environmental Building Science



M. Oshima  
Schematic of integrated simulation system  
“M-SPhyR Circulation”  
(Multi-scale and physics simulator for circulation)



R. Ooka  
Analyses of flowfield in and around building  
using Lattice Boltzmann Method



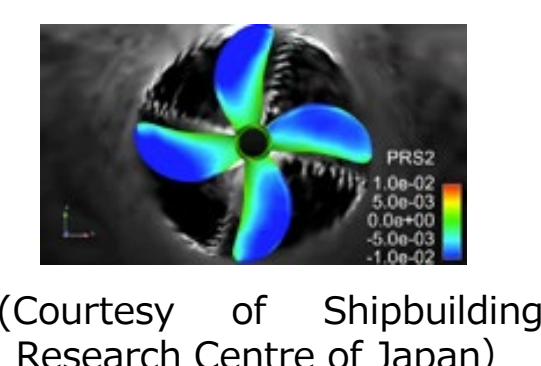
K. Nagai  
Failure of RC beam-column joint by RBSM

### Example of Major National Project being Promoted by CISS

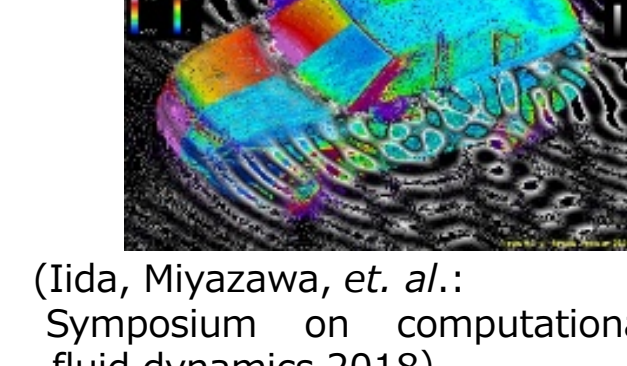
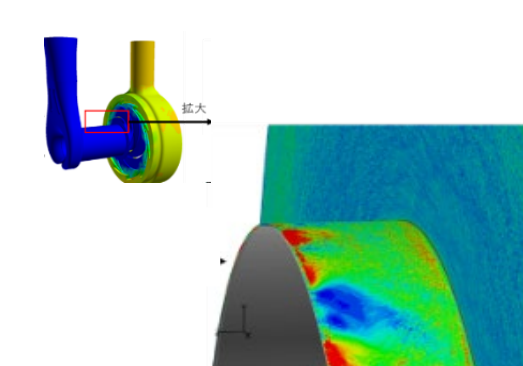
#### Program for Promoting Researches on the Supercomputer Fugaku:

#### Research and development of innovative fluid-dynamics simulations for performance predictions by using Fugaku (2020-2022)

- Overview: We develop application software, by which optimal performance of HPCI (High Performance Computing Infrastructure), including supercomputer Fugaku, is got and manufacturing processes are changed.
- Responsible organization: The Univ. of Tokyo; Kobe Univ.; Kyushu Univ.; Iwate Univ.; Toyohashi Univ. of Tech.; Univ. of Yamanashi; RIKEN



(Courtesy of Shipbuilding  
Research Centre of Japan)



(Iida, Miyazawa, et. al.:  
Symposium on computational  
fluid dynamics 2018)

