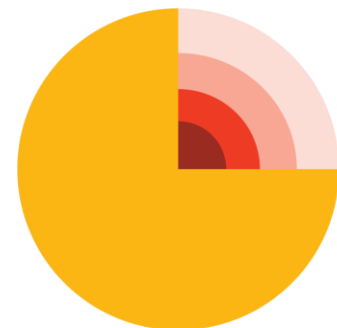


CSC in ChEESE-2

Dr. Thomas Zwinger, Dr. Jussi Heikonen
CSC – IT Center for Science Ltd.



ChEESE



LUMI supercomputer

- Consortium: FI/CSC, BE, CH, CZ, DK, EE, IS, NO, PL, SE
- Hosted in Kajaani, FI in eco-efficient datacenter
- HPE Cray EX
- **AMD** Milan & Trento CPUs and **MI250X GPUs**
- Committed HPL 375 Pflops
- #3 in Top500 list in Nov 22
- Currently in extended beta testing
- General availability in Q1/23
- Access: through EuroHPC & consortium national calls



 **1 SYSTEM**
550+ Pflop/s
PEAK PERFORMANCE


100%
HYDROPOWERED
ENERGY UP TO
200MW

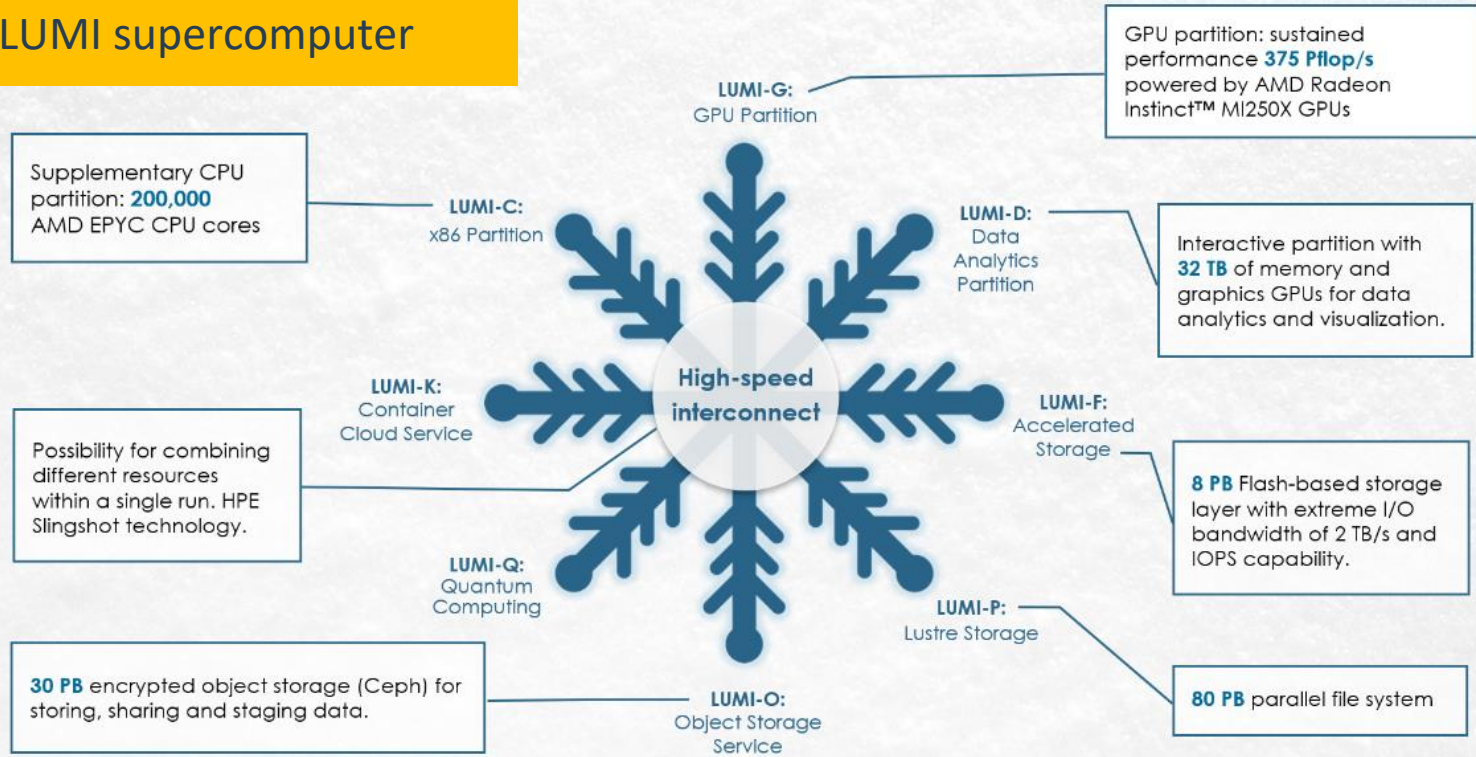

 **117 PB** 
STORAGE



EuroHPC
Joint Undertaking



LUMI supercomputer



CSC effort in ChEESE

Work Package	PMs
WP1: Project Management	2
WP2: Exascale technical challenges in flagship codes	8
WP3: Co-design with European HPC vendors and technologies	-
WP4: Simulation ecosystem	-
WP5: Farming Pilot Demonstrators	16
WP6: SCs and service enabling using EuroHPC infrastructures	6
WP7: Dissemination, outreach and capacity building	2

Main contributions

WP2

LUMI GPU porting support
including performance
analysis and optimization

1. HIP (hipified CUDA)
2. OpenMP
3. OpenACC (Fortran only)
4. Frameworks ...

WP5

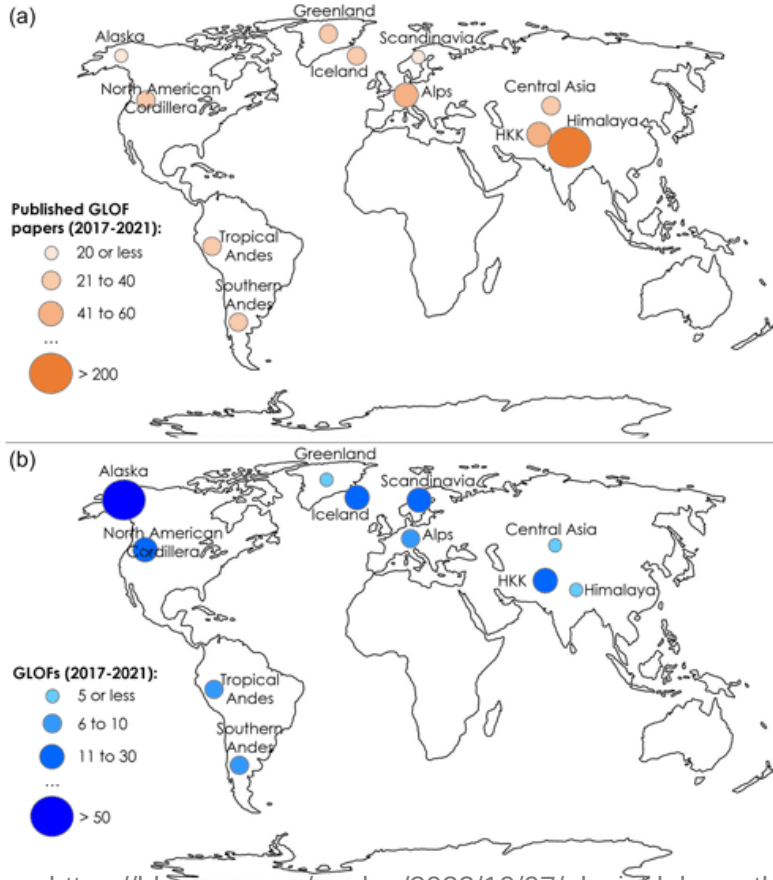
ELMER/ICE & GLOFs
ELMER GPU porting

WP6

Support for urgent
computing on LUMI



Glacial Outburst Floods – IMO + CSC

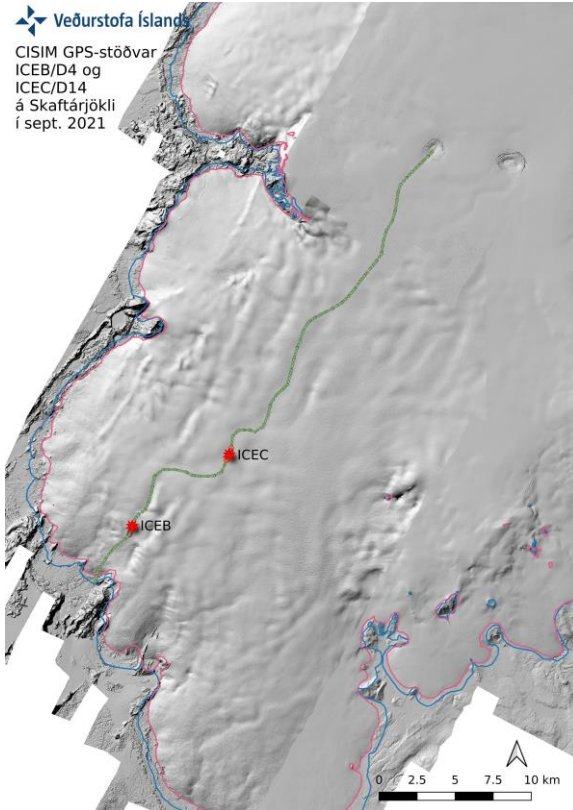


- Glacier Outburst FloodS (GLOFS)
- Sudden release of large amount of water from a glacial lake (pro-, supra- or sub)
- In Iceland triggered by volcanism and named **Jökulhlaups**
- Worldwide GLOFS are a natural hazard with by climate warming increasing risk potential

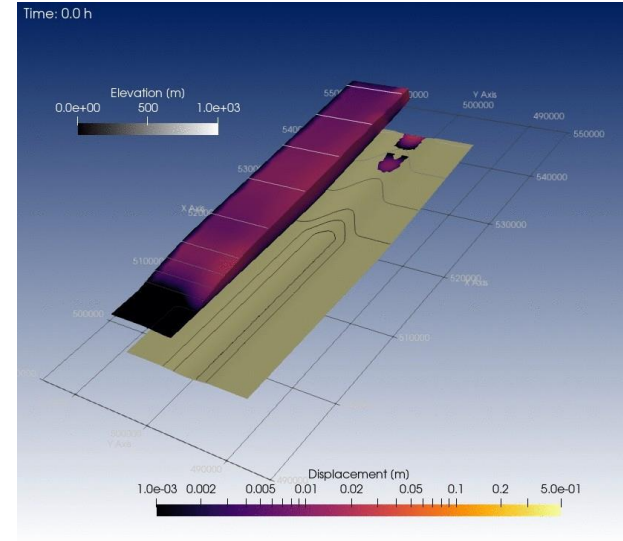
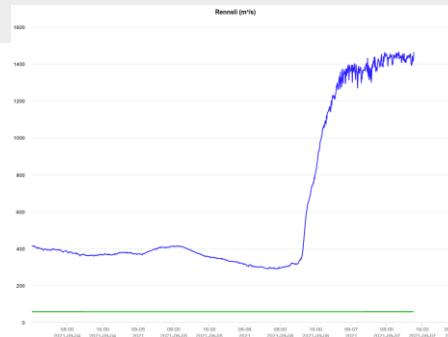
<https://blogs.egu.eu/geolog/2022/10/07/glacial-lake-outburst-floods-what-we-know-about-this-destructive-ice-hazard/>



Glacial Outburst Floods – IMO + CSC (SC9.1)



- Jökulhlaups propagate as pressure waves underneath the glacier
- Timescales are in the order of the Maxwell time
- Fluid-structure interaction of a pressurized waterfilm with an overlying visco-elastic material (ice)

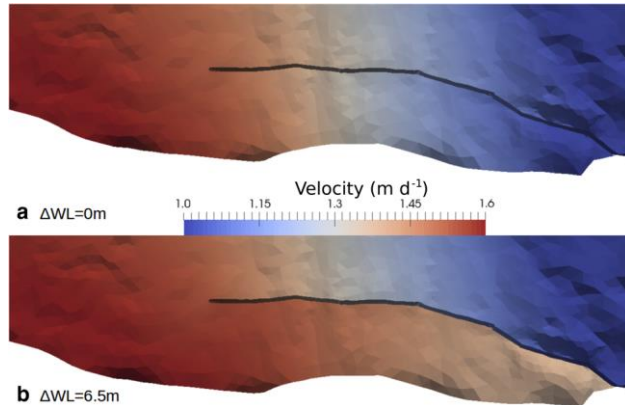


[Animated GIF](#)

(T. Zwinger and T. Johannesson)

Pictures courtesy Tómas Jóhannesson, Icelandic Meteorological Office

Iceberg calving at – CNRS + CSC (SC9.2)

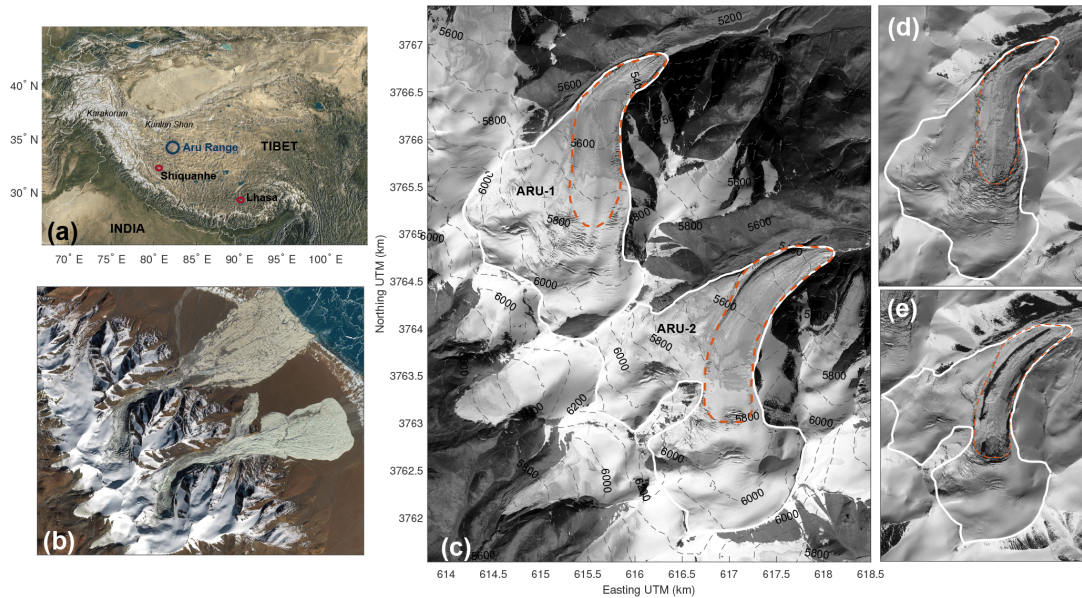


- Using Elmer/Ice to investigate calving behaviour at **Bowdoin glacier**, NW-Greenland
- Seismic measurements as proxies for ice-berg size
- Iceberg size and calving behaviour important for waves generated inside Fjord
- Already existing setup from previous simulations
- New calving remeshing algorithm recently implemented in Elmer/Ice

Van Dongen, E., Jouvét, G., Walter, A., Todd, J., Zwinger, T., Asaji, I., . . . Funk, M. (2020). Tides modulate crevasse opening prior to a major calving event at Bowdoin Glacier, Northwest Greenland. *Journal of Glaciology*, 66(255), 113-123. doi:10.1017/jog.2019.89



Possible cooperation outside (with IGE, CNRS)



- Using Elmer/ICE to investigate thermal and mechanical conditions of glaciers
- Possibilities to predict GLOFS in the Alps
- Possibilities to improve understanding of destabilization of glaciers leading to sudden collapse

Gilbert A., S. Leinss, J. Kargel, A. Käab, S. Gascoin, G. Leonard, E. Berthier, A. Karki and T. Yao, 2018. *Mechanisms leading to the 2016 giant twin glacier collapses, Aru Range, Tibet*, The Cryosphere, 12, 2883-2900, [doi:10.5194/tc-12-2883-2018](https://doi.org/10.5194/tc-12-2883-2018)

Thank you!



@cheese-coe



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