

GPU Technology Conference, May 14-17, 2012
McEnergy Convention Center, San Jose, California
www.gputechconf.com

Sessions on **Climate & Weather Modeling** (subject to change)

IMPORTANT: Visit <http://www.gputechconf.com/page/sessions.html> for the most up-to-date schedule.

S0412 - A 2-Petaflops Stencil Application with Stereoscopic 3D Visualization - Gordon Bell Prize 2011 **Takayuki Aoki (Tokyo Institute of Technology)**

Day: Tuesday, 05/15 | **Time:** 2:00 pm - 2:25 pm

Topic Areas: Supercomputing; Computational Fluid Dynamics; Climate & Weather Modeling; Stereoscopic 3D

Session Level: Intermediate

Most stencil applications such as CFD and structure analysis are memory-bound problems. GPU has high performances in both computation and memory bandwidth suitable for them. The TSUBAME 2.0 supercomputer with 4224 GPUs has started since November 2010. We study a metal dendritic solidification by solving the phase-field model. The performance of 2.0 Petaflops was achieved for 4,096x6,500x1,0400 mesh on 4000 GPUs and we received the ACM Gordon Bell Prize in 2011. We also demonstrated several large-scale stencil applications (Lattice Boltzmann, weather prediction and so on) with stereoscopic 3D visualization.

S0256 - A Stencil Library for the New Dynamic Core of COSMO

Tim Schroeder (NVIDIA), Tobias Gysi (SCS)

Day: Thursday, 05/17 | **Time:** 9:00 am - 9:50 am

Topic Areas: Climate & Weather Modeling; Development Tools & Libraries

Session Level: Advanced

We will present a stencil library used in the heart of the COSMO numeric weather prediction model. During the talk we'll show how we implemented an abstraction that allows easy development of new stencils and solvers on top of a framework allowing execution on both CPU and GPU. The library makes efficient use of GPU resources and we will show how to structure memory accesses and computation optimally. Developers involved in porting or writing fully-featured C++ libraries for CUDA will also be interested in attending.

S0053 - Real Time GPU-Based Marine Scenes Simulation

Jérôme Graindorge (ALYOTECH), Julien Houssay (ALYOTECH)

Day: Thursday, 05/17 | **Time:** 10:00 am - 10:25 am

Topic Areas: Climate & Weather Modeling; Visualization

Session Level: Intermediate

Marine survey, carried out by sea or by air, is of major concern for current defense and security applications. Essential surveillance/ observation/ identification systems involve electro-optics (visible and infra-red) and radar. Optimizing their performance requires amounts of expensive observational data spanning the wide variability of the marine environment. Computer simulation provides a valuable flexible and inexpensive alternative. Since 2007, ALYOTECH, in partnership with the IFREMER (French Research Institute for Exploration of the Sea), has been developing a GPU-based real-time ocean scene simulator for visible, infrared and radar sensors, in order to

meet the challenging requirements arising from marine survey issues.

S0107 - Acceleration of Long-Wave Rapid Radioactive Transfer Model on GPGPU

Mahesh Khadtare (I2IT, Pune University), Prakalp Somawanshi (CRL India)

Day: Thursday, 05/17 | **Time:** 10:30 am - 10:55 am

Topic Areas: Climate & Weather Modeling; Application Design & Porting Techniques; Climate & Weather Modeling

Session Level: Intermediate

The WRF model is a next-generation mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research communities. WRF offers multiple physics options, one of which is the Long-Wave Rapid Radiative Transfer Model. We found, porting `rtrn()` subroutine to the CUDA challenging. It has couple of recursive loops, for which GPGPUs are actually not suitable. We developed a new technique called loop inversion, which helped us in getting 7.7x speed up for the individual, `rtrn()` subroutine without memory transfer, and in turn 10x speed up for overall RRTM module including initialization and memory transfer.