

## Bulgarian Grid Applications

[www.see-grid.eu](http://www.see-grid.eu)



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# Grid Applications in Bulgaria – statistics



- **12 applications** from:
  - Semiconductors and nanoelectronics,
  - Environmental modeling, Fusion,
  - Computational Fluid Dynamics, Computational Chemistry,
  - Biomedicine, Bioinformatics

- Production phase: 6

- Porting phase: 6

Developed by 7 institutes/universities, in collaboration with international partners:

IPP-BAS, IM-BAS, FMI-SU, FF-SU,

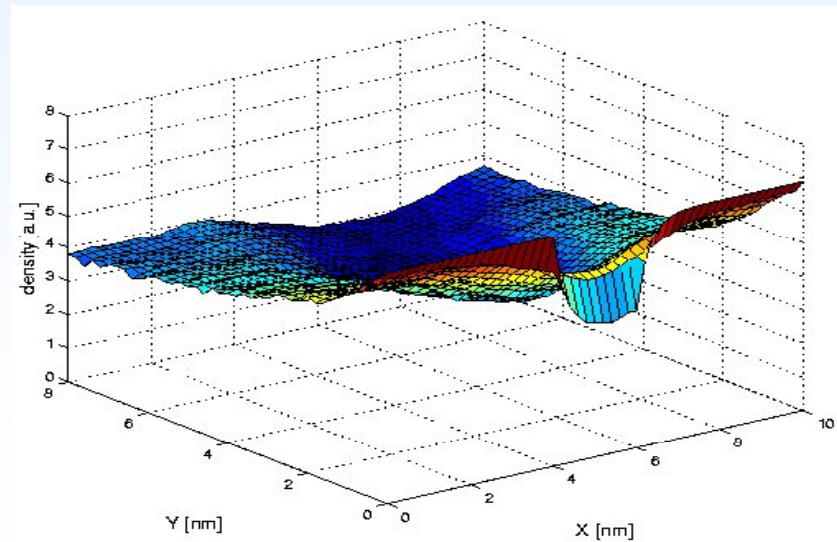
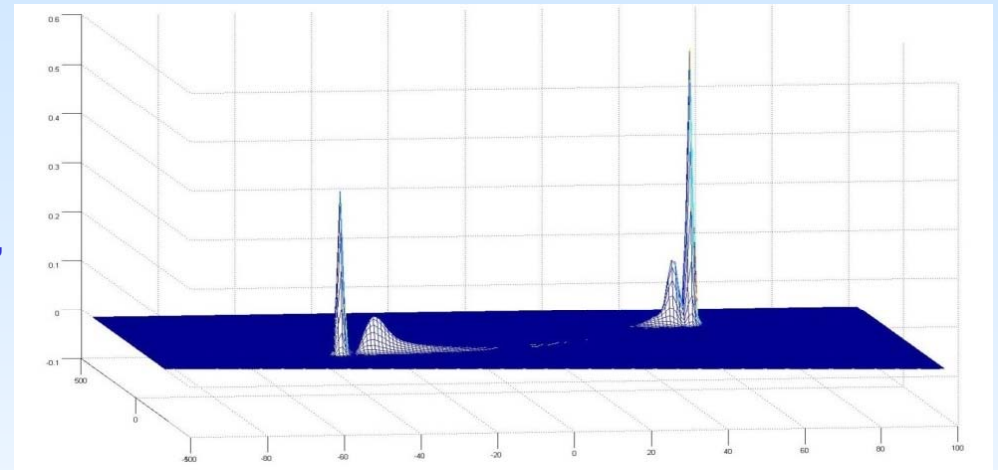
GPh-BAS, OrgChm-BAS, FCh-SU

# SALUTE - Stochastic ALgorithms for Ultra-fast Transport in sEmiconductors



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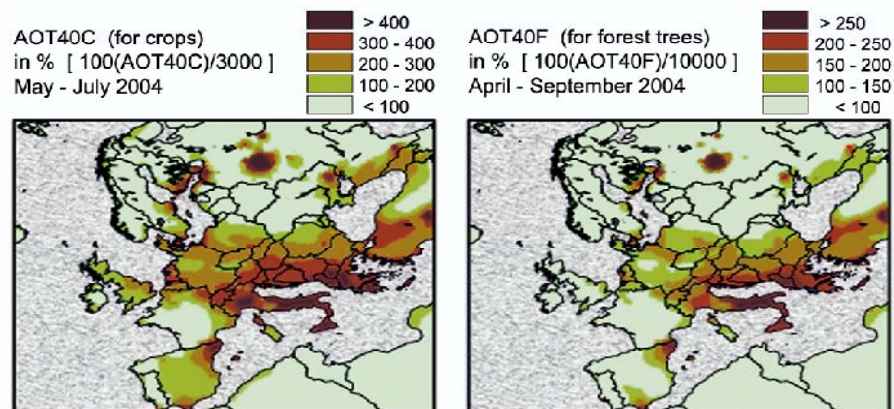
- One of the SEE-GRID 2 flagship applications
- Main developers:
  - E. Atanasov, T. Gurov, A. Karaivanova, M. Nedjalkov from IPP-BAS
- SALUTE used Monte Carlo algorithms to study memory and quantum effects during the relaxation process due to electron-phonon interaction in semiconductors, relevant to design of *new semiconductor devices*
- These results were obtained after ~1000-1500 CPU hours - 500 sequential jobs of 2-3 hours each
- Interest in the results: scientists and engineers from Macedonia, Austria, UK ...



# Environmental Modelling application

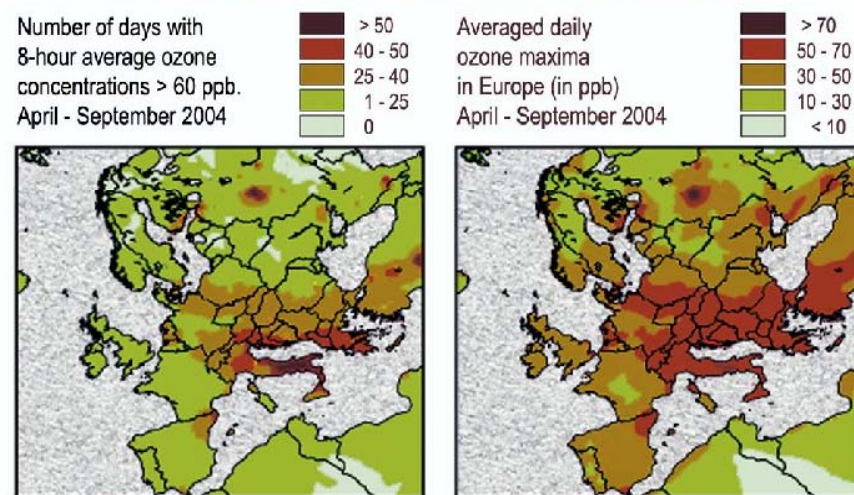
Developers: Tz. Ostromski, Ivan Dimov  
Collaboration with Roskilde institute, Denmark  
Air-pollution modelling and prediction, using Danish  
Eulerian model

## Applications: Plants' exposures to high ozone concentrations, calculated by DEM



The levels of AOT40 for crops (the left plot) and forests (the right plot) respectively for year 2004. This characteristics are used to evaluate the damage of the long-term high ozone concentrations on crops and forest trees respectively.

## Applications: Estimated effect of the high ozone concentrations on the human health



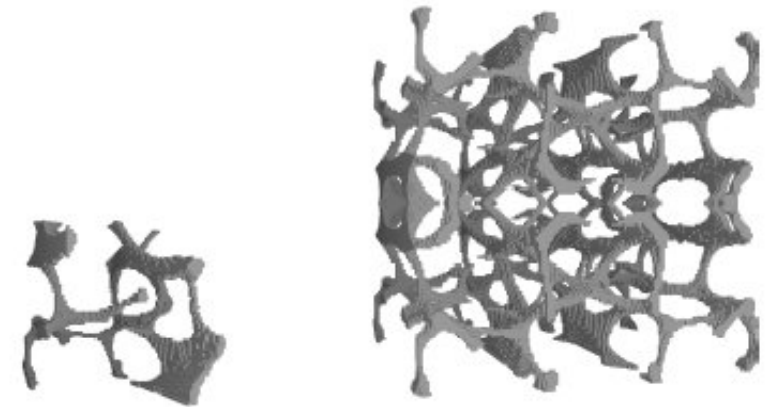


# Voxel models of human bone structure

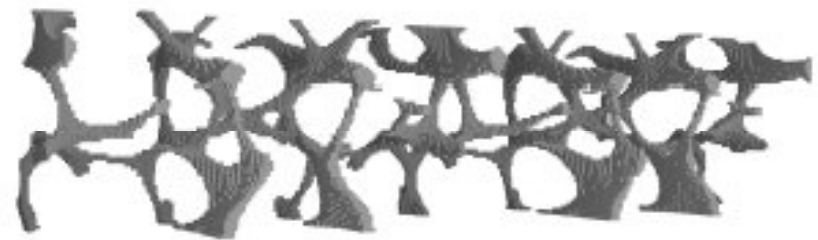


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- Scientific contacts: Svetozar Margenov and Yavor Vutov, IPP-BAS, Sofia, Peter Arbenz, ETH, Zurich, Maya Neytcheva, Uppsala University, ...
- The application is part of a new generation computer aided environment for diagnostics and planning of orthopedics trauma and joint replacement surgery.
- The goal is to equip the full-length 3D image with patient-specific biomechanically relevant parameters allowing for a real-time computer simulation of the stressed-strained state of the loaded bone.
- The application uses the low-latency Myrinet interconnection available at BG04-ACAD site at IPP-BAS for achieving acceptable parallel performance.



- Structure of the solid phase: 64x64x64 and 128x128x128 - right



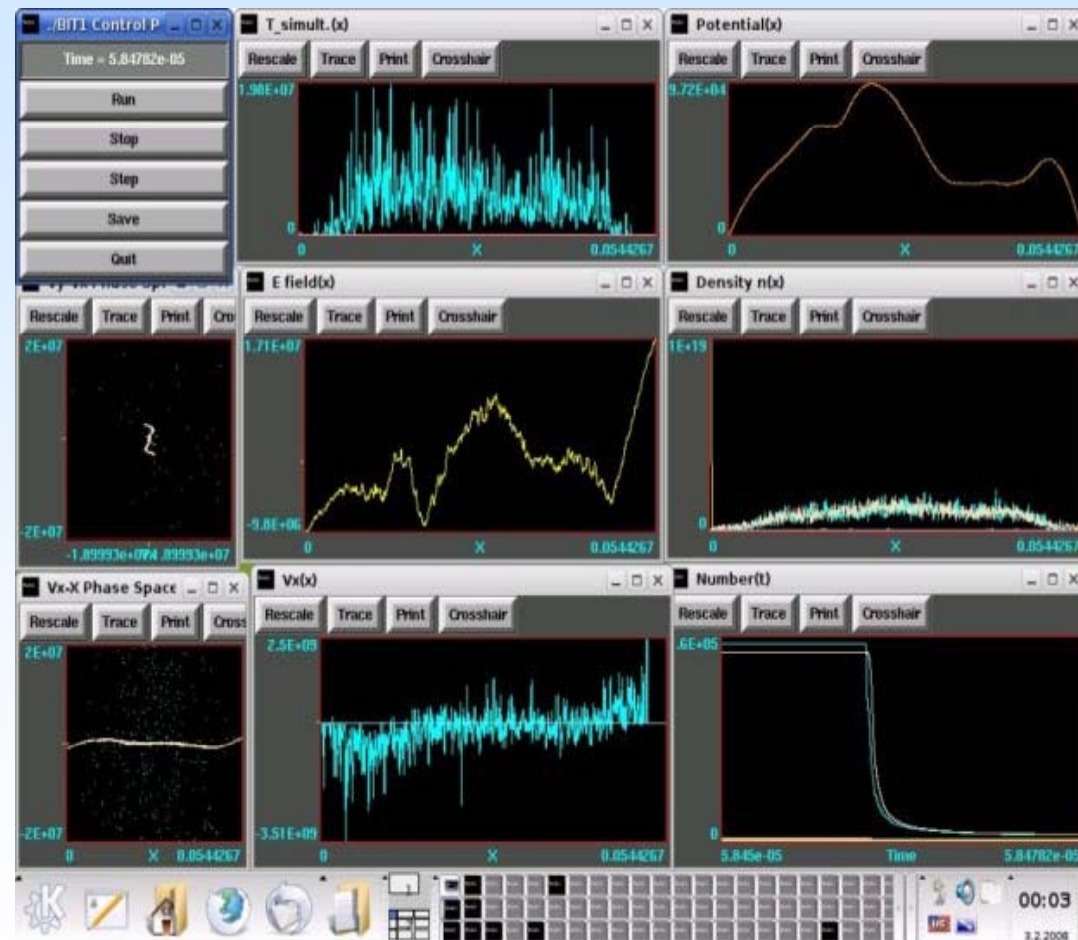
- Structure of the solid phase: 64x64x256

# BIT1: Modules for Transport Codes and Discharge Evolution



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- **Application Description:** The background is our experience performing balance of the contribution of key processes on plasma characteristics in several computer experiments. We have used our code version BIT1-S for self-consistent simulation of charged and neutral particle propagation in Scrap-off-Layer. For validation of the simulation results have been used appropriate experimental data.
- **Discipline:** "Fusion", "High-Energy Physics"
- **Scientific Contact(s):** Lilia Popova (IMI-BAS), [lpopova@math.bas.bg](mailto:lpopova@math.bas.bg); IPP-- Pencho G. Marinov ( IPP-BAS), [pencho@bas.bg](mailto:pencho@bas.bg)
- The application is producing results. Some results were published



# CPU hours spent by BG and other applications

Virtual Organization	Normilized CPU time
Atlas	65 647 356
CMS	35 615 388
biomed	13 456 049
compchem	1 841 034
Geant4	304 240
Earth Science Research	236 966
MAGIC	31 092
E-grid	20 920
SEE-GRID, SEE	1 861 460
BG applications	397383 hours (45 years)