

# SciDAC CCISM Consortium: Software Engineering Update

Patrick Worley (ORNL)  
(On behalf of all the consorts)

Software Engineering Working Group Meeting  
NCAR and Access Grid  
January 25, 2006

## Project Goals

- Software
  - Performance portability
  - Software engineering (repositories, standardized testing – No Code Left Behind initiative)
- Model Development
  - Better algorithms
  - New physical processes (esp. chemistry, biogeochemistry)

## SciDAC Presentations

10:30-10:40

Report on Final Year SE Activities  
(no model development activities)  
(Pat Worley - this talk)

10:40-10:50

Report of SciDAC2 planning and timeline (John Drake)

10:50-11:00

Single Executable Concurrent CCSM (Helen He)

11:00-11:15

Parallel netcdf (Yu-Heng Tseng)

...

1:30- 2:00

Update on BGC Intercomparison (Forrest Hoffman)

## SciDAC SE Activities

- Add interactive carbon & sulfur cycles to CCSM: implement three separate component submodels
  - an interactive carbon cycle submodel, (CASA')
  - a secondary sulfur aerosol submodel, and (CAM Chemistry)
  - an interactive terrestrial biosphere submodel (CLM3/dynveg and POP2/DML+Elliot Ocean ecosystem)
  - Generalized coupler for chemical fluxes
  - Complete (SciDAC Deliverable for DOE)
- CAM porting and performance optimization on Cray X1E and XT3
  - Art Mirin (LLNL), Pat Worley (ORNL)
  - Complete (for the moment)

## SciDAC SE Activities

- Explicit typing of all variables and constants in CAM and CLM
  - Pat Worley (ORNL)
  - Complete
- New release of MCT
  - Jay Larson (ANL), Rob Jacob (ANL)
  - Complete

## SciDAC SE Activities

- Revised/continuation run of BGC in conjunction with working group
  - Rob Jacob (ANL), et al
  - April 2006
  - Subtask: load balance BGC and test of fully-hybrid SWE
- Parallel NetCDF tested at ORNL and NCAR (high res. config.)
  - Helen He (LBNL), et al
  - April 2006
- Analysis of scalability of FVCAM wrt horizontal resolution and processor count
  - Art Mirin (LLNL), Michael Wehner (LBNL), Pat Worley (ORNL)
  - April 2006
  - Subtask: building a performance model, as time permits

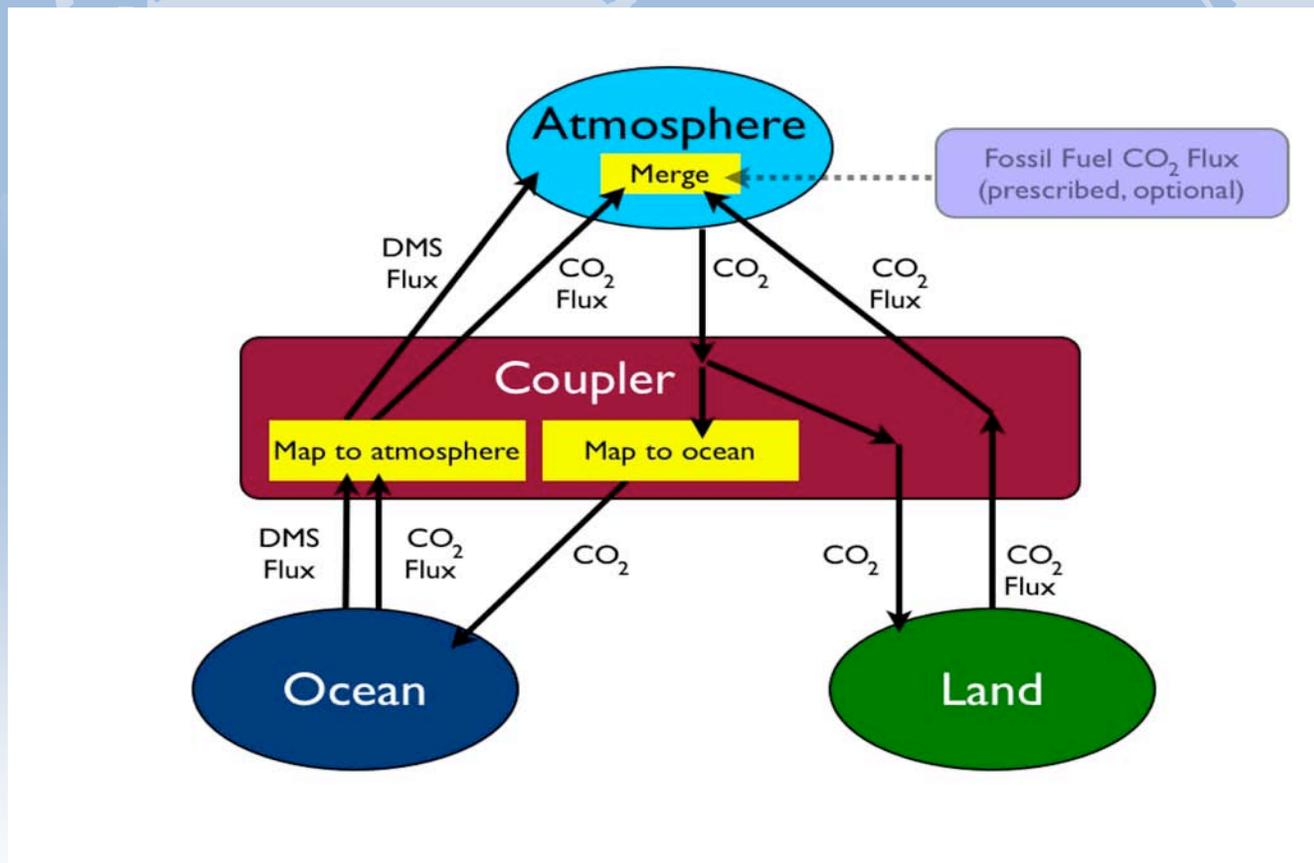
## SciDAC SE Activities

- Performance evaluation and optimization of CAM for large number of tracers
  - Art Mirin (LLNL), Philip Cameron-Smith (LLNL), Pat Worley (ORNL)
  - July 2006
  - Subtask: Analysis of scalability wrt tracer number (February 2006)

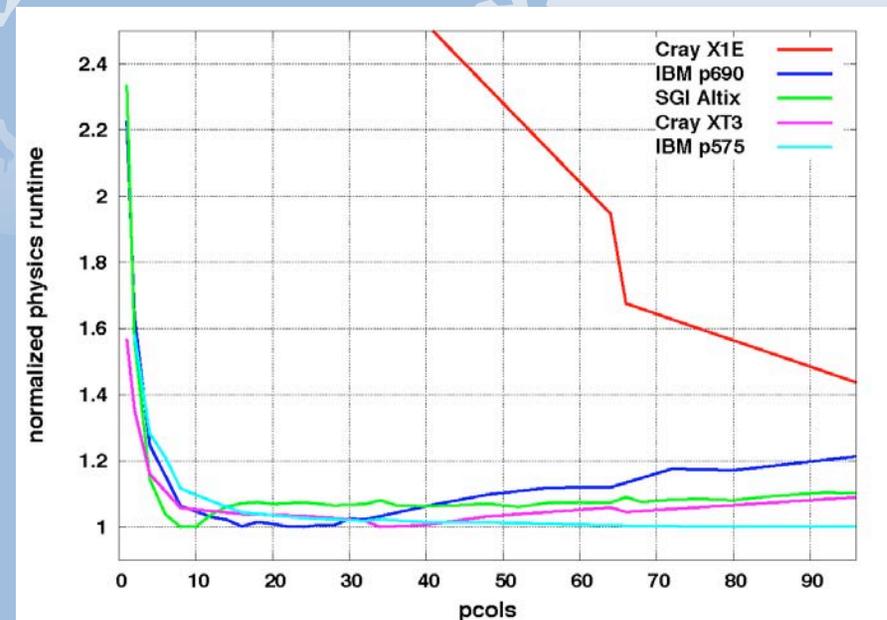
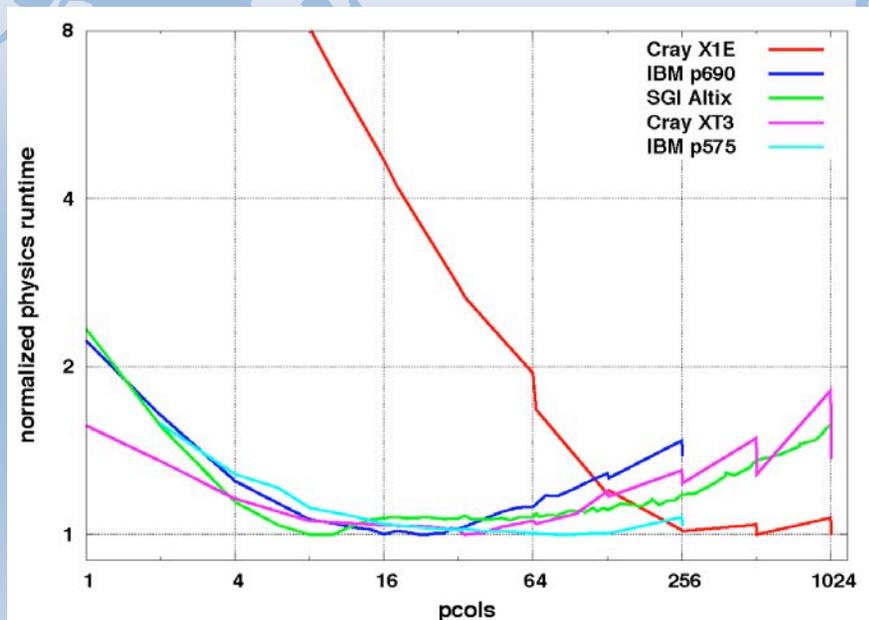
## SciDAC SE Activities

- Single-executable of any components combination (dead model, data model or active model) of CCSM3.0 on CCSM supported platforms.
  - subtask: single-executable of pop2.0 + datm7 + dice6 + dlnd6 + cpl6 on BlueGene/L
  - participants: Helen He (LBNL), Mariana Vertenstein (NCAR), Nancy Norton (NCAR), Brian Kauffman (NCAR), Tony Craig (NCAR), Rob Jacob (ANL), Ray Loy (ANL), John Dennis (NCAR)
  - July 2006
- Implement several ocean ecosystem trace gases through coupler
  - Scott Elliot (LANL)
  - July 2006

# Prototype BGC Simulation



# pcols Tuning Experiments

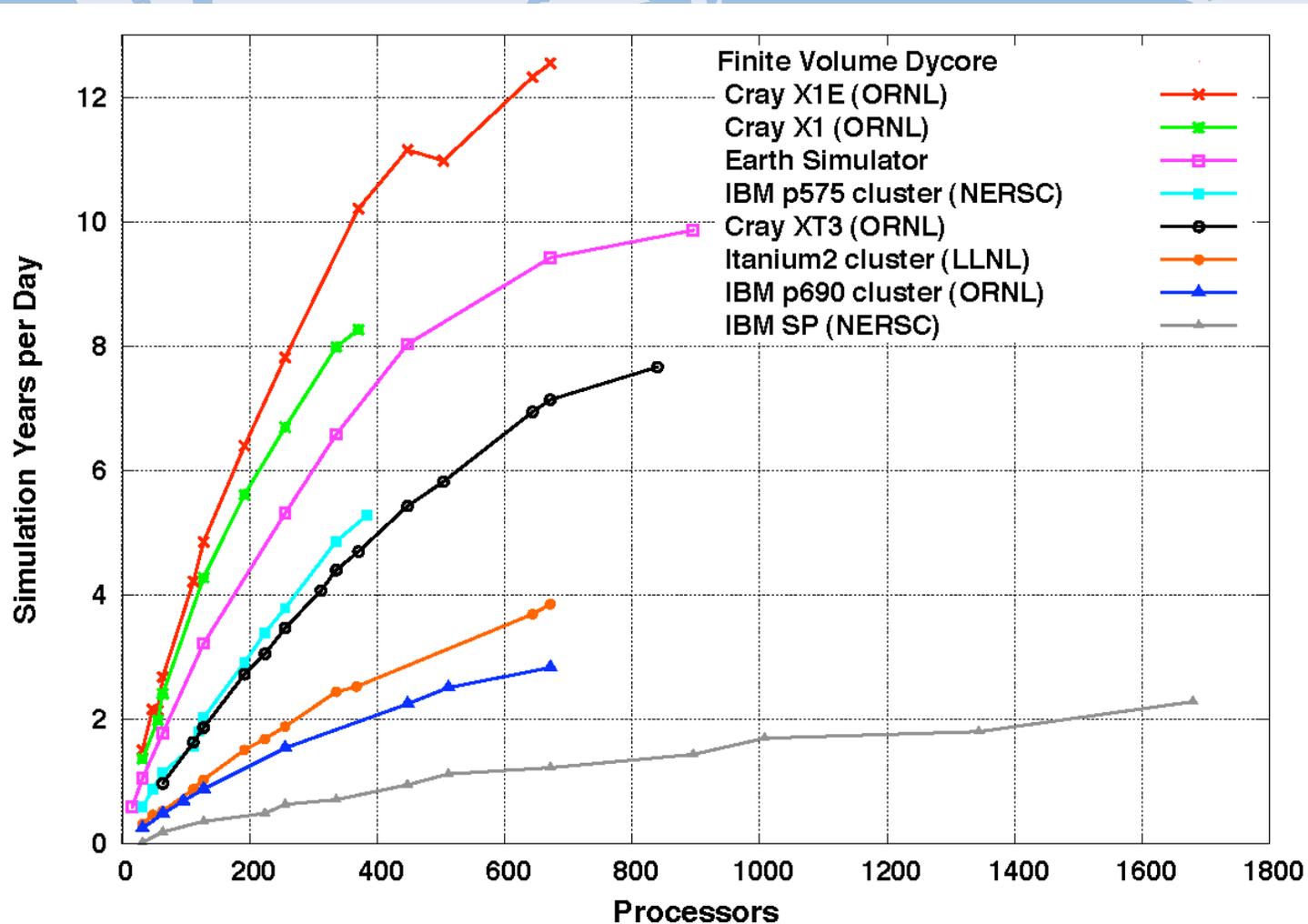


Altix: minimum at pcols = 8  
 p690: minimum at pcols = 24  
 XT3: minimum at pcols = 34

p575: minimum at pcols = 80  
 X1E: minimum at pcols = 514 or 1026

pcols <= 4 bad for all systems.

# Benchmarking: Finite Volume Dycore



# Benchmarking: Spectral Eulerian Dycore

