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Modeling Visualization of Repository Systems and Corrosion Research in Geologic Disposal of Nuclear Waste

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Supervised by

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Org. 6224

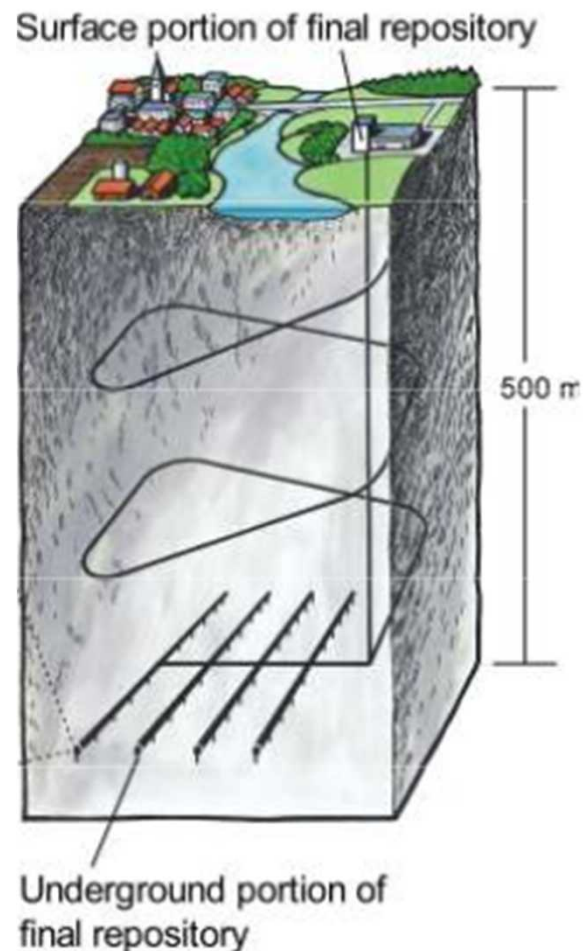
**6220/6230 summer student mini-symposium
August, 16th 2016, Sandia Nat'l Labs, Albuquerque NM**

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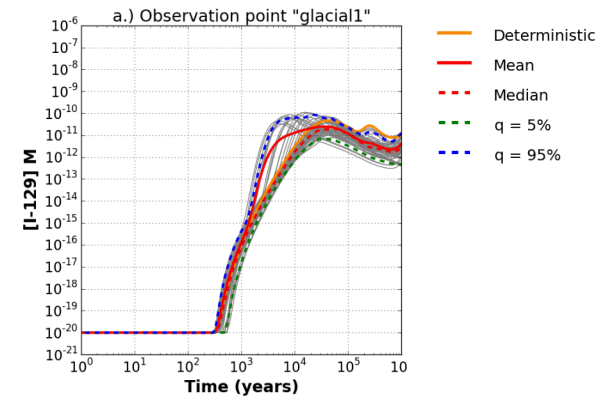
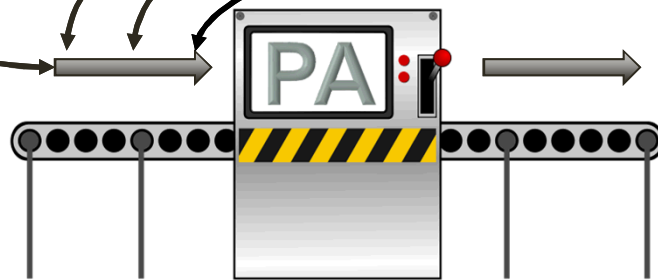
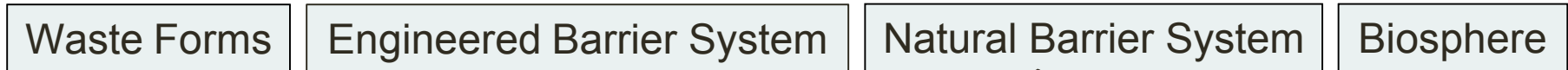
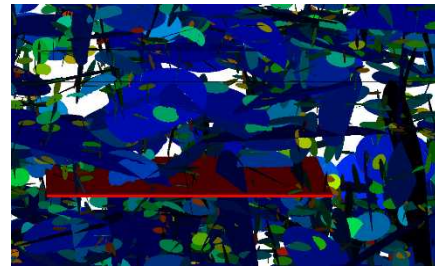
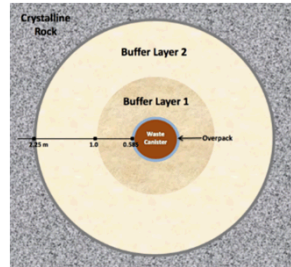
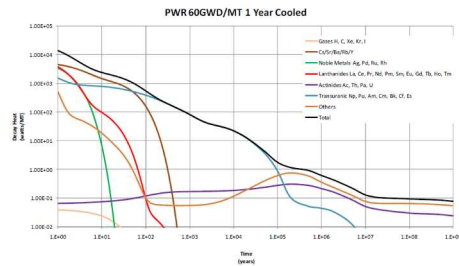


What is Geologic Disposal?

- Disposal of High-Level Waste (HLW) and Spent Nuclear Fuel (SNF)
- Natural and Engineered Barrier Systems
- Minimize the release of radionuclides to the biosphere



Performance Assessment (PA)





- PFLOTRAN
 - Coupled heat and fluid flow
 - Reactive transport
 - Parallel, high-performance computing



- ParaView
 - Domain visualization
 - Filters/Sources



- Python
 - Visualization/Graphics
 - Calculations


Modeling- Methodology

ParaView 4.4.0 64-bit

File Edit View Sources Filters Tools Catalyst Macros Writers CoProcessing Help

Time: 0 of 56

XC Surface



Pipeline Browser

- skybridge (reverse connection) (csrc://skybridge)
- pflotran-0*

Properties Information

Properties

Apply Reset Delete ?

Search ... (use Esc to clear text)

Properties (pflotran-0*)

Point Arrays

Cell Arrays

- Am241(s) Rate [mol_m^3_sec]
- Am241(s) VF
- Am243(s) Rate [mol_m^3_sec]
- Am243(s) VF
- Cl36(s) Rate [mol_m^3_sec]
- Cl36(s) VF
- Cs135(s) Rate [mol_m^3_sec]
- Cs135(s) VF
- I129(s) Rate [mol_m^3_sec]
- I129(s) VF

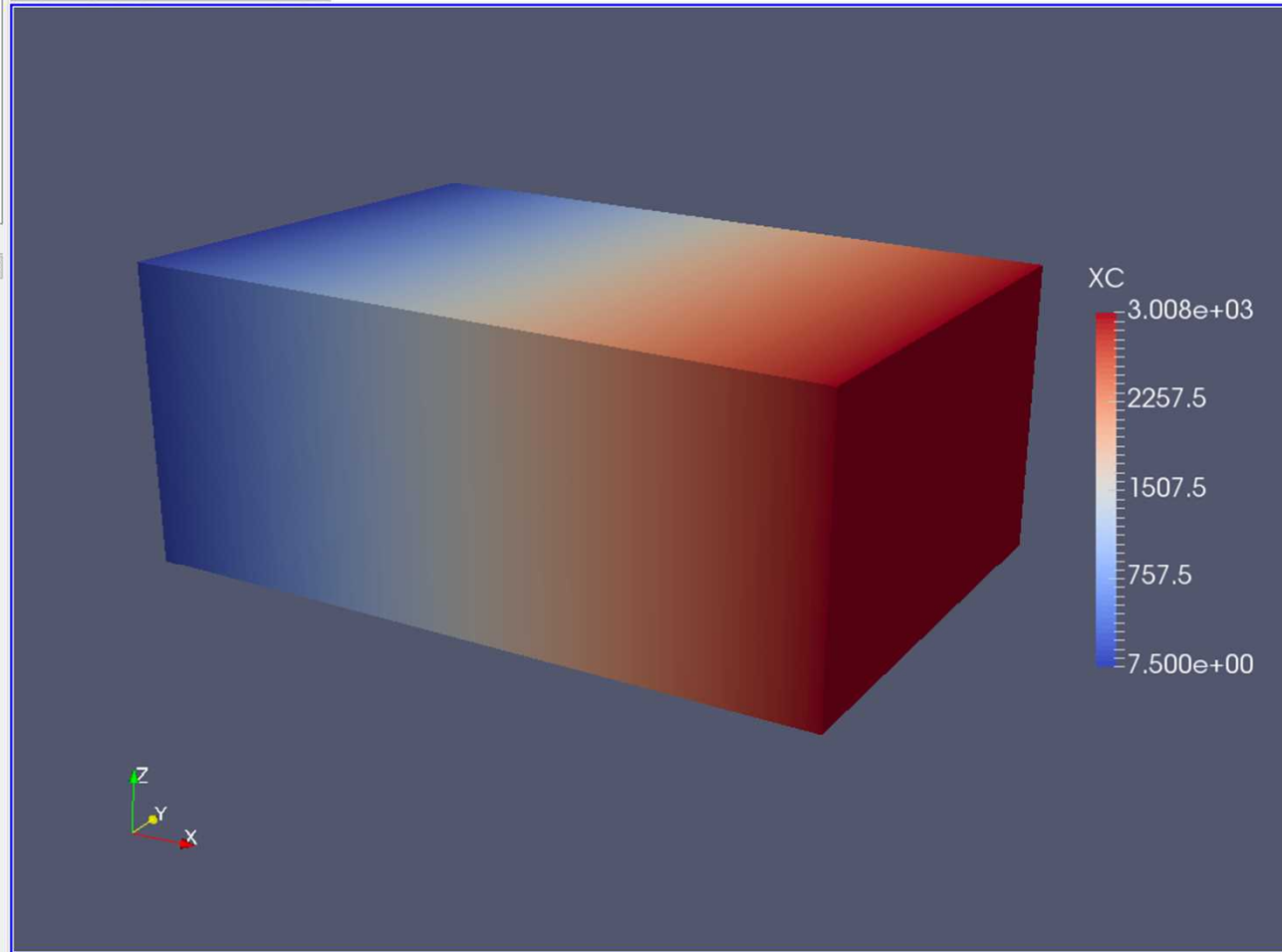
Sets

Blocks Hierarchy

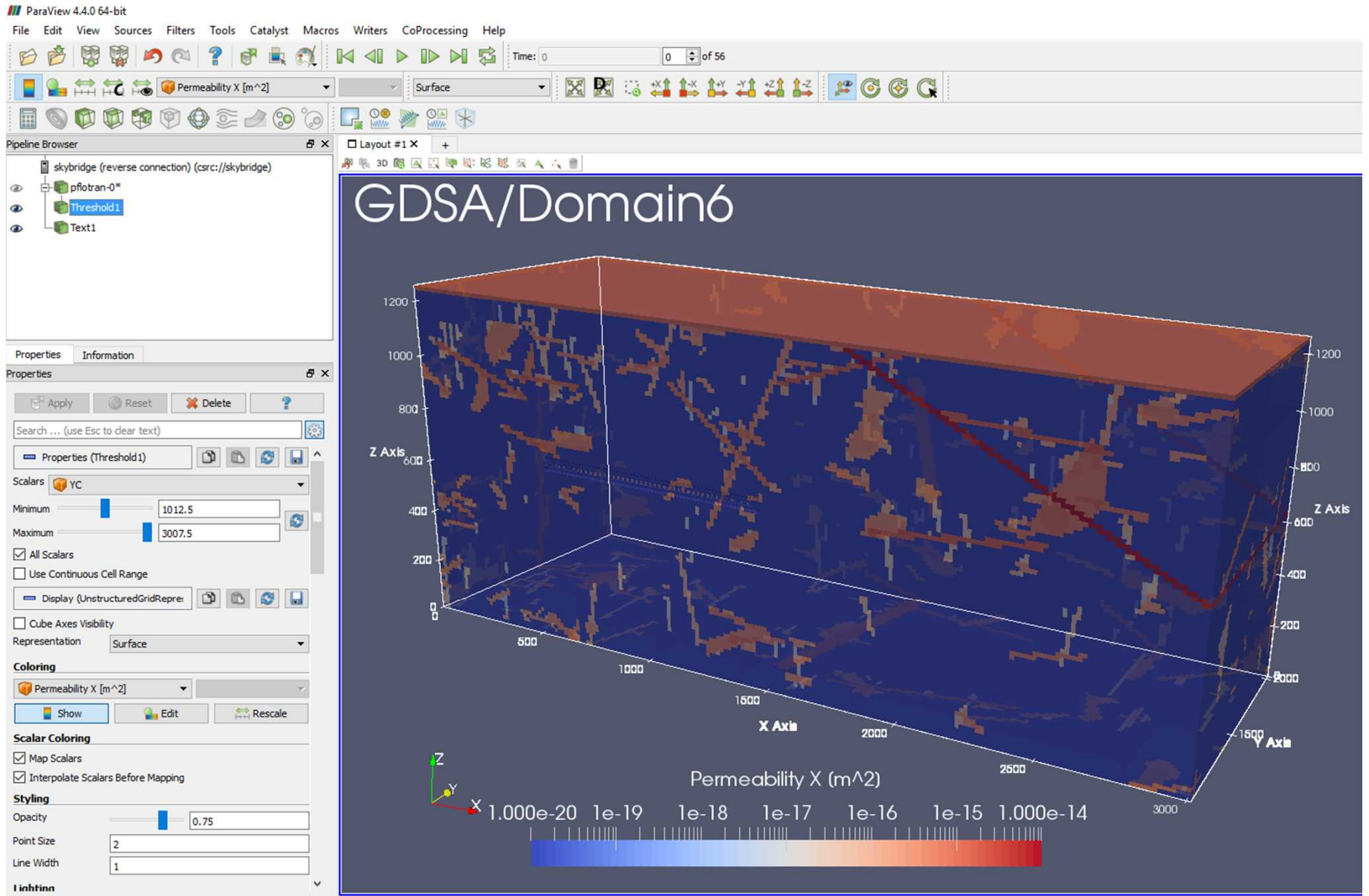
- Blocks
- Mesh

Check Selected Blocks Uncheck Selected Blocks

Stride 1 1 1



Modeling- Permeability

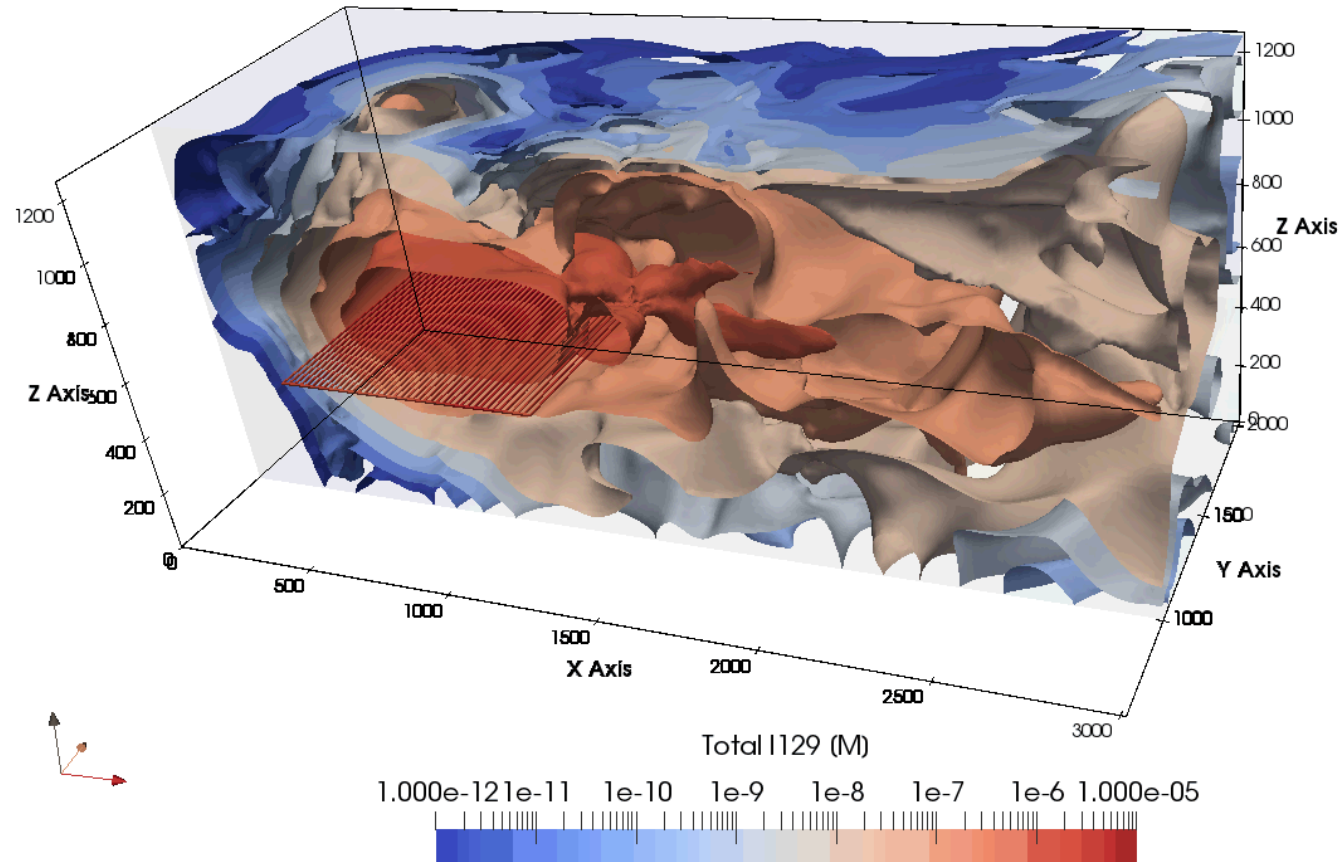


Modeling- Concentration

- Concentration of Iodine-129 vs. Time

Time: 1000000 Years

GDSA/Domain 6



- Research and Study Foreign Nuclear Programs
- The Goal
 - Investigate the different corrosion or degradation models other countries are using.
 - Material
 - Environment



Foreign Programs Investigated



- Sweden



- Canada



- Finland



- Switzerland



- Japan



- United Kingdom

- Modeling:
 - Figures created for upcoming reports
 - Figures used for debugging model set-up
 - Graphics will continue to be produced as needed
- Research:
 - Reference for types of models being used by others
 - Will inform implementation of corrosion model in PA
 - On-going process
- Problems:
 - Learning curve
 - Loss of connection
 - Reliable sources
 - Abundance of information

- Importance:
 - Deep Geological Repository for HLW & SNF
 - Good sources and knowledge of what corrosion models are being used.
- Publication contributions:
 - “Generic Disposal System Model Development and Reference Case Applications”
Authored by P.E. Mariner, E.R. Stein, J.M. Frederick, S.D. Sevougian, G.E. Hammond, and D.G. Fascitelli
- Benefits from the internship:
 - Exposure to computer programming languages and software applications
 - Refined research abilities
 - Experience contributing to a team
 - Networking

Presenter Information

- Dominic G. Fascitelli
- Albuquerque, New Mexico
- Sophomore at New Mexico Tech
- Major:
 - Mechanical Engineering
- Plans (3 to 5 years):
 - Graduate From NMT with High Honors
 - Critical Skills Master's Program (CSMP)
 - Position at Engineering Firm or Laboratory

