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Sandia National Laboratories

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
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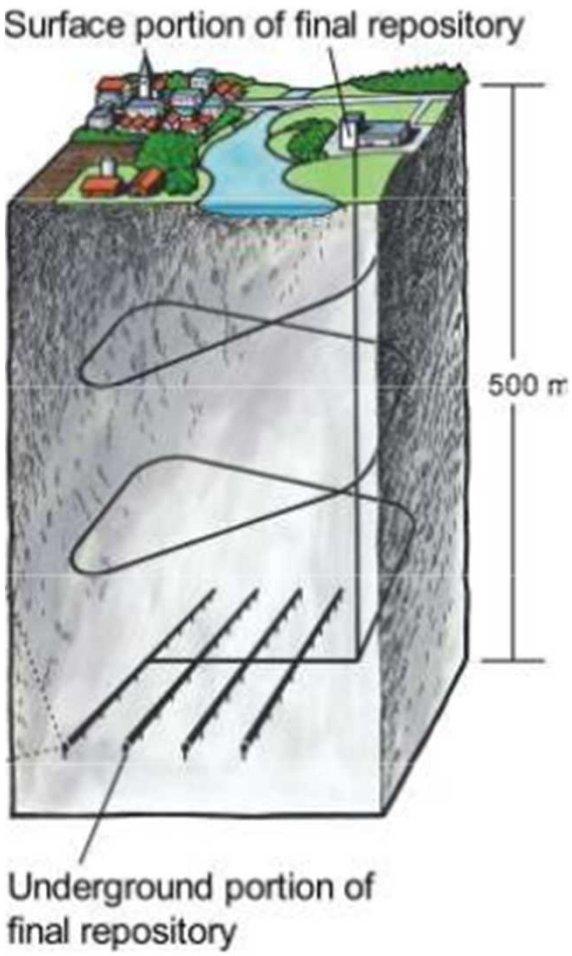
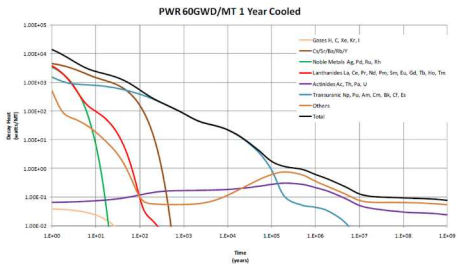
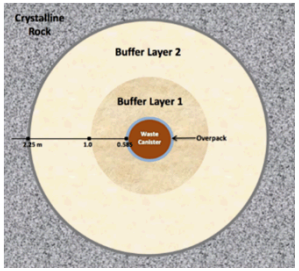
What is Geologic Disposal?

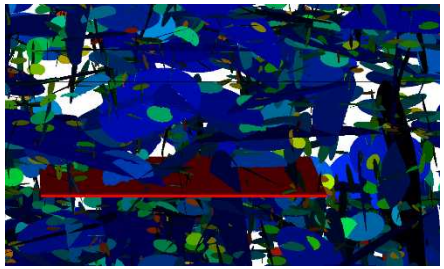
- Disposal of High-Level Waste (HLW) and Spent Nuclear Fuel (SNF)
- Natural and Engineered Barrier Systems
- Minimize the release of radionuclides to the biosphere



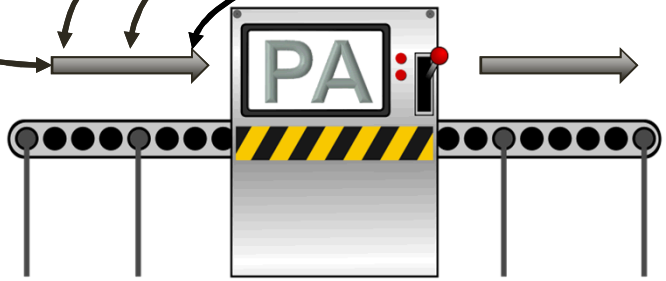
Performance Assessment (PA)

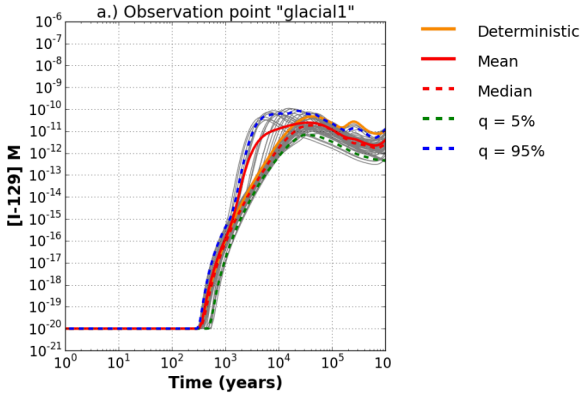






Waste Forms | Engineered Barrier System | Natural Barrier System | Biosphere

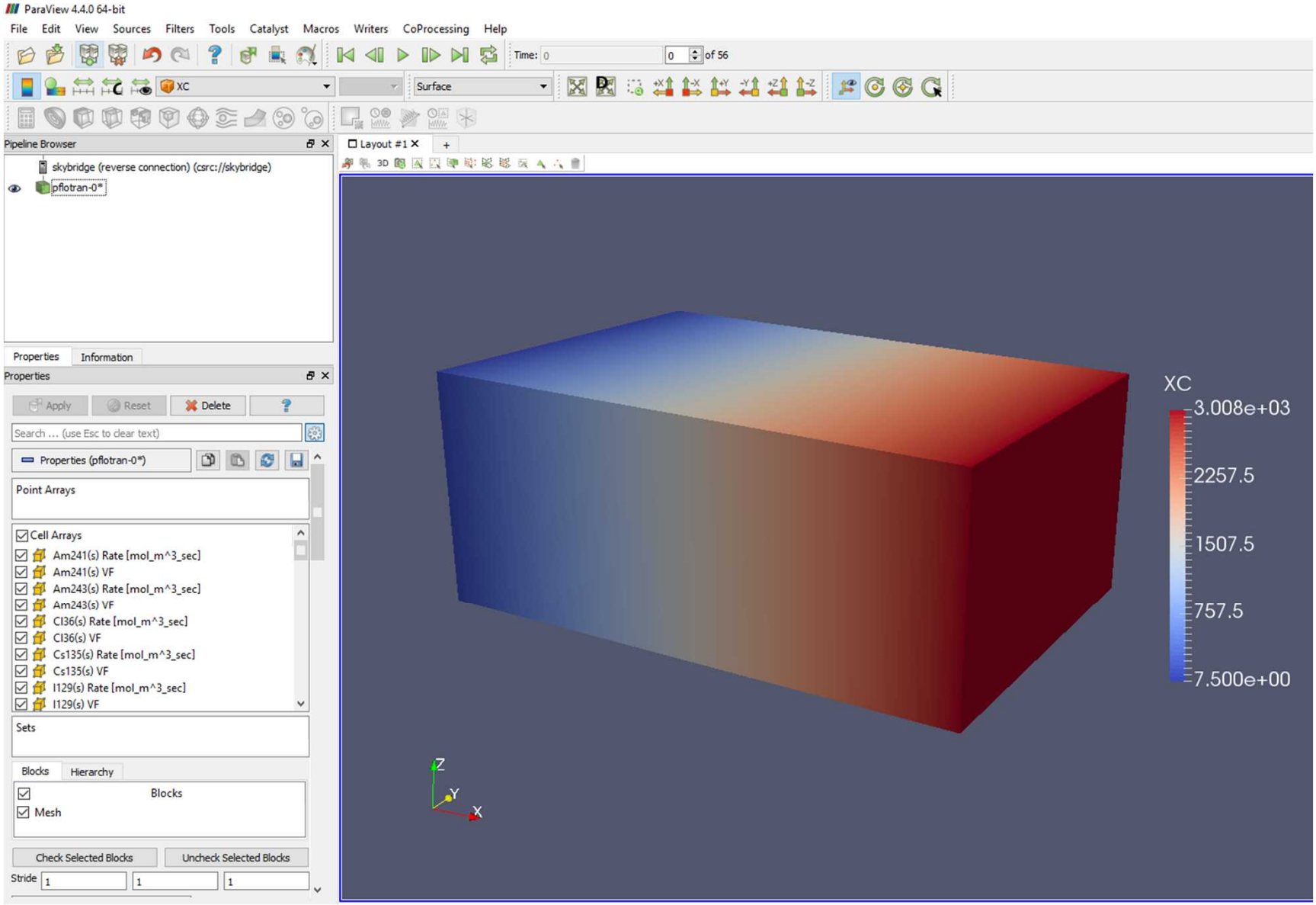




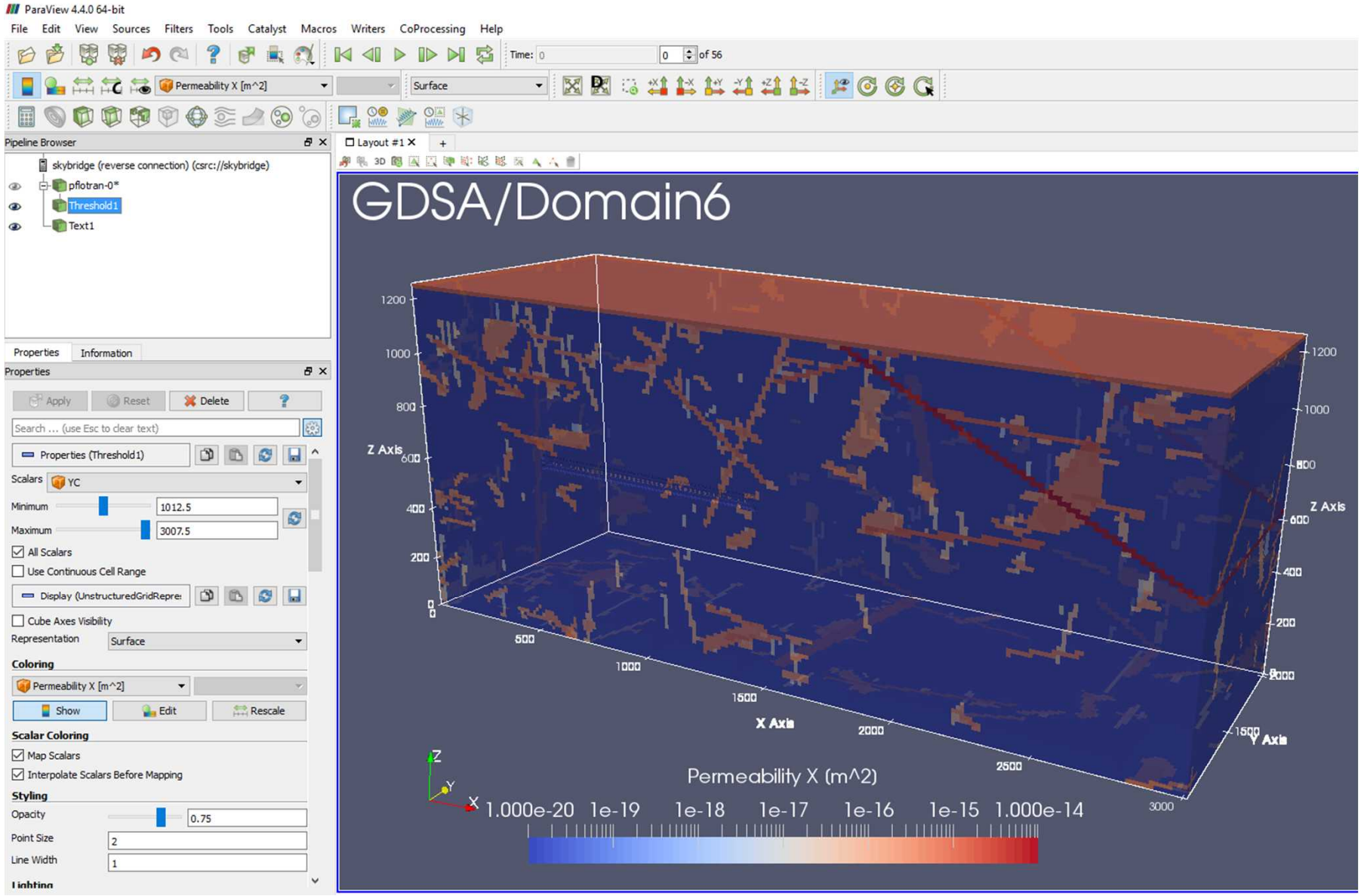
Modeling

- PFLOTRAN
  - Coupled heat and fluid flow
  - Reactive transport
  - Parallel, high-performance computing
- ParaView
  - Domain visualization
  - Filters/Sources
- Python
  - Visualization/Graphics
  - Calculations

Modeling- Methodology

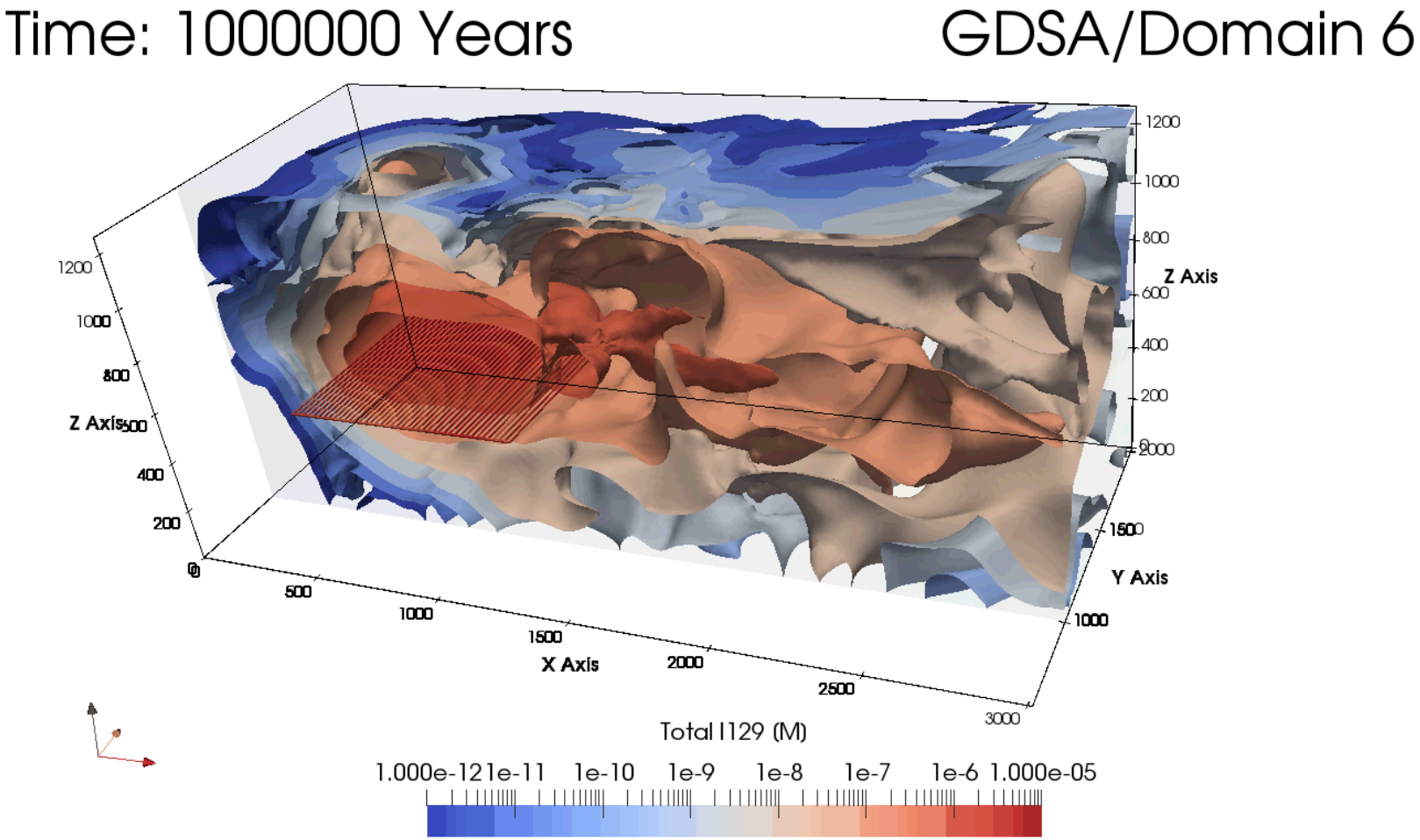


Modeling- Permeability

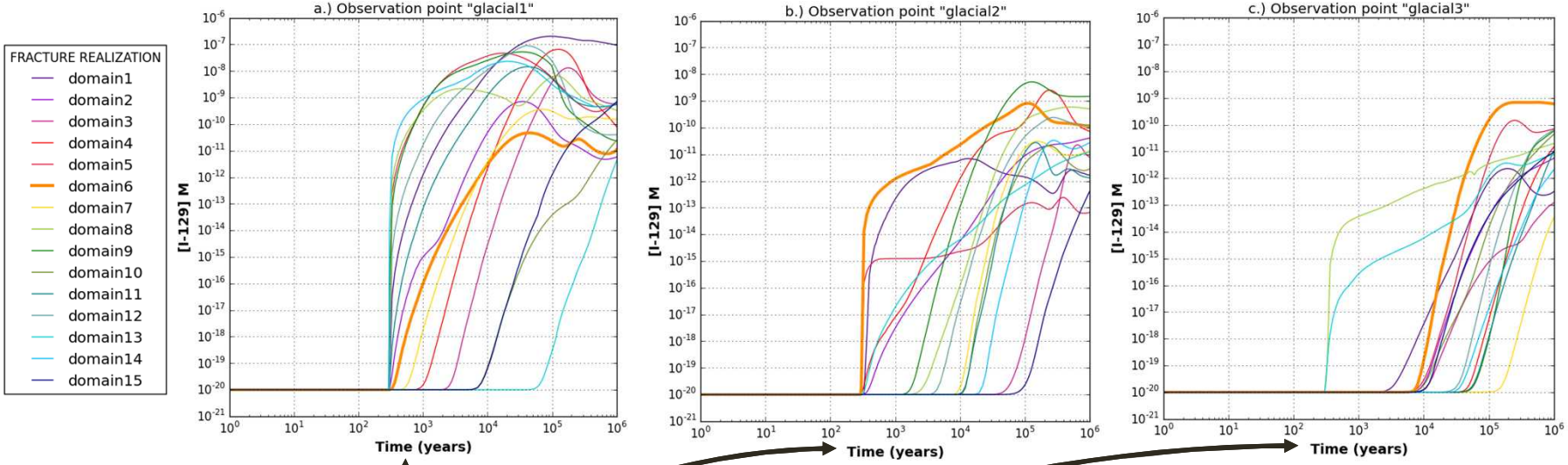


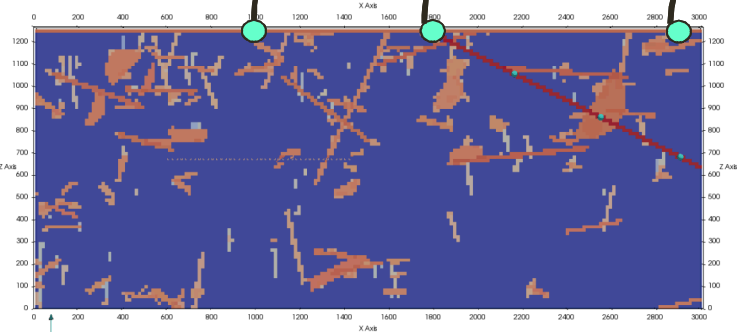
Modeling- Concentration

- Concentration of Iodine-129 vs. Time



Modeling- Concentration





Research

- 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

Results

- 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

Conclusion

- 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