Summary: Coupled Thermal-Hydrological-Mechanical-Chemical-Biological Experimental Facility at DUSEL Homestake

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1. Selected experiment locations
2. Facility needs
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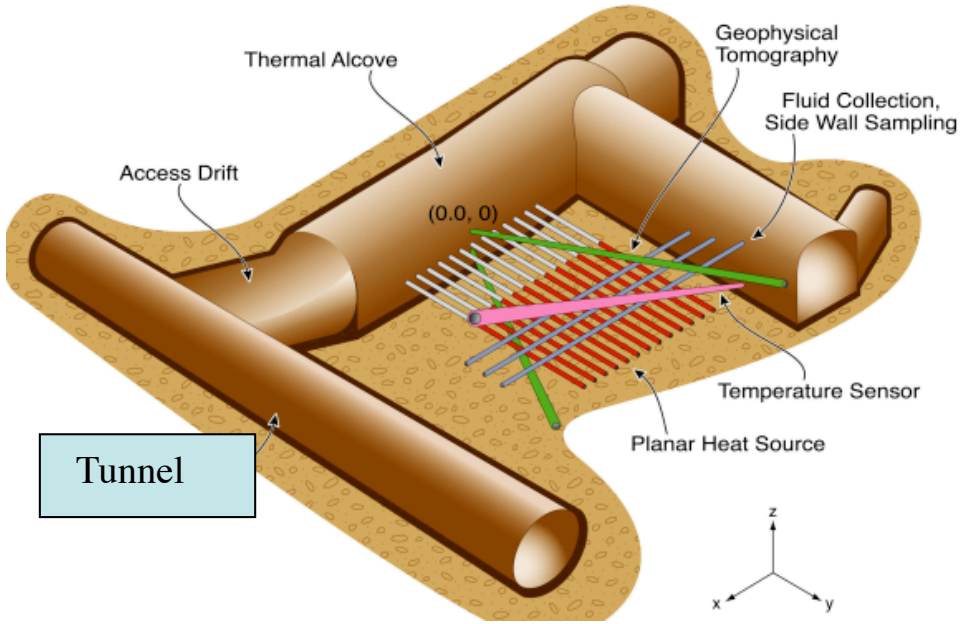
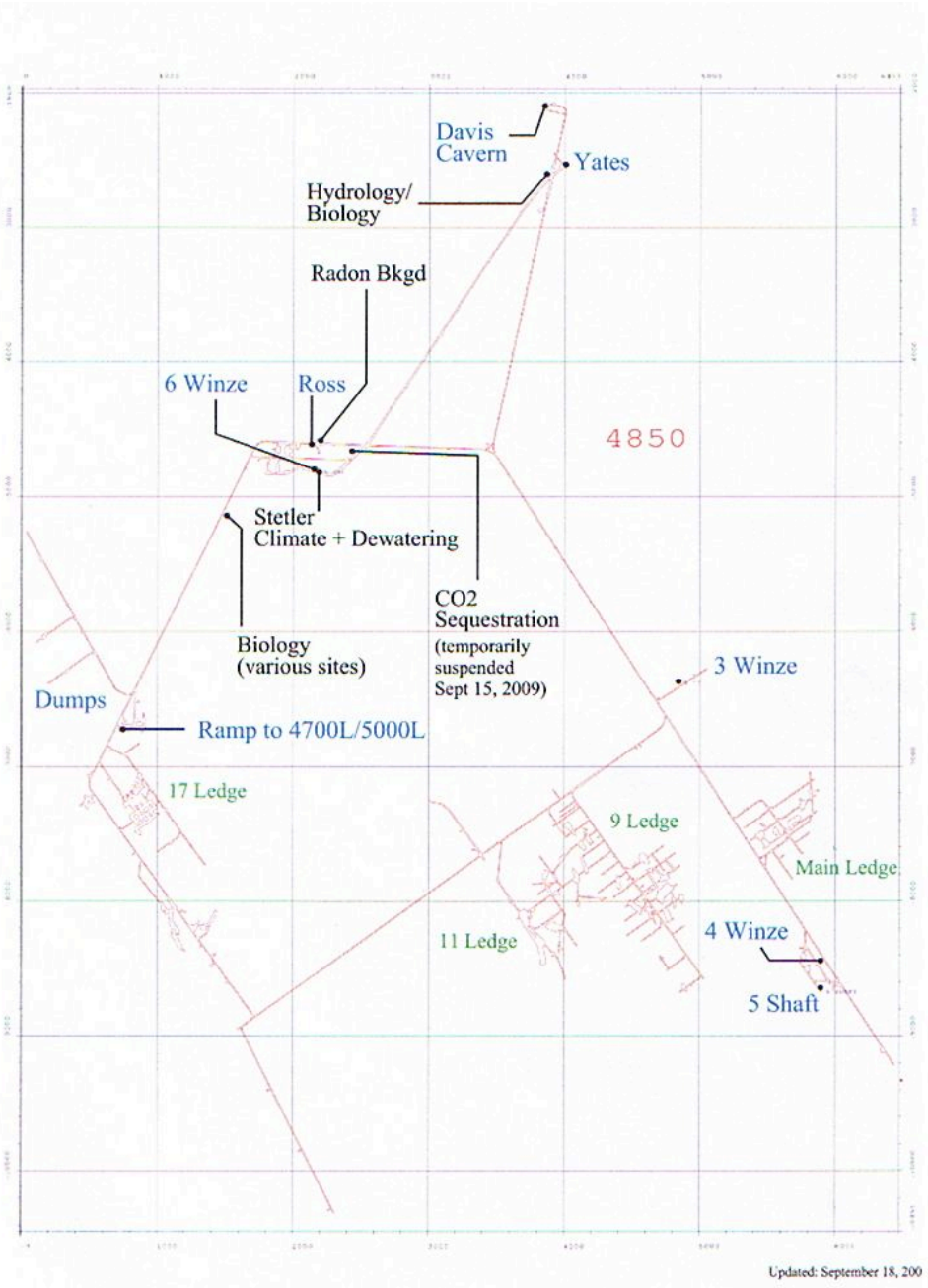
4. Major outstanding R&D needs
5. Points of Contact
   Engineers -- Salve/Marks
   E&O Mailloux (east), Maher (west), Uzunlar (SD)

THMCB Experiment Conceptual Design

Attributes

- Block Size: ~ 100x100x50m +
- Planar heat source (vertical plane would set up rapid upward convective flow)
- Scalable: Nominally heaters are 40 m x 40 m in area
- Temperature Max (~ 200 C)
- Sample collection and observation boreholes (geochemistry, thermal, mechanics, biological)
- Geophysical/thermal measurements





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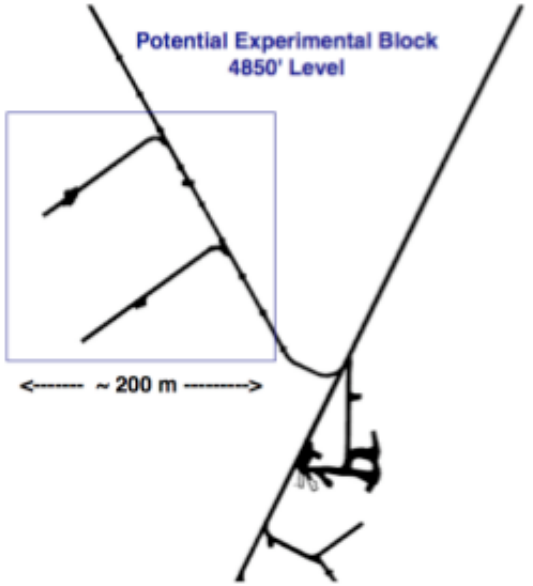
Experiment Locations

- 2 potential sites on 4850 (planned visits for scoping, sampling, mapping, etc.) -- possible 2nd expt on 7400 level
- Both in Poorman Fm, potentially with some Homestake Fm and rhyolite dikes
- Primary Requirements:
  - Moderate to high fracture density, i.e. fracture permeability
  - Seeping fractures, indicating active flowing fractures
  - Some lithologic heterogeneity
  - Relatively large unperturbed block with access for heater boreholes and observation/sampling boreholes
  - Large enough block to accommodate potentially other similar experiments, such as the Fault Rupture (Germanovitch)



Facility Needs

- Access to power (~200 kw), ventilation
- Adits on at least 2 sides for observation/monitoring boreholes, alcove(s) for controlling/monitoring equipment
- Boreholes (~ 50m) for heaters, water/gas collection, geophysical monitoring (e.g., GPR, ERT, acoustic emission, …)
- Subsurface (Mobile laboratory could be employed) and surface laboratories for field analyses and sampling equipment

Schedules for occupancy and for deliverables

- Winter/early Spring 2010 -- site(s) surveyed/sampled. (Uzunlar leading). Selection of site on 4850 level. (tiltmeters installed by Stetler nearby already)
- Preliminary conceptual model for rock/fluid geochemistry, hydrology, fracture characteristics, structure (~ March 2010)
- Numerical models (TH, THC, THM) for alternative designs (2009 - 2010)
- Initial selection/costing of heaters, packers, thermal sensors, DTPS, controlling equipment for draft MREFC submittal (
- 2010-2012 THMCB block experiment design and instrumentation
- 2012-2013 Construction and instrumentation
- 2013 - Initiation of first heating phase

Major outstanding R&D needs

- In-situ fracture permeability at the 1 to 10 meter scale
- Water content of intact rock matrix, fractures, and fluid fluxes (in-situ geophysical measurements - Transparent Earth)
- In-situ water chemistry - planned sampling by Stetler with chemical and isotopic analyses (Maher, Conrad, Uzunlar)
- Mineral geochemistry, isotopic composition (Maher, Uzunlar) 2009 --
- Permeability, rock mechanical, density, and thermal properties measurements (Elsworth, Lowell - 2009-2010)
- Detailed 3-D geologic structure (Uzunlar)
- In-situ stress measurements (Transparent Earth)
- Sampling for microbiology (Mailloux, early 2010)
- THMC model of experiment (Sonnenthal, 2009 -)