TEGA Oven 0 High Temperature Run

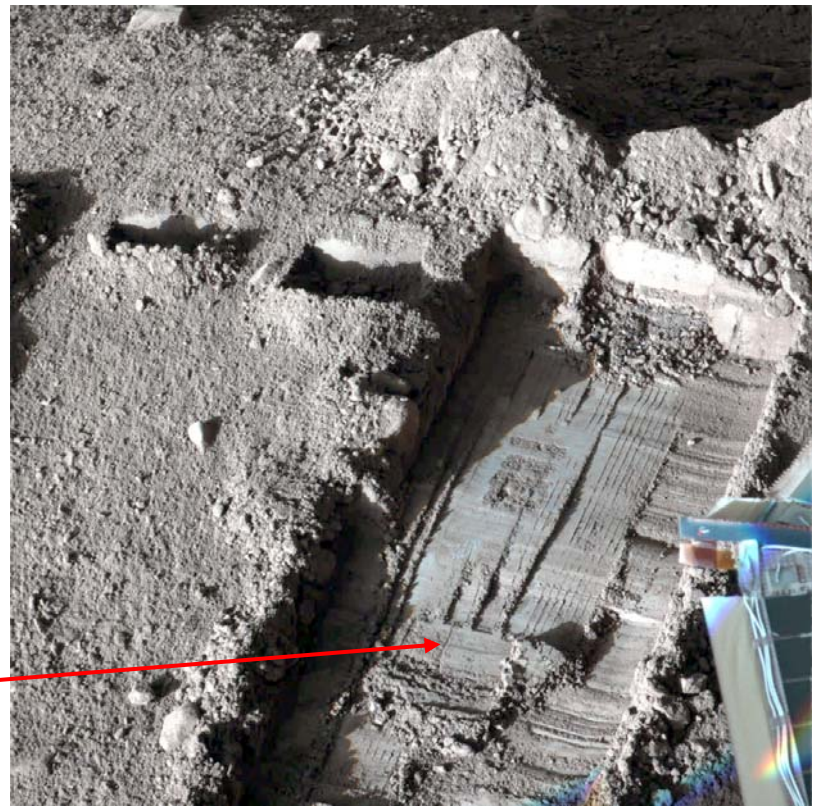
Thermal and Evolved Gas Analysis of Wicked Witch

Doug Ming and the TEGA Team

August 11, 2008
EOS, Sol 76

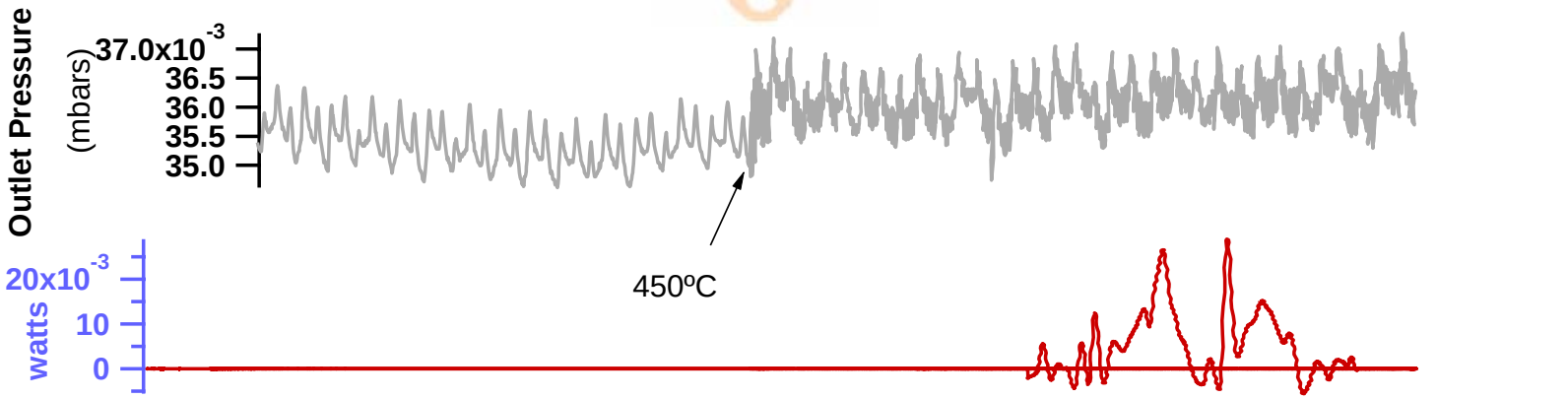
Phoenix - TEGA
Wicked Witch

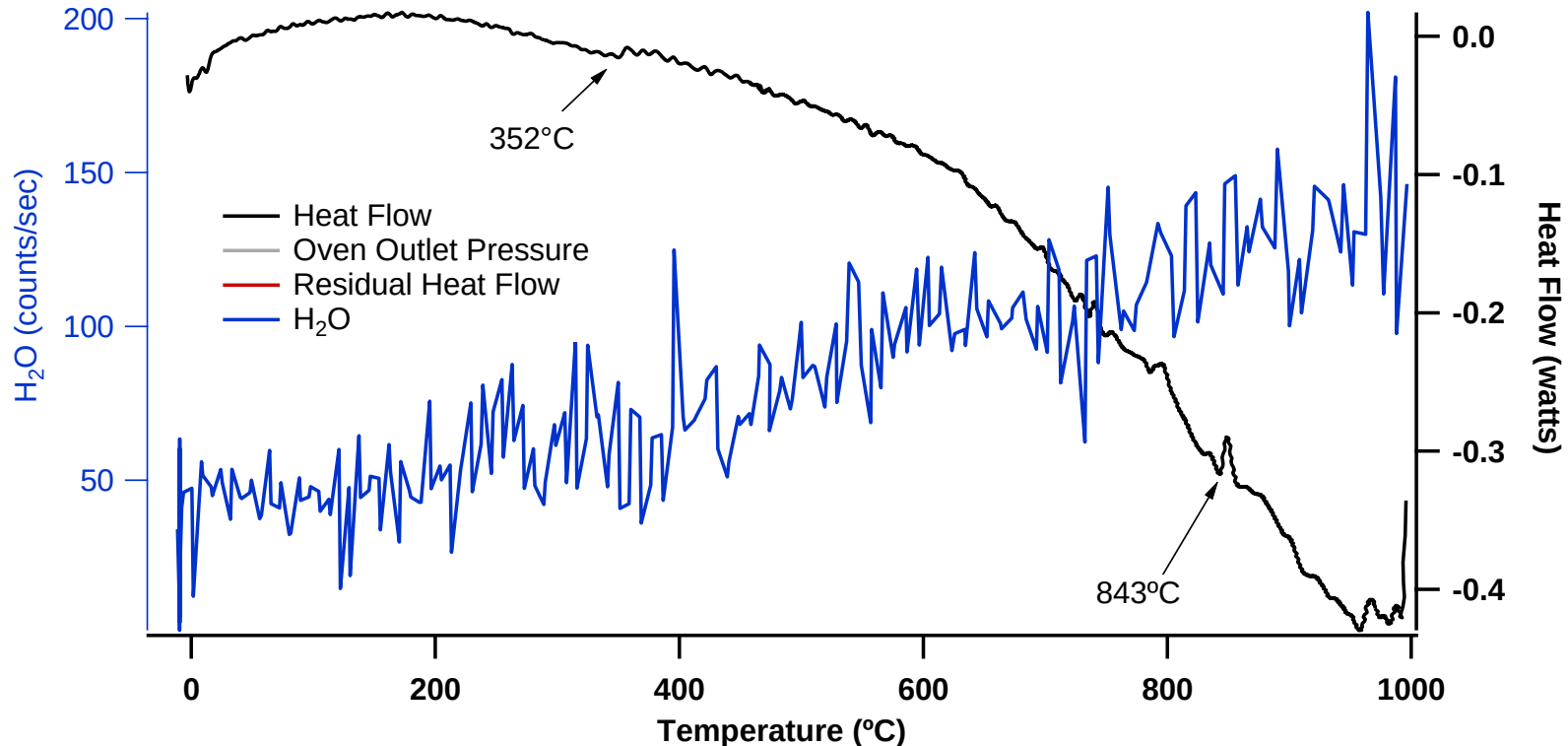
- Wicked Witch was a subsurface sample acquired by the RA scoop from the Snow White Trench on Sol 64



Phoenix - TEGA

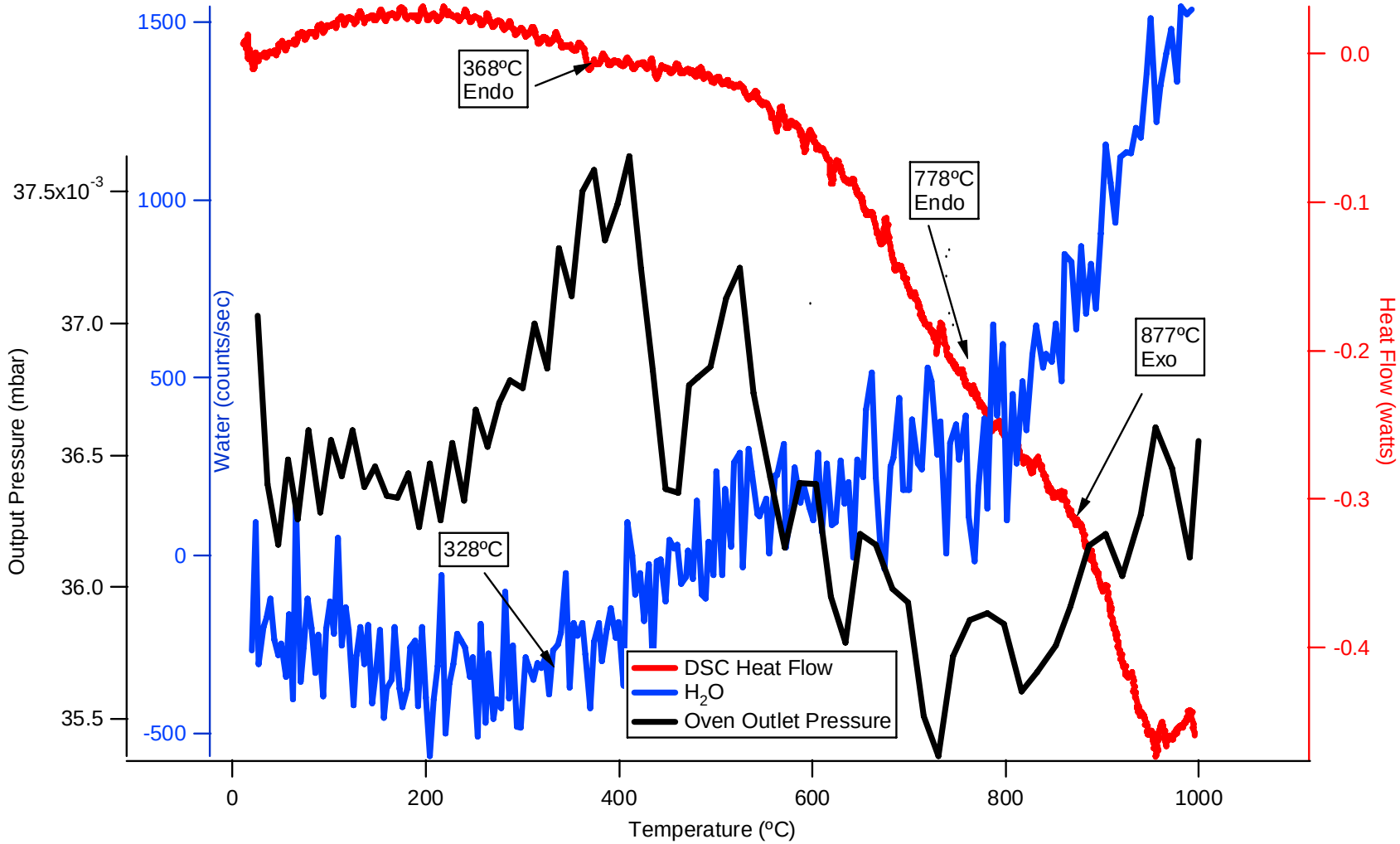
Wicked Witch H_2O Releases





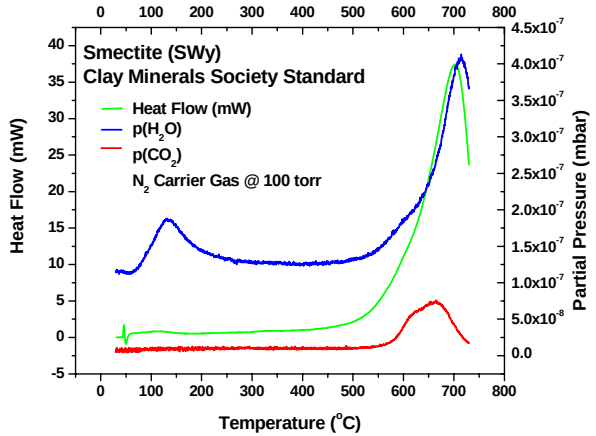
Phoenix - TEGA

Baby Bear H_2O Releases



Candidate Water-Bearing Phases

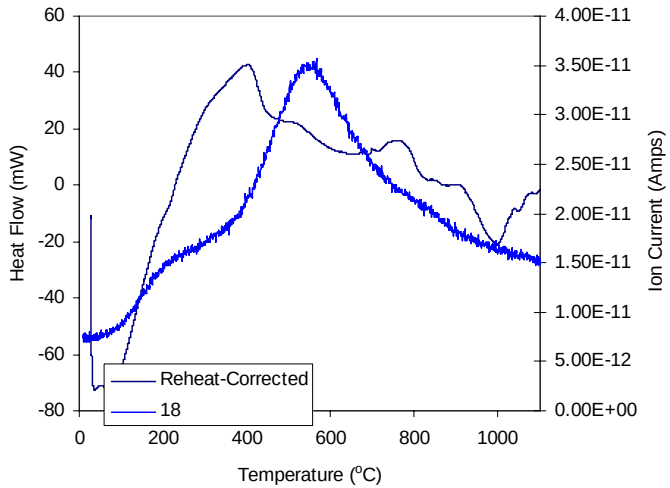
- 700-1000°C
  - Dehydroxylation of Al-OH from octahedral positions
    - Montmorillonite
    - Beidellite
    - Many others



Smectite (Wyoming)

High Temp Endo and Exothemic reactions

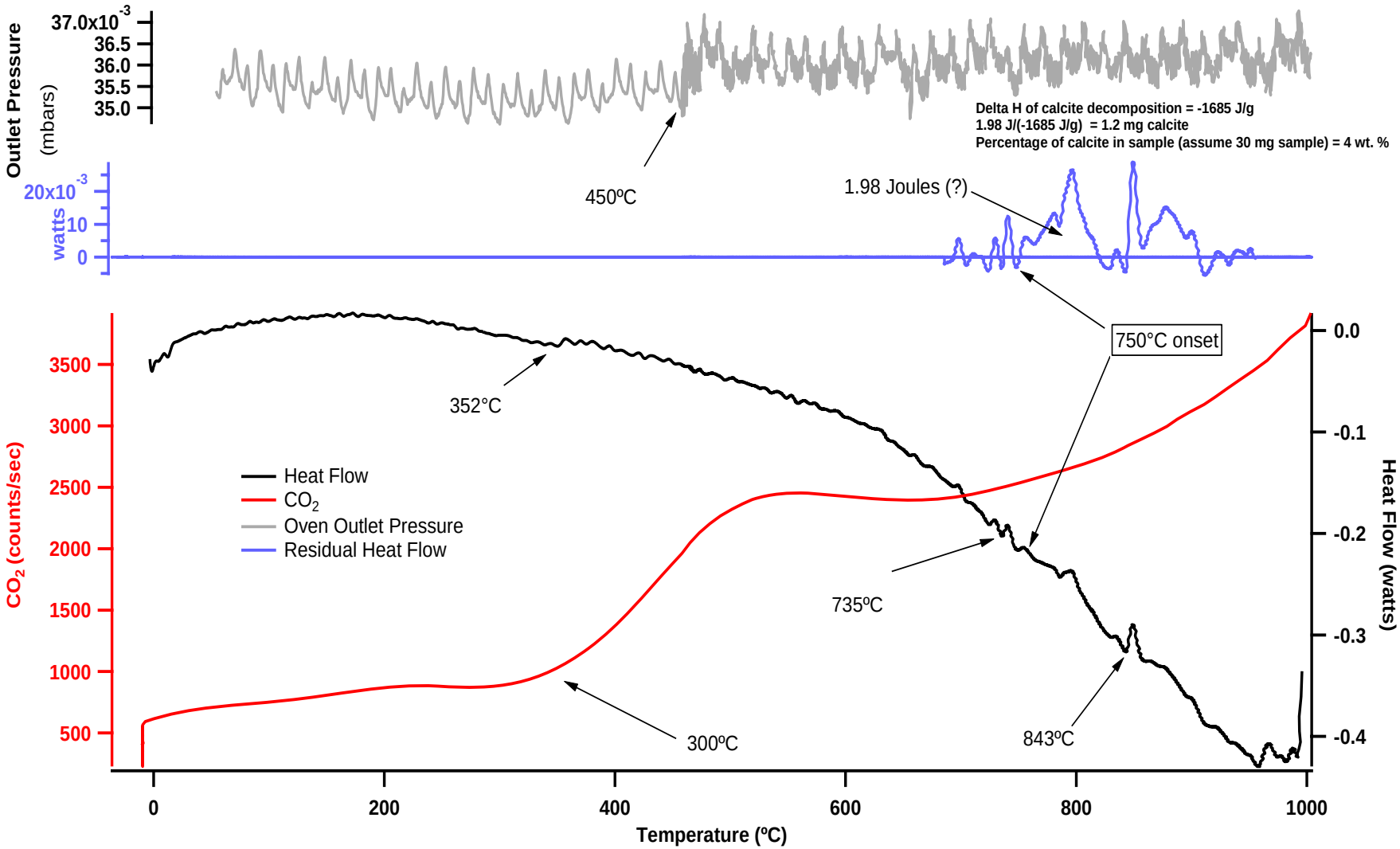
- Dehydroxylation of Trans-vacant Al-OH in Montmorillonite and subsequent formation of enstatite



Smectite (Washington)

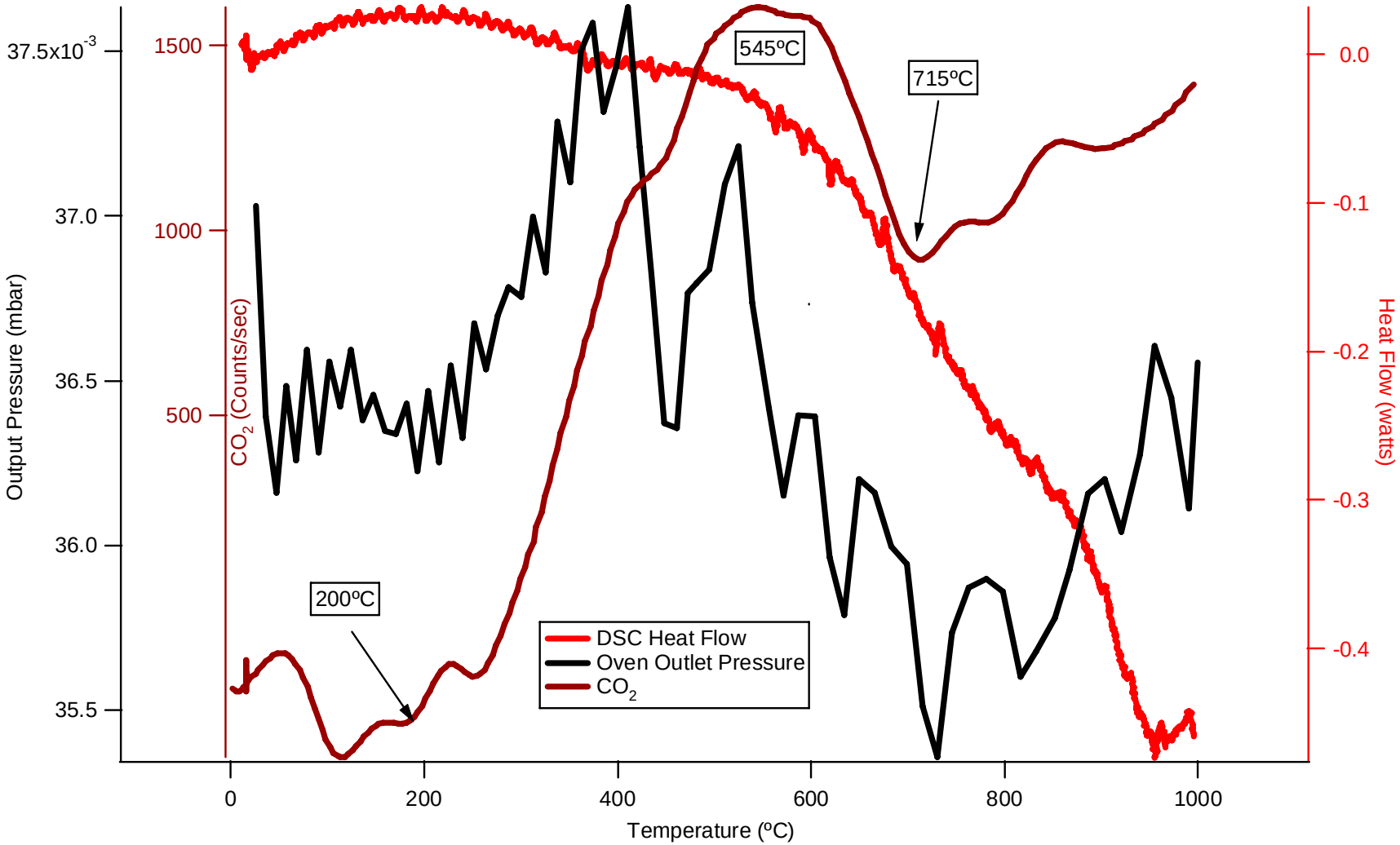
Phoenix - TEGA

Wicked Witch CO_2 Release



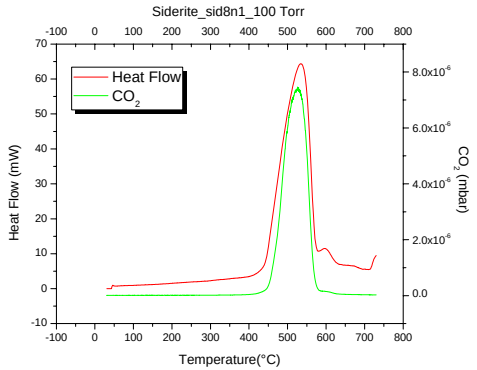
Phoenix - TEGA

Baby Bear CO_2 Release

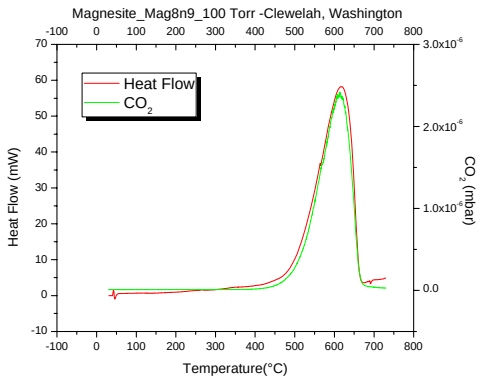


Candidate CO_2-Bearing Phases

- 350-550°C
  - Pyrolysis of organic molecules
  - Decomposition of Fe-carbonate
- 450-700°C
  - Pyrolysis of organic molecules (e.g., kerogen-like)
  - Decomposition of Fe-, Mg- and/or Fe-Mg-Ca mixed carbonates
- 700-1000°C
  - Decomposition of Ca-carbonate

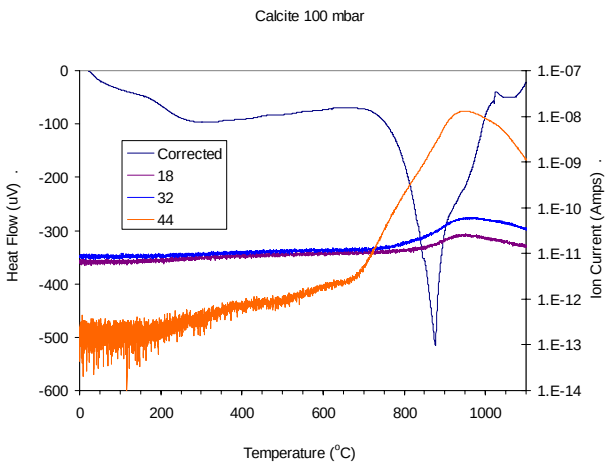


Siderite



Magnesite

Calcite



Wicked Witch Evolved Gas Summary

- CO_2 evolved over a wide range
  - 325-600°C
  - 700-1000°C
- High temperature water release
  - Very small amount released
  - 600-1000°C
- No Mass 64 or 70 observed
- No organic fragments observed in run
  - Organics may have been combusted if they were present
  - Or there are no organics in the surface soil

Wicked Witch Thermal Analysis Summary

- "Major" Endotherms
  - 750-800°C
  - Candidate
    - Calcite (based upon CO_2 evolution)
- 840-880°C
  - Candidates
    - Al-OH dehydrolylation (based upon small amount of water release)