

S9_Isobar_Comparison_Plotter

November 30, 2023

1 Inter-model Isobar Comparision

This notebook provides code to visualize differences in isobars plotted for an alkali basalt and a rhyolite sample using each of VESIcal's H₂O-CO₂ models.

```
[ ]: import VESIcal as v
import pandas as pd
%matplotlib inline
```

```
[ ]: alkbasalt = v.Sample({'SiO2': 49.0,
                          'TiO2': 1.27,
                          'Al2O3': 19.7,
                          'Fe2O3': 3.74,
                          'FeO': 5.33,
                          'MnO': 0.17,
                          'MgO': 4.82,
                          'CaO': 8.85,
                          'Na2O': 4.23,
                          'K2O': 1.00,
                          'P2O5': 0.37,
                          'H2O': 4.51,
                          'CO2': 0.25})
```

```
rhyolite = v.Sample({'SiO2':77.19,
                    'TiO2':0.06,
                    'Al2O3':12.80,
                    'FeO':0.94,
                    'MgO':0.03,
                    'CaO':0.53,
                    'Na2O':3.98,
                    'K2O':4.65,
                    'CO2':0.05,
                    'H2O':0.26})
```

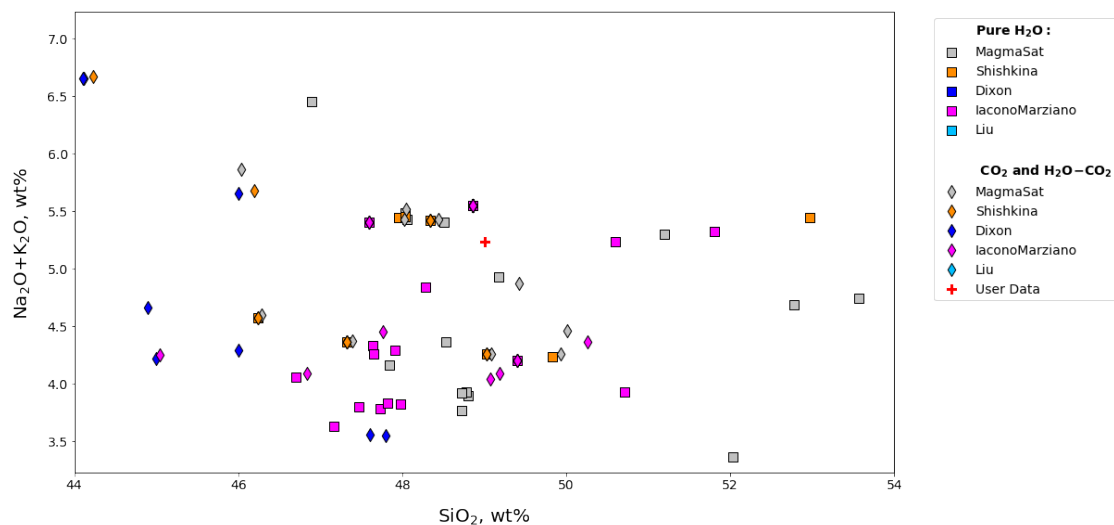
```
sample_table = pd.DataFrame([alkbasalt.get_composition(), rhyolite.
    ↪get_composition()], index=["Alkali Basalt", "Rhyolite"])
sample_table
```

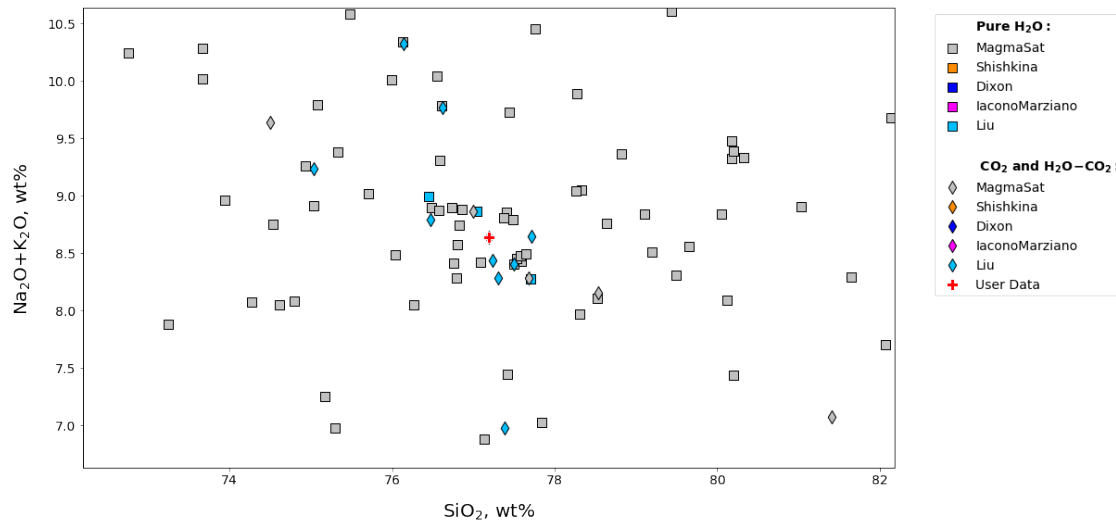
```
[ ]:      SiO2  TiO2  Al2O3  Fe2O3  FeO  MnO  MgO  CaO  Na2O  K2O  \
Alkali Basalt  49.00  1.27  19.7   3.74  5.33  0.17  4.82  8.85  4.23  1.00
Rhyolite       77.19  0.06  12.8   NaN   0.94  NaN   0.03  0.53  3.98  4.65

      P2O5  H2O  CO2
Alkali Basalt  0.37  4.51  0.25
Rhyolite       NaN  0.26  0.05
```

```
[ ]: #check calibration
v.calib_plot(user_data=alkbasalt.get_composition(), model='mixed',
             zoom='user_data')
v.calib_plot(user_data=rhyolite.get_composition(), model='mixed',
             zoom='user_data')
```

```
[ ]: (<Figure size 1224x576 with 1 Axes>,
      <matplotlib.axes._subplots.AxesSubplot at 0x7fd733d23e90>)
```





```
[ ]: alkbasalt_isobars, alkbasalt_isopleths = v.
      ↪calculate_isobars_and_isopleths(sample=alkbasalt, temperature=1200,
      ↪pressure_list=[500, 1000, 2000], isopleth_list=[0.5], print_status=True).
      ↪result
```

```
rhyolite_isobars, rhyolite_isopleths = v.
      ↪calculate_isobars_and_isopleths(sample=rhyolite, temperature=800,
      ↪pressure_list=[500, 1000, 2000], isopleth_list=[0.5]).result
```

Calculating isobar at 500 bars

done.

Calculating isobar at 1000 bars

done.

Calculating isobar at 2000 bars

done.

Done!

Calculating isobar at 500 bars

done.

Calculating isobar at 1000 bars

done.

Calculating isobar at 2000 bars

done.

Done!

```
[ ]: Iac_alkbasalt_isobars, Iac_alkbasalt_isopleths = v.
      ↪calculate_isobars_and_isopleths(sample=alkbasalt, temperature=1200,
      ↪pressure_list=[500, 1000, 2000], isopleth_list=[0.5],
      ↪model="IaconoMarziano").result
```

```

Dixon_alkbasalt_isobars, Dixon_alkbasalt_isopleths = v.
    ↪calculate_isobars_and_isopleths(sample=alkbasalt, temperature=1200,
    ↪pressure_list=[500, 1000, 2000], isopleth_list=[0.5], model="Dixon").result
Shish_alkbasalt_isobars, Shish_alkbasalt_isopleths = v.
    ↪calculate_isobars_and_isopleths(sample=alkbasalt, temperature=1200,
    ↪pressure_list=[500, 1000, 2000], isopleth_list=[0.5],
    ↪model="ShishkinaIdealMixing").result

Liu_rhyolite_isobars, Liu_rhyolite_isopleths = v.
    ↪calculate_isobars_and_isopleths(sample=rhyolite, temperature=800,
    ↪pressure_list=[500, 1000, 2000], isopleth_list=[0.5], model="Liu").result

```

```

/opt/anaconda3/lib/python3.7/site-packages/VESIcal/calculate_classes.py:60:
RuntimeWarning: pressure exceeds 1000 bar, which Iacono-Marziano et al. (2012)
suggest as an upper calibration limit of the Dixon (1997, Pi-SiO2 simpl.) Model,
  w.warn(self.calib_check, RuntimeWarning)

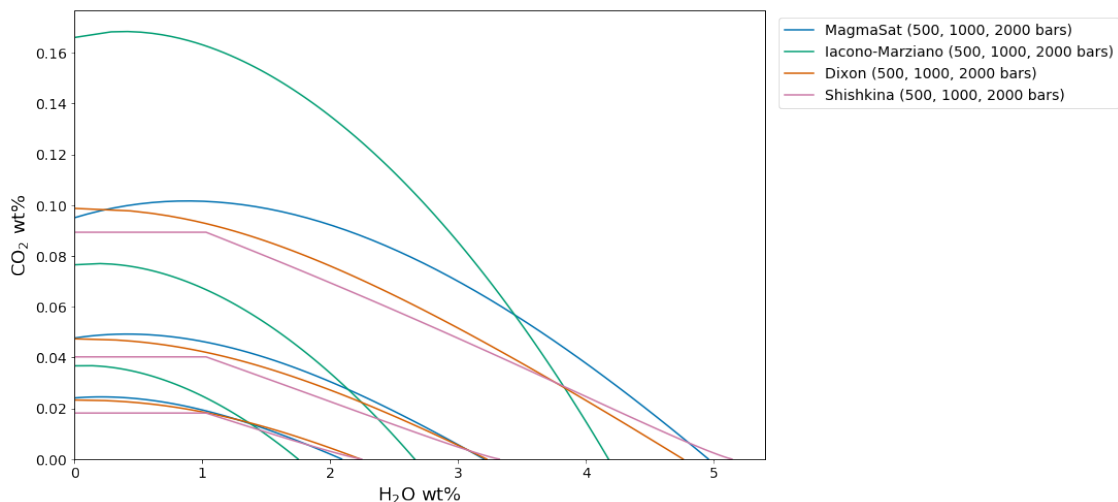
```

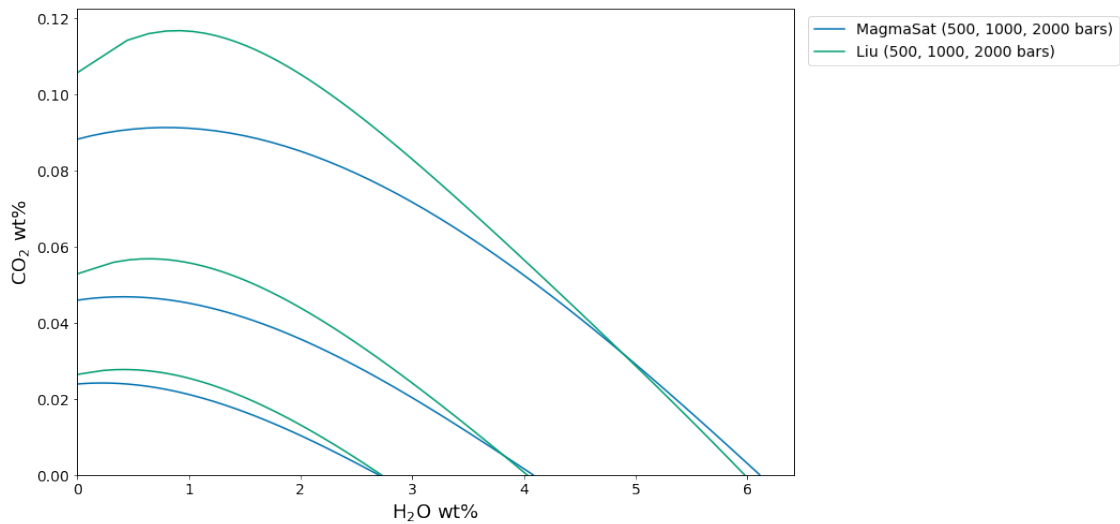
```

[ ]: fig, ax = v.plot(isobars=[alkbasalt_isobars, Iac_alkbasalt_isobars,
    ↪Dixon_alkbasalt_isobars, Shish_alkbasalt_isobars],
    ↪isobar_labels=["MagmaSat", "Iacono-Marziano", "Dixon", "Shishkina"])
v.show()

fig, ax = v.plot(isobars=[rhyolite_isobars, Liu_rhyolite_isobars],
    ↪isobar_labels=["MagmaSat", "Liu"])
v.show()

```





```
[ ]: fig, ax = v.plot(isobars=Shish_alkbasalt_isobars)
      v.show()
```

