GSA Data Repository Item 2017140
Wang, C., Adriaens, R., Hong, H., Elsen, J., Vandenberghe, N., Lourens, L.J., Gingerich, P.D., and Abels, H.A., 2017, Clay mineralogical constraints on weathering in response to early Eocene hyperthermal events in the Bighorn Basin, Wyoming (Western Interior USA): GSA Bulletin, doi:10.1130/B31515.1.

DATA REPOSITORY TABLES

Data Table DR1

Data Table DR2

Data Table DR3

Table DR1 Clay mineral assemblages in the fraction less than 0.2 μm

Sample No.	Illite	Chlorite	Smectite	IS	Kaolinite
EDC69	0	0	86.4	10.5	3.0
EDC111	0.6	0	85.6	10.5	3.2
EDC187	0	0	82.3	15.0	2.7
EDC208	0.6	0	82.7	14.6	2.2
EDC236	0	0	83.8	13.2	3.0
EDC240	0.4	0	88.7	8.5	2.4
EDC336	0	0	86.3	11.6	2.2
EDC390	0.3	0	81.2	16.0	2.4
Average	0.2	0.0	84.6	12.5	2.6
Standard deviation	0.3	0.0	2.5	2.6	0.5

Table DR2 Average clay mineral distribution (<2 µm) in different grain-size and soil development index from samples during and outside the hyperthermals. Note that the clay mineral averages present in bold number, under which are their standard deviation in brackets. Clay mineral distribution that could be affected by the grain-size sorting remarkably shows decrease of smectite and increase of mixed-layer illite-smectite along with a decrease of grain-size in non-hyperthermal and low SDI samples. Slight increases of smectite from low SDI to high SDI samples are shown in both groups in non-hyperthermal and hyperthermals. Relative larger increases of smectite are observed in the hyperthermal samples with respect to non-hyperthermal samples.

Non-Hyperthermal	**Low Soil Development**					**Medium to High Soil Development**						**Impact of Soil Formation**					
Grain-size	Illite	Chlorite	Smectite	IS	Kaol.	**Grain-size**	Illite	Chlorite	Smectite	IS	Kaol.	**Grain-size**	Illite	Chlorite	Smectite	IS	Kaol.
Sandy mudstones	**5.6**	**1.4**	**66.0**	**17.6**	**9.5**	**Sandy mudstones**	**5.2**	**1.7**	**66.1**	**20.8**	**6.1**	**Sandy mudstones**	**-0.4**	**0.3**	**0.1**	**3.3**	**-3.4**
STDEV(n=15)	(2.0)	(0.3)	(6.7)	(6.6)	(2.9)	**n=3**	(2.4)	(0.5)	(7.0)	(2.7)	(1.6)		(3.1)	(0.6)	(9.7)	(7.1)	(3.3)
Clayey mudstones (all)	**6.0**	**1.4**	**59.4**	**26.1**	**5.6**	**Clayey mudstones (all)**	**5.3**	**1.2**	**61.9**	**24.8**	**6.8**	**Clayey mudstones (all)**	**-0.7**	**-0.2**	**2.5**	**-1.3**	**1.3**
n=27	(0.9)	(0.2)	(5.8)	(6.1)	(3.6)	**n=49**	(0.7	(0.1)	(4.0)	(2.9)	(0.5)		(1.3)	(0.1)	(1.8)	(3.2)	(3.3)
Clayey silt	**6.1**	**1.3**	**63.9**	**21.5**	**7.2**	**Clayey silt**	**4.7**	**1.1**	**65.0**	**22.7**	**6.5**	**Clayey silt**	**-1.4**	**-0.2**	**1.0**	**1.2**	**-0.7**
STDEV (n=9)	(1.2)	(0.5)	(4.0)	(3.2)	(1.0)	**n=16**	(2.6)	(0.3)	(5.8)	(4.9)	(1.4)		(2.9)	(0.6)	(7.0)	(5.9)	(1.7)
Silty clay	**6.6**	**1.5**	**58.4**	**26.8**	**6.8**	**Silty clay**	**5.5**	**1.2**	**61.2**	**24.9**	**7.2**	**Silty clay**	**-1.1**	**-0.3**	**2.8**	**-1.9**	**0.4**
STDEV (n=11)	(1.7)	(0.4)	(3.7)	(4.3)	(0.4)	**n=15**	(1.8)	(0.3)	(4.5)	(4.5)	(0.8)		(2.5)	(0.5)	(5.8)	(6.2)	(0.9)
Clay	**5.3**	**1.5**	**55.9**	**30.0**	**7.3**	**Clay**	**5.7**	**1.2**	**59.4**	**26.9**	**6.8**	**Clay**	**0.4**	**-0.3**	**3.5**	**-3.1**	**-0.5**
STDEV (n=7)	(2.7)	(0.4)	(7.6)	(6.3)	(1.3)	**n=18**	(2.0)	(0.4)	(6.5)	(5.0)	(1.0)		(3.4)	(0.6)	(10.0)	(8.0)	(1.7)

Hyperthermals	**Low Soil Development**					**Medium to High Soil Development**						**Impact of Soil Formation**					
Sandy mudstones	**4.9**	**1.0**	**72.3**	**13.2**	**8.7**	**Sandy mudstones**	**3.4**	**1.6**	**67.1**	**21.7**	**6.2**	**Sandy mudstones**	**-1.4**	**0.6**	**-5.1**	**8.5**	**-2.5**
STDEV (n=10)	(2.2)	(0.5)	(6.6)	(5.3)	(2.1)	**n=6**	(3.4)	(0.7)	(7.3)	(3.8)	(1.0)		(4.1)	(0.9)	(9.8)	(6.5)	(2.3)
Clayey mudstones (all)	**4.9**	**1.4**	**64.3**	**22.8**	**6.7**	**Clayey mudstones (all)**	**4.2**	**1.1**	**67.1**	**21.2**	**6.3**	**Clayey mudstones (all)**	**-0.7**	**-0.3**	**2.8**	**-1.5**	**-0.3**
STDEV (n=13)	(1.3)	(0.3)	(4.0)	(2.7)	(0.5)	**n=25**	(1.2)	(0.2)	(4.3)	(2.8)	(0.5)		(0.6)	(0.5)	(2.8)	(2.6)	(0.6)
Clayey silt	**5.2**	**1.4**	**62.1**	**24.3**	**7.1**	**Clayey silt**	**4.9**	**1.2**	**67.0**	**20.7**	**6.3**	**Clayey silt**	**-0.3**	**-0.2**	**4.9**	**-3.6**	**-0.8**
STDEV (n=5)	(1.8)	(0.2)	(10.2)	(10.0)	(1.6)	**n=7**	(1.8)	(0.4)	(7.4)	(6.1)	(0.7)		(2.5)	(0.4)	(12.6)	(11.7)	(1.8)
Silty clay	**5.6**	**1.3**	**63.2**	**23.4**	**6.5**	**Silty clay**	**4.5**	**1.3**	**64.2**	**23.5**	**6.7**	**Silty clay**	**-1.1**	**0.0**	**0.9**	**0.1**	**0.2**
STDEV (n=4)	(0.8)	(0.5)	(5.2)	(3.2)	(1.8)	**n=14**	(2.1)	(0.3)	(4.5)	(3.6)	(1.3)		(2.3)	(0.5)	(6.9)	(4.8)	(2.2)
Clay	**3.8**	**1.7**	**67.5**	**20.6**	**6.4**	**Clayey mudstones**	**3.3**	**1.0**	**70.2**	**19.5**	**6.0**	**Clay**	**-0.5**	**-0.7**	**2.7**	**-1.1**	**-0.4**
STDEV (n=4)	(1.3)	(0.5)	(2.5)	(2.6)	(1.7)	**n=4**	(2.0)	(0.2)	(3.9)	(3.9)	(0.9)		(2.4)	(0.5)	(4.7)	(4.7)	(1.9)

Impact Hyperthermals	**Low SDI**					**High SDI>1**						**Soil formation**					
Sandy mudstones	**-0.8**	**-0.4**	**6.3**	**-4.4**	**-0.8**	**Sandy mudstones**	**-1.8**	**-0.2**	**1.0**	**0.9**	**0.1**	**Sandy mudstones**	**-1.1**	**0.2**	**-5.3**	**5.3**	**0.9**
STDEV	(3.0)	(0.6)	(9.4)	(8.4)	(3.6)		(4.2)	(0.9)	(10.1)	(4.7)	(1.9)		(5.1)	(1.1)	(13.8)	(9.7)	(4.1)
Clayey mudstones (all)	**-1.1**	**0.0**	**4.9**	**-3.3**	**-0.4**	**Clayey mudstones (all)**	**-1.1**	**-0.1**	**5.3**	**-3.6**	**-0.5**	**Clayey mudstones (all)**	**0.0**	**-0.1**	**0.4**	**-0.3**	**-0.1**
	(1.6)	(0.4)	(7.1)	(6.7)	(3.6)		(1.4)	(0.2)	(5.9)	(4.1)	(0.7)		(1.4)	(0.5)	(3.4)	(4.1)	(1.1)
Clayey silt	**-0.9**	**0.1**	**-1.9**	**2.8**	**-0.1**	**Clayey silt**	**0.2**	**0.0**	**2.1**	**-2.0**	**-0.2**	**Clayey silt**	**1.0**	**0.0**	**3.9**	**-4.8**	**-0.1**
STDEV	(2.1)	(0.5)	(10.9)	(10.5)	(1.9)		(3.2)	(0.5)	(9.4)	(7.8)	(1.5)		(3.8)	(0.7)	(14.4)	(13.1)	(2.5)
Silty clay	**-1.0**	**-0.2**	**4.8**	**-3.4**	**-0.3**	**Silty clay**	**-1.0**	**0.0**	**3.0**	**-1.4**	**-0.6**	**Silty clay**	**0.0**	**0.3**	**-1.9**	**2.0**	**-0.3**
STDEV	(1.9)	(0.6)	(6.3)	(5.3)	(1.9)		(2.8)	(0.4)	(6.4)	(5.8)	(1.5)		(3.3)	(0.7)	(9.0)	(7.8)	(2.4)
Clay	**-1.5**	**0.2**	**11.6**	**-9.4**	**-0.8**	**Clay**	**-2.4**	**-0.2**	**10.8**	**-7.3**	**-0.8**	**Clay**	**-0.9**	**-0.4**	**-0.8**	**2.0**	**0.1**
STDEV	(3.0)	(0.6)	(8.1)	(6.8)	(2.1)		(2.9)	(0.4)	(7.6)	(6.4)	(1.4)		(4.1)	(0.8)	(11.1)	(9.3)	(2.5)

Table DR3 Average clay mineral distribution from the non-hyperthermal and the hyperthermals H2 and ETM2

	Illite	Chlorite	Smectite	IS	Kaol.
Non-hyperthermal	5.6(2.1)	1.3(0.4)	62.0(6.4)	23.9(6.1)	7.3(1.8)
H2	5.6(1.9)	1.2(0.3)	65.1(6.8)	21.3(6.4)	6.8(1.9)
ETM2	3.0(1.2)	1.4(0.5)	69.1(6.1)	19.5(5.7)	7.0(1.3)

Note that numbers after average data in the bracket are standard deviation

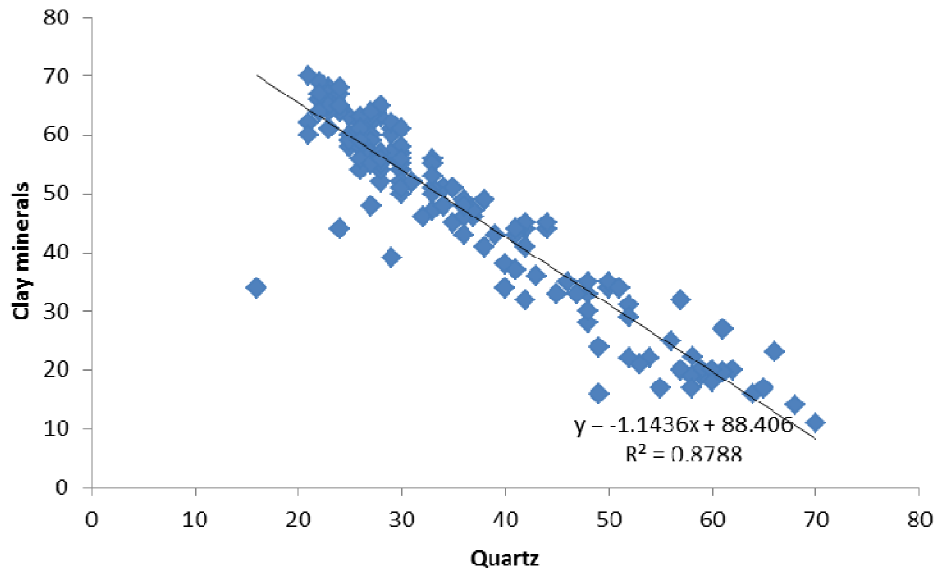

Figure DR1 Bivariate plot of paired percentages of quartz and clay minerals, showing a strong inverse relationship in all samples.

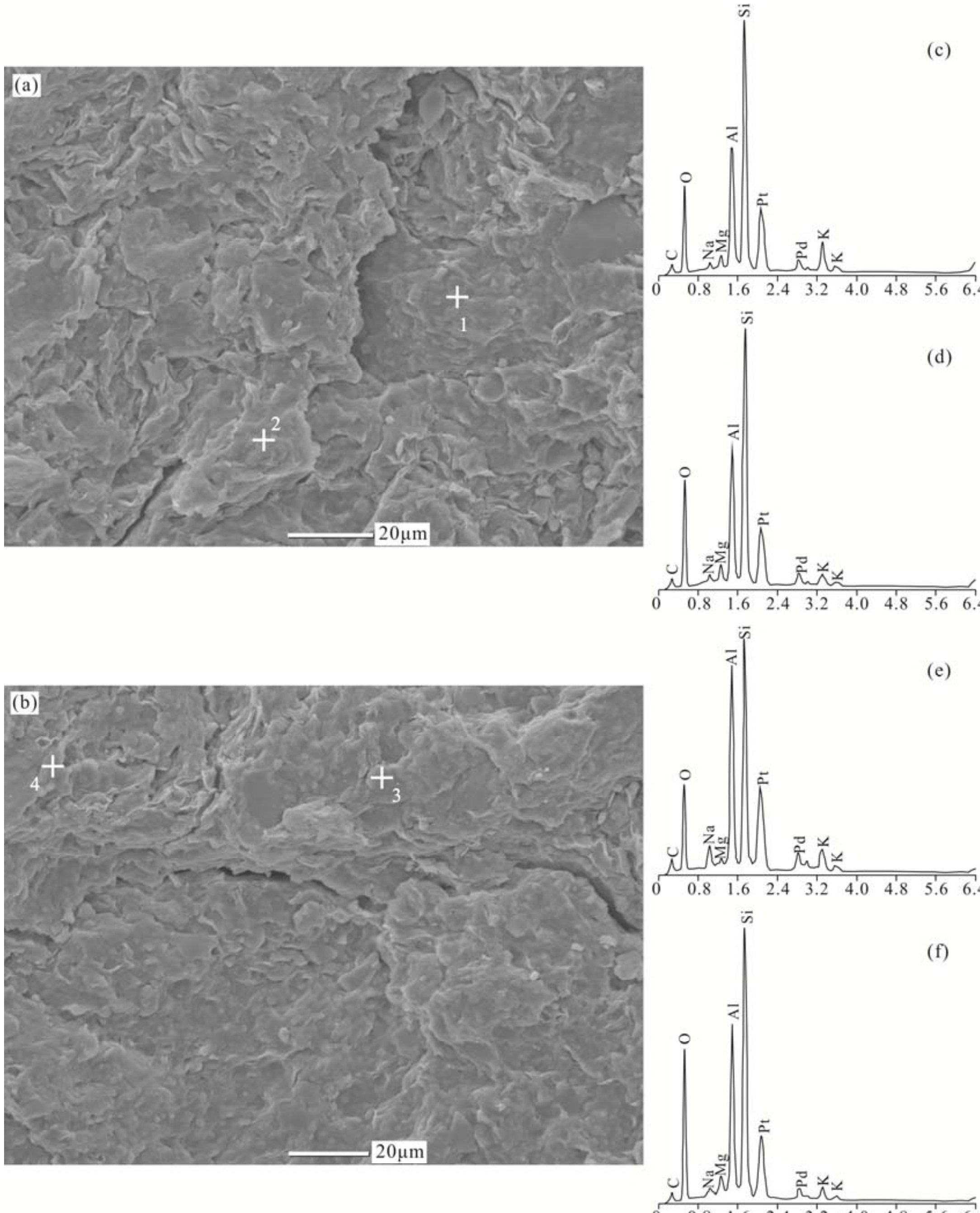

Figure DR2 SEM images and elements composition of dissolved clay plates (Sample UDC301). Note that figures c-d relate to the spots from 1to 4, respectively. Clay particles have different cation concentrations. Illites are rich in K and Na (c and e), wihle mixed-layer illite-smectites are rich in Mg and minor K, besides Si, Al, and O (d and f).

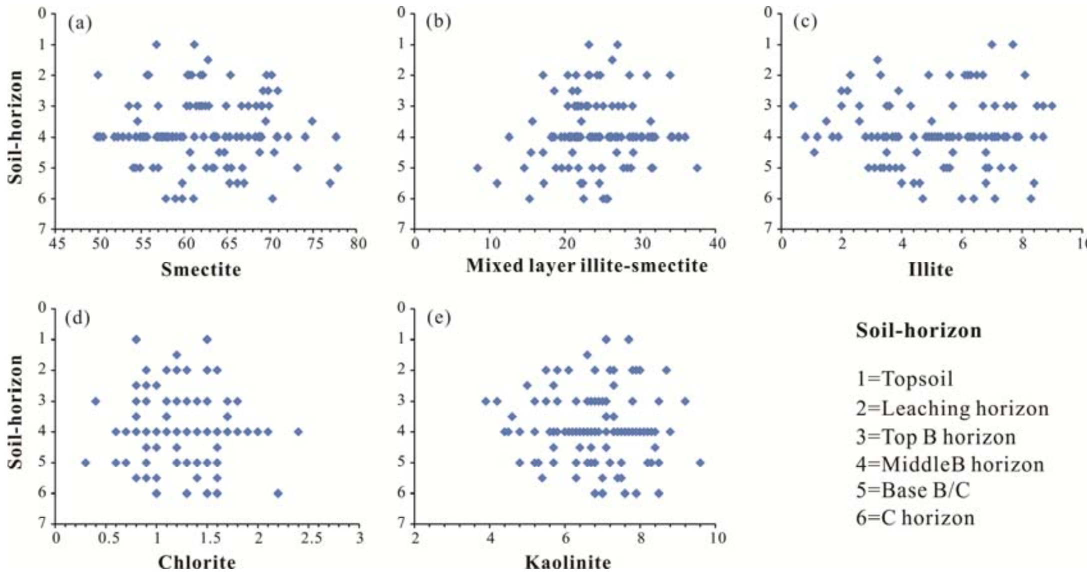

Figure DR3 Clay mineral distribution plotted against soil horizon. Note that numbers at vertical axis are related to different horizons as marked in the figure. Smectite generally increases down profile, while its high proportions largely occur in soil B-horizons. Mixed-layer illite-smectite slightly decreases down the profile. The lowest illite and lowest kaolinite contents occur in the soil-B horizons only. Chlorite shows no significant change, while absolute abundances are very low in general.