AGU PUBLICATIONS

Journal of geophysical Research (Atmosphere)

Supporting Information for

A laboratory desert dust generator from stock soil using vibration. A mineralogical and compositional study

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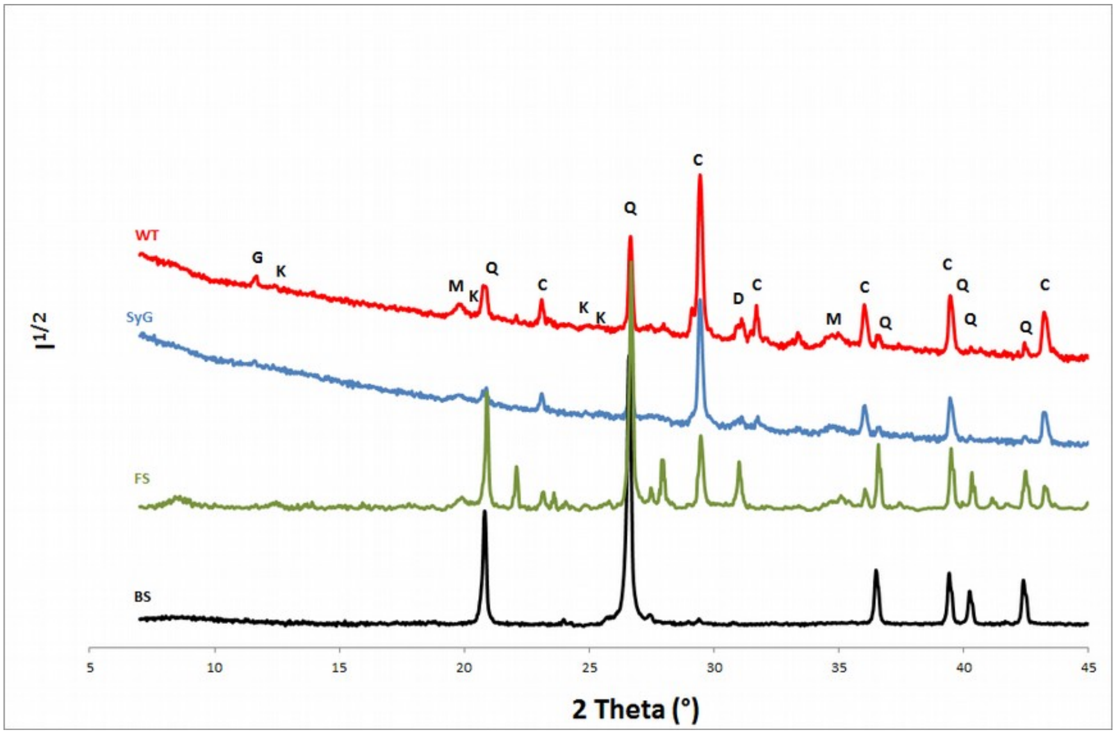
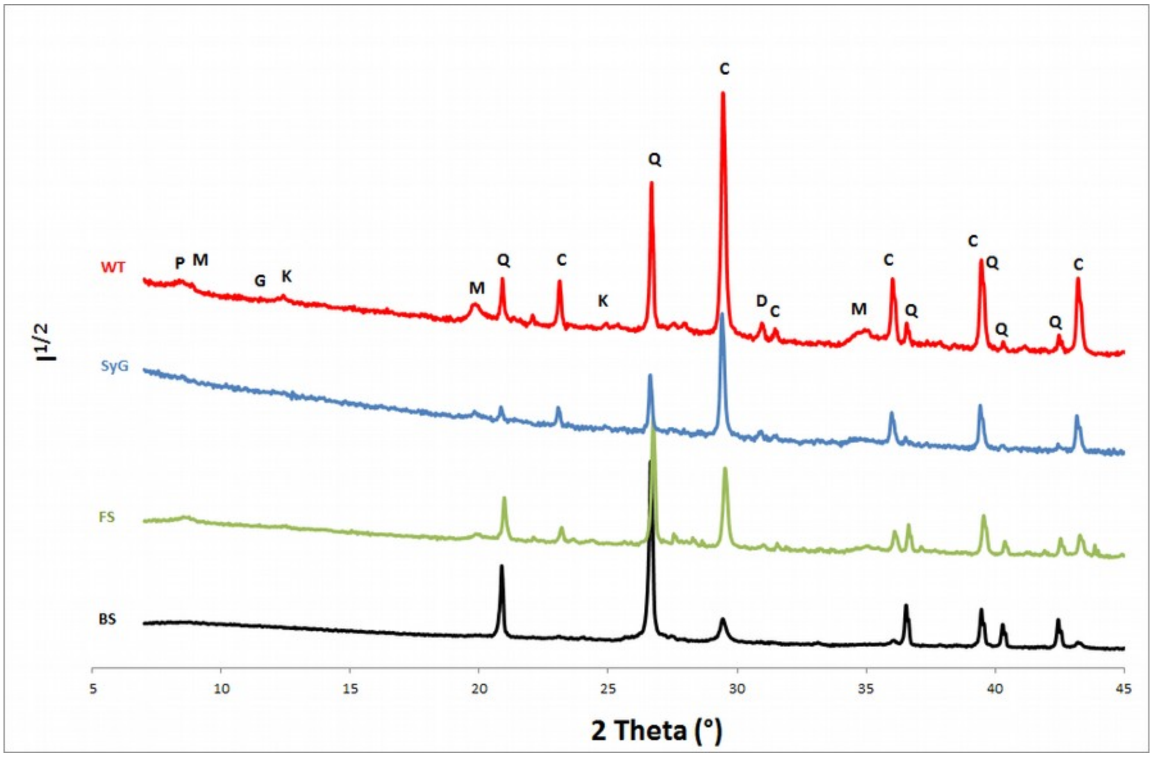
Introduction

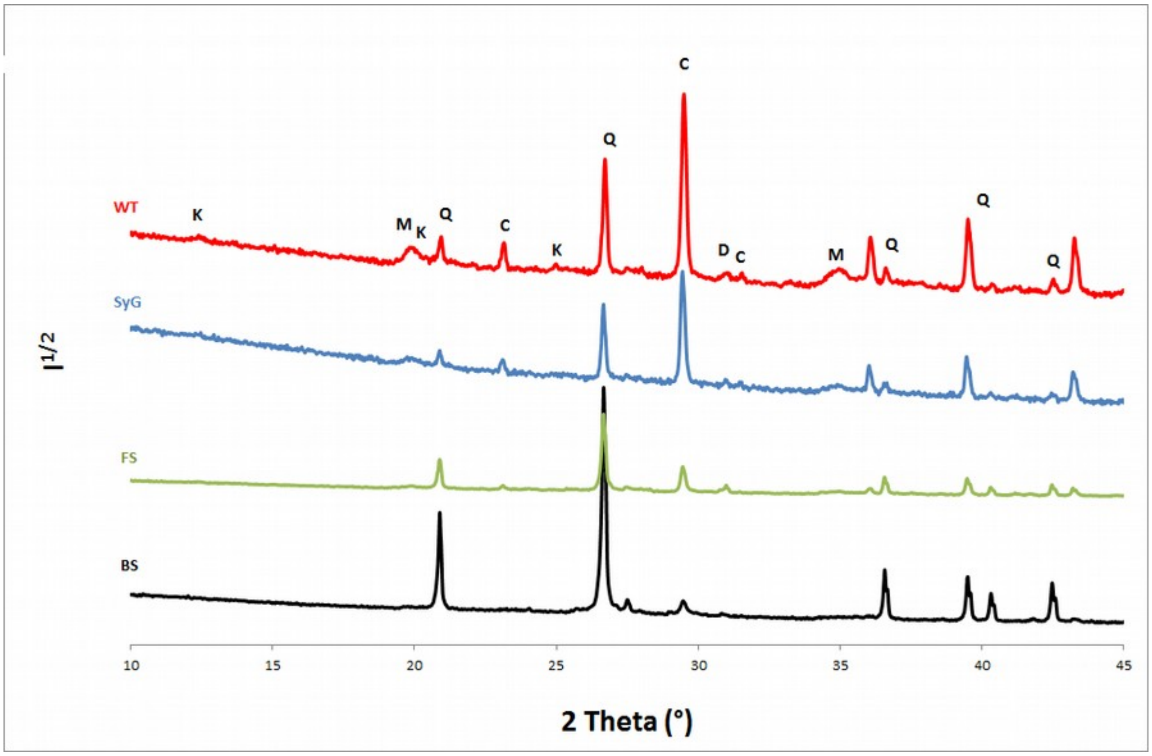
We have put in this file extra tables and figures which are not necessary to read and understand the paper but which allow to check the description of the data that is written in the text.



Q: quartz, D: Attaya:dolomite, C: calcite, M: muscovite, K: kaolinite, P: palygorskite, G: gypsum.

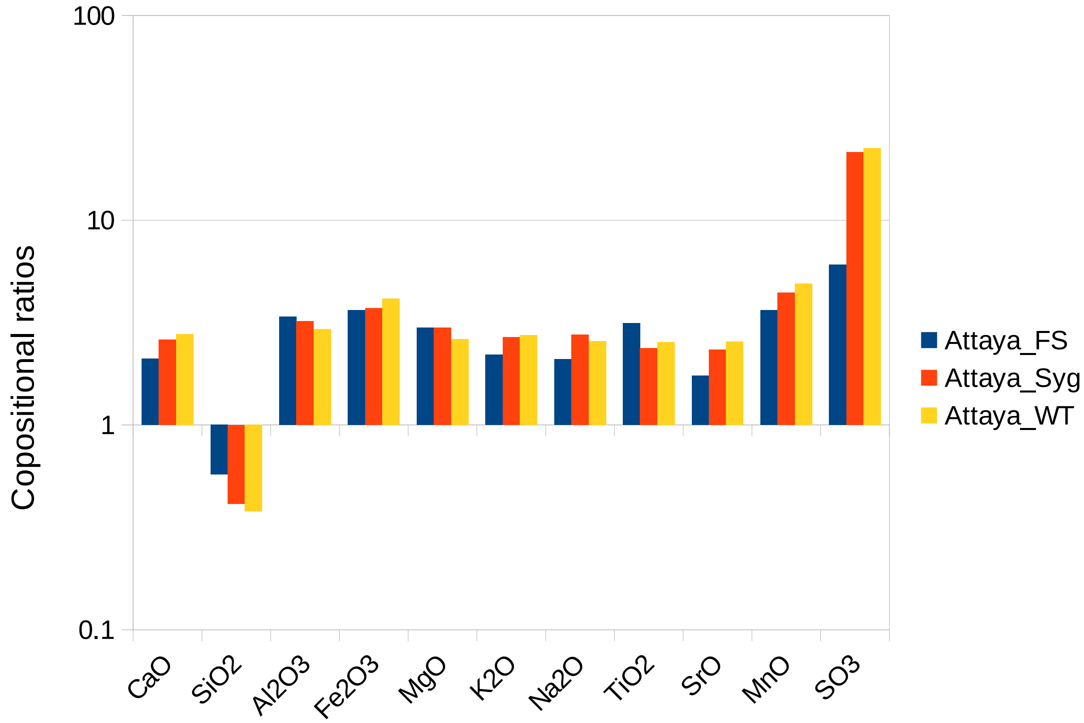


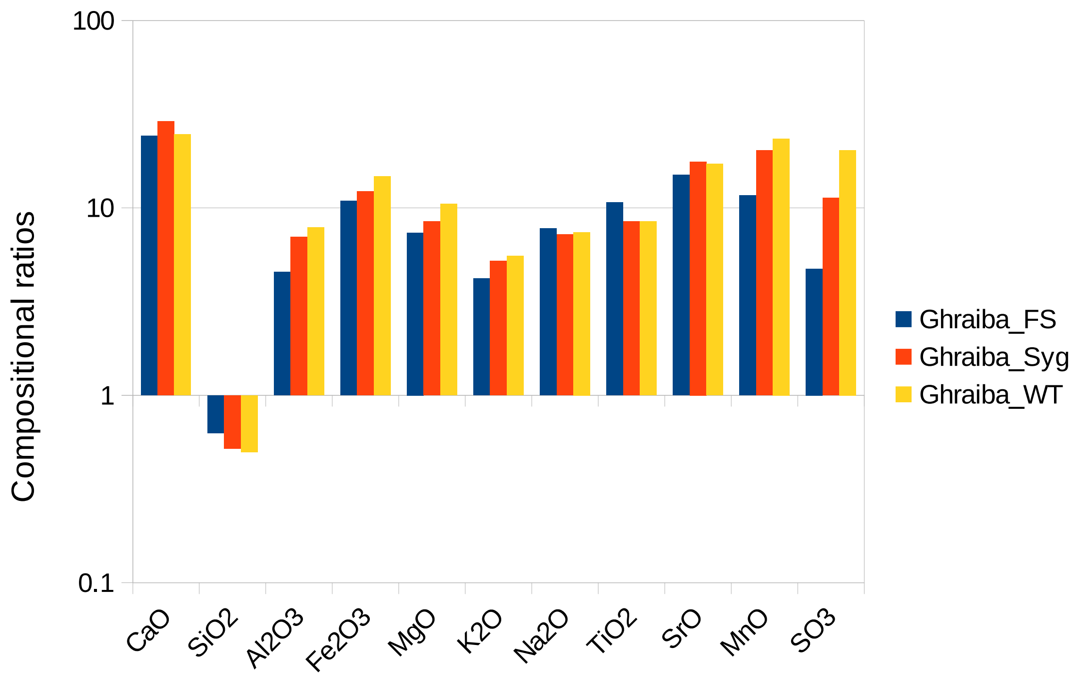
Hsar; Q: quartz, D: dolomite, C: calcite, M: muscovite, K: kaolinite, P: palygorskite, G: gypsum.



Cherrarda: Q: quartz, D: dolomite, C: calcite, M: muscovite, K: kaolinite, P: palygorskite, G: gypsum.

Figure S1. Diffractograms of all 16 samples including parent soils (BS), fine sieved soils (FS), wind tunnel aerosols (WT) and SyGaVib aerosols (SyG) grouped by soil origin. The ordinate axis exhibits a relative square root intensity scale that has been rescaled for each spectrum and a shifted origin.


100
10
1
0.1
Copositional ratios
CaO
SiO2
Al2O3
Fe2O3
MgO
K2O
Na2O
TiO2
SrO
MnO
SO3
Attaya_FS
Attaya_Syg
Attaya_WT


100
10
1
0.1
Compositional ratios
CaO
SiO2
Al2O3
Fe2O3
MgO
K2O
Na2O
TiO2
SrO
MnO
SO3
Ghraiba_FS
Ghraiba_Syg
Ghraiba_WT

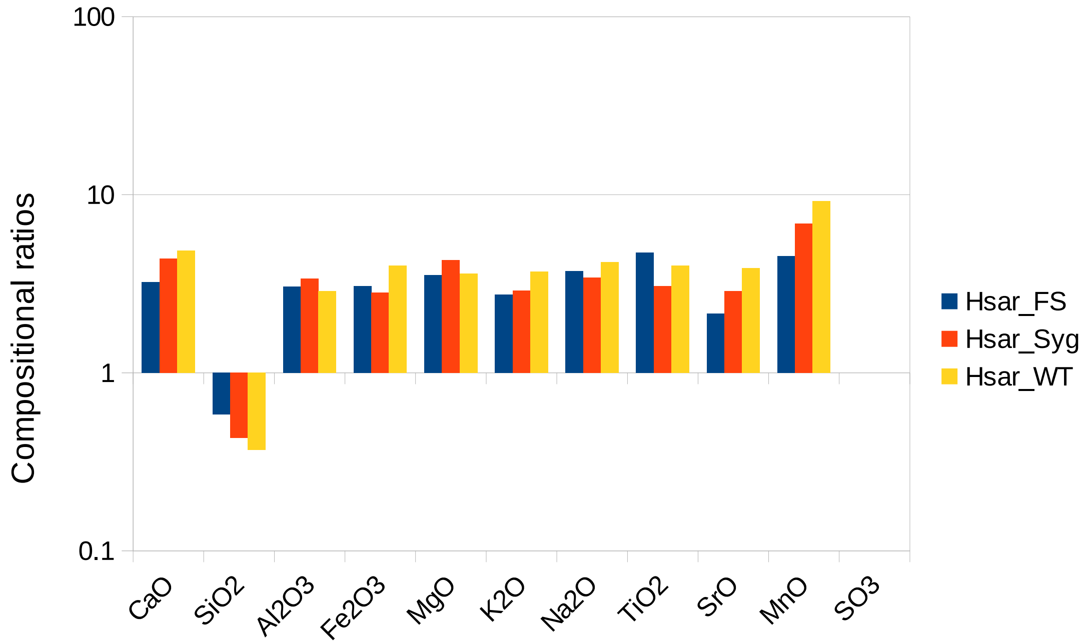


Figure S2. Compositional ratio of child samples to parent soil. and

µm sieving	Attaya	Cherarda	Ghraiba	Hsar
800 - 2000	2.0%	1.2%	2.1%	1.7%
400 - 800	7.1%	6.0%	33.6%	11.9%
315 - 400	5.0%	12.9%	10.3%	8.0%
250 - 315	9.0%	7.0%	15.5%	13.4%
200 - 250	6.9%	8.8%	7.7%	9.3%
160 - 200	18.2%	17.7%	11.9%	14.7%
100 - 160	22.2%	20.6%	9.5%	19.9%
80 - 100	12.9%	12.2%	4.5%	5.6%
63 - 80	8.3%	9.4%	3.1%	8.0%
40 - 63	5.4%	3.1%	1.5%	5.2%
0 - 40	3.1%	1.0%	0.3%	2.4%

Table S1. Size distribution of soils expressed as the mass fraction found in each sieving size.

	Quartz	Calcite	Dolomite	Microcline	Muscovite	Kaolinite	Palygorskite	Gypsum	Halite
Attaya_BS	85%	10%	0.5%	1.7%	1.6%	0.6%	0.8%	0.1%	0.5%
Attaya_FS	42%	36%	5.8%	1.4%	7.6%	2.2%	3.8%	1.0%	0.7%
Attaya_SyG	18%	61%	2.5%	0.4%	11%	2.7%	2.5%	2.0%	0.4%
Attaya_WT	18%	55%	2.7%	0.2%	10%	2.3%	2.6%	9.2%	0.0%
Cherarda_BS	92%	2%	0.2%	2.4%	1.4%	0.7%	0.6%	0.3%	0.5%
Cherarda_FS	69%	21%	5.3%	0.2%	1.2%	2.6%	0.9%	0.3%	0.2%
Cherarda_SyG	22%	54%	2.8%	1.7%	13%	4.5%	0.2%	2.0%	0.4%
Cherarda_WT	20%	58%	1.7%	0.1%	15%	4.8%	0.8%	0.1%	0.1%
Ghraiba_BS	96%	0.7%	0.2%	1.5%	0.8%	0.3%	0.7%	0.1%	0.1%
Ghraiba_FS	59%	17%	9.4%	1.9%	6.8%	2.5%	2.3%	0.2%	0.8%
Ghraiba_SyG	28%	42%	8.9%	0.2%	9.2%	7.2%	2.0%	2.2%	0.4%
Ghraiba_WT	19%	45%	5.5%	0.4%	17%	8.7%	2.1%	2.7%	0.0%
Hsar_BS	85%	10%	0.3%	1.5%	2.1%	0.1%	1.1%	0.1%	0.1%
Hsar_FS	46%	39%	2.2%	1.3%	4.3%	1.8%	4.4%	0.9%	0.7%
Hsar_SyG	16%	66%	3.1%	1.2%	7.8%	4.2%	1.2%	0.0%	0.3%
Hsar_WT	18%	63%	0.8%	1.6%	8.7%	3.7%	2.4%	2.2%	0.02%

Table S2. Relative mineralogical composition for bulk soil (_BS), fine soil (_FS) and laboratory generated aerosol using SyGAVib and the wind tunnel (_Syg and _WT respectively).

	CaO	SiO_2	Al_2O_3	Fe_2O_3	MgO	K_2O	Na_2O	TiO_2	SrO	MnO	SO_3
Attaya_Syg	34%	32%	9%	5.0%	3.5%	2.8%	2.3%	0.67%	0.18%	0.06%	7.5%
RSD	9%	7%	13%	16%	1%	12%	3%	17%	19%	14%	12%
Attaya_WT	36%	29%	8%	5.7%	3.2%	2.9%	1.9%	0.73%	0.20%	0.07%	7.9%
RSD	10%	13%	16%	17%	4%	13%	26%	12%	25%	16%	9%
Cherrarda_Syg	31%	43%	13%	6.0%	2.7%	2.5%	0.2%	0.83%	0.05%	0.07%	0.35%
RSD	4%	3%	3%	10%	8%	7%	28%	6%	21%	7%	18%
Cherrarda_WT	33%	39%	12%	7.6%	3.0%	3.0%	0.2%	0.96%	0.07%	0.09%	0.48%
RSD	12%	10%	14%	17%	5%	13%	32%	14%	22%	16%	17%
Ghraiba_Syg	22%	49%	14%	5.1%	3.4%	2.7%	0.4%	0.91%	0.06%	0.08%	1.7%
RSD	2%	2%	3%	3%	24%	3%	31%	5%	13%	5%	10%
Graiba_WT	18%	47%	15%	6.1%	4.3%	2.9%	0.4%	0.91%	0.06%	0.09%	3.1%
RSD	18%	6%	8%	10%	6%	10%	57%	11%	59%	7%	17%
Hsar_Syg	42%	36%	10%	4.2%	3.6%	2.2%	0.2%	0.58%	0.11%	0.05%	0.67%
RSD	1%	0.5%	1%	1%	3%	1%	31%	1%	1%	2%	2%
Hsar_WT	49%	29%	8%	6.2%	3.1%	2.9%	0.2%	0.78%	0.16%	0.07%	0.76%

Table S3: Aerosol generation repeatability. Averages and relative standard deviations (RSD%) were calculated from replicate filters of all generated aerosols corresponding to each soil. SyGAVib replicates are less variable than those performed with the wind tunnel: median RSD% = 5% for SyGAVib vs. 13% for the wind tunnel. As expected, the highest variability is observed when concentrations were close to the detection limits. Bulk and fine sieved soils were measured using pressed pellets without replication so that the uncertainty observed typically comes from the method itself: approximately 5% for all elements.