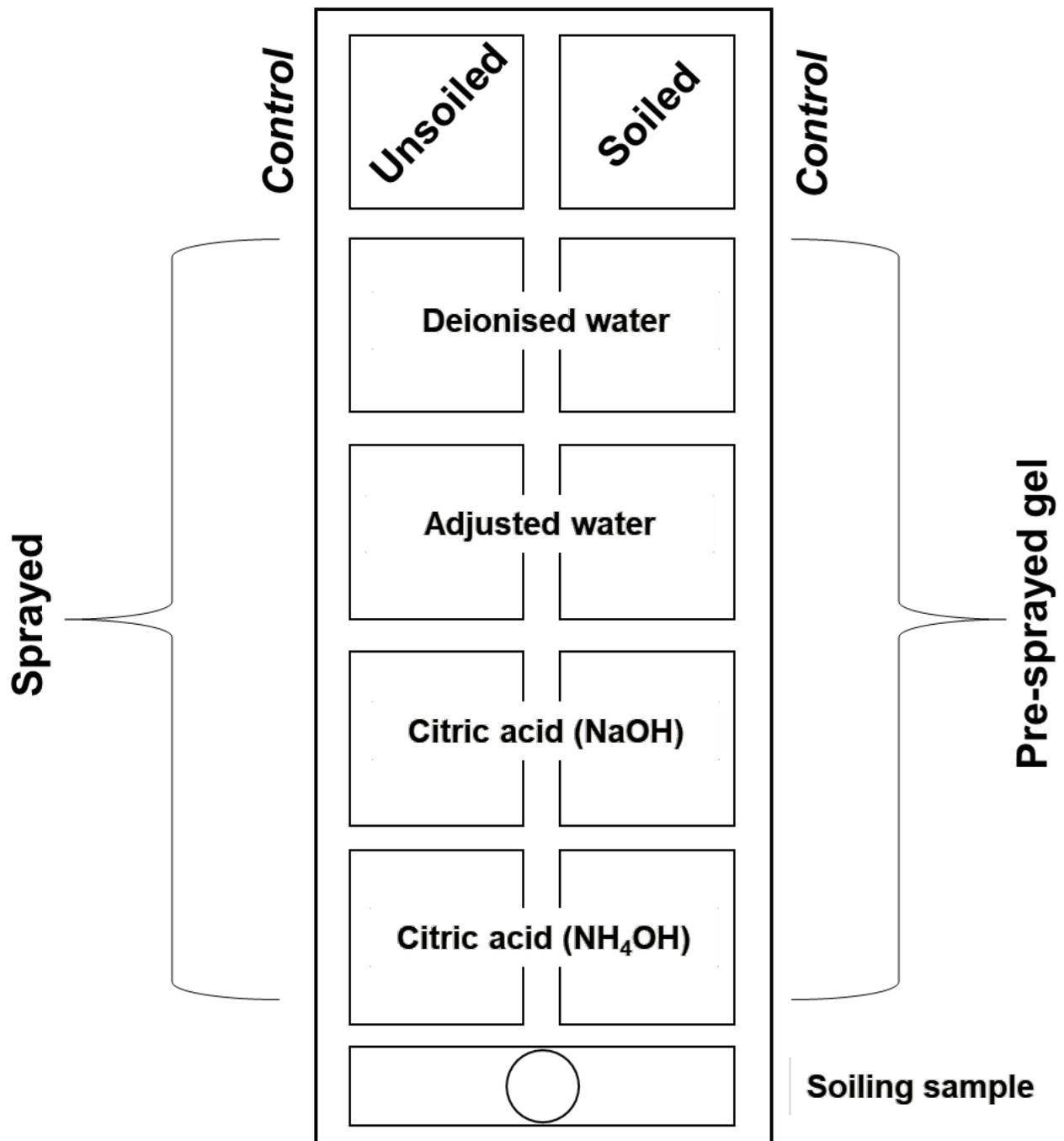


Supplementary material (1): VNIR- and SWIR-HSI soiling maps.

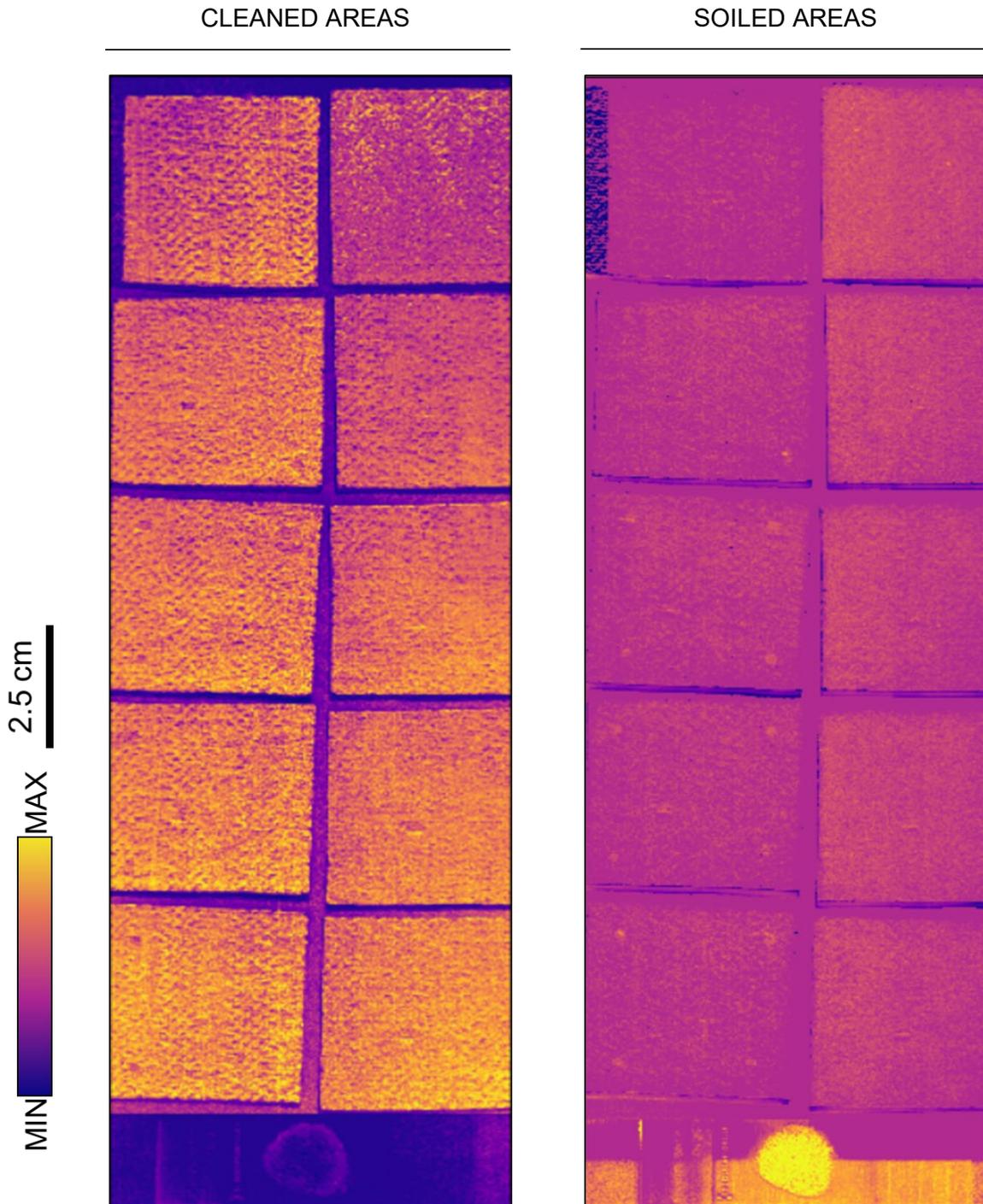
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▲ **Figure S1:** Legend to interpreting the spectral unmixing maps presented in this work.

CHALK-GLUE GROUND

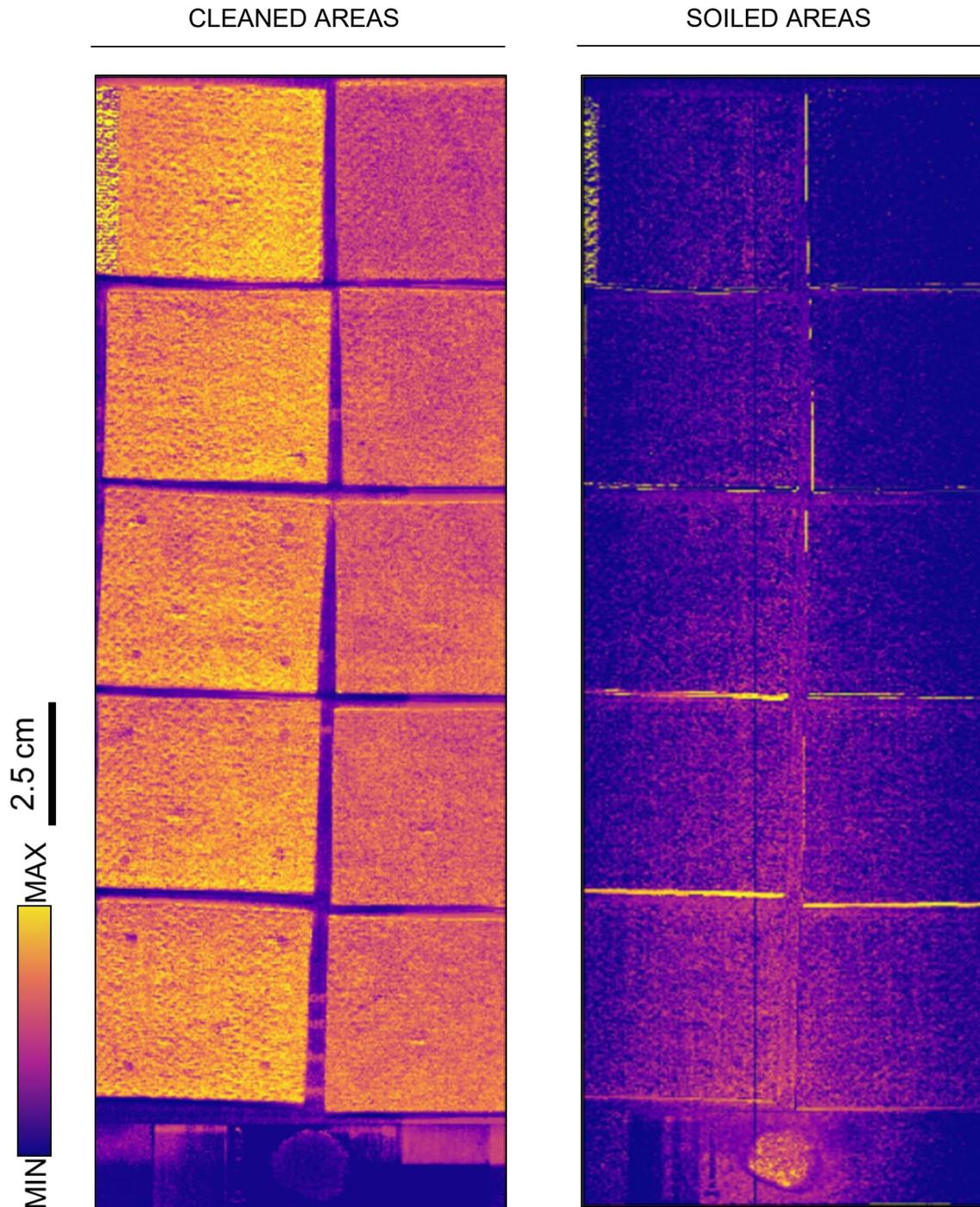
SUPERVISED UNMIXING • VNIR RANGE



▲ **Figure S2:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHALK-GLUE GROUND

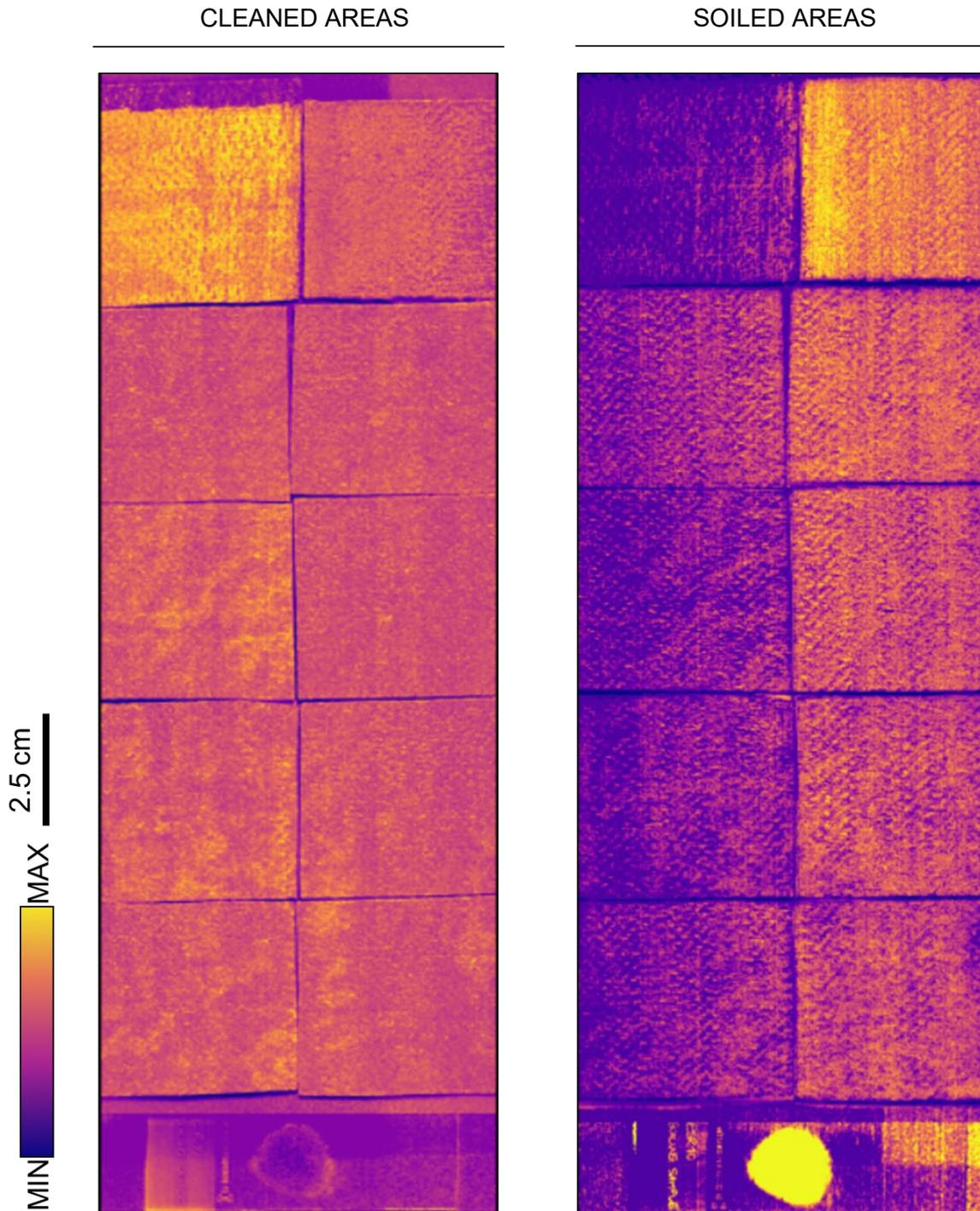
SUPERVISED UNMIXING • SWIR RANGE



▲ **Figure S3:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

HALF-CHALK GROUND

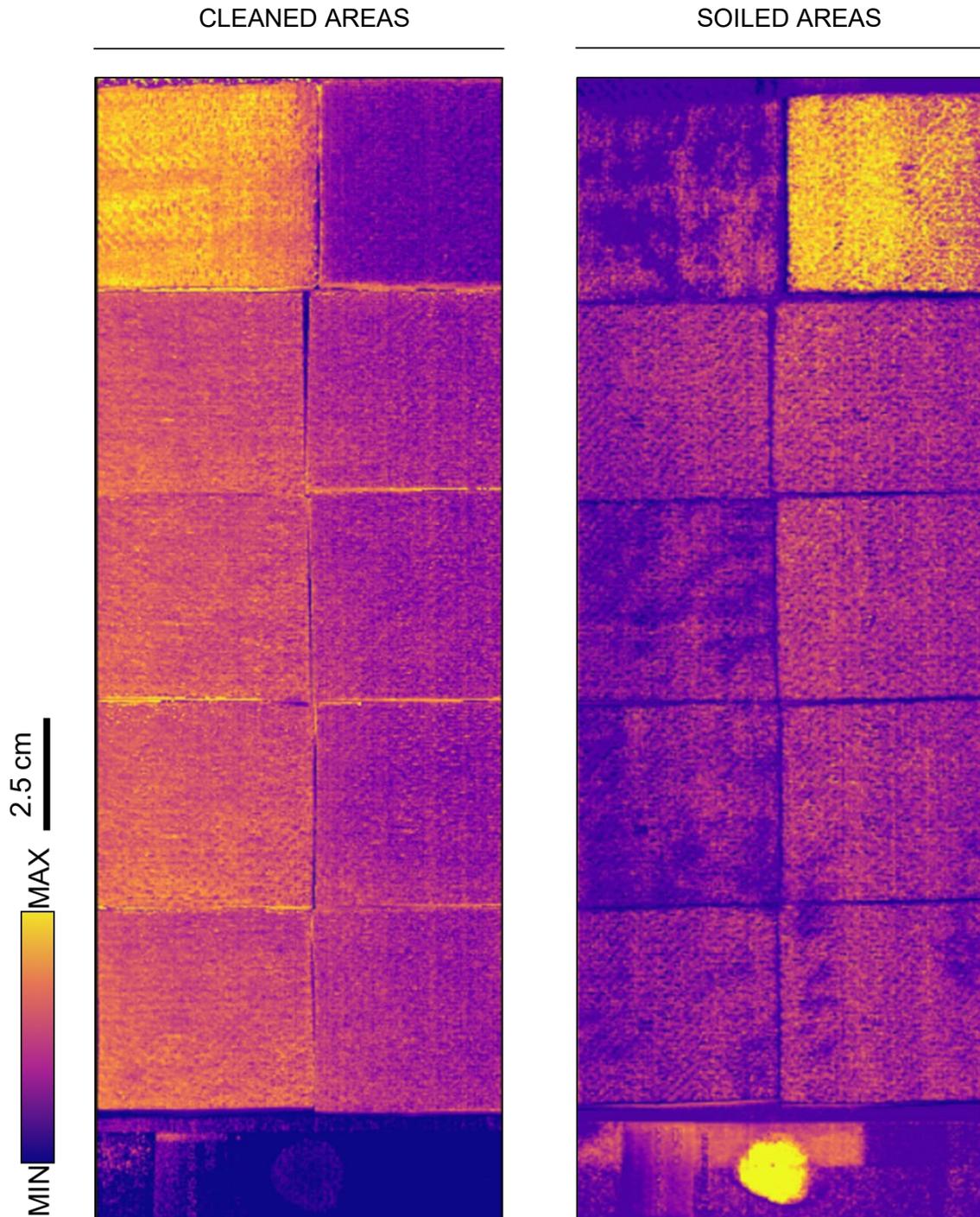
SUPERVISED UNMIXING • VNIR RANGE



▲ **Figure S4:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

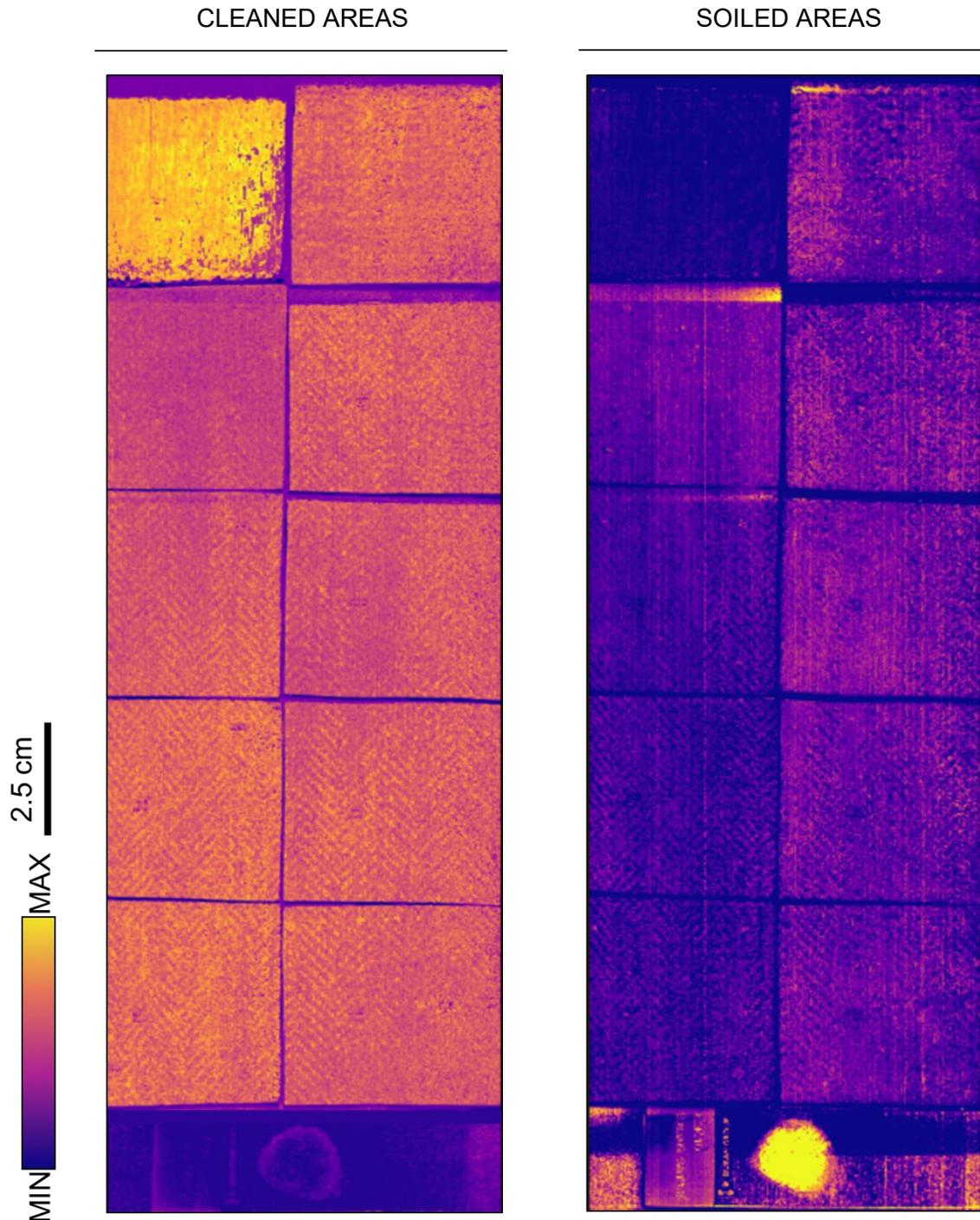
HALF-CHALK GROUND

SUPERVISED UNMIXING • SWIR RANGE



▲ **Figure S5:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

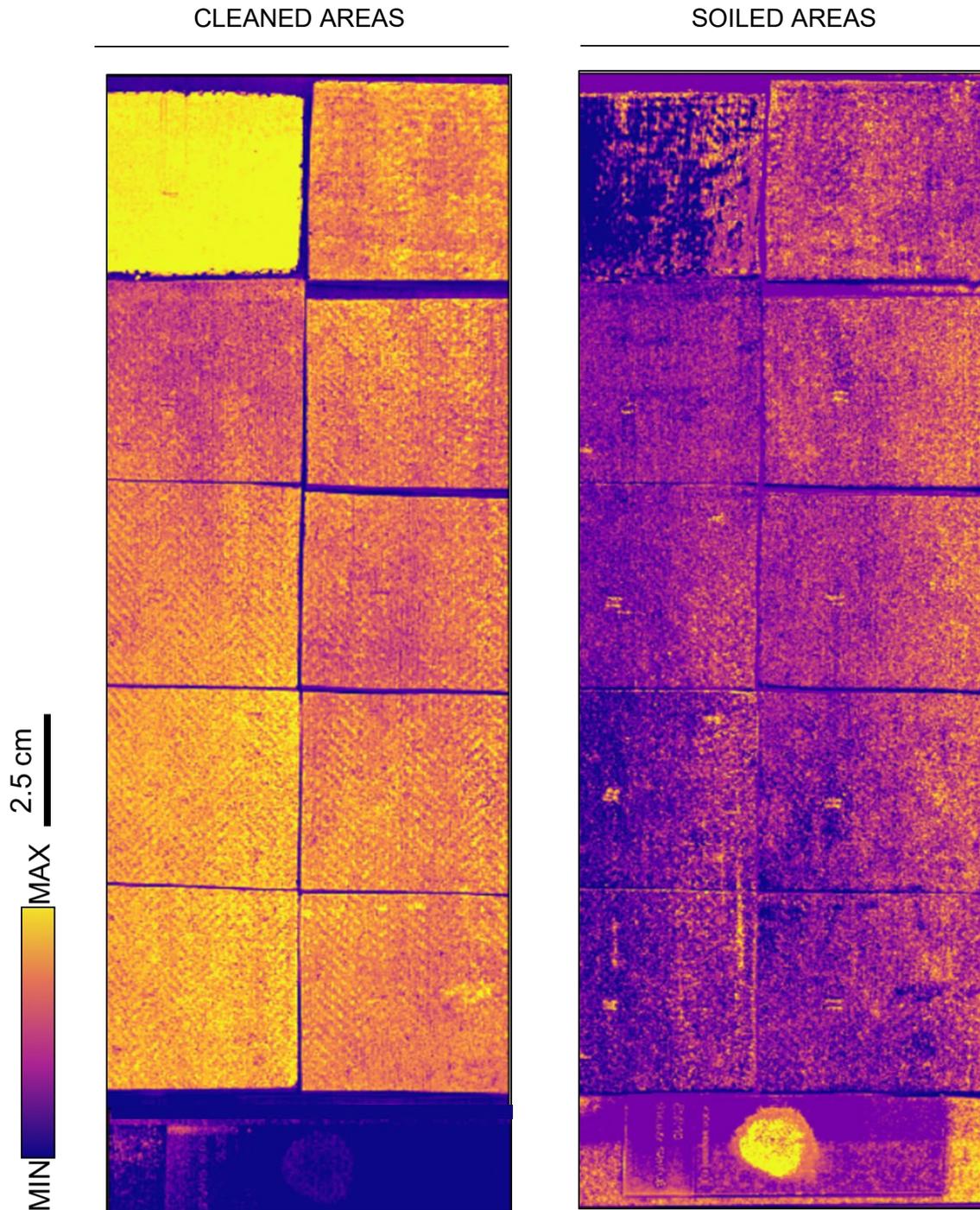
CHROMIUM OXIDE GREEN IN LINSEED OIL
SUPERVISED UNMIXING • VNIR RANGE



▲ **Figure S6:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHROMIUM OXIDE GREEN IN LINSEED OIL

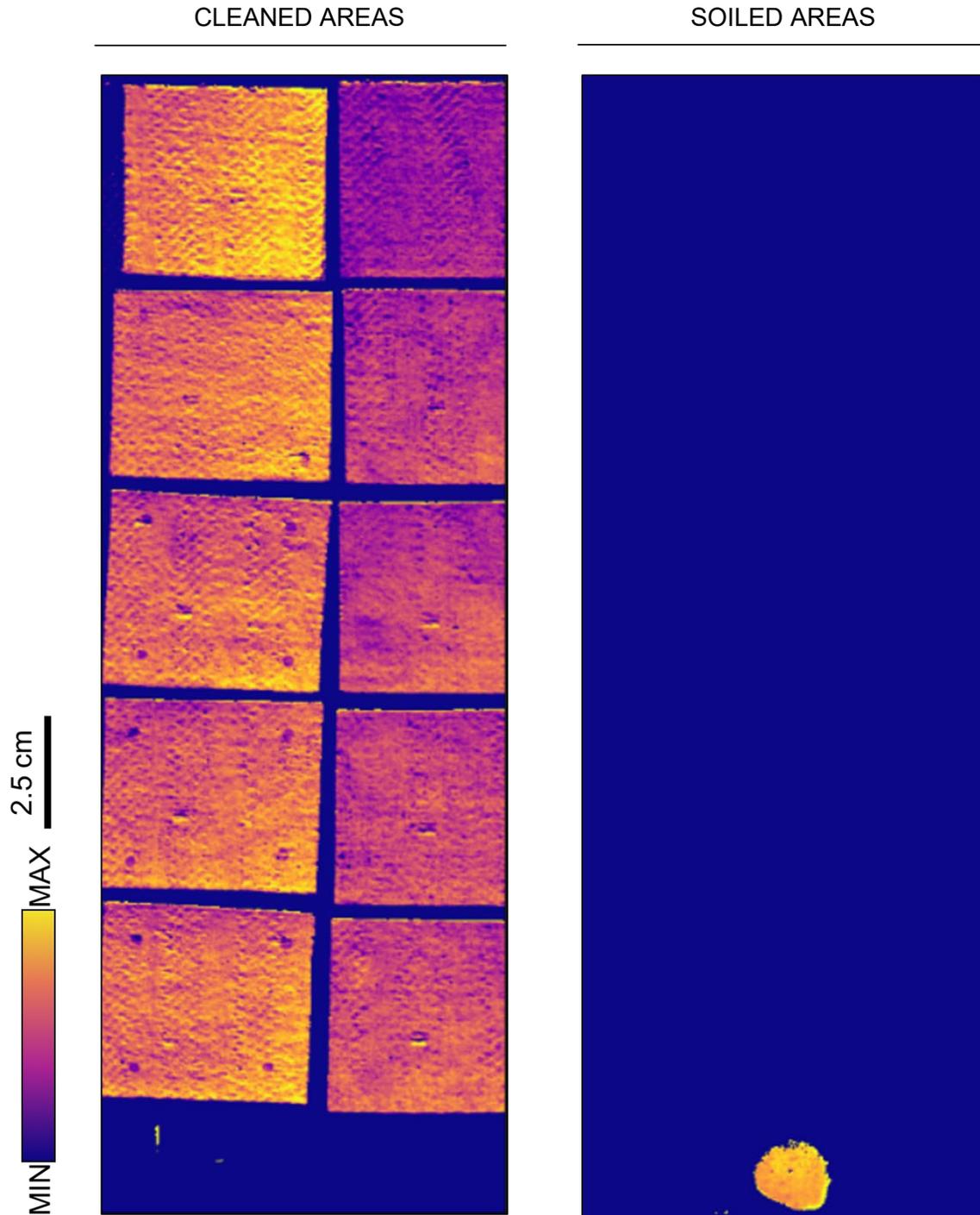
SUPERVISED UNMIXING • SWIR RANGE



▲ **Figure S7:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHALK-GLUE GROUND

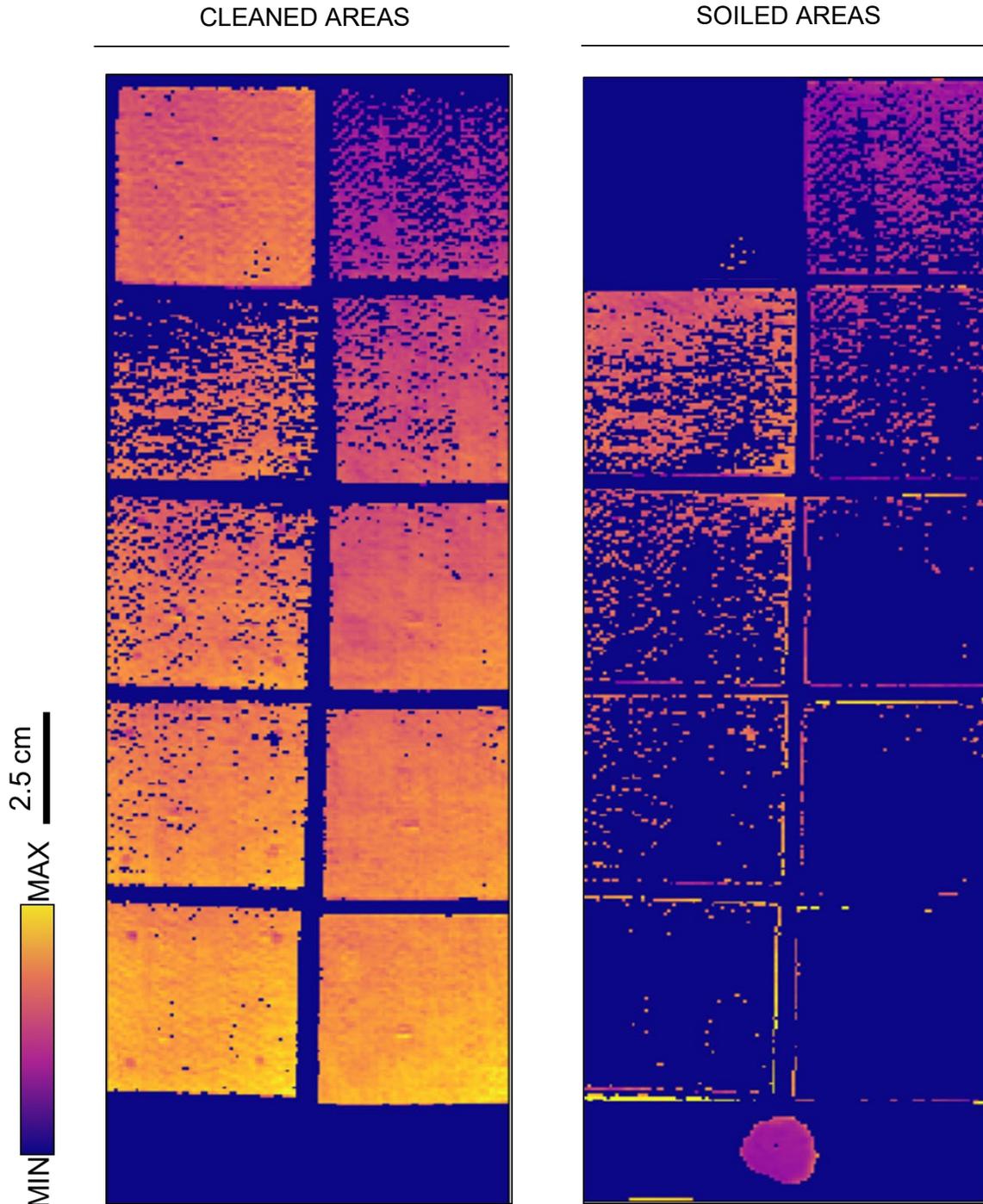
UNSUPERVISED UNMIXING • VNIR RANGE



▲ **Figure S8:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHALK-GLUE GROUND

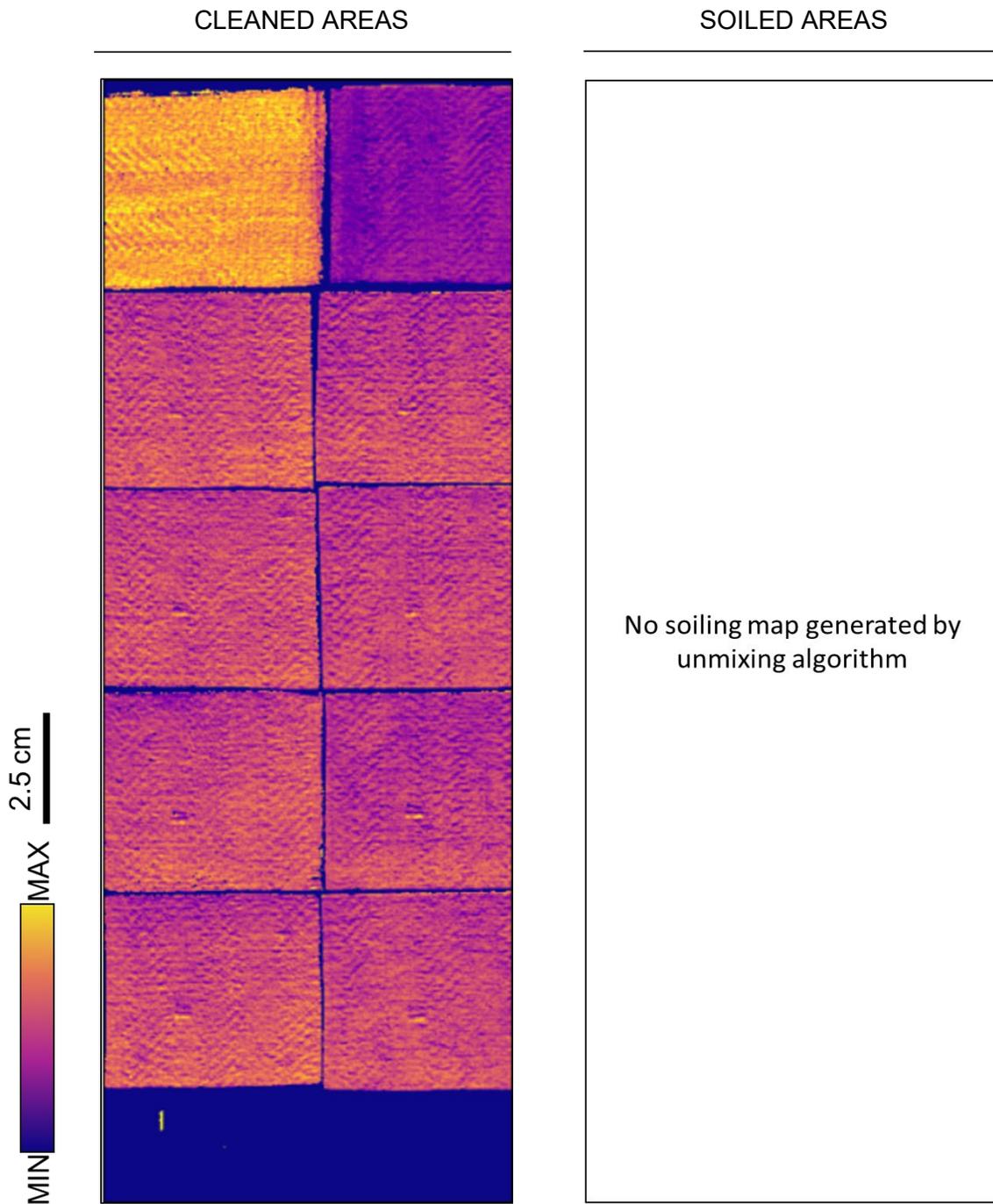
UNSUPERVISED UNMIXING • SWIR RANGE



▲ **Figure S9:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

HALF-CHALK GROUND

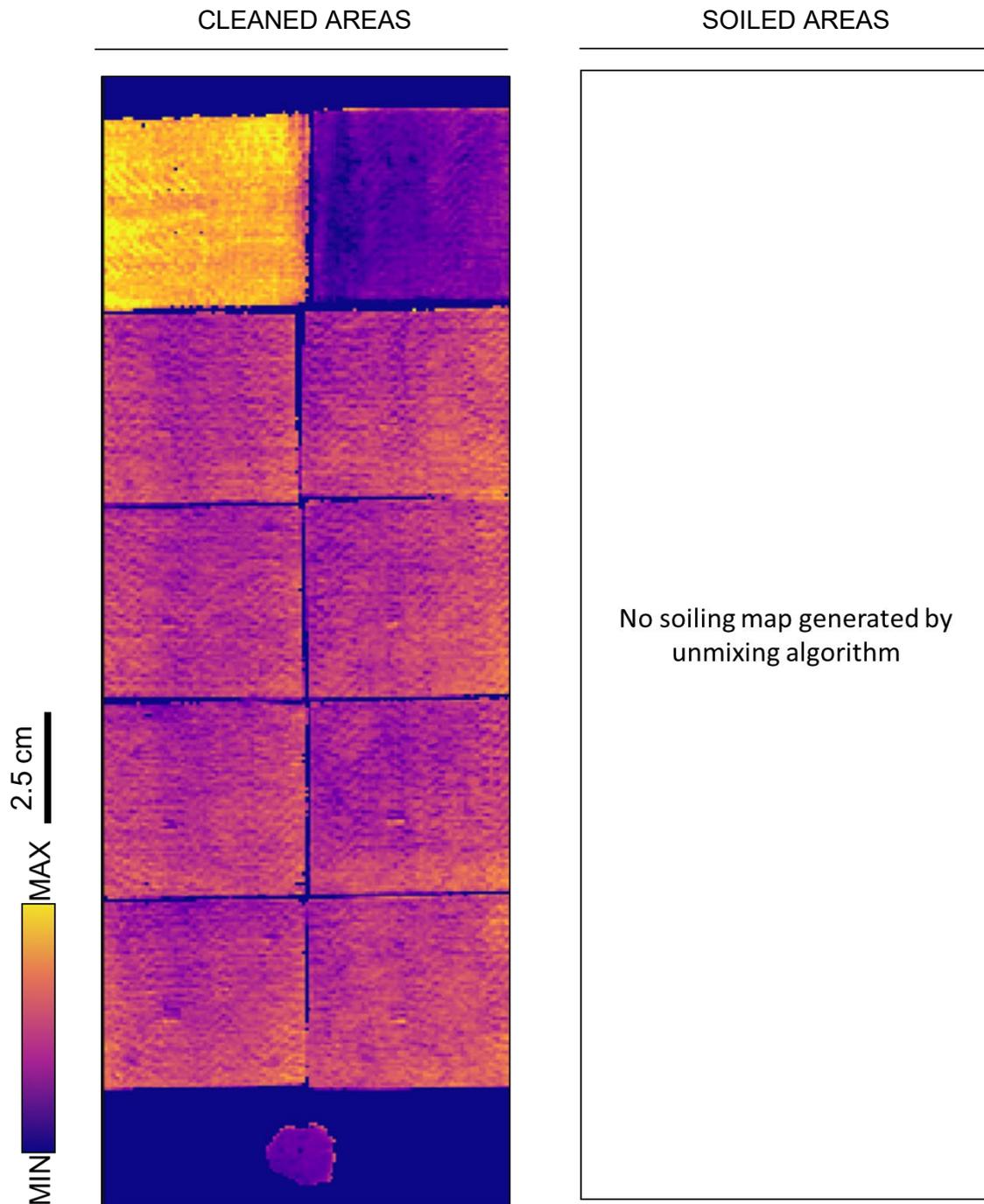
UNSUPERVISED UNMIXING • VNIR RANGE



▲ **Figure S10:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

HALF-CHALK GROUND

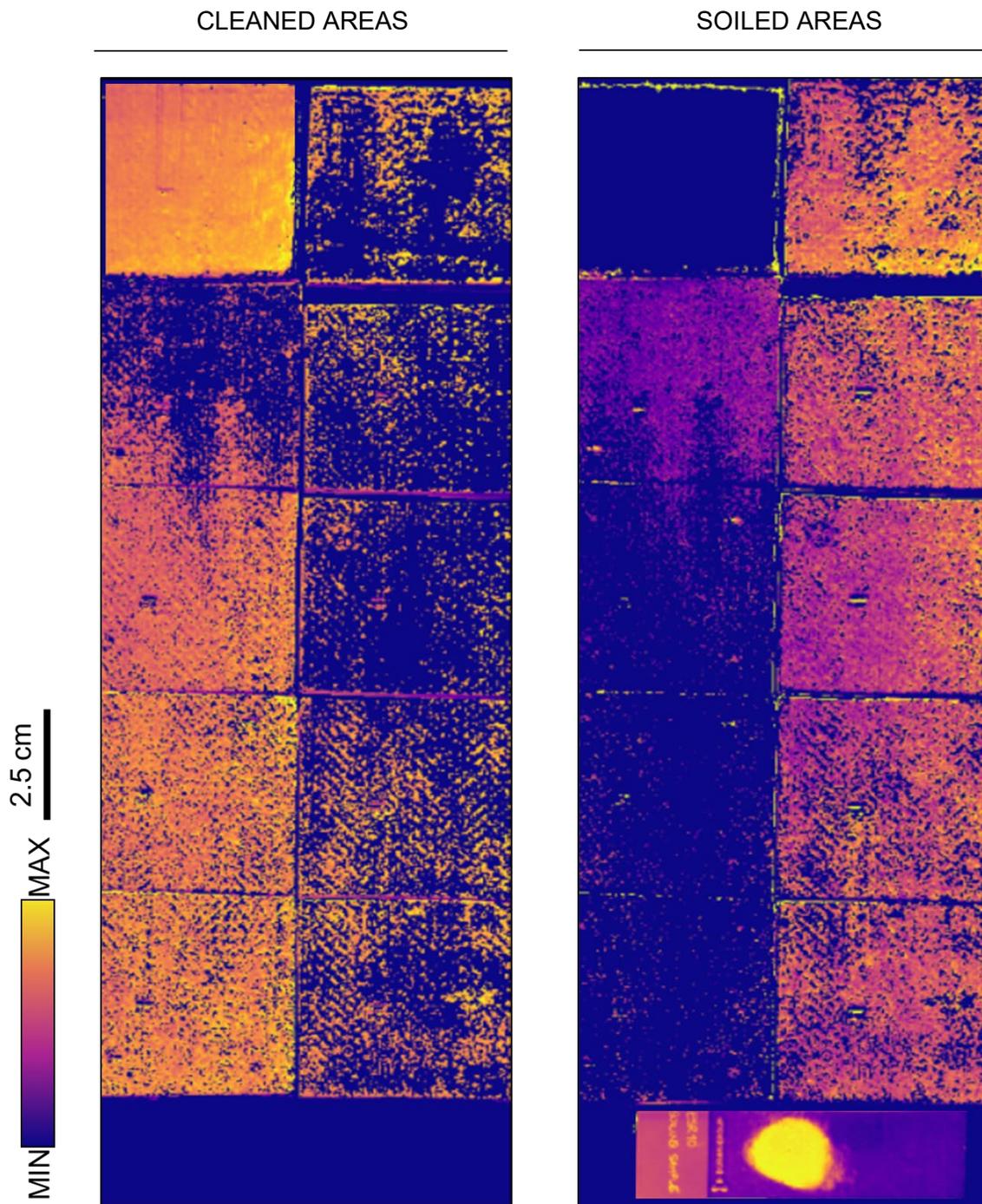
UNSUPERVISED UNMIXING • SWIR RANGE



▲ **Figure S11:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHROMIUM OXIDE GREEN IN LINSEED OIL

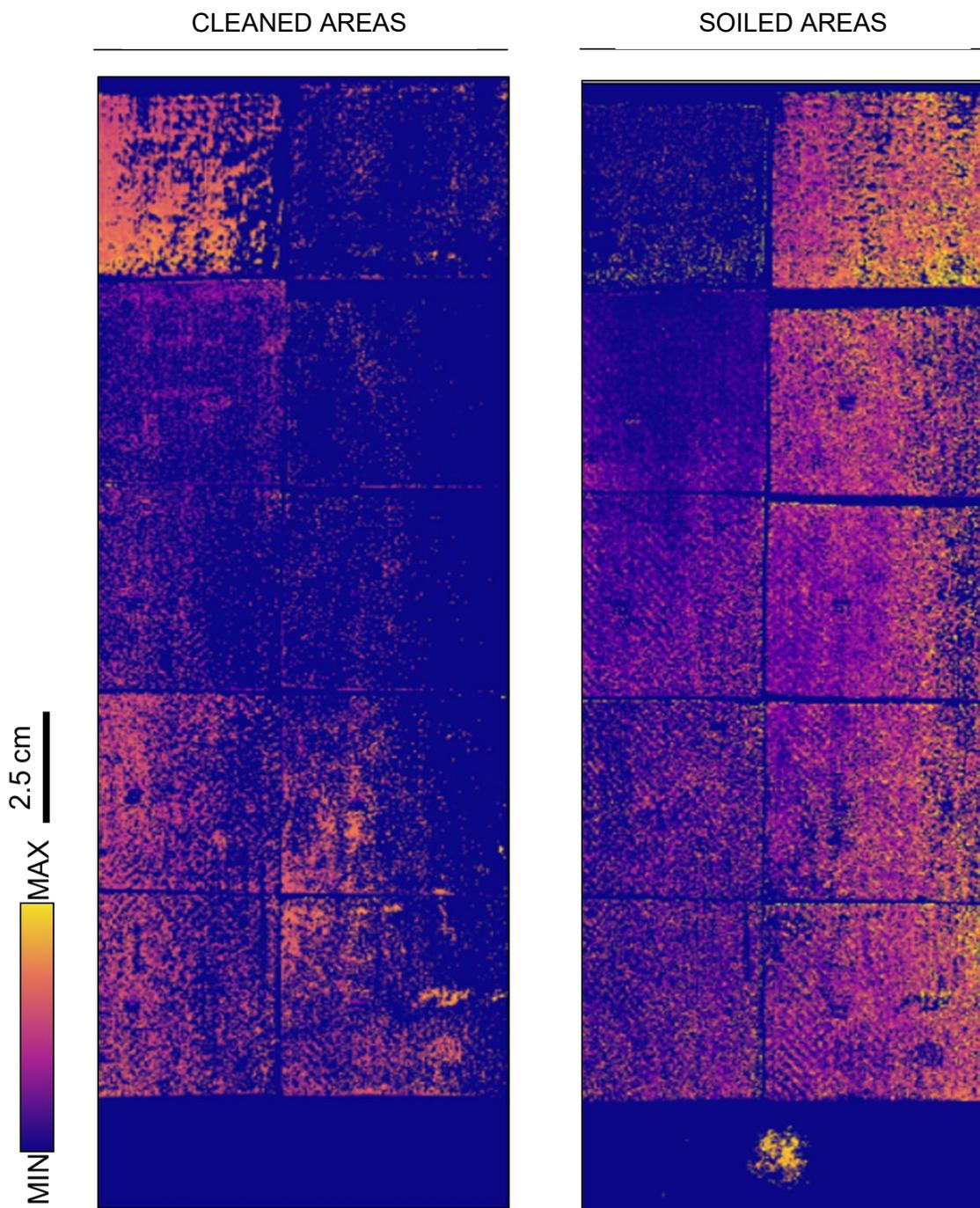
UNSUPERVISED UNMIXING • VNIR RANGE



▲ **Figure S12:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHROMIUM OXIDE GREEN IN LINSEED OIL

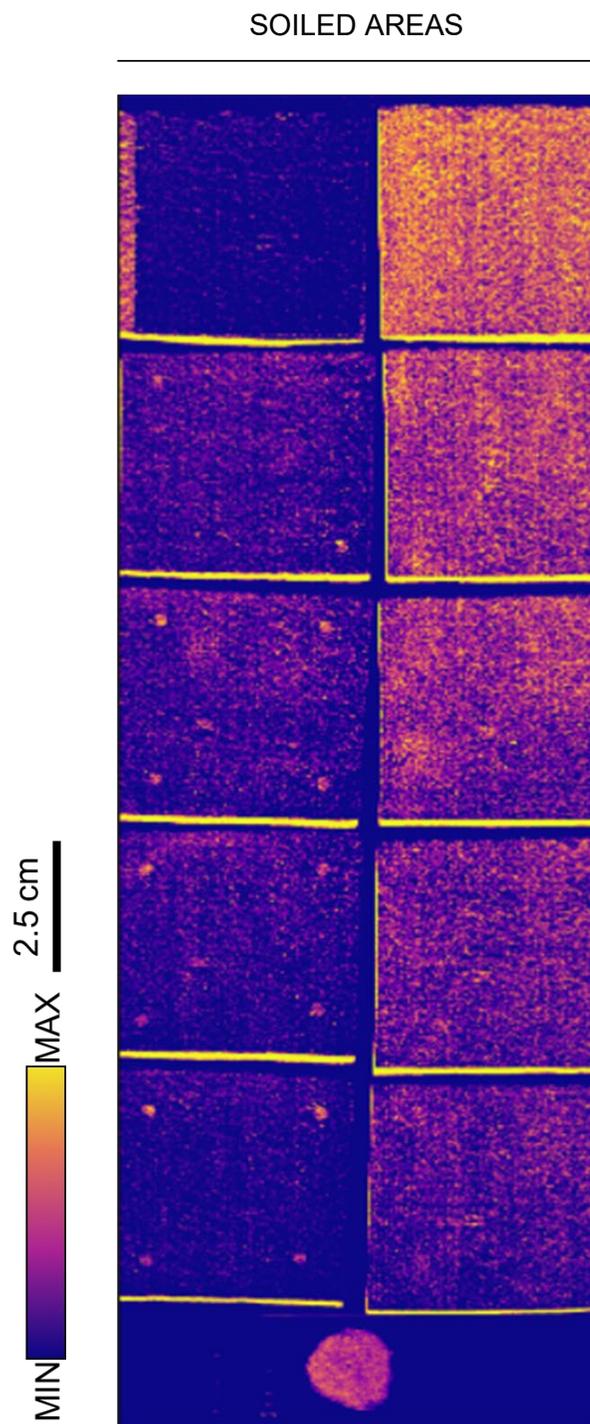
UNSUPERVISED UNMIXING • SWIR RANGE



▲ **Figure S13:** spectral maps for cleaned (left) and soiled (right) areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively, in each map. Both maps feature spray cleaned mock-ups on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHALK-GLUE GROUND

NDI MAPPING • SWIR RANGE

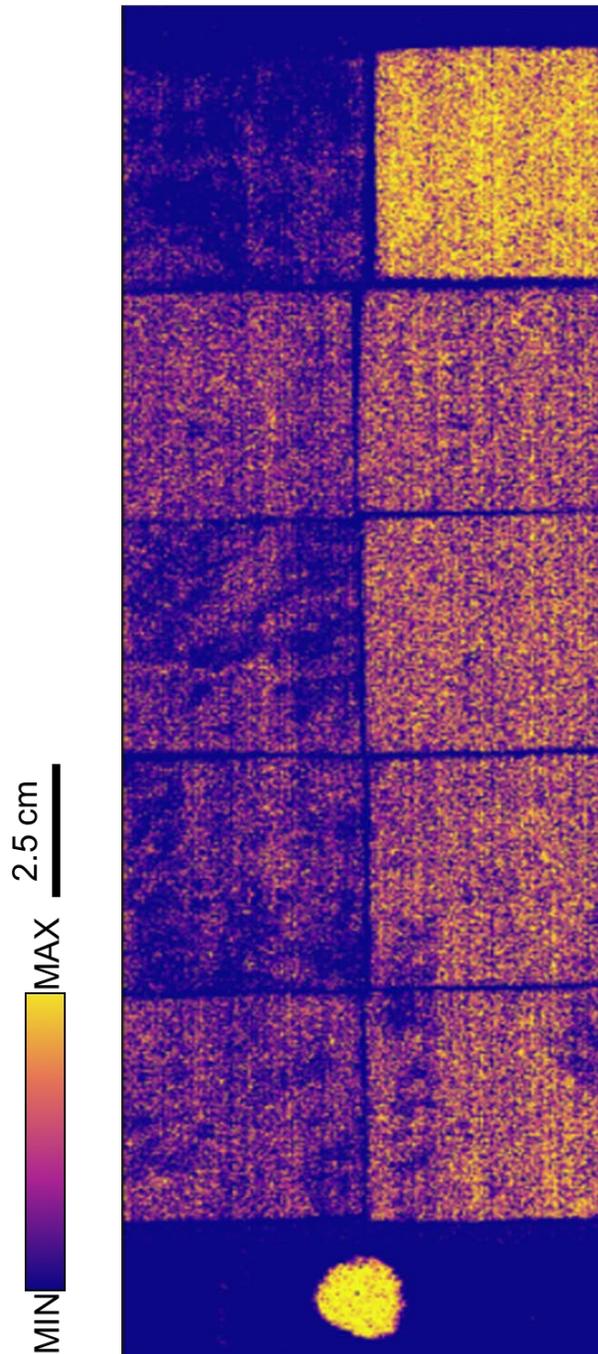


▲ **Figure S14:** spectral NDI map for soiled areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively. Spray cleaned mock-ups are found on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

HALF-CHALK GROUND

NDI MAPPING • SWIR RANGE

SOILED AREAS

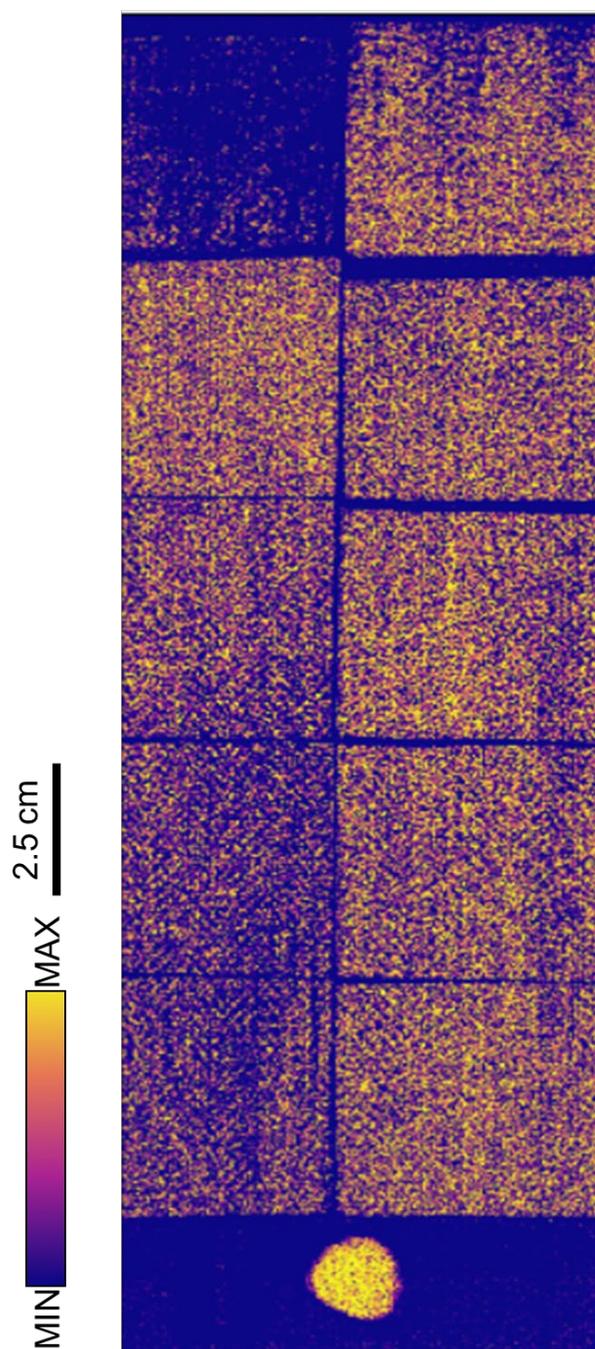


▲ **Figure S15:** spectral NDI map for soiled areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively. Spray cleaned mock-ups are found on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

CHROMIUM OXIDE GREEN IN LINSEED OIL

NDI MAPPING • SWIR RANGE

SOILED AREAS



▲ **Figure S16:** spectral NDI map for soiled areas on the mock-up surfaces after treatment. Unsoiled and soiled controls are found topmost left and right, respectively. Spray cleaned mock-ups are found on the left column, and mock-ups cleaned by pre-sprayed gel, on the right column. In each column, mock-ups are placed in descending order according to cleaning solution: deionised water, adjusted water, citric acid/NaOH, and citric acid/NH₄OH. A soiling sample is placed at the very bottom of each map for reference purposes.

Supplementary material (2): Additional table supporting methodology

	Experimental conditions											
	Test #	Room T	Room RH	Surface T	V agar	T _i agar	T _j agar	Spray t	Action t	Film h	Solution	Mockups
SPRAY	1.1	19	35	17	400	90	70	02:00	02:00	2	DI	T.G1.8,9,10
GEL	1.2	_____	_____	_____	_____	_____	19	_____	02:00	2	DI	T.G1.32,33,34
SPRAY	2.1	20	37	18	400	80	60	02:00	02:00	2	DI	T.G2.8,9,10
GEL	2.2	_____	_____	_____	_____	_____	19	_____	02:00	2	DI	T.G2.32,33,34
SPRAY	3.1	19	40	18	400	80	60	02:00	02:00	2	DI	T.O.8,9,10
GEL	3.2	_____	_____	_____	_____	_____	18	_____	02:00	2	DI	T.O.32,33,34
SPRAY	4.1	20	43	20	400	80	60	02:00	02:00	2	AW_1500_5.5	T.G1.14,15,16
GEL	4.2	_____	_____	_____	_____	_____	18	_____	02:00	2	AW_1500_5.5	T.G1.38,39,40
SPRAY	5.1	21	42	19	400	80	60	02:00	02:00	2	AW_500_5.5	T.G2.14,15,16
GEL	5.2	_____	_____	_____	_____	_____	19	_____	02:00	2	AW_500_5.5	T.G2.38,39,40
SPRAY	6.1	20	50	17	400	80	60	02:00	02:00	2	AW_500_5.0	T.O.14,15,16
GEL	6.2	_____	_____	_____	_____	_____	17	_____	02:00	2	AW_500_5.0	T.O.38,39,40
SPRAY	7.1	20	48	17	400	80	60	02:00	02:00	2	C1_5.0	T.G1..20,21,22
GEL	7.2	_____	_____	_____	_____	_____	17	_____	02:00	2	C1_5.0	T.G1.44,45,46
SPRAY	8.1	20	46	17	400	80	60	02:00	02:00	2	C1_4.5	T.G2..20,21,22
GEL	8.2	_____	_____	_____	_____	_____	18	_____	02:00	2	C1_4.5	T.G2.44,45,46
SPRAY	9.1	20	43	17	400	80	60	02:00	02:00	2	C1_4.5	T.O..20,21,22
GEL	9.2	_____	_____	_____	_____	_____	17	_____	02:00	2	C1_4.5	T.O.44,45,46
SPRAY	10.1	20	50	18	400	70	60	02:00	02:00	2	C2_5.0	T.G1.26,27,28
GEL	10.2	_____	_____	_____	_____	_____	15	_____	02:00	2	C2_5.0	T.G1.50,51,52
SPRAY	11.1	20	48	17	400	70	60	02:00	02:00	2	C2_4.5	T.G2.26,27,28
GEL	11.2	_____	_____	_____	_____	_____	17	_____	02:00	2	C2_4.5	T.G2.50,51,52
SPRAY	12.1	19	47	17	400	70	60	02:00	02:00	2	C2_4.5	T.O.26,27,28
GEL	12.2	_____	_____	_____	_____	_____	17	_____	02:00	2	C2_4.5	T.O.50,51,52

KEY	DI	Deionised water	T _i	T agar transferred to canister
	AW	Adjusted water (ammonium acetate buffer)	T _j	T agar sprayed
	C1	Citric acid / sodium hydroxide		
	C2	Citric acid / ammonium hydroxide		

▲ **Table S1** Environmental parameters measured during agar spray tests.