



Vortrag: **Bewässerungsstrategien für Dachbegrünungen**

FKZ: SWD-10.08.18.7-16.41
Kurtztitel: „Bewässerte Gründächer“
Titel: Regenwassermanagement mit bewässerten Gründächern zur Gebäudeklimatisierung sowie zur Verbesserung der Aufenthaltsqualität
Bearbeiter: Prof. Dr. Manfred Köhler (Projektleitung)
Daniel Kaiser (wiss. Ma)
Fiona Wolff (WHK)
Laufzeit des Vorhabens: 24 Monate + 2 Monate (kostenneutrale Verlängerung)



Senatsverwaltung
für Stadtentwicklung
und Wohnen



- 11/2016 – 12/2018 Wissenschaftlicher Mitarbeiter im Projekt
„„Regenwasserbewirtschaftung mit bewässerten
Gründächern zur Gebäudeklimatisierung, sowie zur
Verbesserung der Aufenthaltsqualität und der
Biodiversität““
- 06/2013 – 10/2016 Wissenschaftlicher Mitarbeiter im
Verbundforschungsvorhaben „Konzepte für
urbane Regenwasserbewirtschaftung und
Abwassersysteme“. Kurztitel: „KURAS“
- 09/2010 – 05/2013 Master of Science (M.Sc) Hochschule
Neubrandenburg
- 09/2007 – 08/2010 Bachelor of Science (B. Sc) Hochschule
Neubrandenburg
- 09/2003 – 08/2006 Berufsausbildung zum Baumschulgärtner







STORMWATER MANAGEMENT





GRAVEL ROOF



1. EXT. GREENROOF (KFU)



2. EXT. GREENROOF (KFO)



3. EXT. GREENROOF (KFZ)

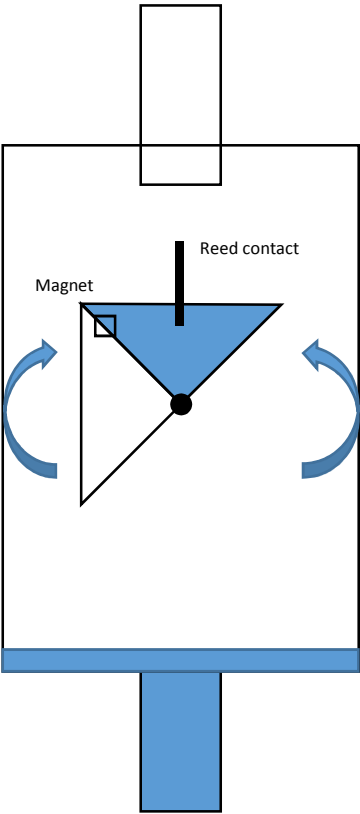


Name der Versuchsfläche	Kies	KFZ	KFO	KFU
Messreihe	2014-2017	2014-2015	2014-2017	2014-2017
Gebaut	1999	1999	2001	2001
Versuchsfläche in m ²	103,79	112	206,16	150,62
Dränage	keine	Noppenmatte	Schüttdränage	Schüttdränage
Substrattiefe in cm	16	10	10	10
Typ des Substrats	Kies	Ziegelbruch	Systemsubstrat	Systemsubstrat
Vegetation	keine	gut	gut	wenig

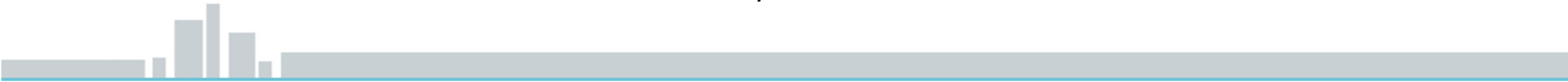


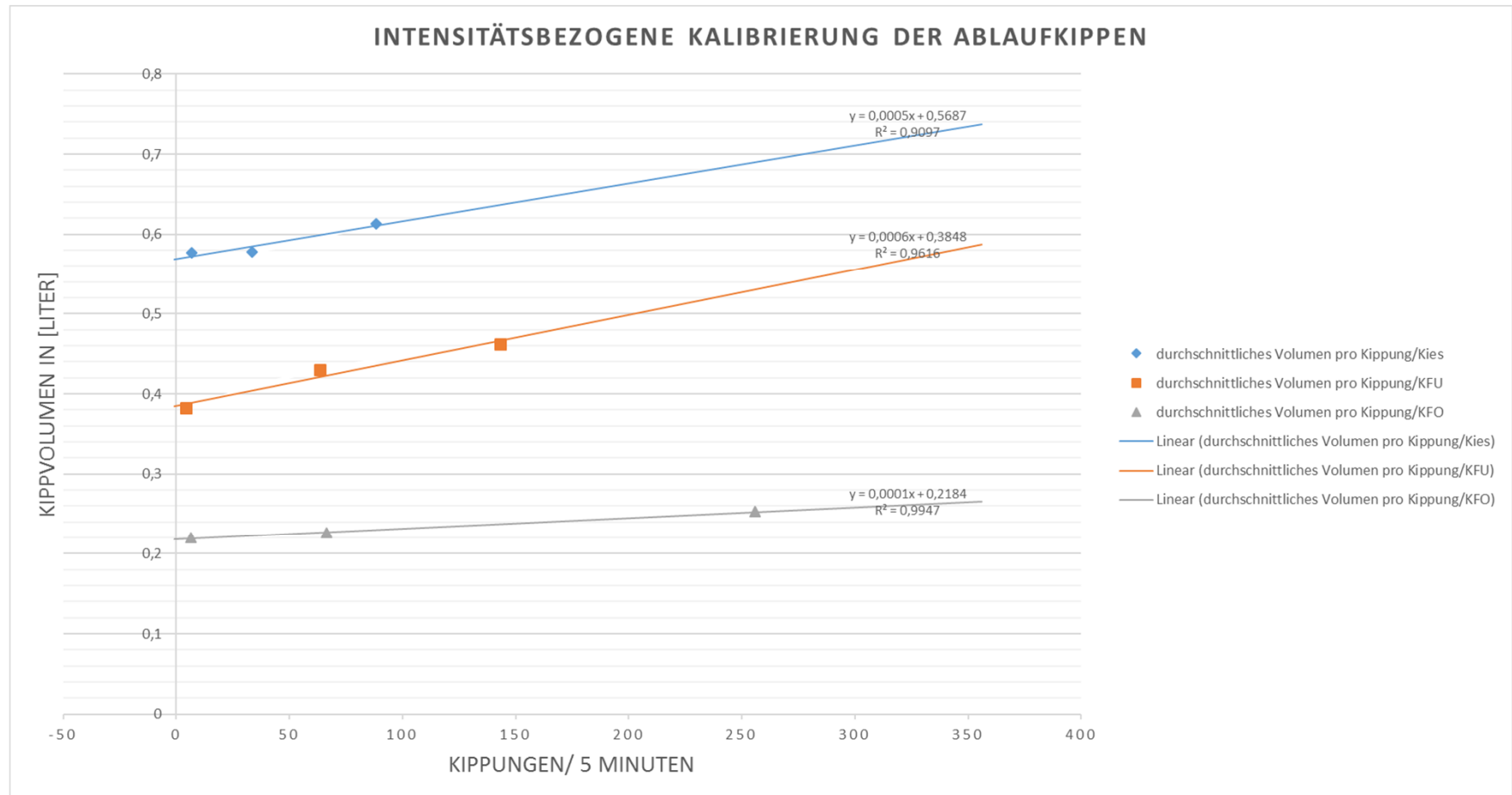


Green roof

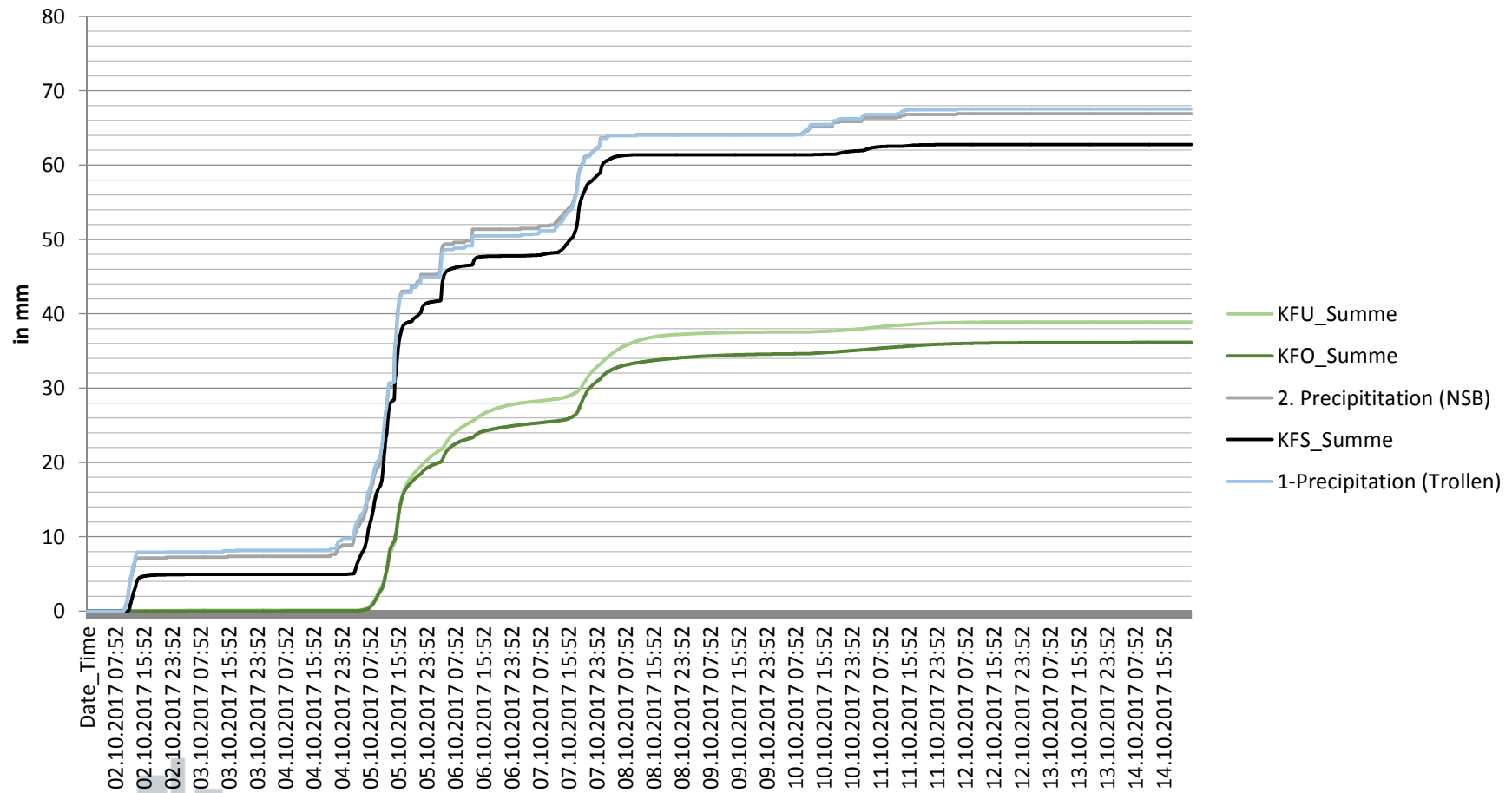


Sewer system





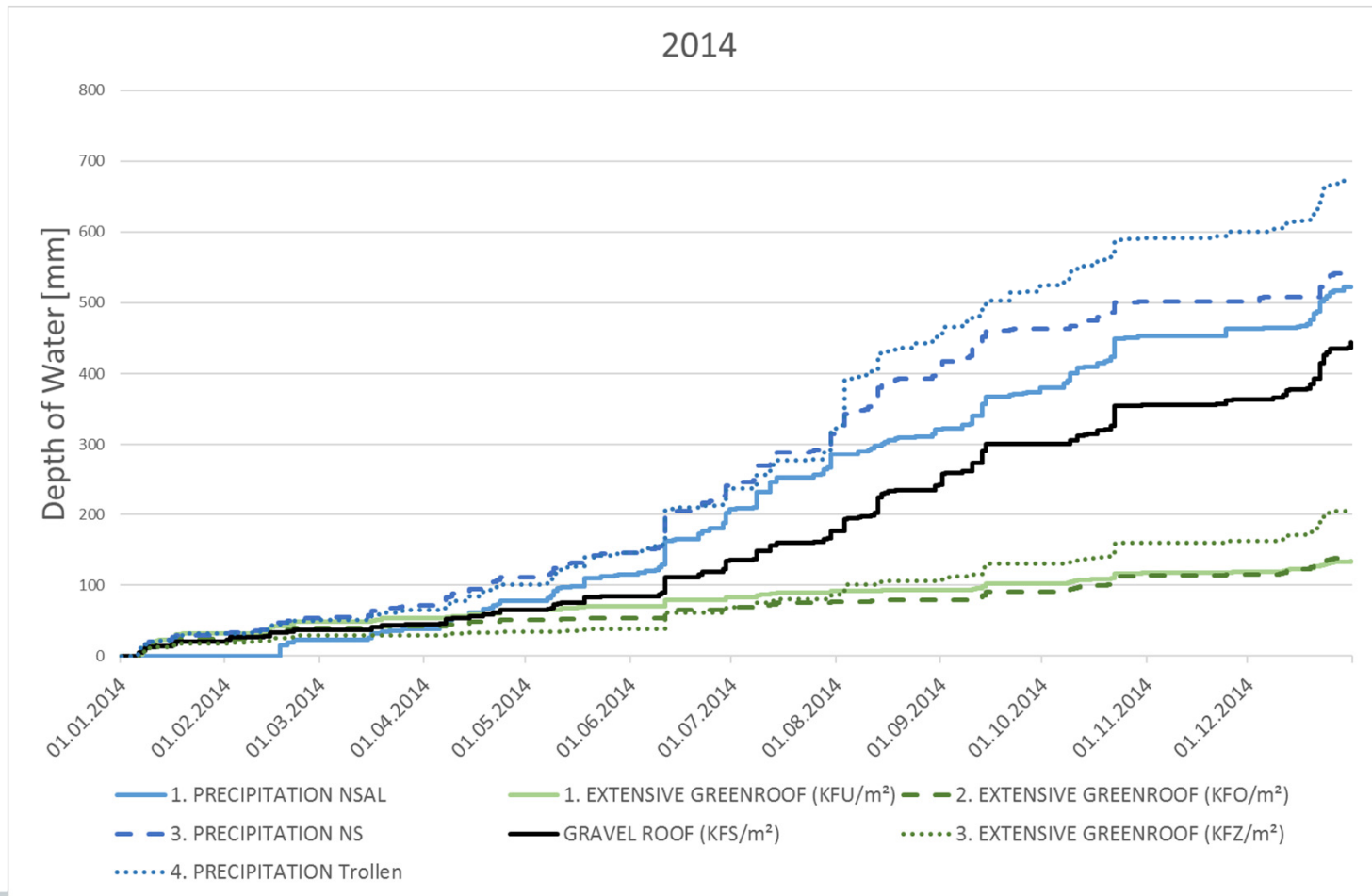
40mm/ 15h; 68mm/ 12 days

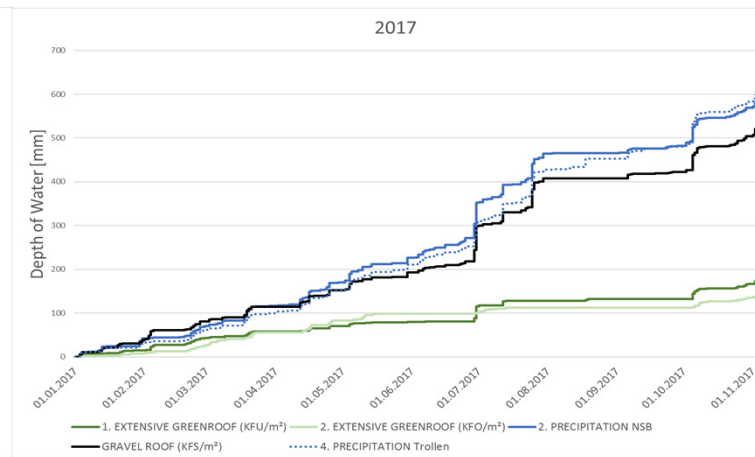
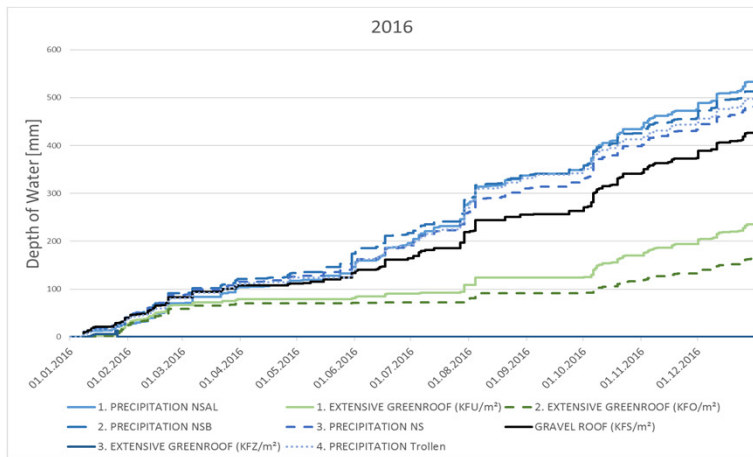
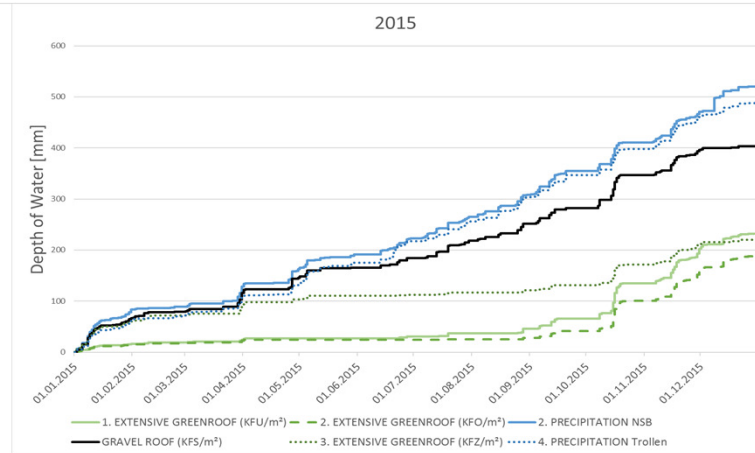
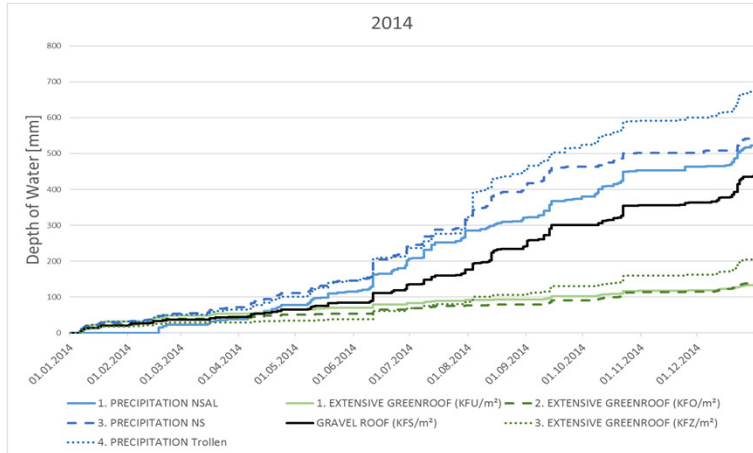


Event-number	Date	Rain		Gravel roof		Green roof	
		Precipitation depth [mm]	Duration [h]	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient
1	09.10.14	6.3	5.2	5.3	0.84	2.6	0.41
2	11.10.14	8.6	6.1	8.2	0.96	4.0	0.46
3	13.10.14	4.1	71.2	3.1	0.75	1.2	0.30
4	17.10.14	5.8	1.8	5.0	0.87	2.2	0.38
5	19.10.14	50.3	64.3	39.8	0.79	21.7	0.43
6	21.11.14	2.3	2.1	1.0	0.45	0.0	0.00
7	24.11.14	8.1	3.7	7.1	0.88	3.1	0.39
8	07.12.14	20.8	258.9	16.9	0.92	9.1	0.52
9	07.01.15	54.1	202.4	43.1	0.80	26.4	0.49
10	01.03.15	13.0	54.0	7.9	0.61	2.8	0.22
11	29.03.15	62.2	96.4	39.5	0.63	18.4	0.30
12	25.04.15	40.8	48.8	23.8	0.58	4.2	0.10
13	30.04.15	10.1	14.3	4.7	0.46	0.6	0.06
14	03.05.15	11.2	4.6	5.9	0.53	0.5	0.04
15	05.05.15	20.1	12.5	11.9	0.59	6.1	0.30

YEARLY RUNOFF







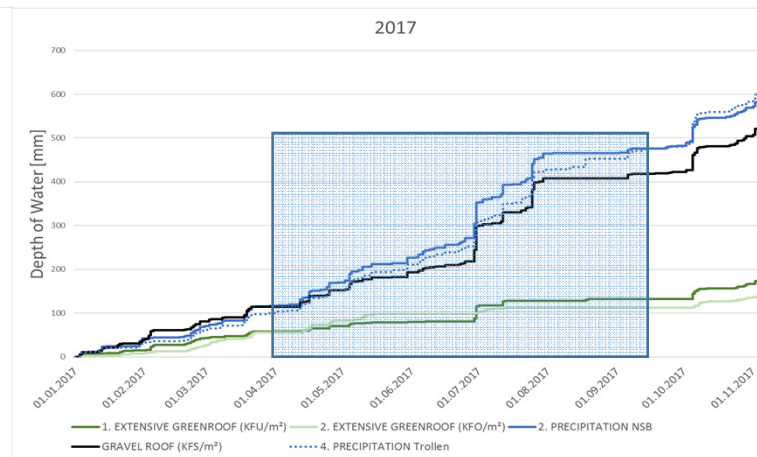
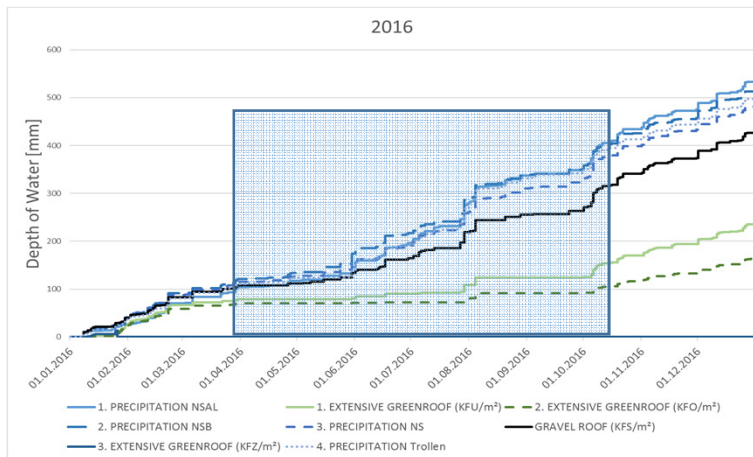
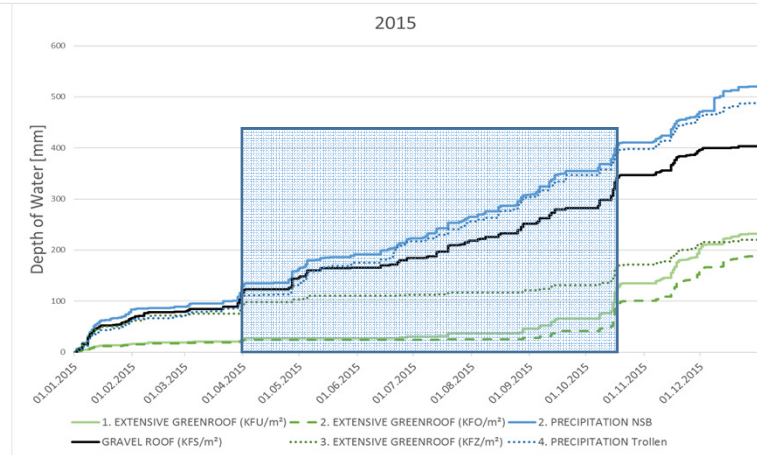
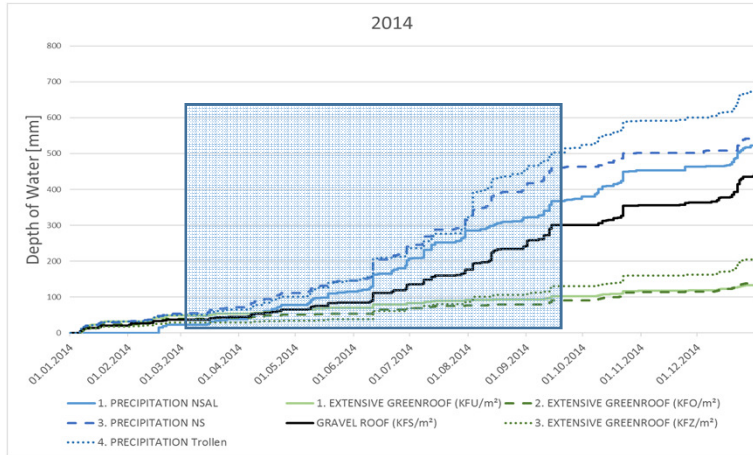
Year	Rain (average)	Gravel roof		1. Green roof (KFU)		2. Green roof (KFO)		3. Green roof (KFZ)	
	Precipitation depth [mm]	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient
2014	579,23	444,01	0,77	133,82	0,23	140,08	0,24	206,88	0,36
2015	505,37	403,79	0,80	231,53	0,46	187,76	0,37	220,13	0,44
2016	505,86	426,16	0,84	235,60	0,46	163,16	0,32		
2017	590,46	521,37	0,88	173,81	0,29	138,10	0,23		
Average	545,23	448,83	0,82	193,69	0,35	157,27	0,29	213,51	0,40

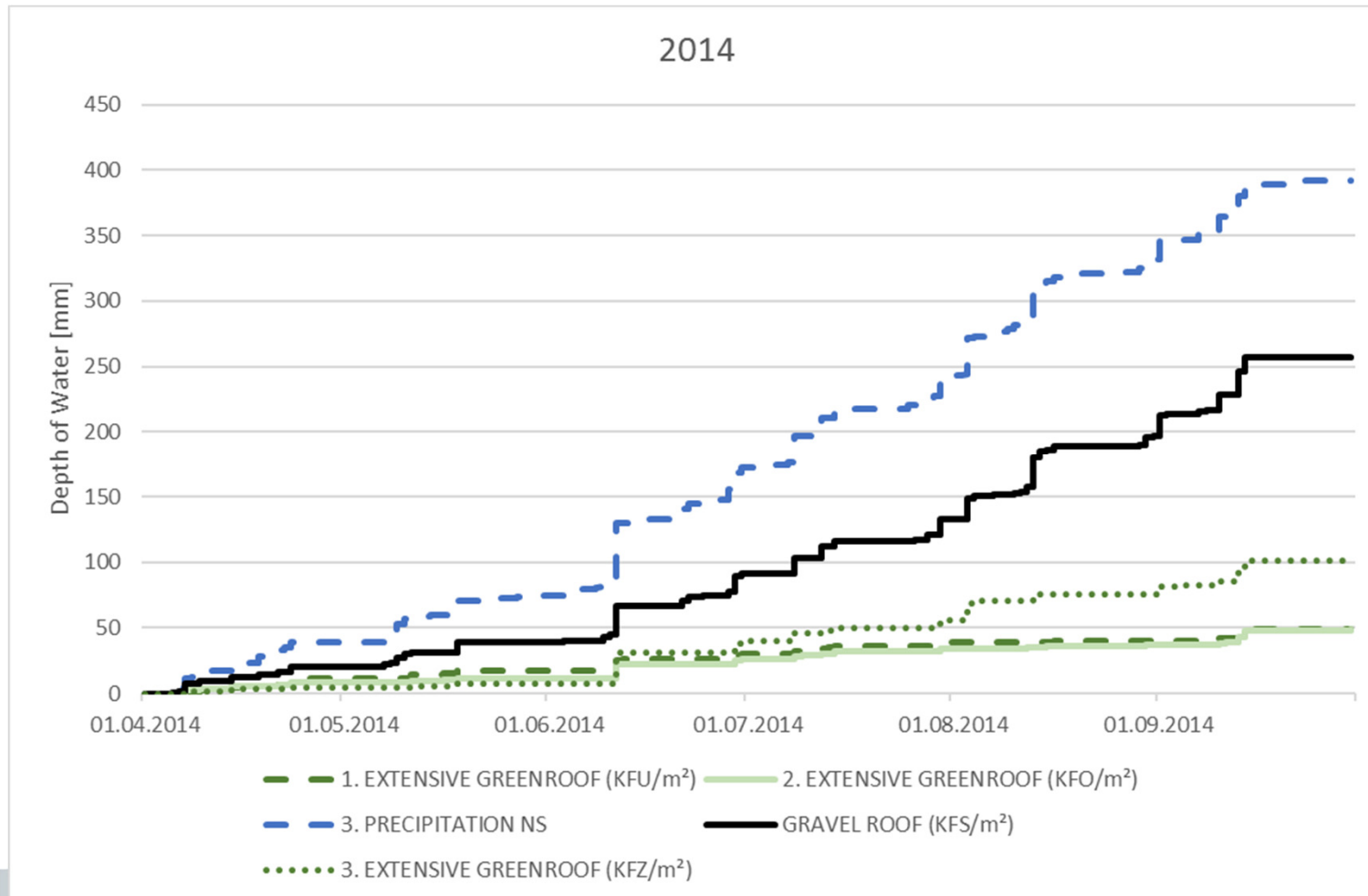


RUNOFF IN THE GROWING SEASON

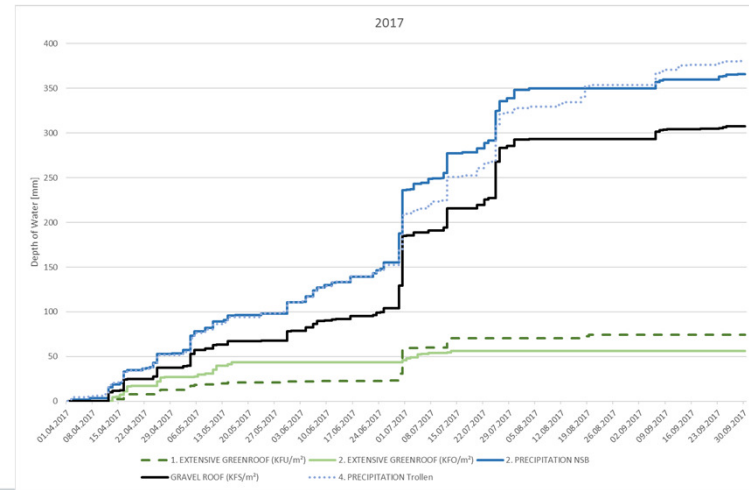
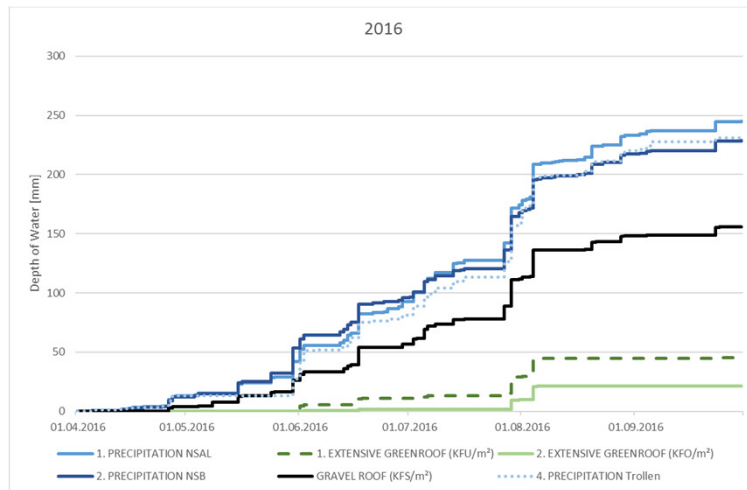
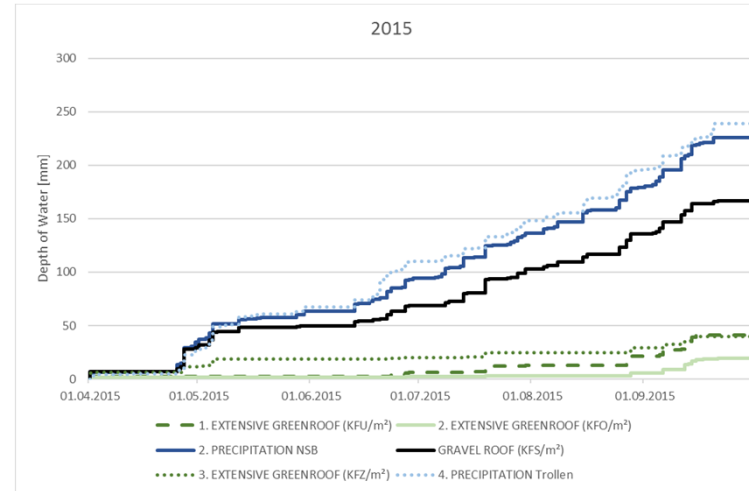
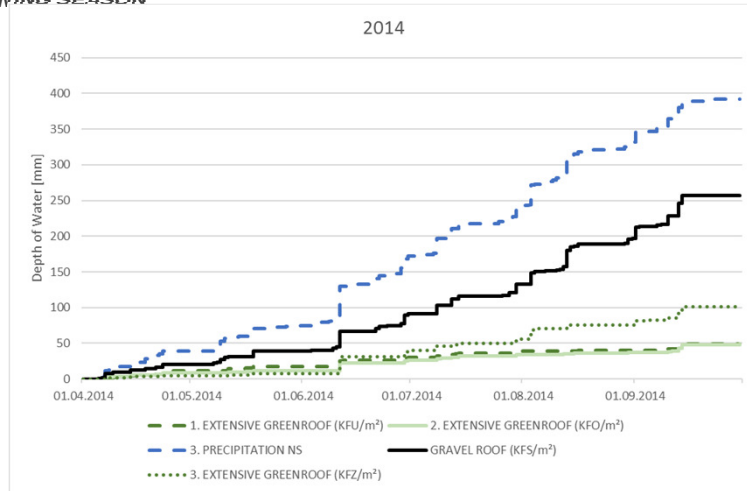


GROWING SEASON





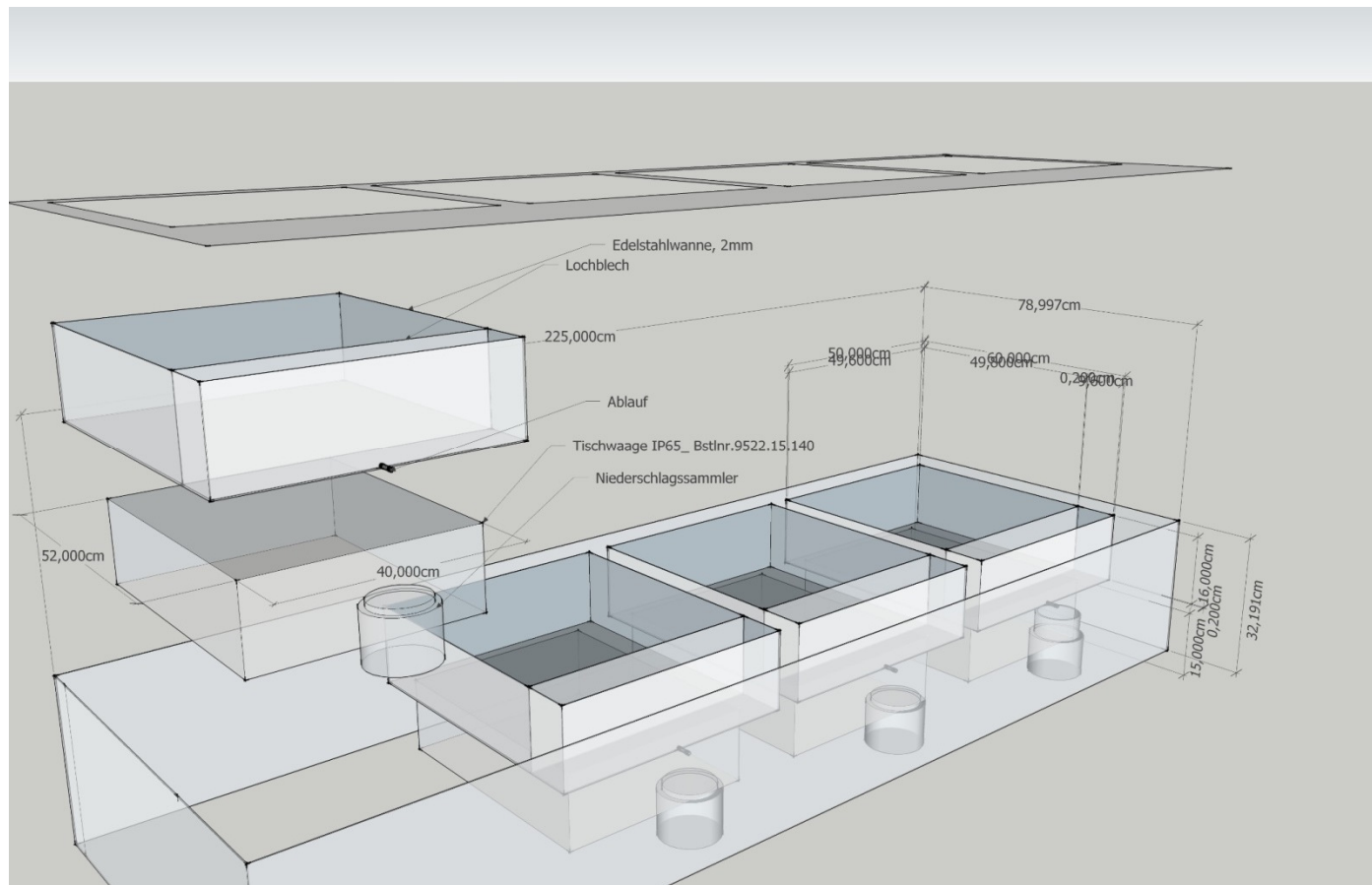
GROWING SEASON



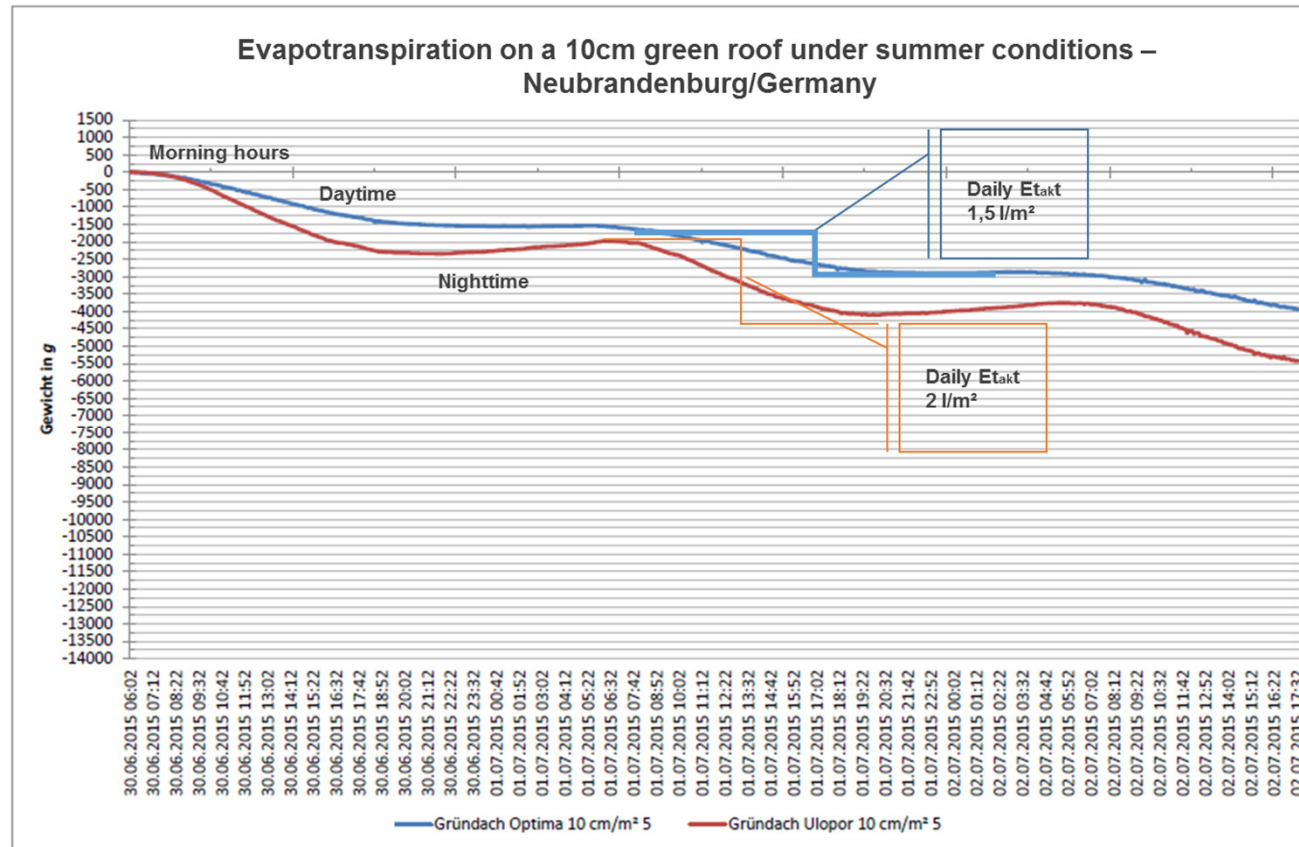
Year	Rain (average)	Gravel roof		1. Green roof		2. Green roof		3. Green roof	
	Precipitation depth [mm]	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient	Runoff [mm]	Runoff coefficient
2014	391	256	0,65	48	0,12	48	0,12	101	0,26
2015	238	166	0,70	39	0,16	19	0,08	39	0,16
2016	231	155	0,67	45	0,19	21	0,09		
2017	380	307	0,81	74	0,19	56	0,15		
Average	310	221	0,71	52	0,17	36	0,11	70	0,21

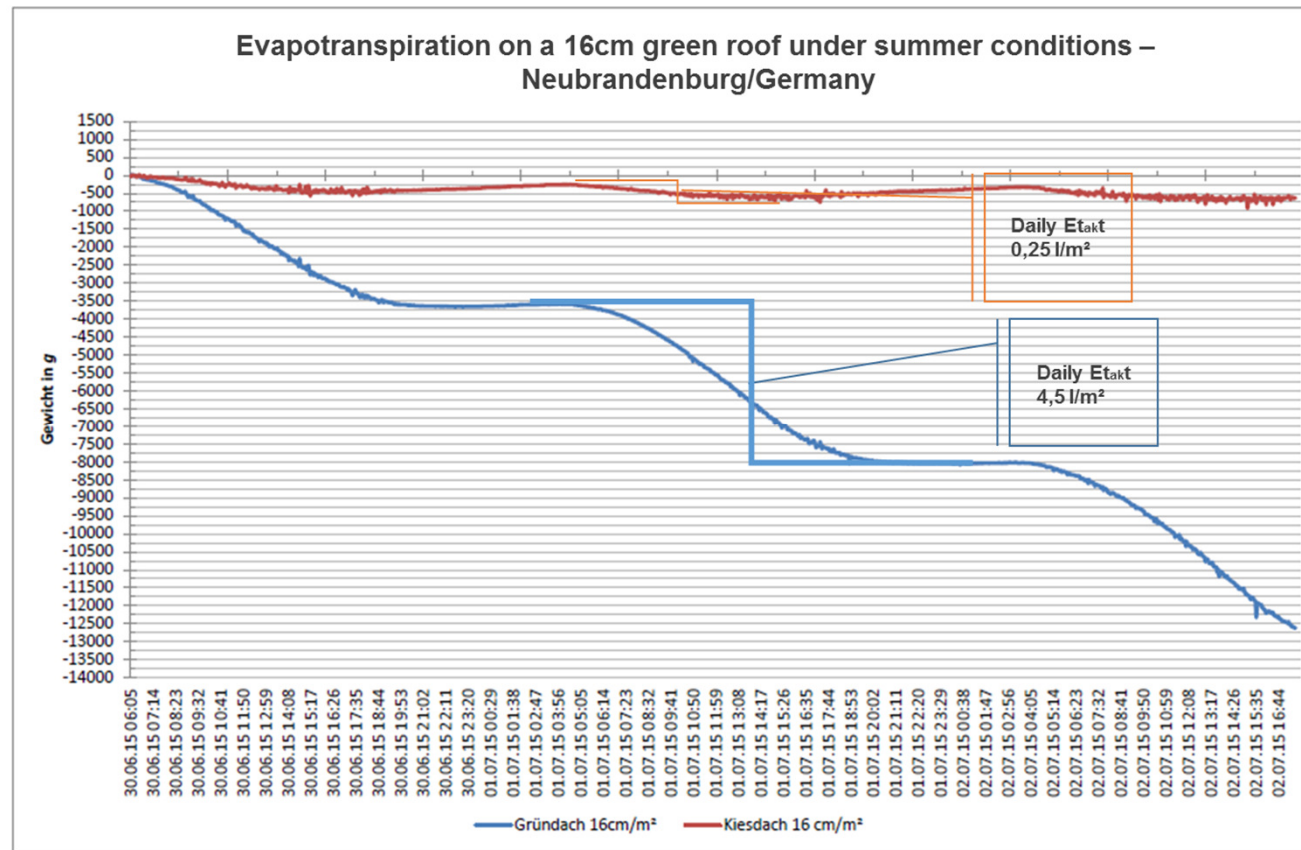
EVAPOTRANSPIRATION



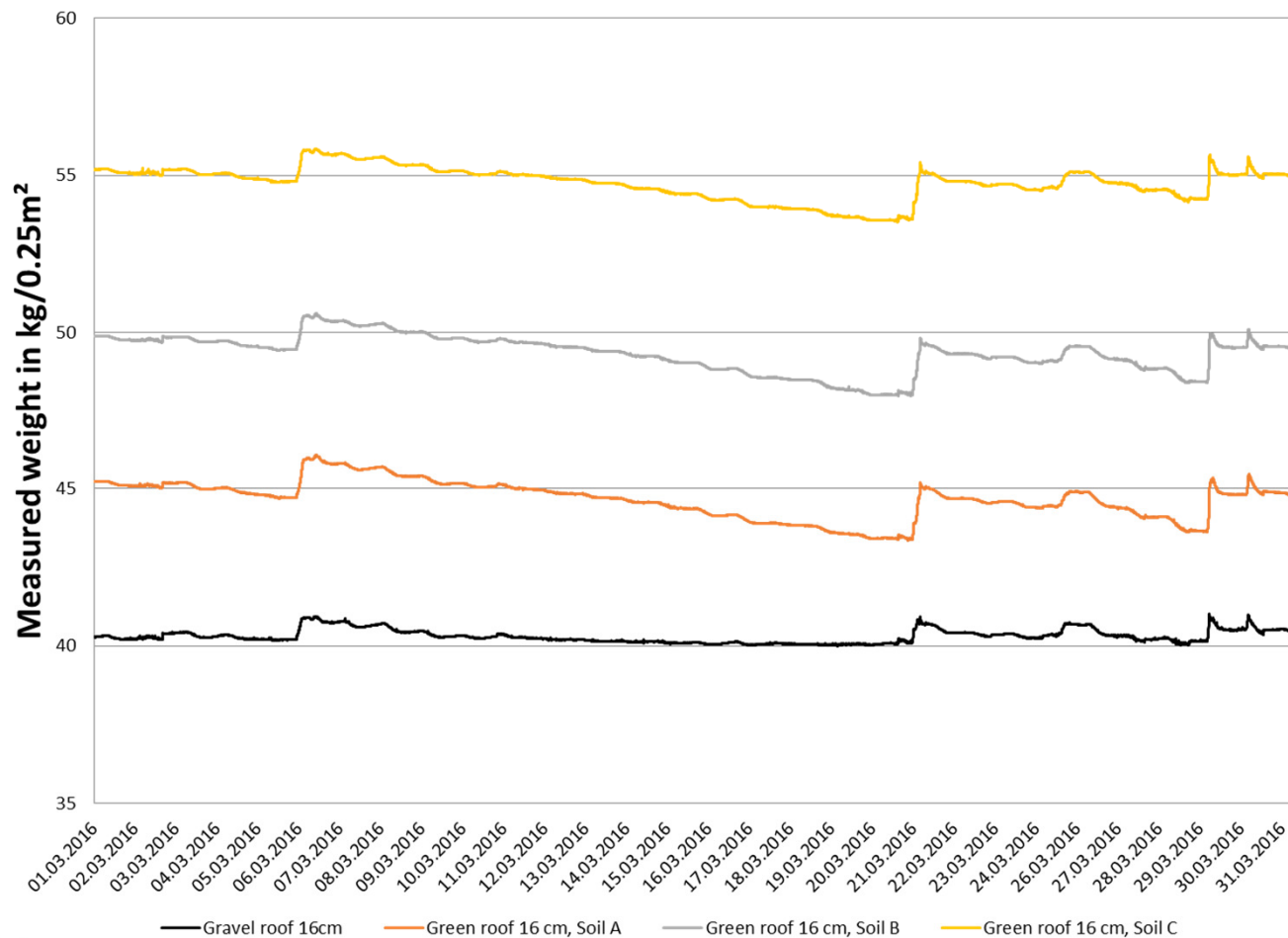




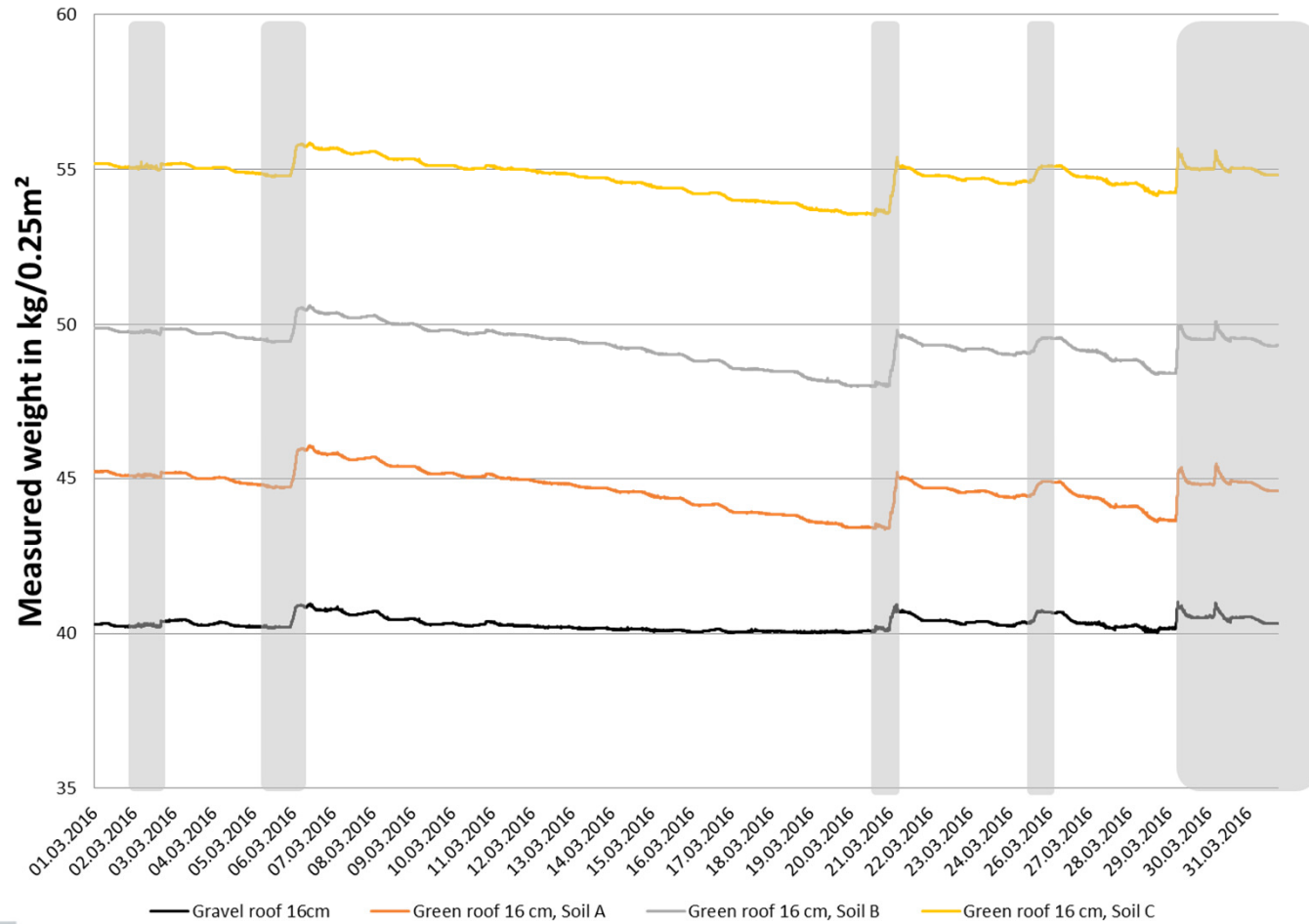




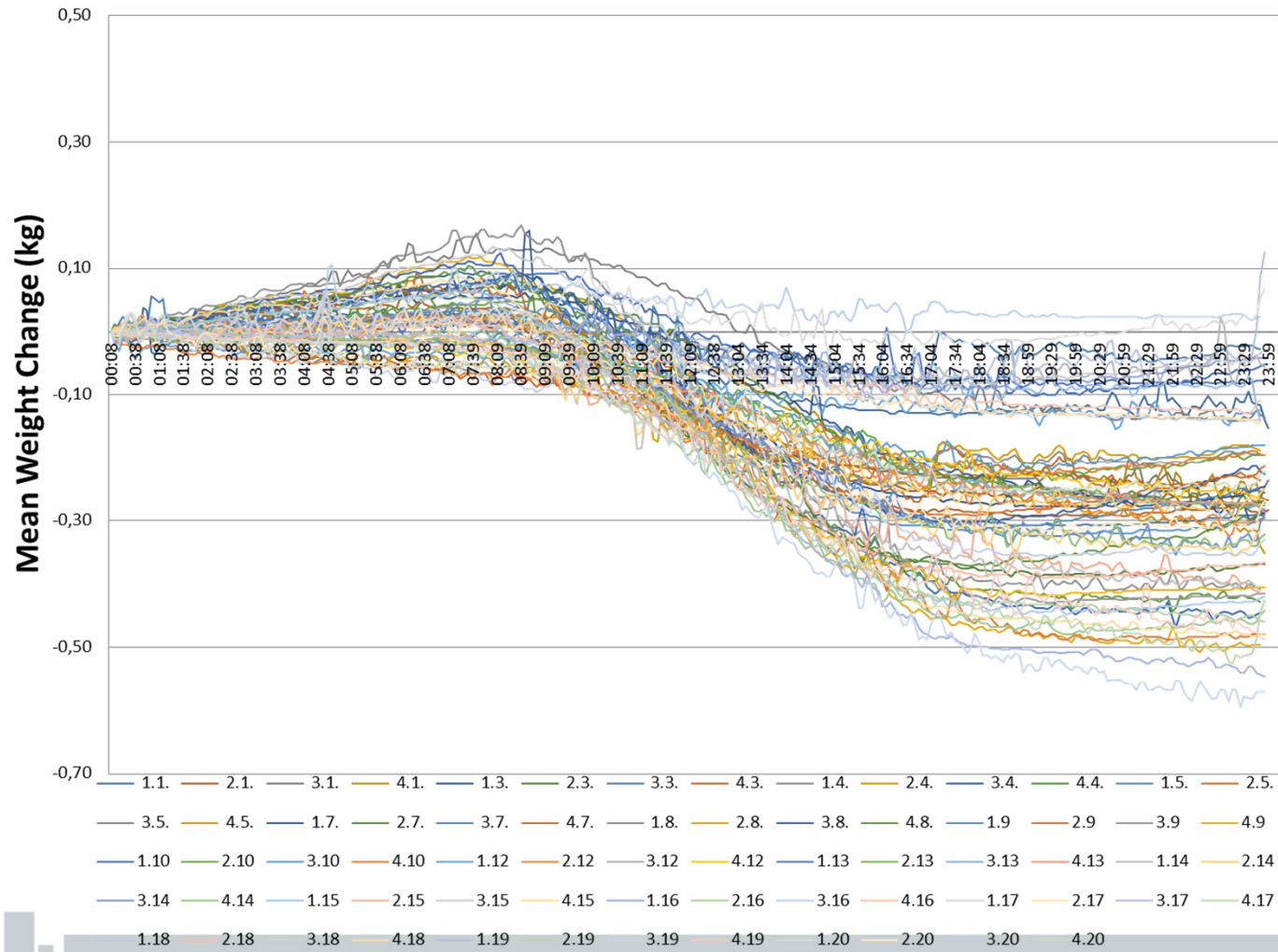
March - 5 minutes measurements (n=31)



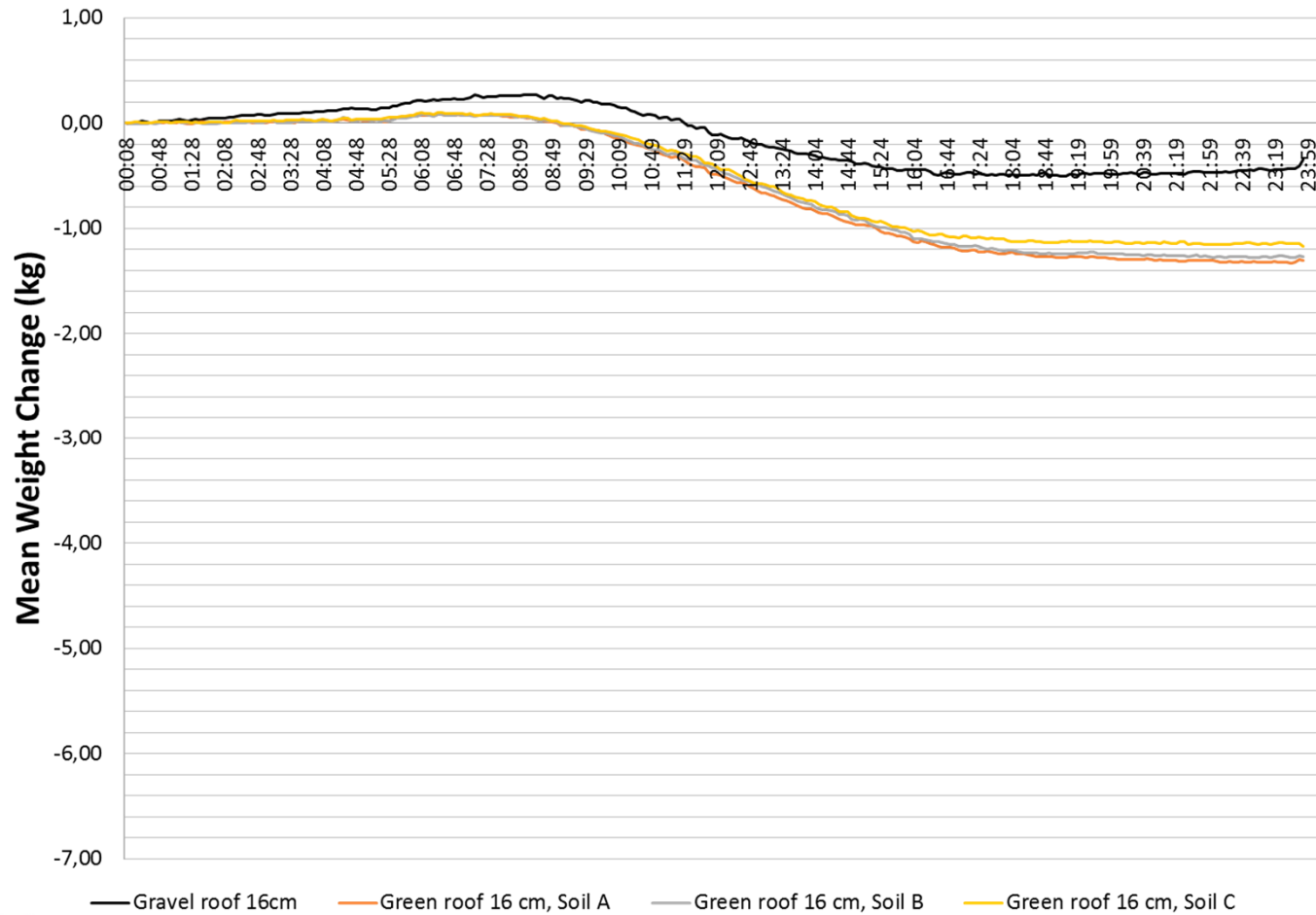
March - 5 minutes measurements (n=31)

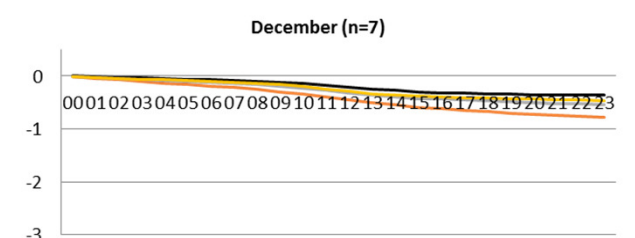
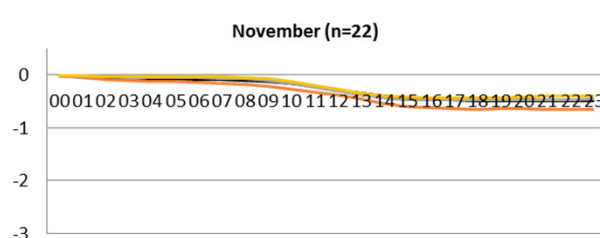
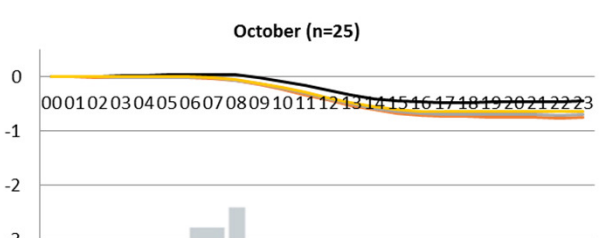
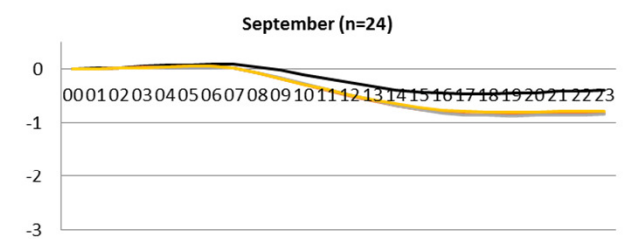
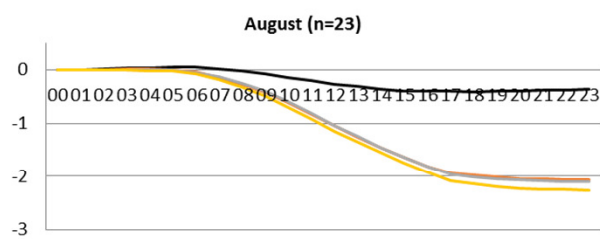
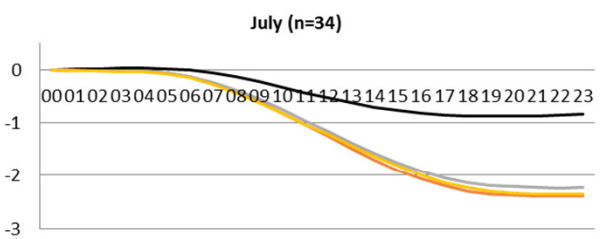
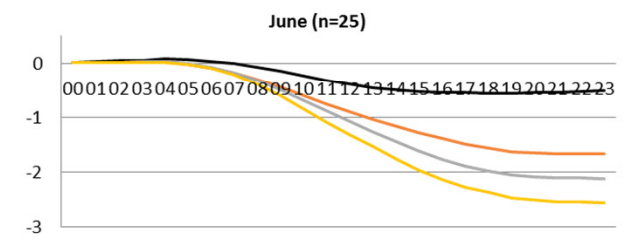
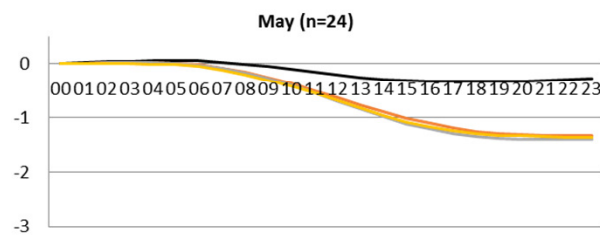
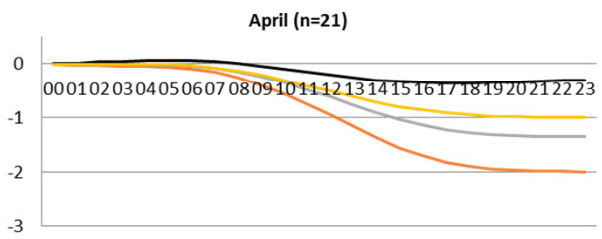
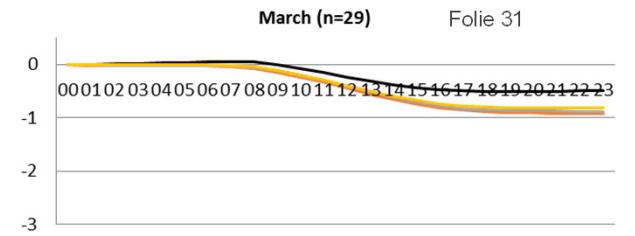
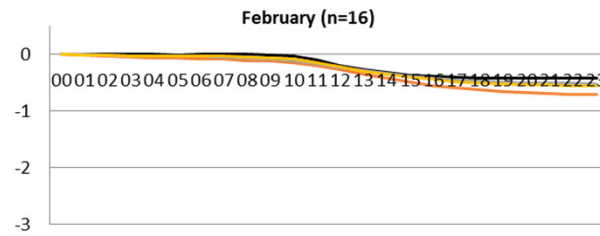
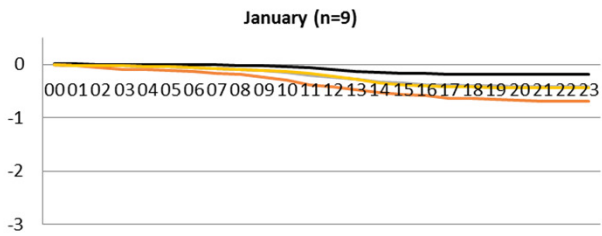


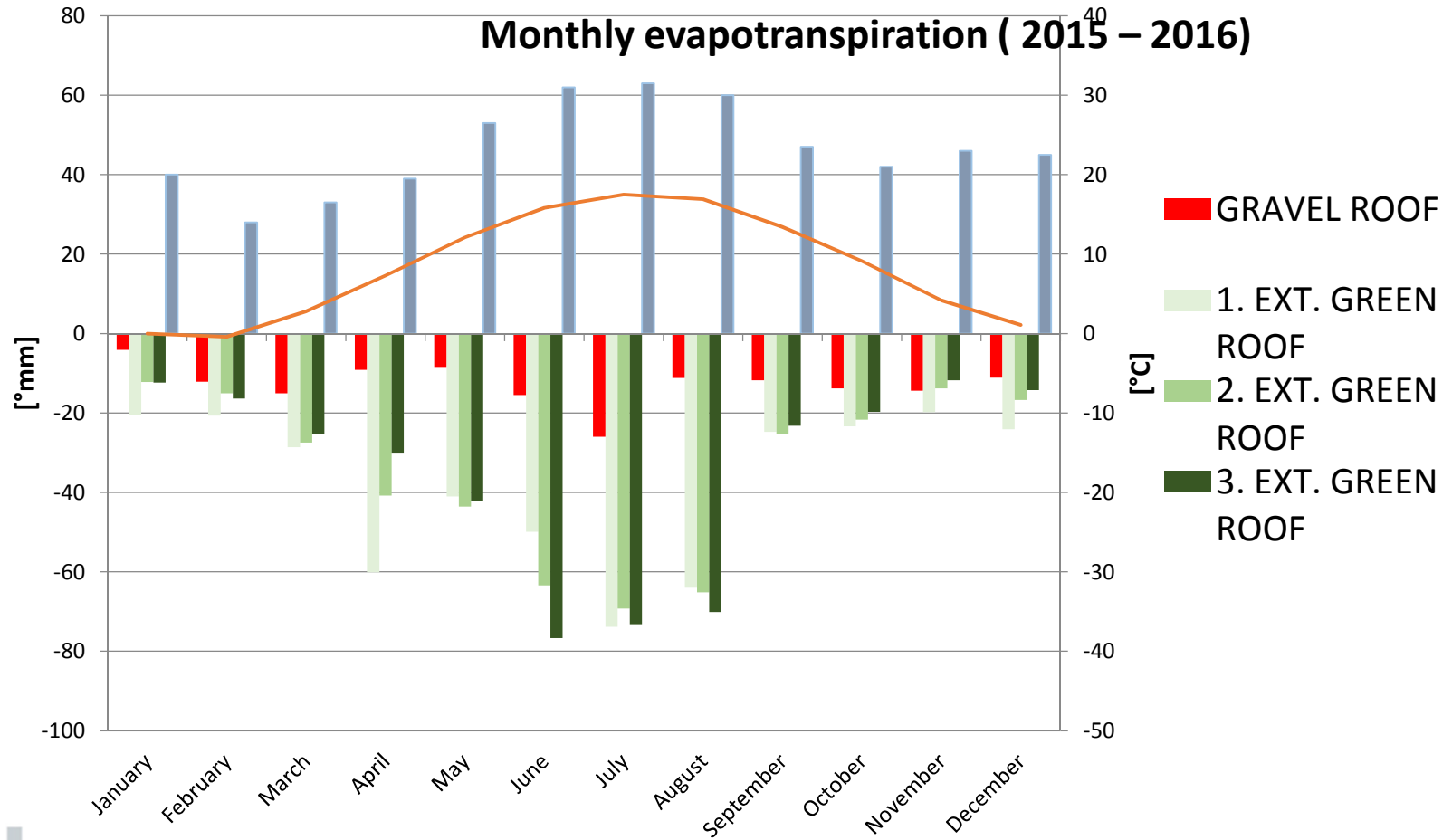
March - Average daily evapotranspiration for 0.25m² (n=17)



March - Average daily evapotranspiration for 1m² (n=17)







IRRIGATED EXT. GREEN ROOFS



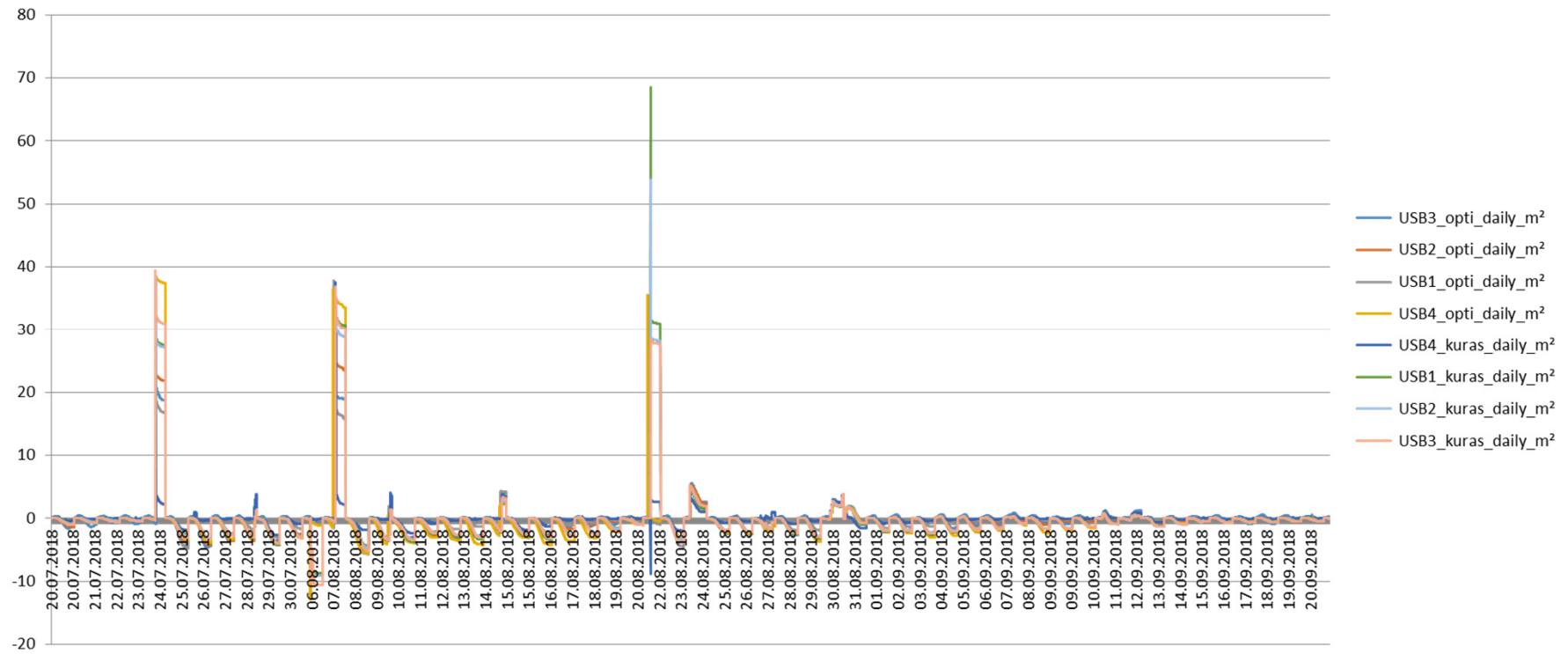
22.09.2017



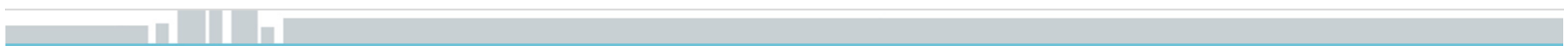
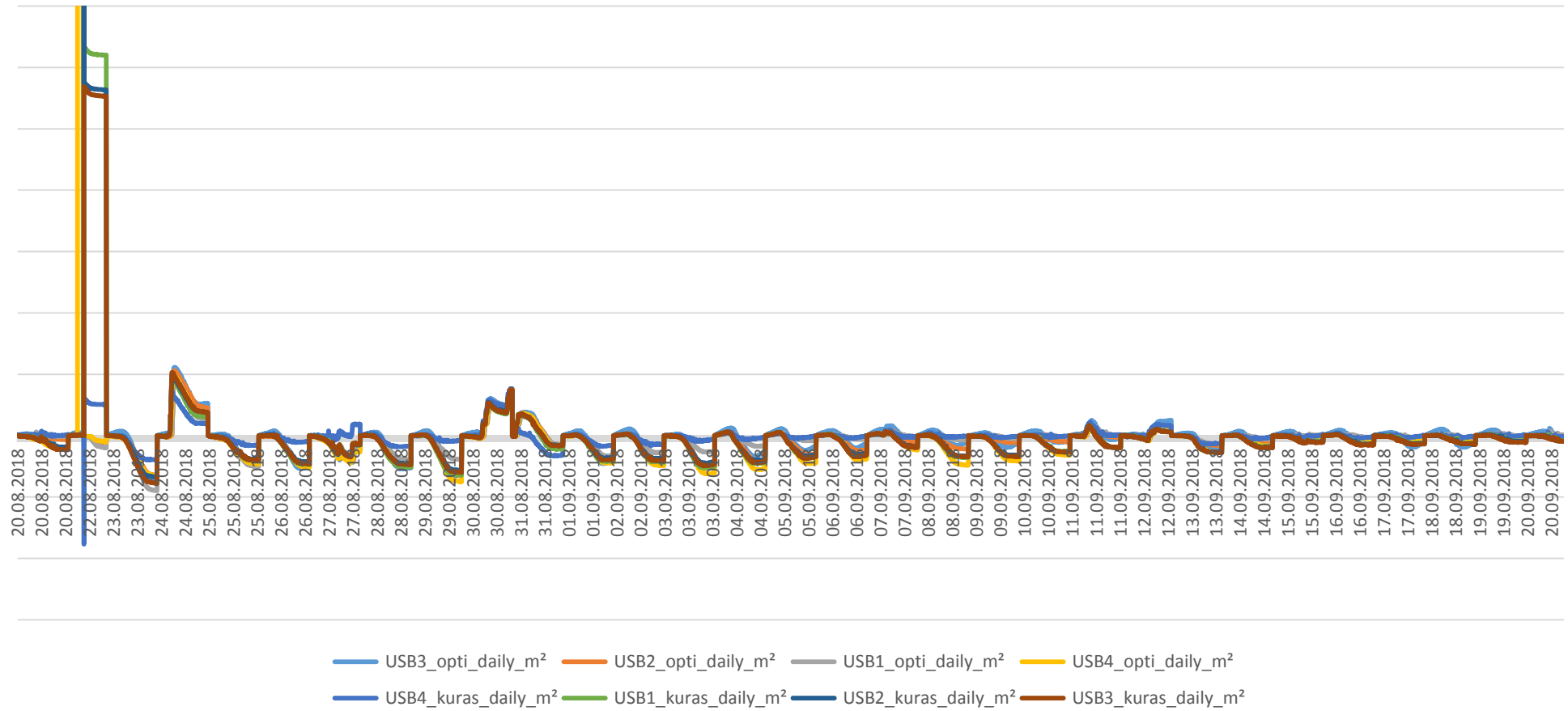


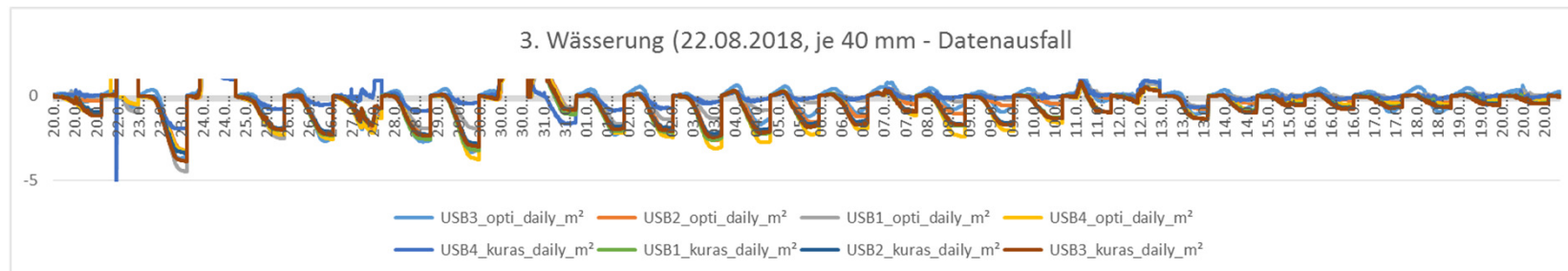
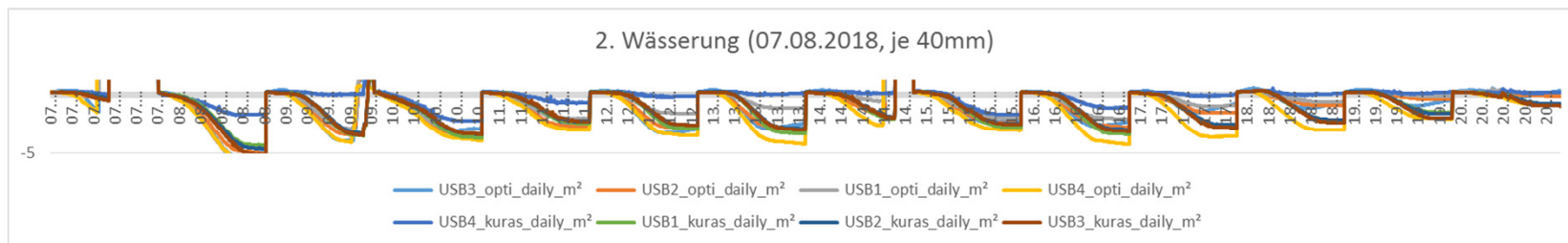
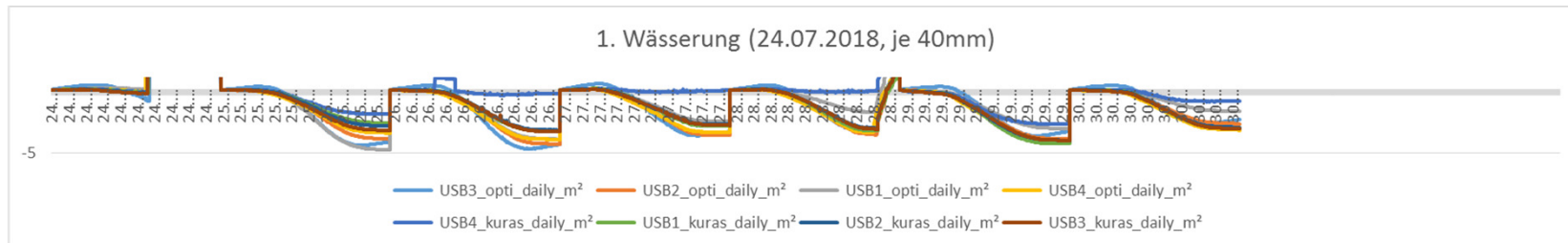
USB 4 (mit 3,5 cm Anstau)			USB 3			USB 2			USB 1		
Aufbau	Höhe [cm]	Gewicht wasserges. [kg]	Aufbau	Höhe [cm]	Gewicht wasserges. [kg]	Aufbau	Höhe [cm]	Gewicht wasserges. [kg]	Aufbau	Höhe [cm]	Gewicht wasserges. [kg]
Schutzlage	0,28	0,58	Schutzlage	0,28	0,58	Schutzlage	0,28	0,58	Schutzlage	0,28	0,58
Retention sbox	8,50	10,15	Retentionsbox	8,50	0,38	Drän-Speicherelement	2,50	1,28	Drän-Speicherelement	2,50	1,28
Filtervlies	0,10	0,00	Filtervlies	0,10	0,00	Filtervlies	0,10	0,00	Filtervlies	0,10	0,00
Ext.-Substrat leicht	12,00	43,20	Ext.-Substrat leicht	12,00	43,20	Ext.-Substrat	12,00	43,20	Ext.-Substrat	6,00	21,60
Sedum-Gras-Kraut		2,50	Sedum-Gras-Kraut		2,50	Sedum-Gras-Kraut		2,50	Sedum-Gras-Kraut		2,50
	20,88	56,43		20,88	46,65		14,88	47,55		8,88	24,95

USB 1-3 (kuras)			USB 4 (kuras)		
Aufbau	Höhe [cm]	Gewicht wasserges. [kg]	Aufbau	Höhe [cm]	Gewicht wasserges. [kg]
Filtervlies	0,10	0,00	Kies (16 – 32)	10	
Ext.-Substrat	16,00	57,6		10	80
Sedum-Gras-Kraut		2,50			
	16,10	60,10			

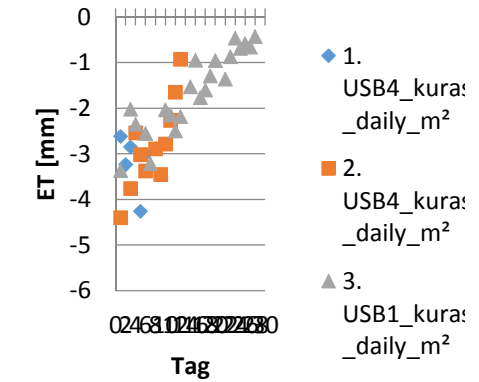
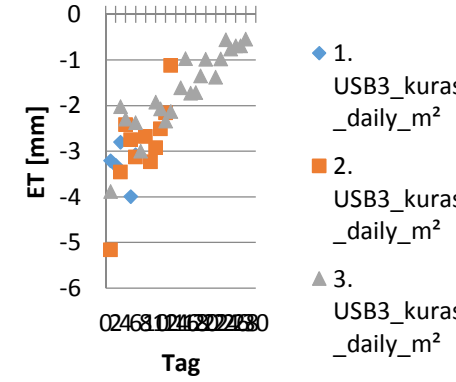
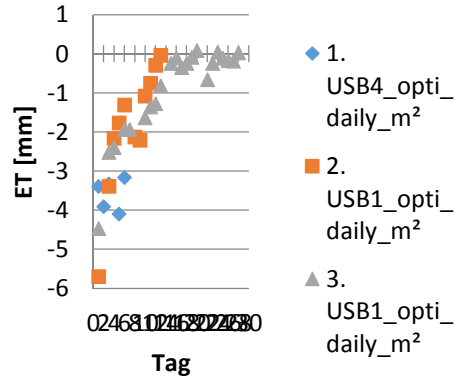
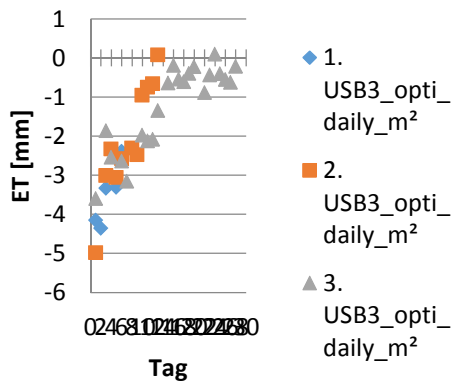
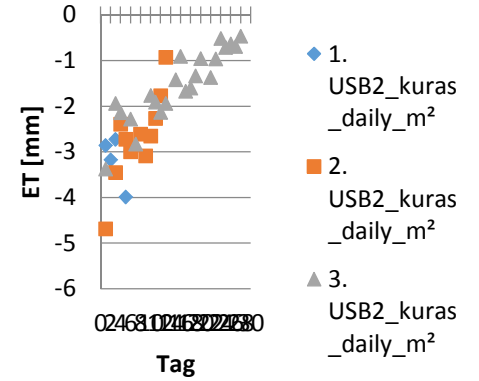
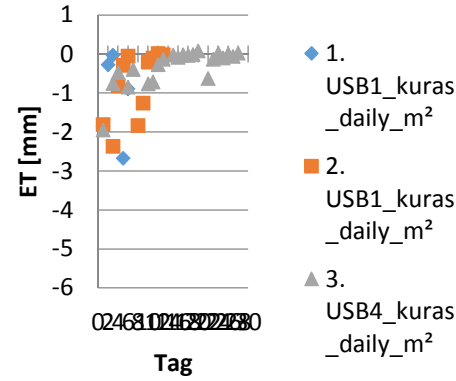
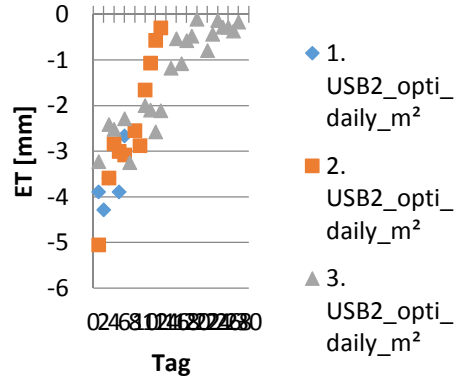
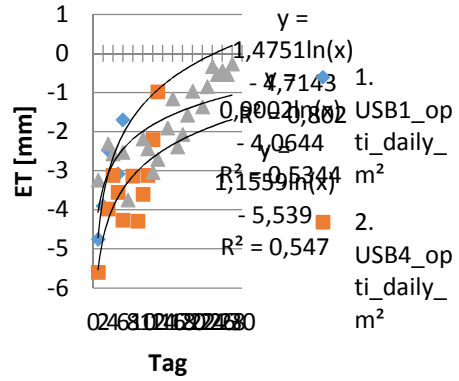


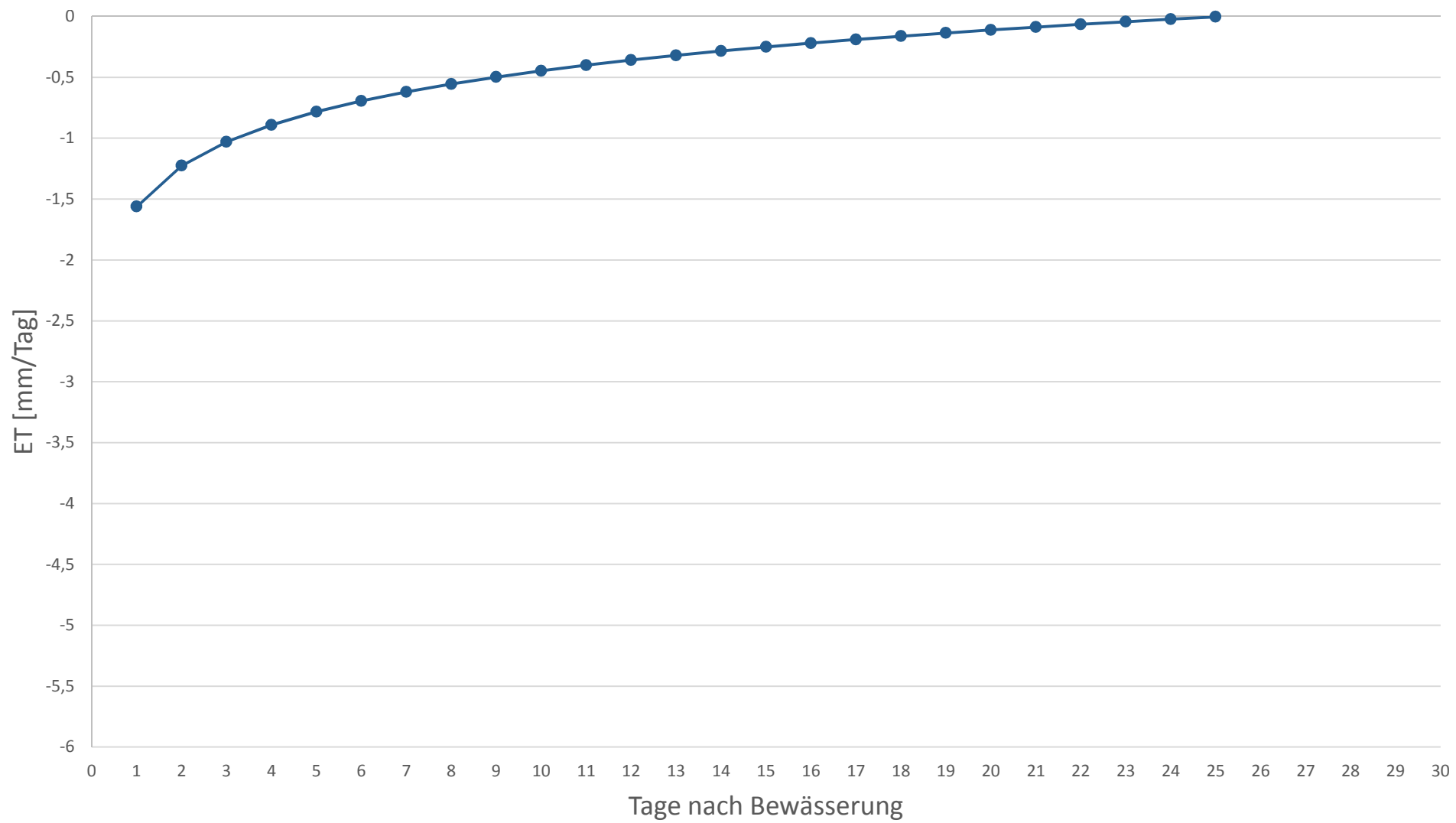
3. Bewässerung

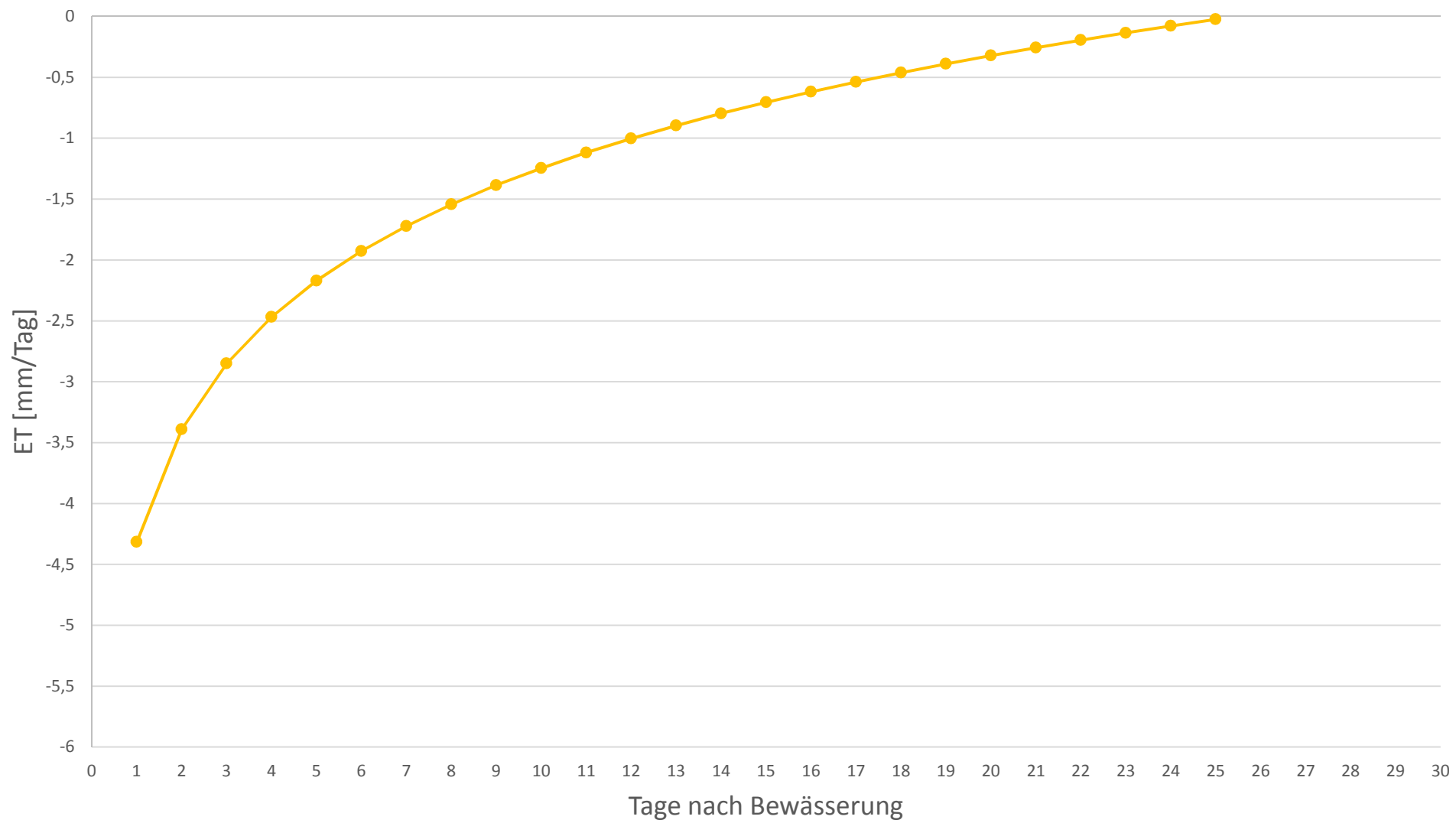


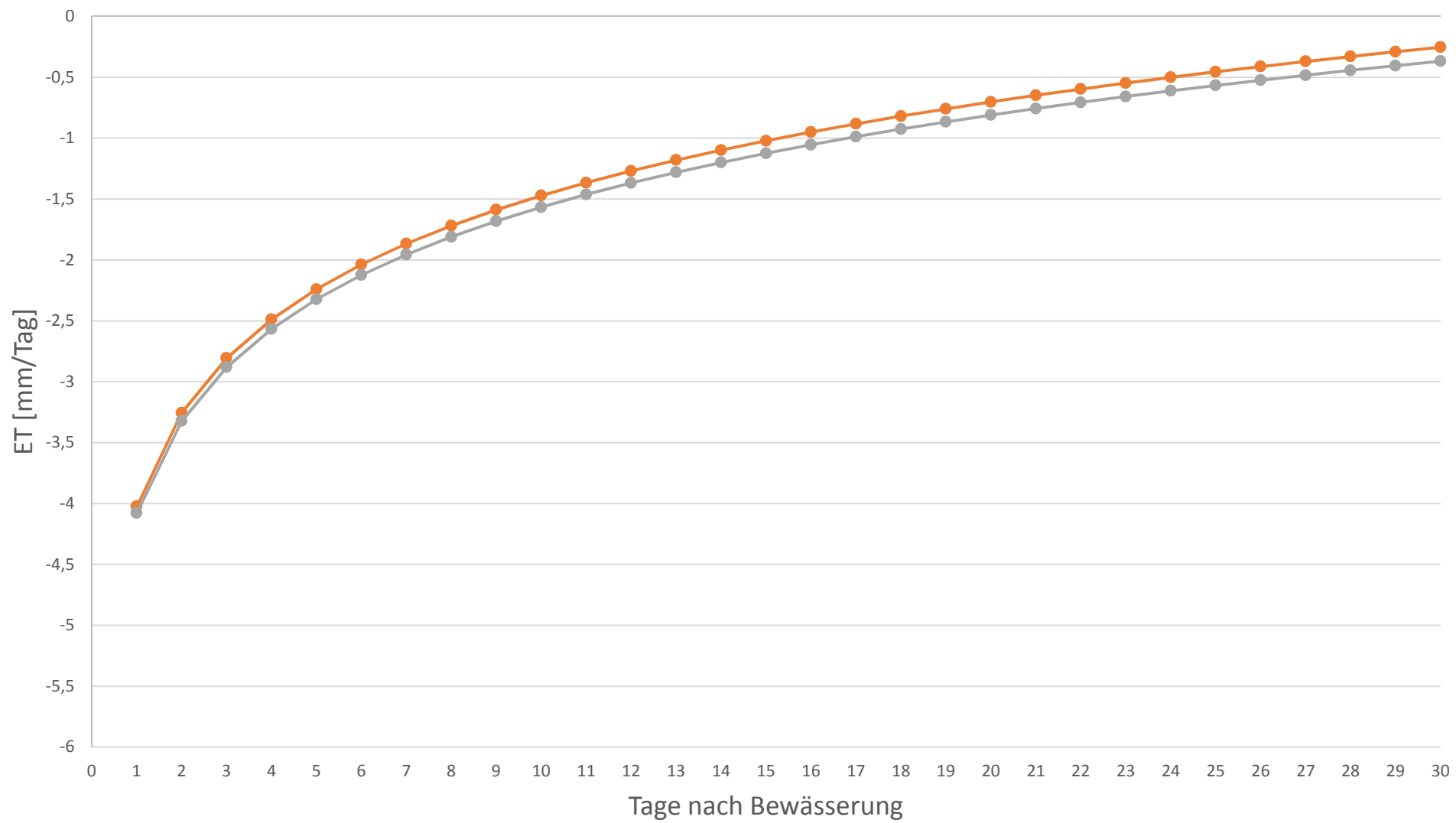


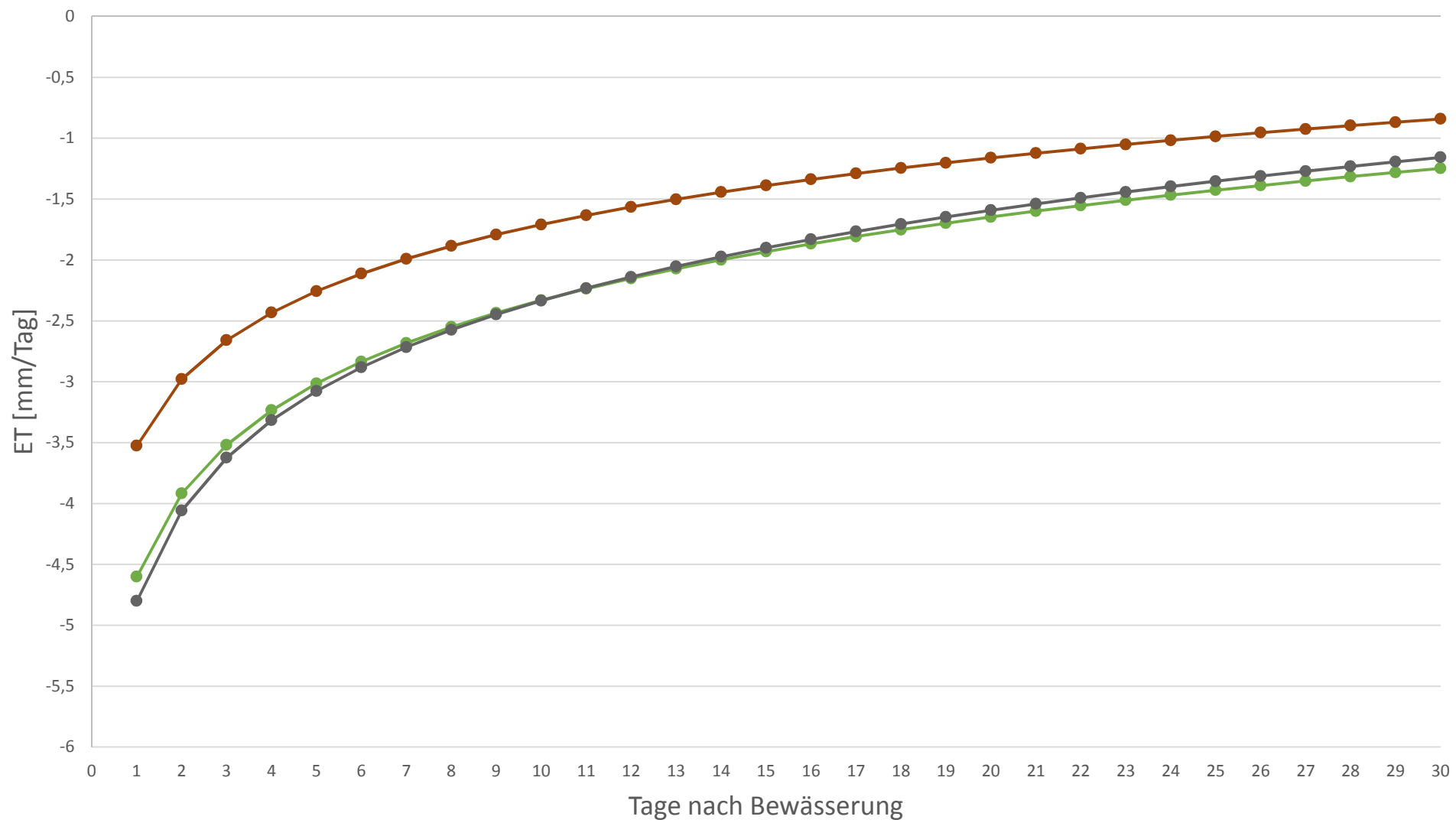
Tägliche Verdunstungsleistung

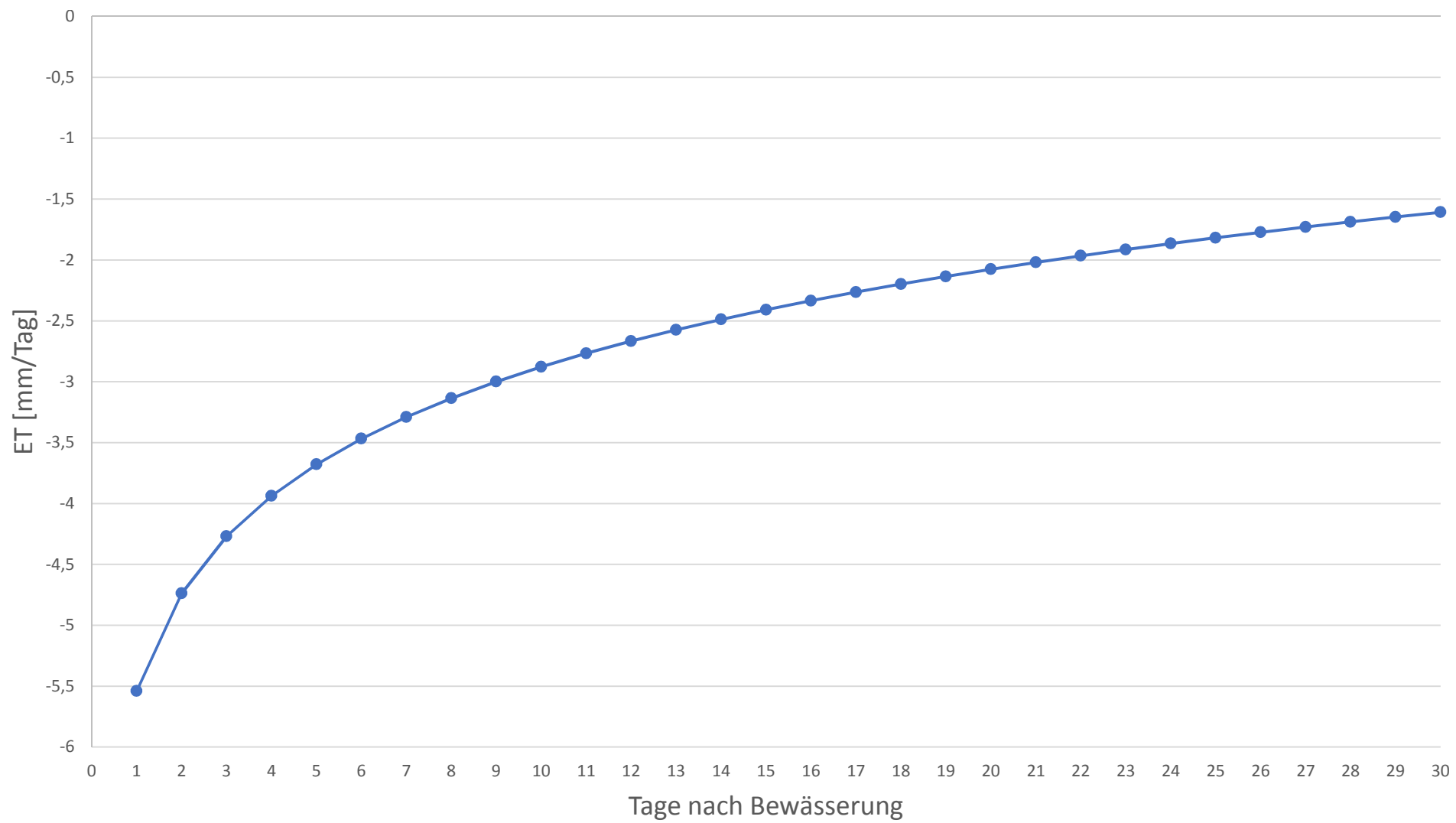


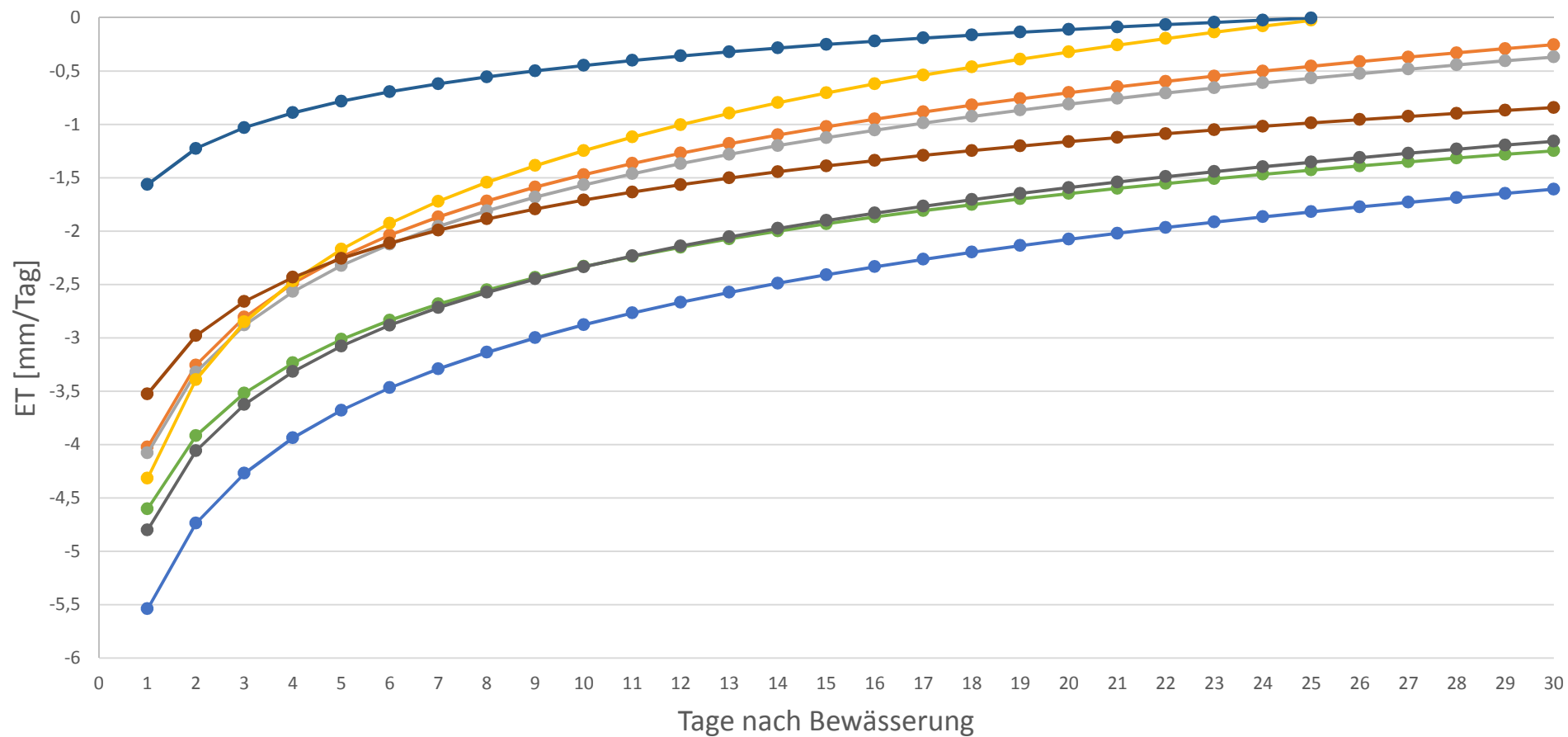










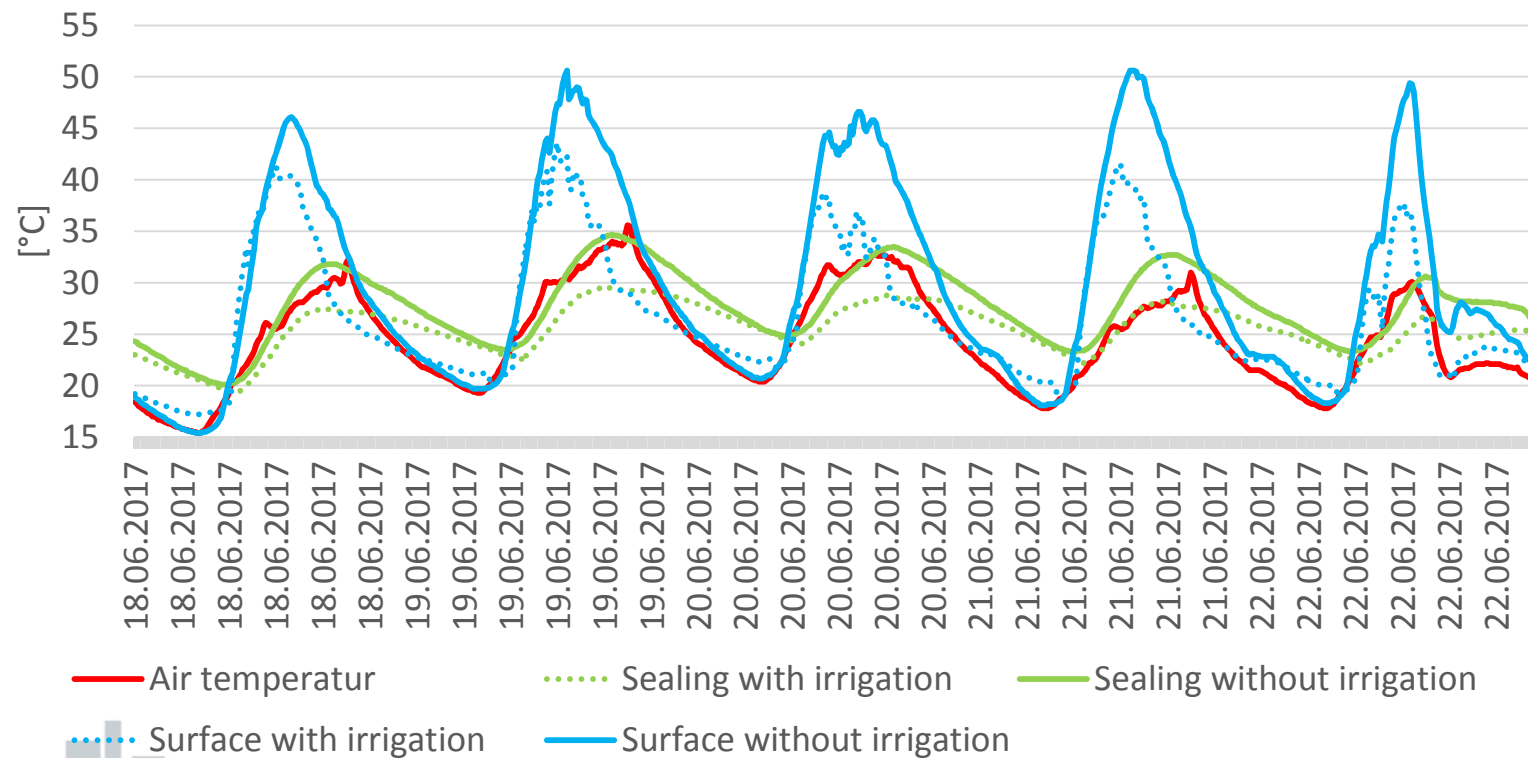


- 8,5 cm (Ret.) +12 cm
- 2,5 cm (Drän) +6 cm
- 16 cm A
- 2,5 cm (Drän.) +12 cm
- 8,5 cm (Ret. Incl. 3,5 cm Anstau) +12 cm
- Kies

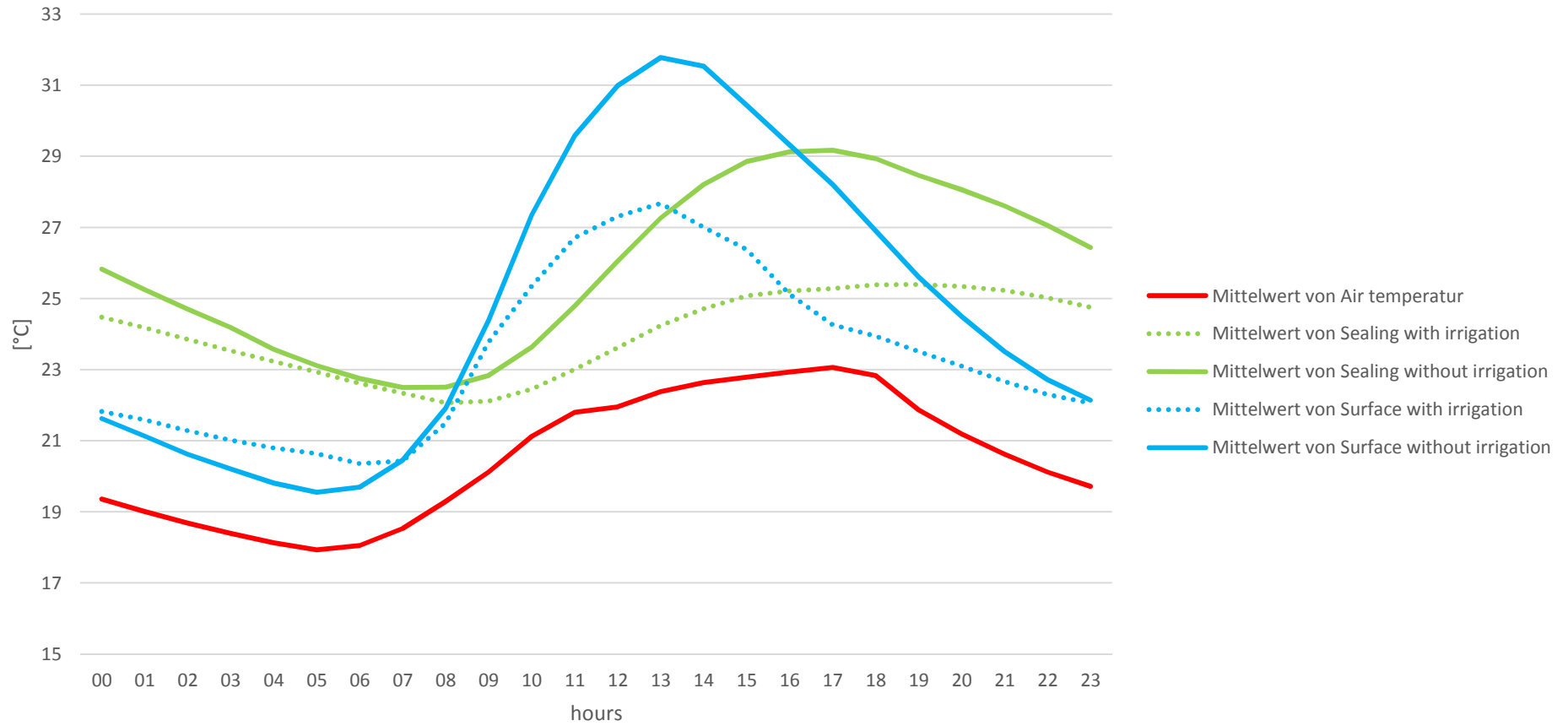
Temperature reduction with irrigated extensive green roofs (06.06.-16.08.2017)



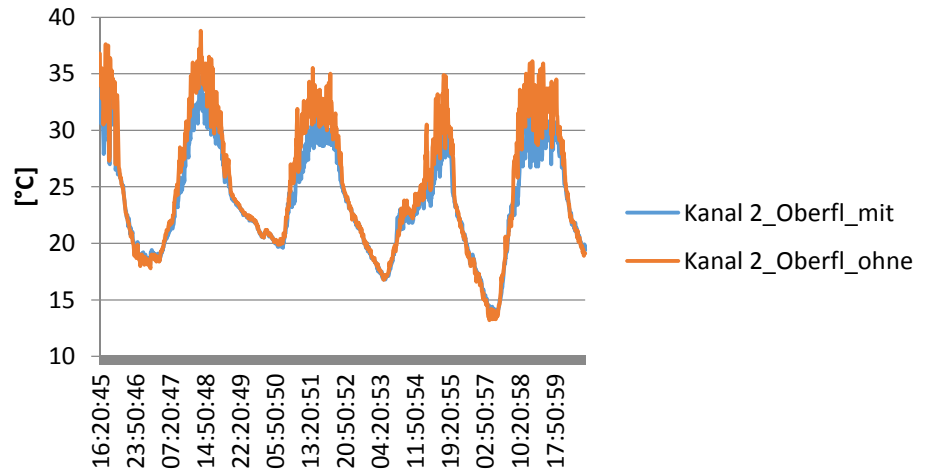
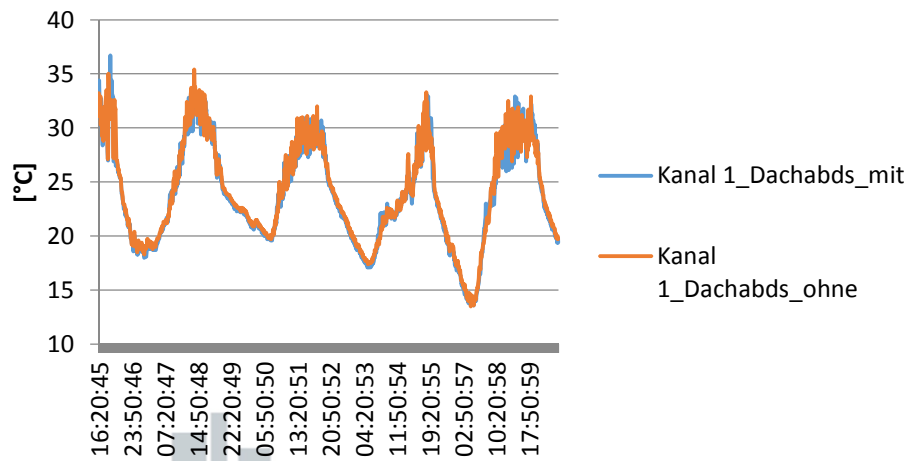
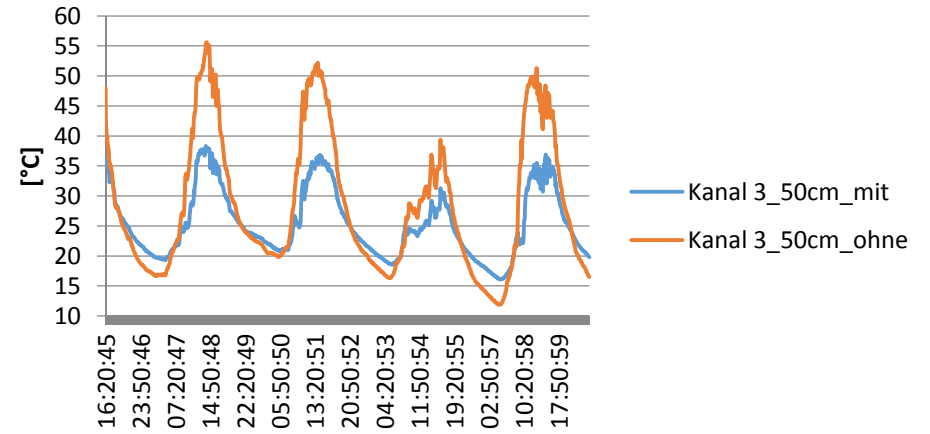
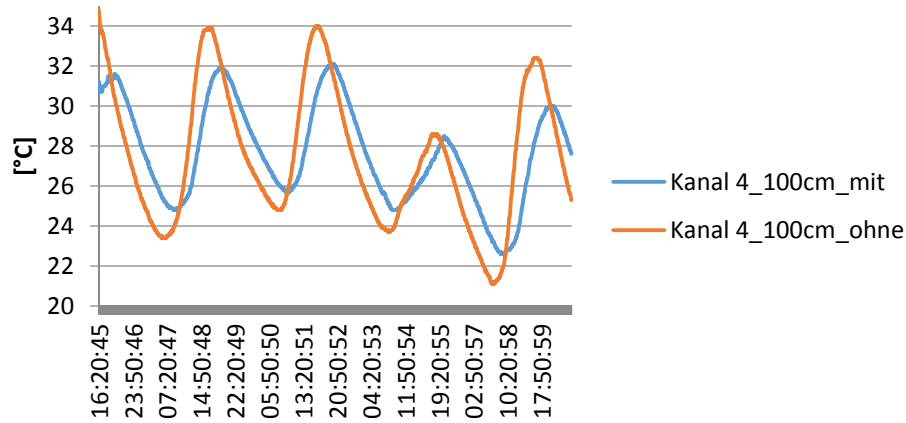
Temperature reduction with irrigated extensive green roofs (18.06.- 22.06.2017)



Average summer temperatures on irrigated extensive green roofs



Temperaturreduzierung durch bewässerte Gründächer (Zeitraum: 23.07.-27.07.2018, ufaFabrik Berlin)



JUST A COOL ROOF.

