Bundesministerium für Bildung und Forschung

TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

TERENO SoilCan – The German Lysimeter Network in Operation–

T. Pütz, U. Wollschläger, H. Rupp, M. Sommer, R. Kiese, E. Borg, E. Priesack, H. Papen, H. Gerke, M. Schwank, & H. Vereecken

Agrosphere Institute, Forschungszentrum Jülich

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Challenges of SoilCan

- Observation of long term effects of climate change on terrestrial systems with special focus on:
  - changes of the coupled C-/N-cycles and C-/N-storage (temporal dynamics)
  - biosphere-atmosphere exchange of greenhouse gases
  - vegetation / biodiversity
  - terrestrial hydrology (water balance, evapotranspiration, precipitation variability, water retention capacity)
- Land use changesComprehensive data sets for:
  - modell development
  - modell calibration – remote sensing
- Supplementation of the highly instrumented test sites
- Bridging the gap between single measurement and field (up-scaling)

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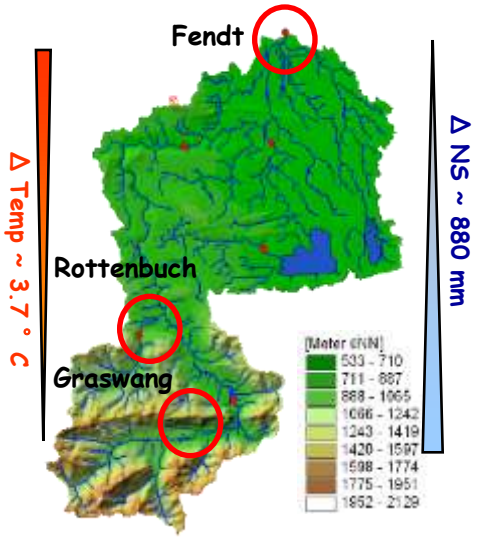
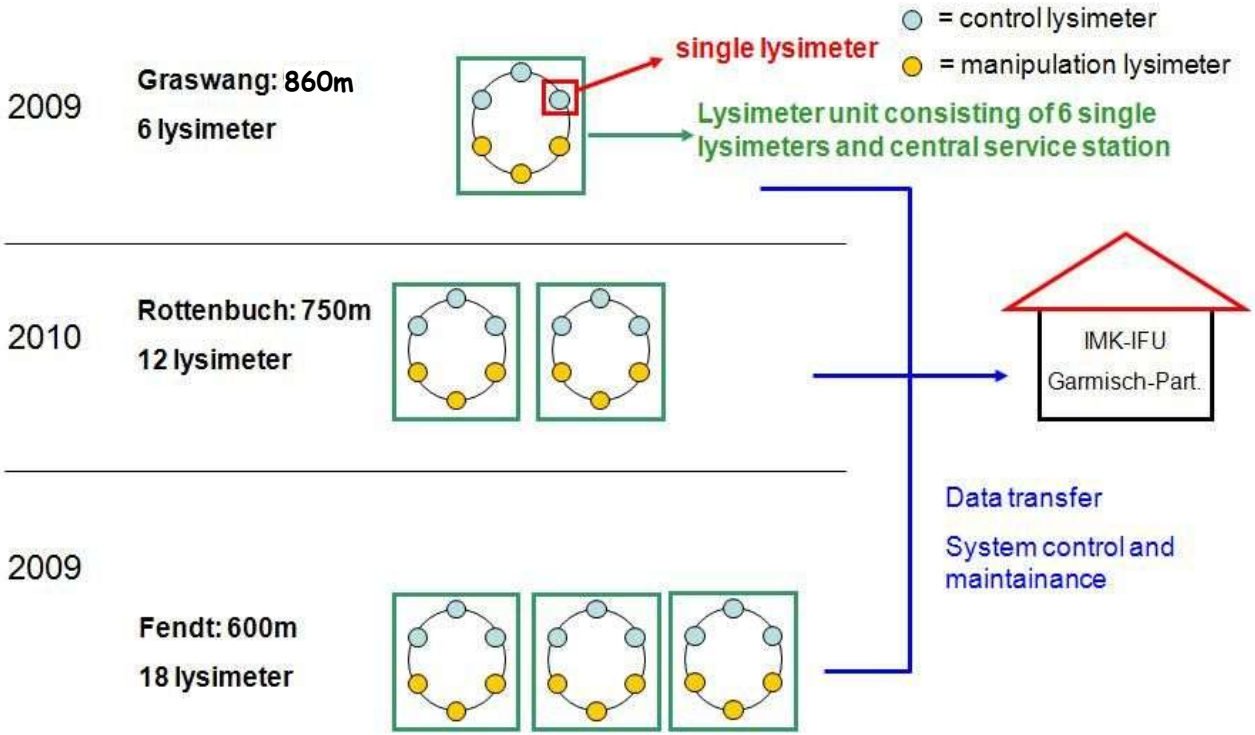
Large scale climate feedback experiment

Lysimeter network of the Ammer catchment:





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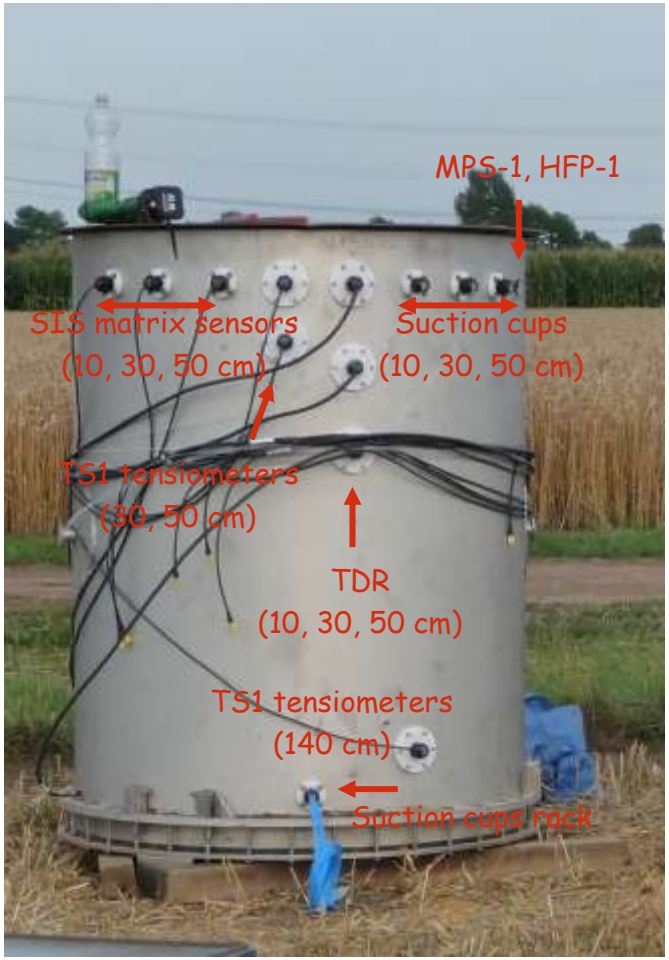
Sensors per Lysimeter



- 3 SIS matrix potential sensors (10, 30, 50 cm)
- 3 suction cups (10, 30, 50 cm)
- 3 TS1 tensiometers (30, 50, 140 cm)
- 3 Campbell Scientific TDR-probes (10, 30, 50cm)
- 1 MPS-1 matrix potential sensor (10 cm)
- 1 HFP1 heat flux sensor (10 cm)
- 6 temperature sensors (10, 30, 50, 140 cm)
- 1 CO_2 gas sensor (10 cm)
- 2 balances (lysimeter, leachate)

Suction cups rack as lower boundary condition

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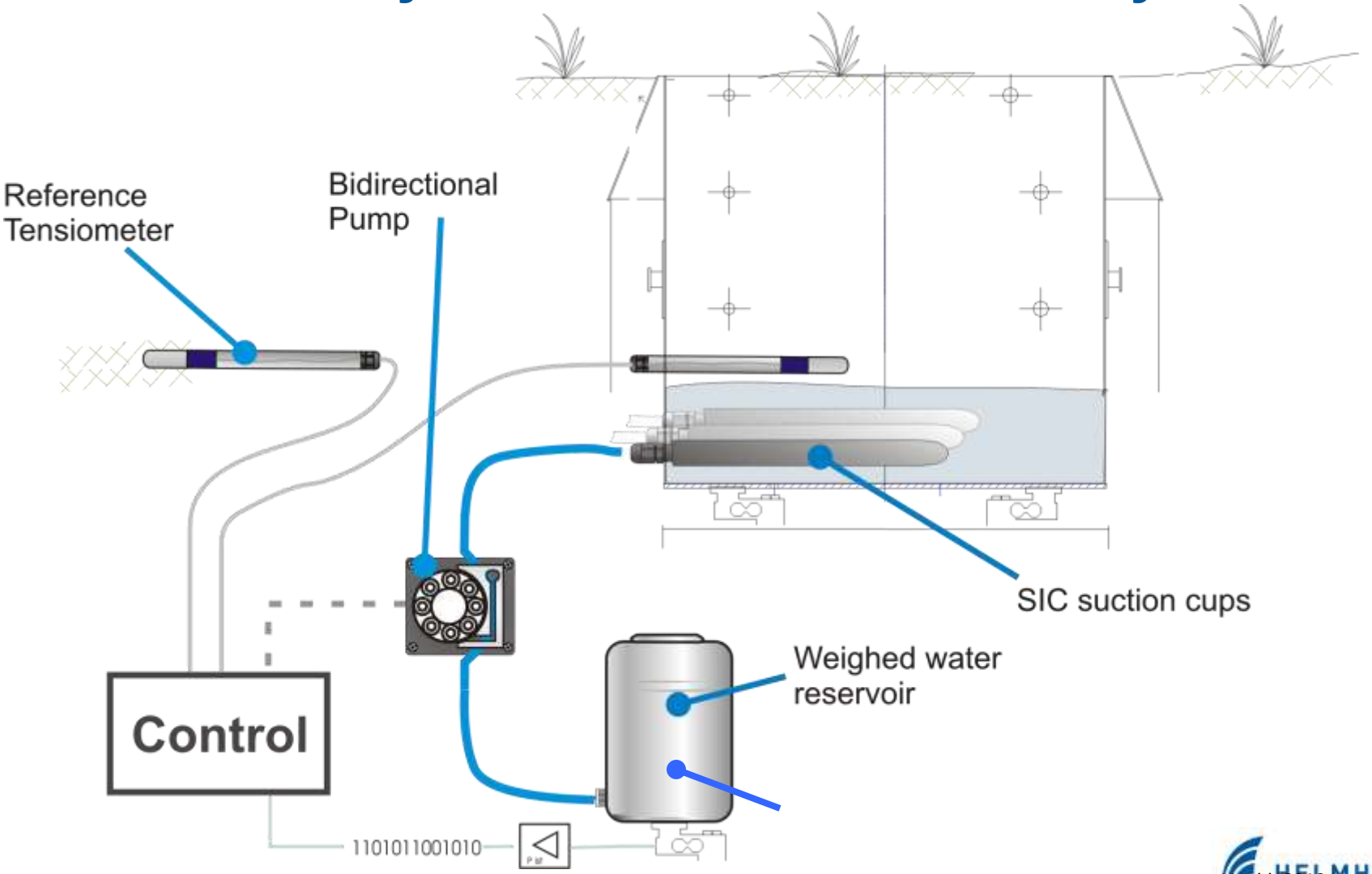
Lower Boundary Condition of SOILCan Lysimeters



von Unold, 2010

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SoilCan / CT Pedosphere Group activities

SoilCan-meeting :

10.01. 2011 Fa. UMS, Munich

22.03. 2011 UFZ, Leipzig (crop rotation SoilCan)

20.06. 2011 UFZ, Halle (control of the lower boundary)

Spring 2012 ????

Technicians Training:

23.11. 2010 Fa. UMS, Munich

18.05 2011 Lysimeter Station Falkenberg, UFZ

Spring 2012 ????

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Soil Characterization for Each SoilCan Testside

Bad Lauchstädt

Bildnachweis: U. Wollschläger, H. Rupp, H.-J. Vogel & S. Zacharias, UFZ

Standards for the characterization:

- "Bodenkundliche Kartieranleitung"
- description per soil horizon
- bulk density
- pF/WG-curves
- saturated hydraulic conductivity
- texture analysis
- analysis of chemical soil parameters

Dedelow

Bildnachweis: M. Sommer, G. Verch, W. Hierold, ZALF

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Agricultural Management of the Lysimeters

1st approach:

- crop rotation of the source location (arable and grassland farming)

2nd approach:

- standard crop rotation to focus on climate change (rape – winter wheat – pea – winter barley)
- minimum tillage
- straw amendment,
- agricultural management in respect to the local intensity
- grassland farming (intensive/extensive intensity)

Bildnachweis: M. Sommer, G. Verch, W. Hierold, ZALF

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Maize Harvest Lysimeter Station Dedelow 04.10.2011

Lysimeter	Total-FM kg/Lysimeter	FM dt/ha	DM %	DM dt/ha
1	8.1	810.0	45.7	370.2
2	6.0	600.0	39.4	236.4
3	8.6	860.0	39.4	338.8
4	5.9	590.0	38.5	227.2
5	7.5	750.0	40.4	303.0
6	6.3	630.0	42.2	265.9

	MV (dt/ha)	SD (dt/ha)
Parabraunerden lysimeter 1, 3 & 5 of the field close to the hexagon	337	24
Parabraunerden lysimeter 2, 4 & 6 of the Carbo-ZALF-D-experimental site	247	30

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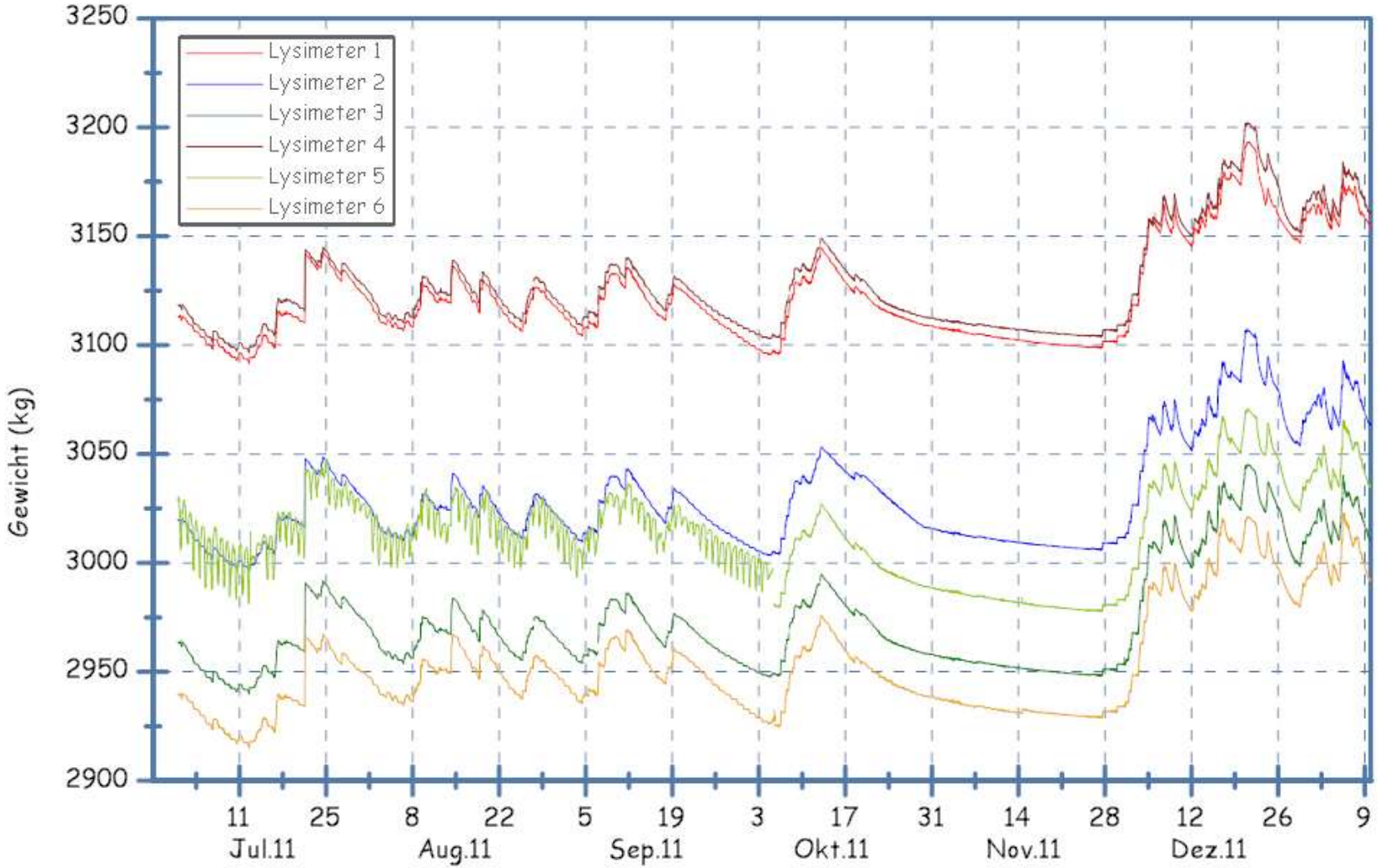
Lysimeter Weight of Wüstebach Station



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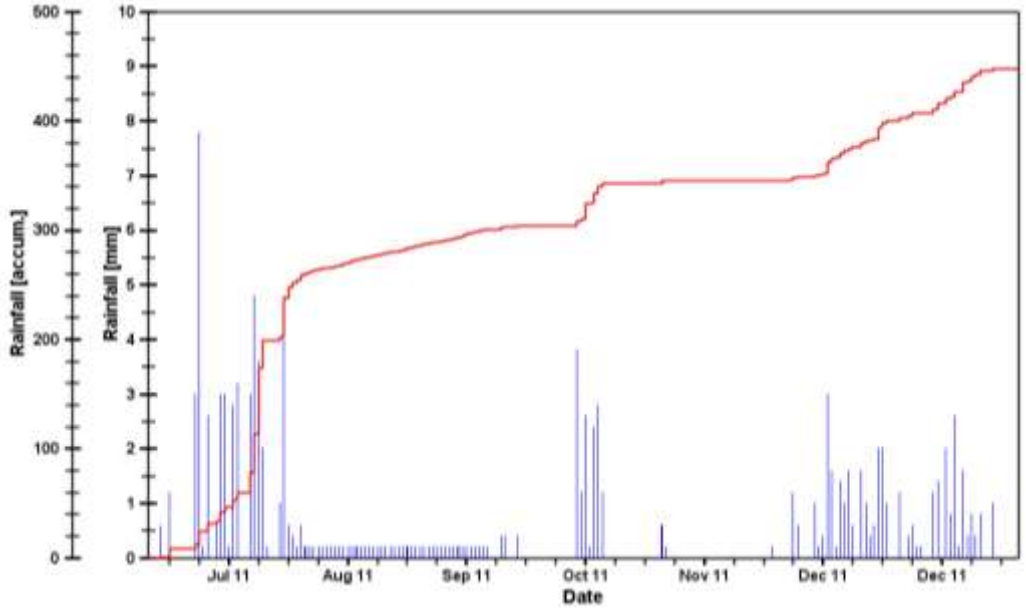
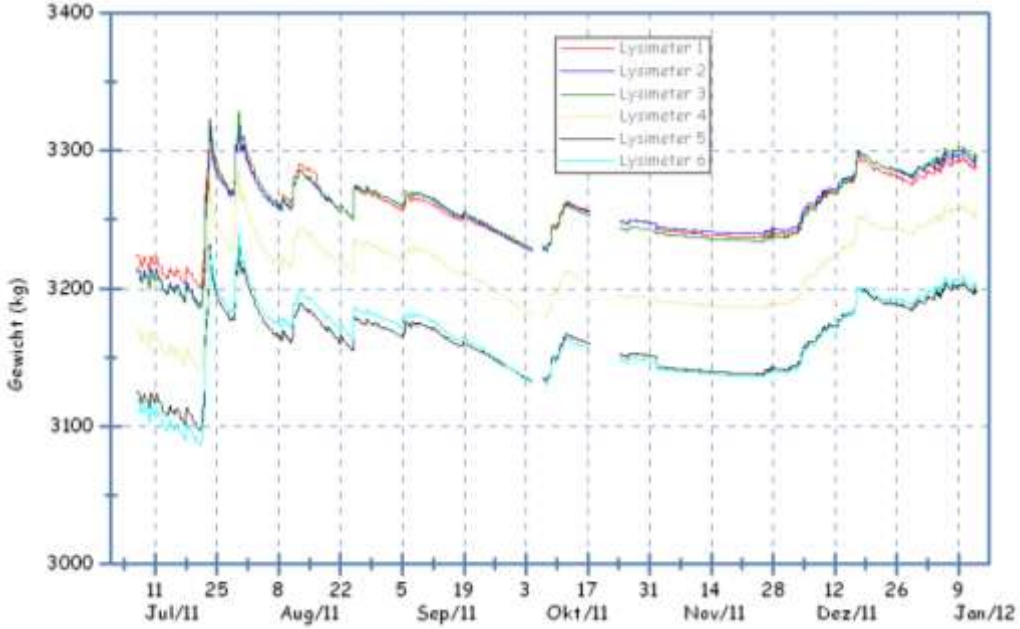


Rainfall in Seeberg
Cloose to Demmin



Lysimeter Weight of
Demmin Station

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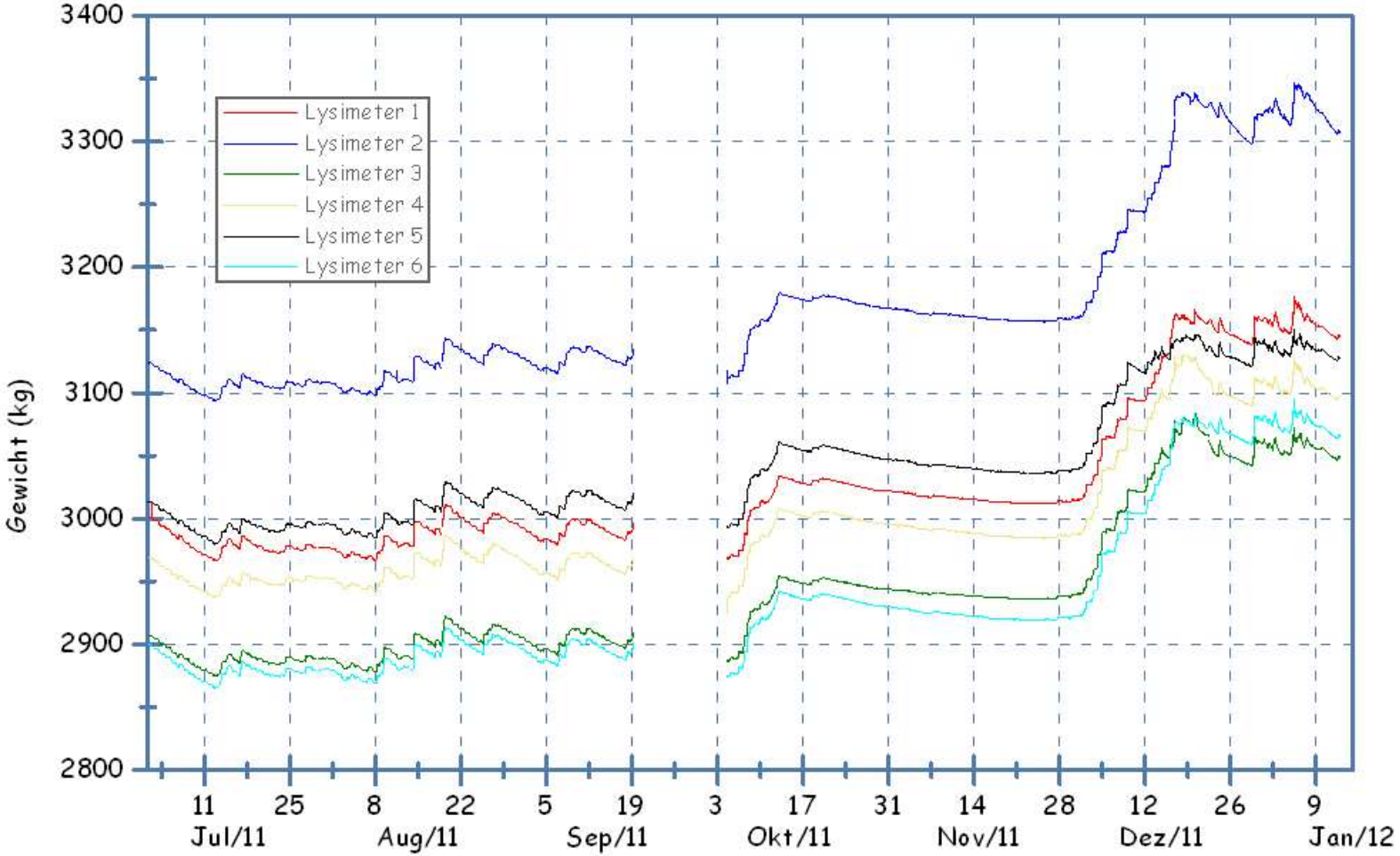
Lysimeter Weight of the Rollesbroich Station



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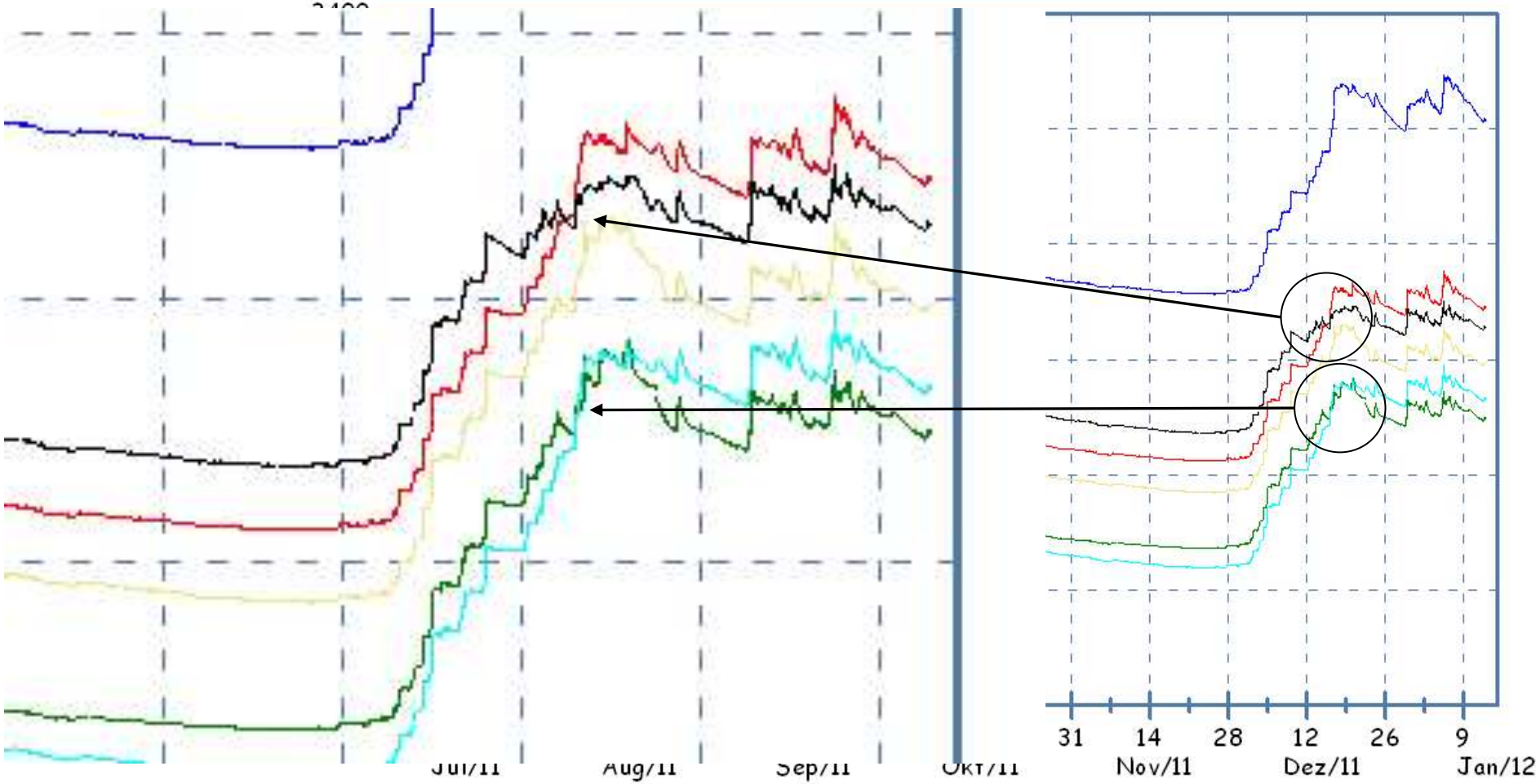
Control Problems of the Lower Boundary



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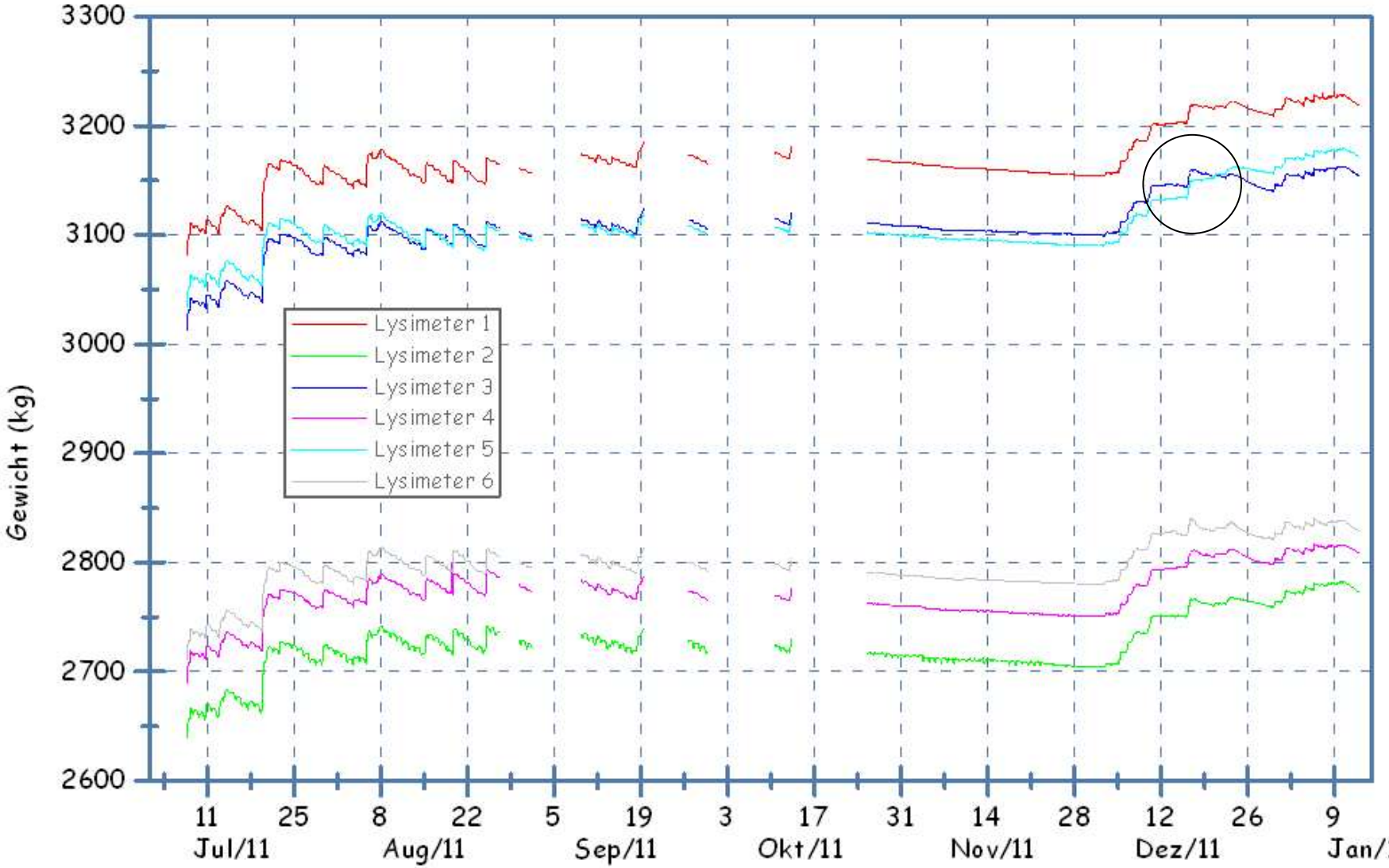
Lysimeter Weight of the Scheyern Station



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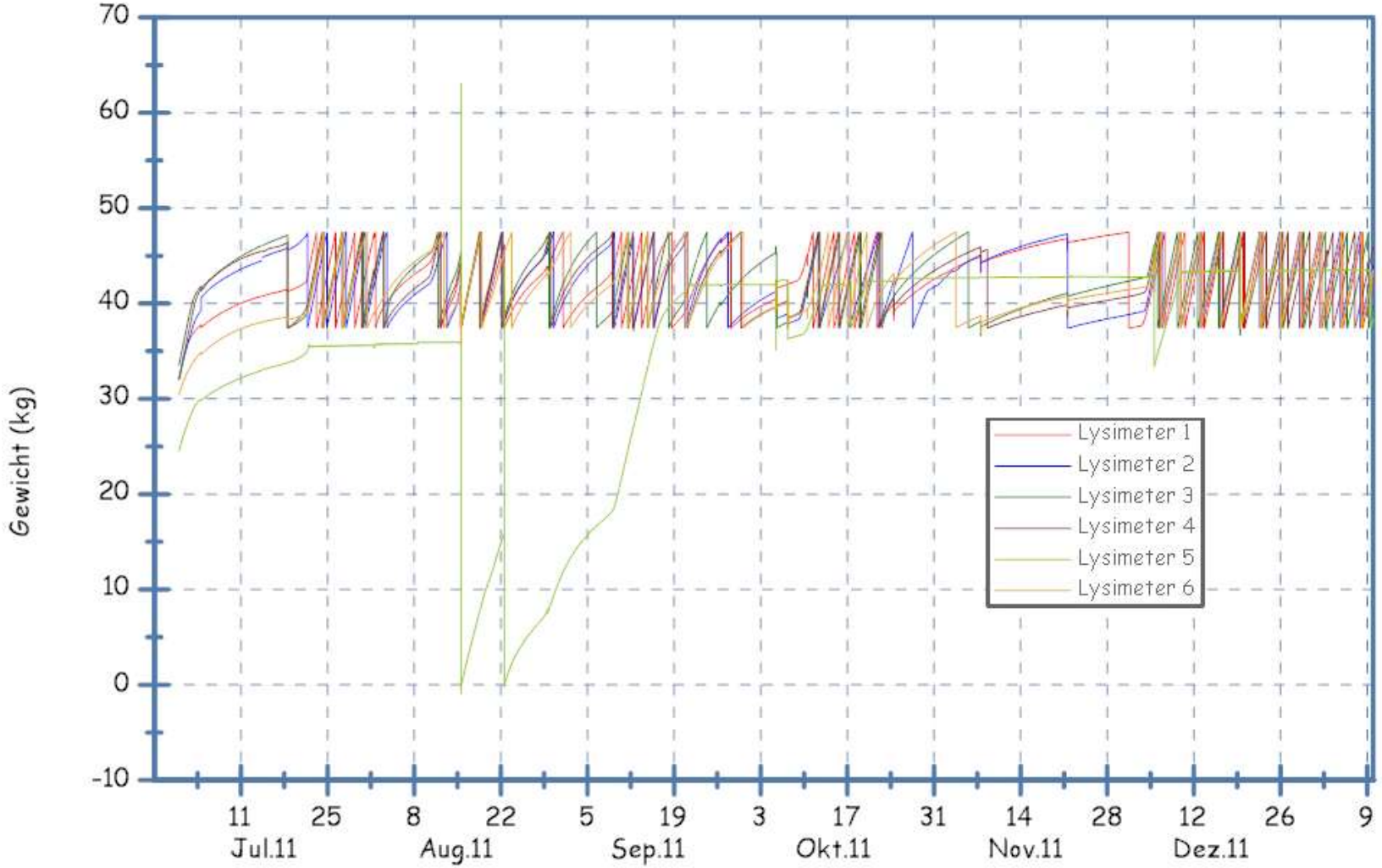
Leachate Weight of Wüstebach Station



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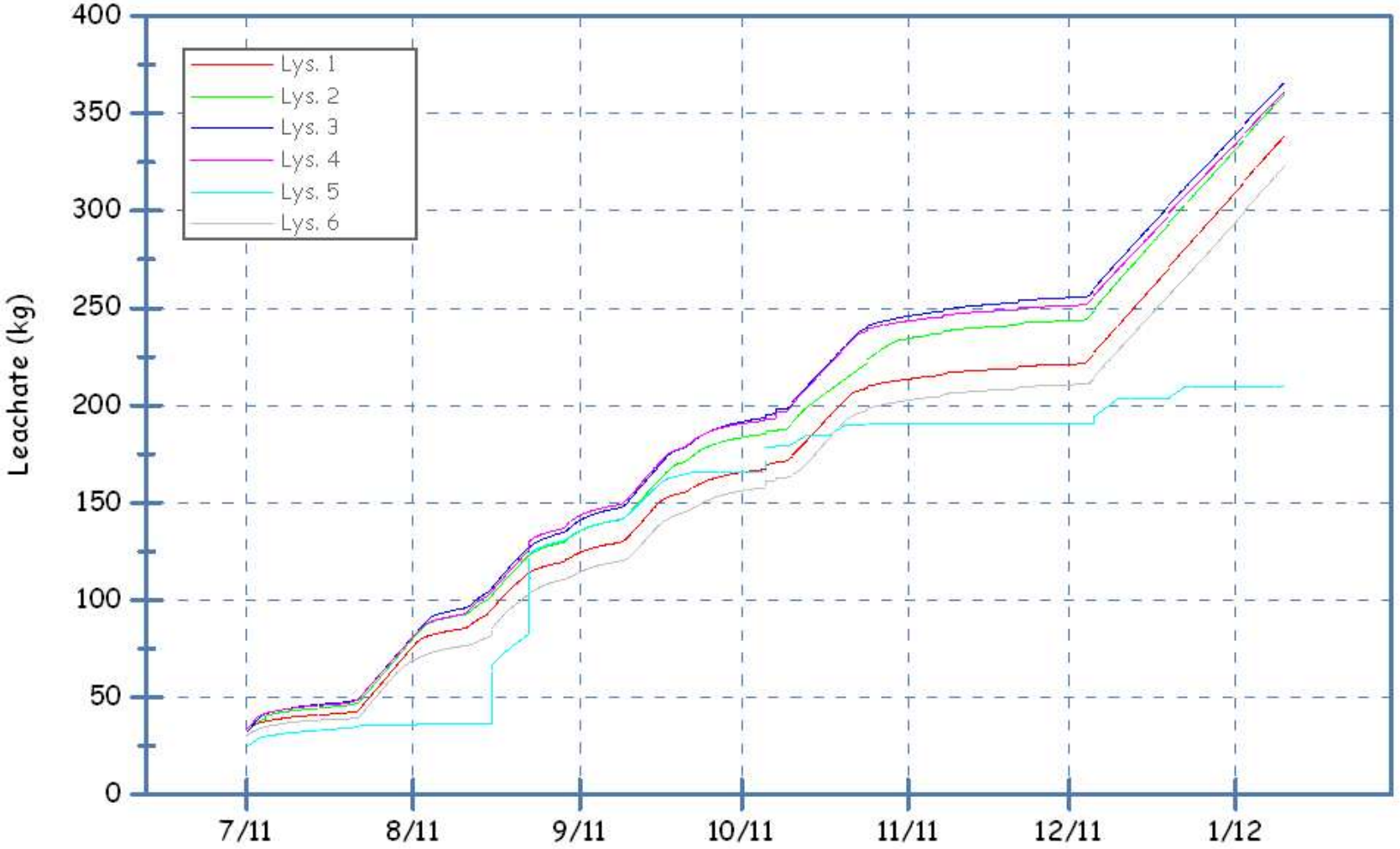
Leachate Weight of Wüstebach Station



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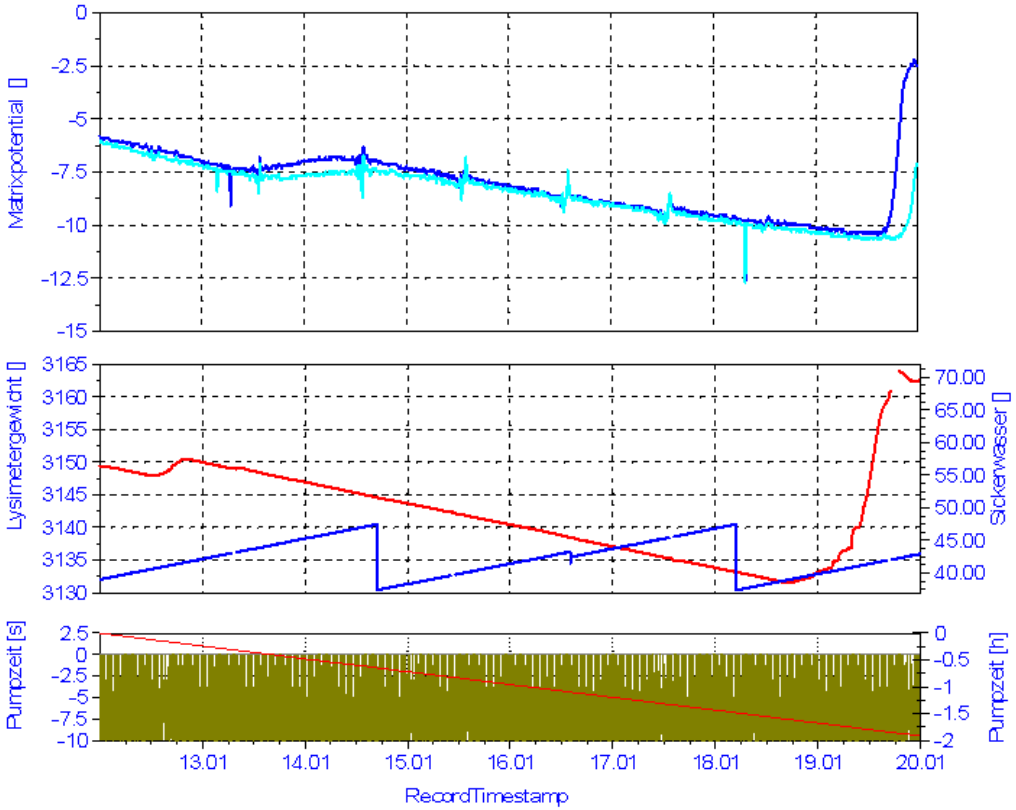
Lower Boundary Lysimeter 1 (Wüstebach Station)



	Kanalname	Spannweite
	L_1_TS1_M_140	NOVAL ... NOVAL hPa
	F_1_TS1_M_140	-12.60 ... -2.20 hPa
	F_2_TS1_M_140	NOVAL ... NOVAL hPa
	F_3_TS1_M_140	-12.70 ... -6.00 hPa

	Kanalname	Spannweite
	L_1_WAG_L_000	3131.52 ... 3164.00 kg
	L_1_WAG_D_000	37.43 ... 47.47 kg

	Kanalname	Spannweite
	L_1_PUC_Summe	-1.91 ... 0.00 h
	L_1_PUC_S_POS	0.00 ... 0.00 s
	L_1_PUC_S_NEG	-10.00 ... -0.00s

Lysimeterherkunft: Wüstebach
Job / Lysimeterstandort: WU-V103
Herkunftsdatei: Wüstebach_FS1_7Tage.TDM
Herkunftsdateipfad: U:\Produkte\Messdatenerfassung\Kundendaten\Diadem Datenablage\Tereno\WochenDateien\

Zeitbereich (1151 Messpunkte)
vom : 12.01.2012 00:00 Uhr
bis: 19.01.2012 23:40 Uhr

UMS measure to know

erstellt von :

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Balance Measurement – Status

- since October 2010 all balances problems are eliminated
- subsequent installation of bottles for leachate sampling is almost finished
- in progress: control of the lower boundary for lysimeters transferred to other test sites
- in progress: pump intervals of the leachate
- **very important: continuous plausibility check of the data!!!**

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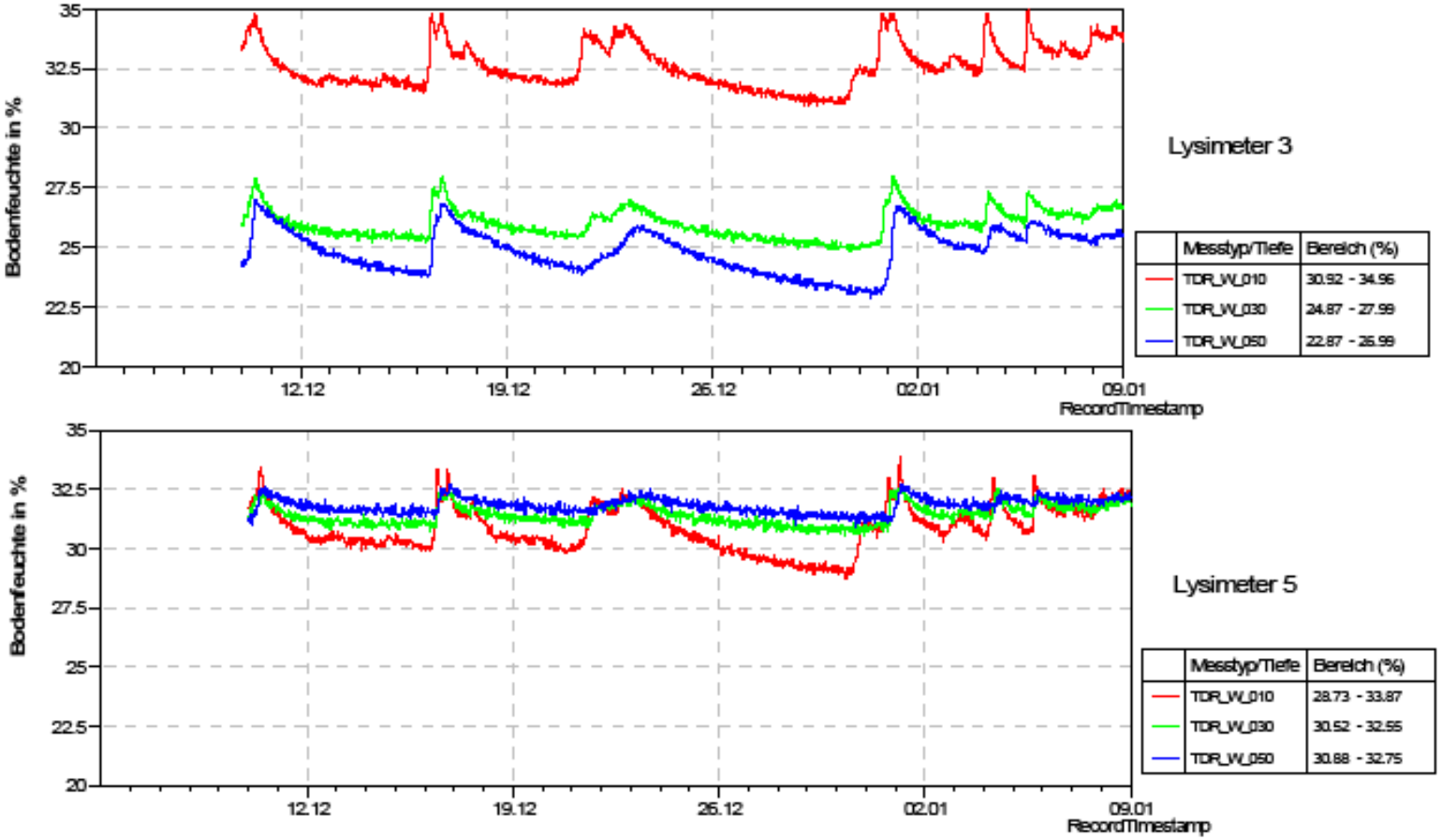
TDR-Messungen



Lysimeterherkunft: Scheyern
Standort: Scheyern
Herkunftsdatei: Scheyern_30Tage.TDM
Herkunftsdateipfad: U:\Produkte\Messdatenerfassung\Kundendaten\Diadem Datenablage\Tereno\MonatsDateien\

Zeitbereich (4319 Messpunkte)
vom : 10.12.2011 00:00 Uhr
bis: 08.01.2012 23:40 Uhr

UMS

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TDR-Measurement – Status

- Sensor installation: almost all sensors of UFZ-sites show good raw data signals
  - Garmisch soil very clayey, this results a larger noise of the water content (main problem of the TDR-analysis)
  - singular, direct measurement of the raw data signals (traces) for all SoilCan sites for verification of the logged signals is recommended
  - periodic measurements of control traces via data logger (e.g. 14-day)
- at few test site problems in the measurement chain: multiplexer ➔ TDR-device ➔ data logger (e.g. Selhausen)
- in progress: optimization of the analysis of raw data signals ➔ absolute volumetric water content
- **very important: continuous plausibility check of the data!!!**

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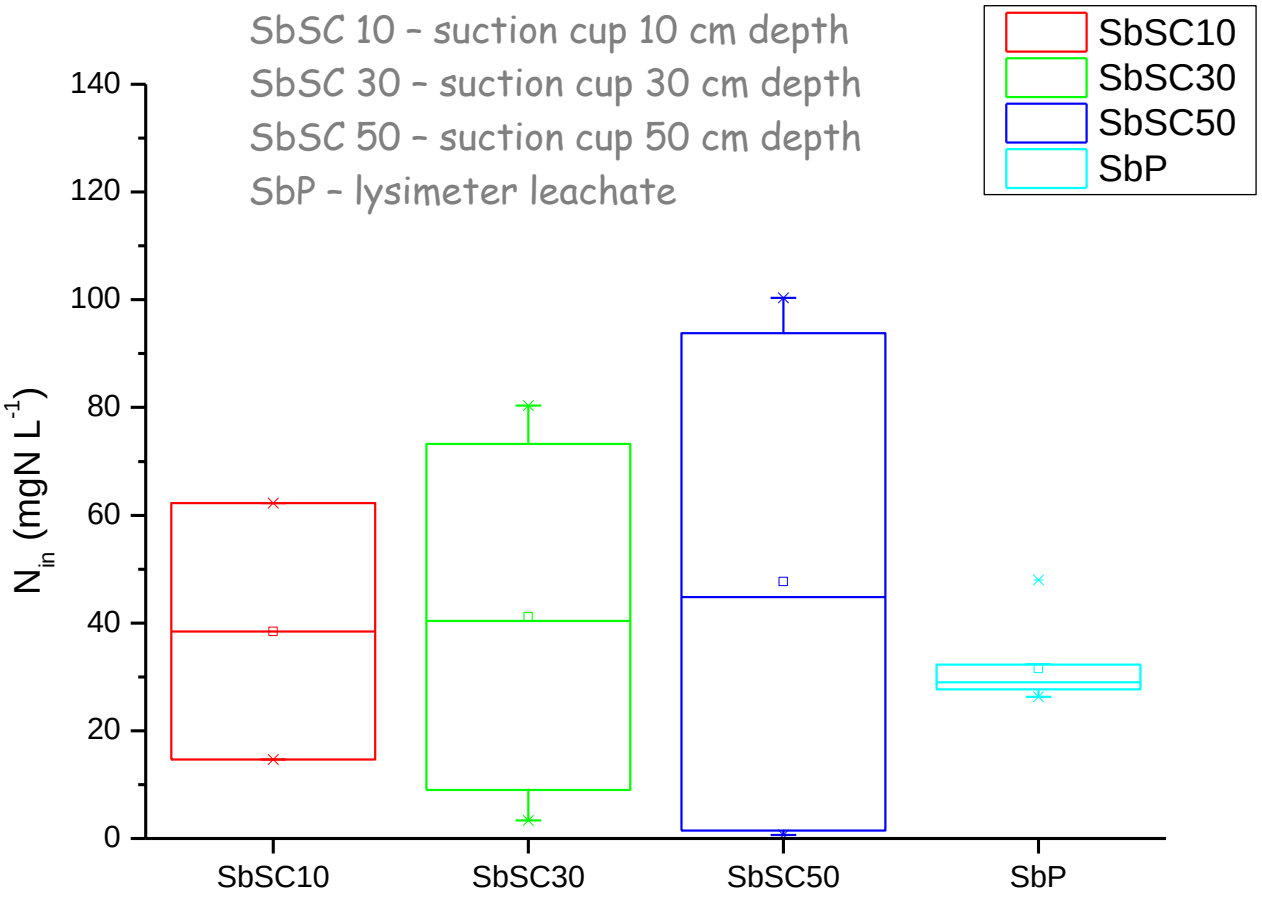
Concentration of Inorganic Nitrogen (N_{in}) in suction cup seepage and lysimeter leachate, site Sauerbach (Sb)

SbSC 10 – suction cup 10 cm depth
SbSC 30 – suction cup 30 cm depth
SbSC 50 – suction cup 50 cm depth
SbP – lysimeter leachate



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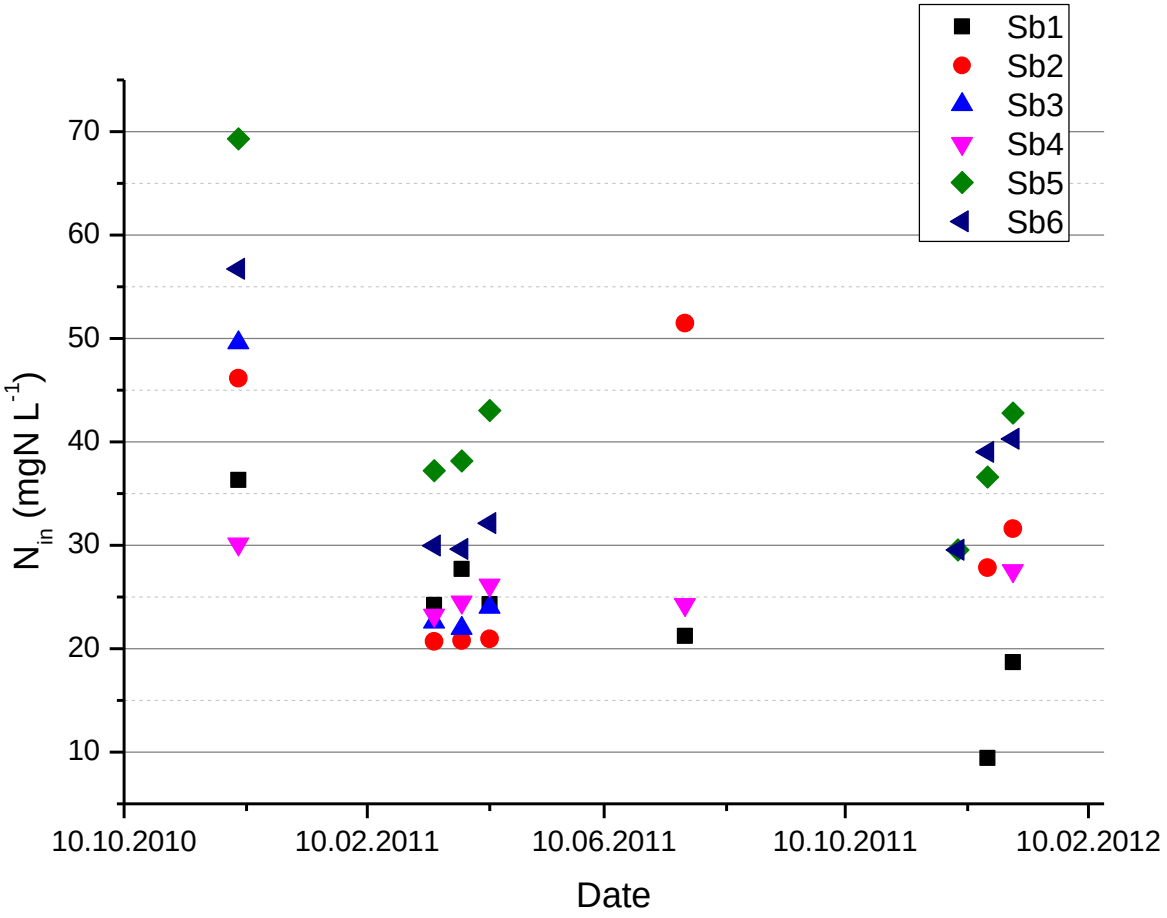
Concentration of Inorganic Nitrogen (N_{in}) in Lysimeter Leachate, Site Sauerbach (Sb)



Sb1 – Sauerbach lysimeter 1
Sb2 – Sauerbach lysimeter 2
Sb3 – Sauerbach lysimeter 3
Sb4 – Sauerbach lysimeter 4
Sb5 – Sauerbach lysimeter 5
Sb6 – Sauerbach lysimeter 6

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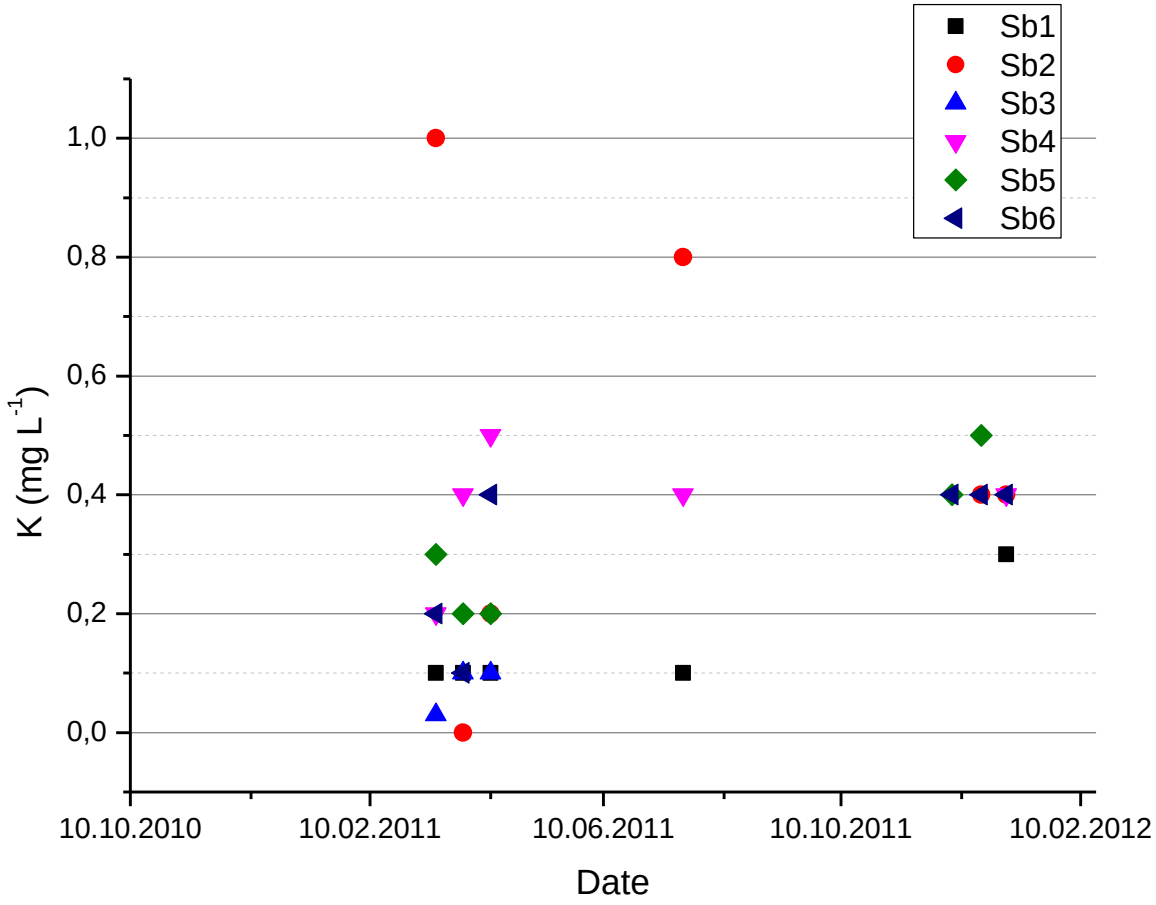
Potassium (K) Concentration in Lysimeter Effluent, Site Sauerbach (Sb)



Sb1 – Sauerbach lysimeter 1
Sb2 – Sauerbach lysimeter 2
Sb3 – Sauerbach lysimeter 3
Sb4 – Sauerbach lysimeter 4
Sb5 – Sauerbach lysimeter 5
Sb6 – Sauerbach lysimeter 6

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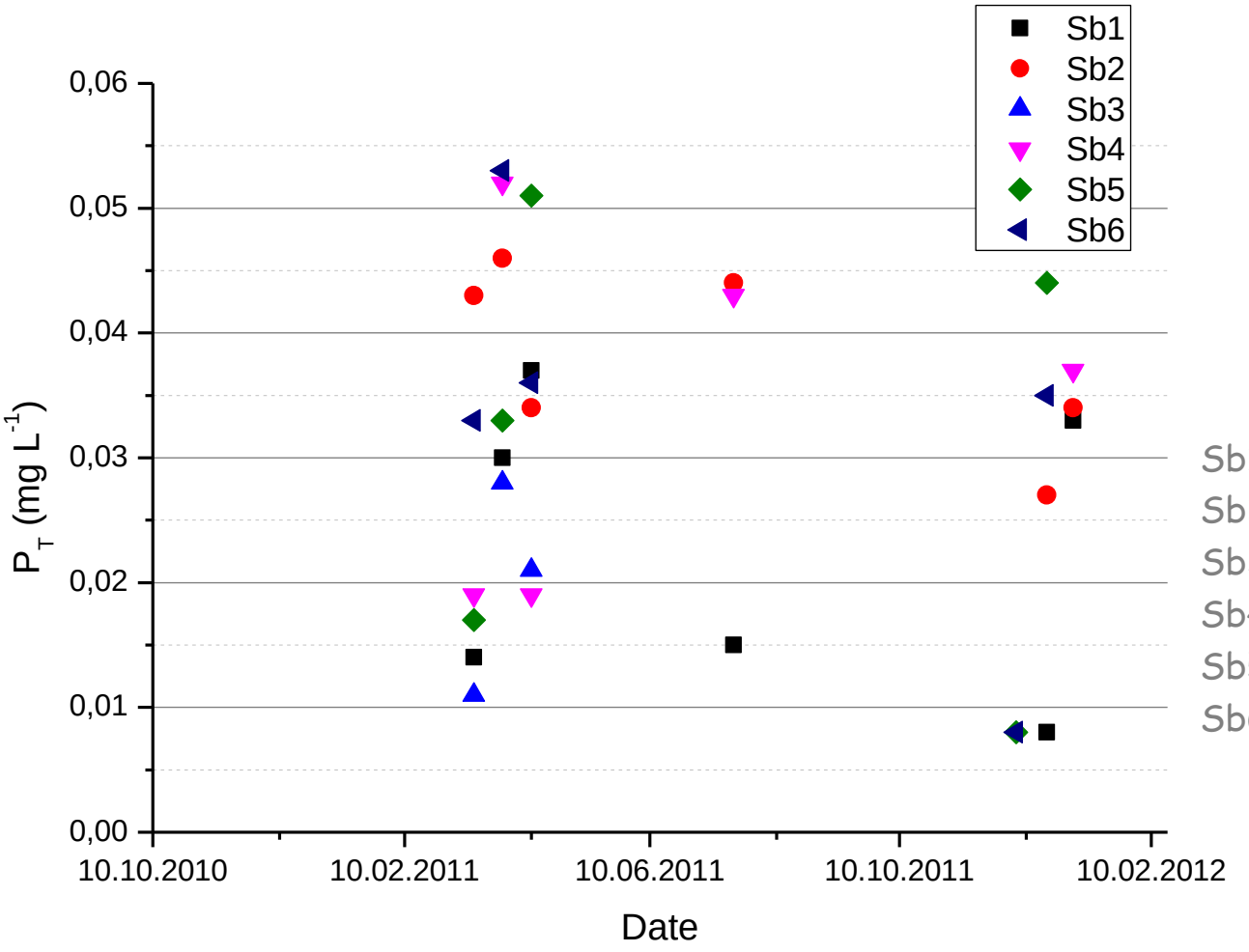
Total Phosphorus (P_T) Concentration in Lysimeter Leachate, Site Sauerbach (Sb)



Sb1 – Sauerbach lysimeter 1
Sb2 – Sauerbach lysimeter 2
Sb3 – Sauerbach lysimeter 3
Sb4 – Sauerbach lysimeter 4
Sb5 – Sauerbach lysimeter 5
Sb6 – Sauerbach lysimeter 6

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Outlook

- Detailed documentation of:
  - Soil identification and characterization
  - Physical and chemical soil parameters
  - Botanical / vegetation acquisition
- Evaluation of TDR-systems, tensiometer, lysimeter balances
- Evaluation of the control of the lower boundary
- Measurement of the soil solution and leachate in reference to our agreement
- Tracer experiment on all lysimeters to check their functionality and characterize the water balance
- Data management
- Start of the monitoring/experimental program

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Test Site Selhausen (l) & Soil Respiration Chamber (r)


Kamera
Net Radiometer