LUBW
Landesanstalt für Umwelt
Baden-Württemberg

Optimierung der Bodenfeuchtemessungen in einem Bodenmonitoring-Programm

Am Beispiel der Intensiv-Messstelle Baltmannsweiler in Baden-Württemberg

Werkstattbericht - Masterarbeit

Ramona Schüßler

REFERAT 22 – BODEN, ALTLASTEN

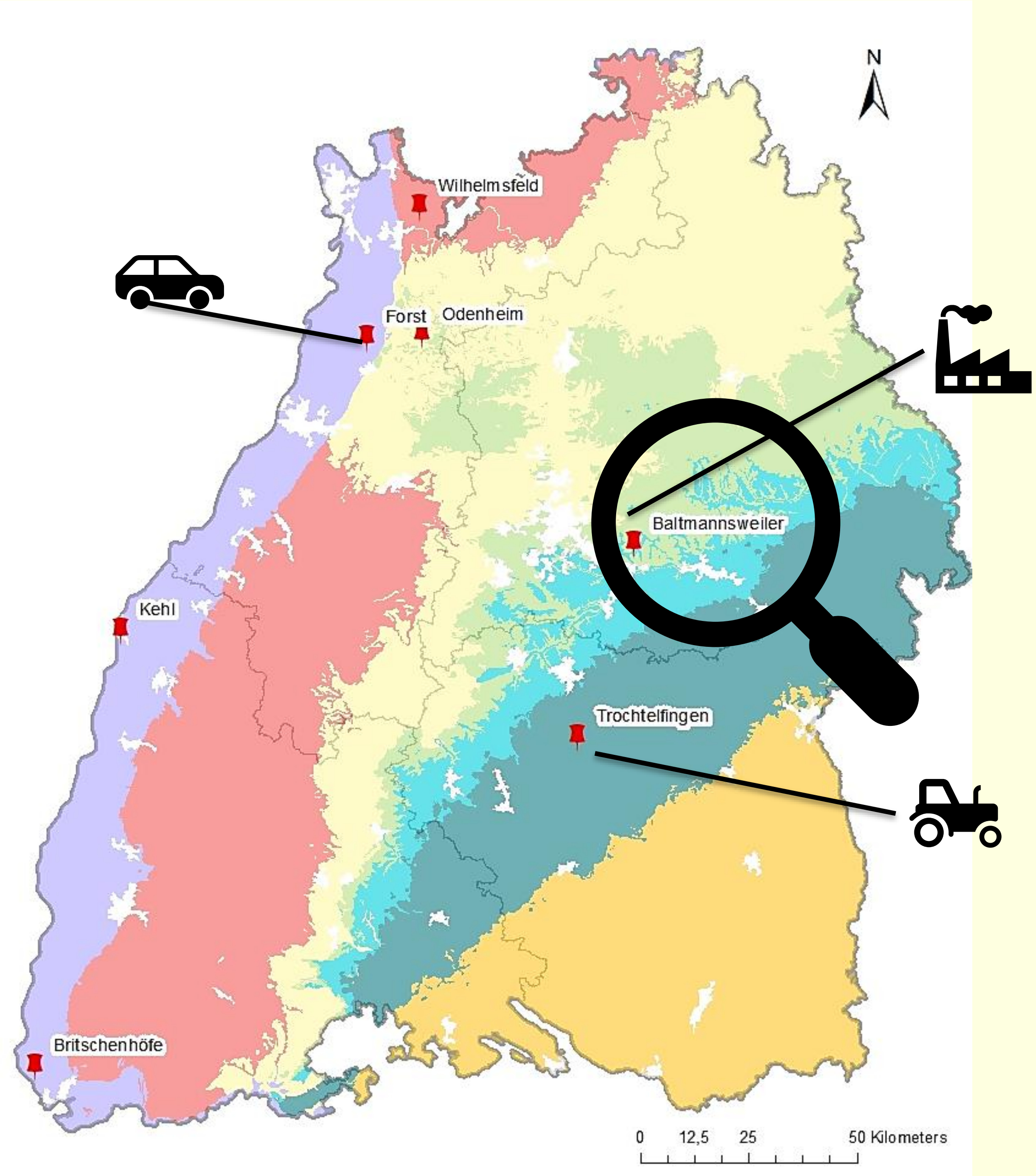
Baden-Württemberg

Gliederung

- Zielsetzung der Arbeit
- Messstelle Baltmannsweiler
  - Lage
  - Funktion
- Messtechnik
  - Klimadaten
  - Bodendaten
- Bodenfeuchte-Daten
  - erste Auswertungen
- Ausblick

Aufgabenstellung/Zielsetzung

- bisherige Daten der LUBW und Forstlichen Versuchs- und Forschungsanstalt BW (FVA) auswerten
- Messtechniken vergleichen
- Verbesserungsoptionen definieren



N
Wilhelmsfeld
Forst
Odenheim
Baltmannsweiler
Kehl
Trochtelfingen
Britschenhöfe
0
12,5
25
50 Kilometers

Intensiv-BDF

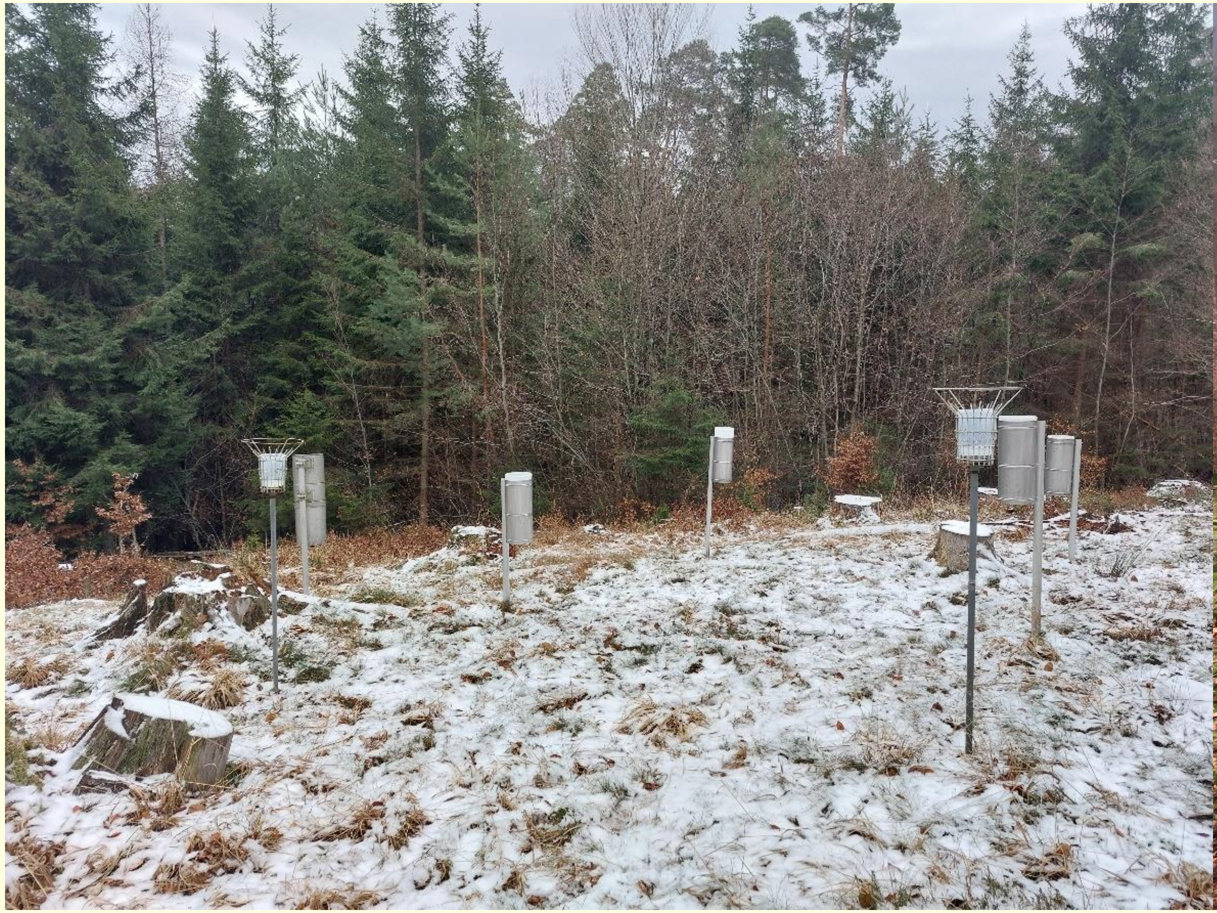
- Erfassung möglichst vollständiger Stoffein und -austräge, Stoffumsätze im Boden

- je nach Standort ein eigener Schwerpunkt

Intensiv-BDF Baltmannsweiler

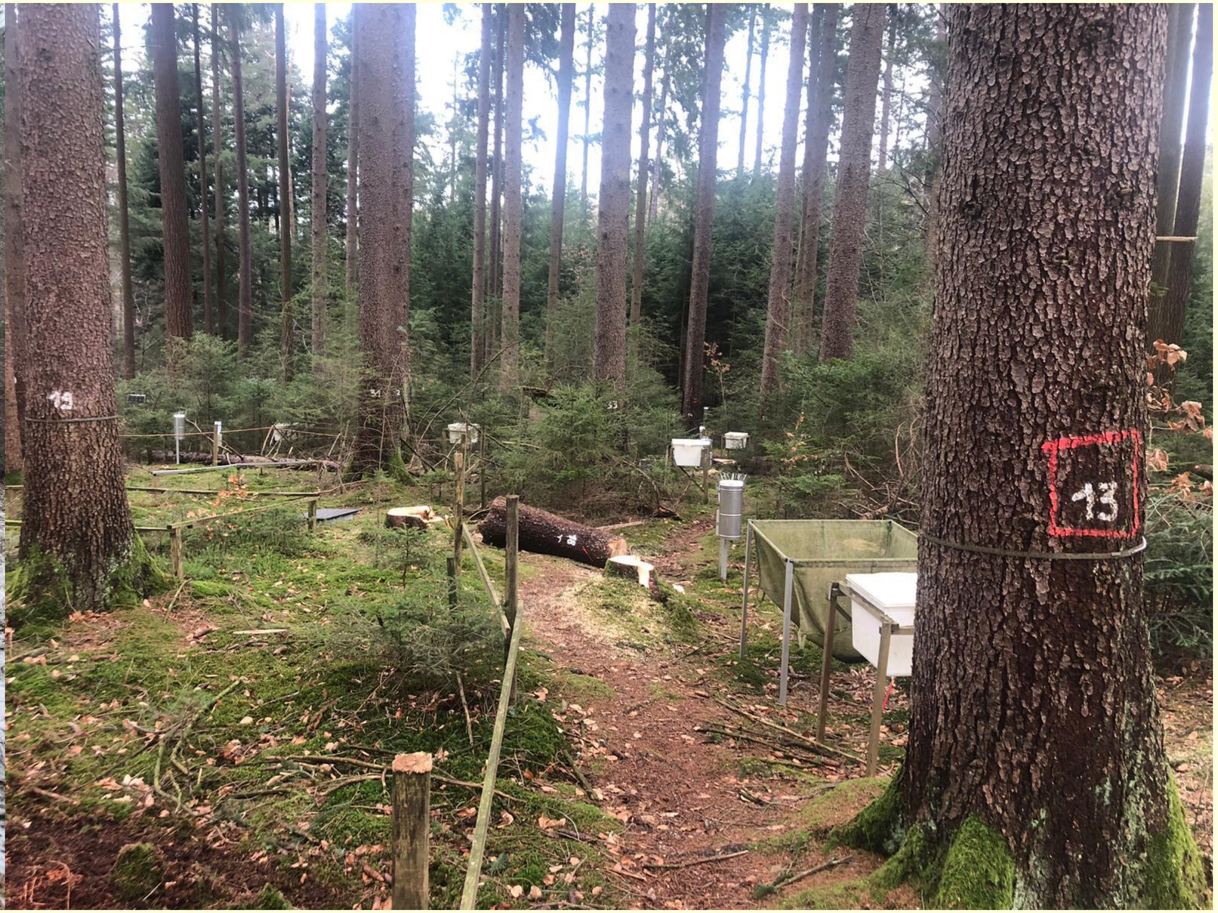
- 1995 errichtet
- Waldstandort mit Fichte und Douglasie
- FVA

Freifläche



Bestandsfläche

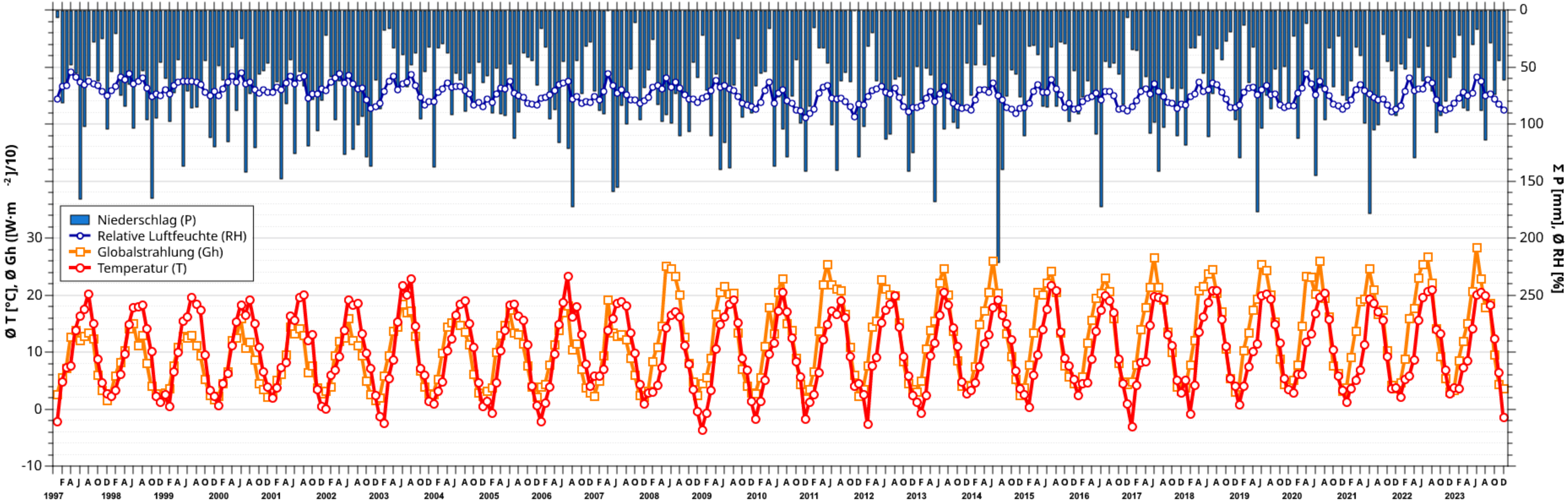
oberes Messfeld/ unteres Messfeld



Was wird gemessen?

Klimadaten:

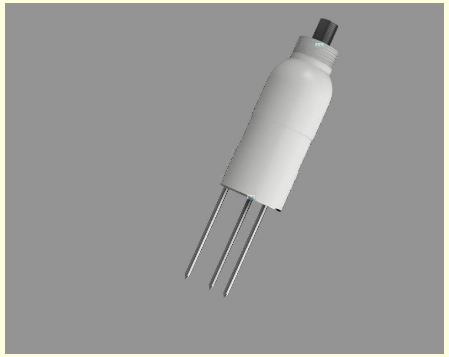
- Lufttemperatur
- Niederschlag (auch im Bestand)
- Rel. Luftfeuchte
- Globalstrahlung
- Windgeschwindigkeit


Niederschlag (P)
Relative Luftfeuchte (RH)
Globalstrahlung (Gh)
Temperatur (T)
Ø T [°C], Ø Gh ([W·m^{-2}]/10)
Σ P [mm], Ø RH [%]
30
20
10
0
-10
0
50
100
150
200
250
F A J A O D
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

Was wird gemessen?

Bodenparameter:

- Bodentemperatur (FVA)
- Wassergehalt
- Saugspannung

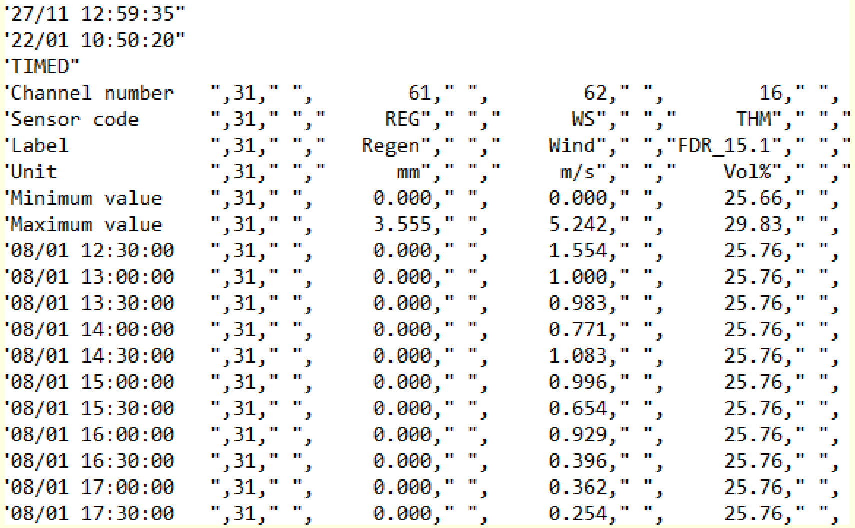


Was wird gemessen?

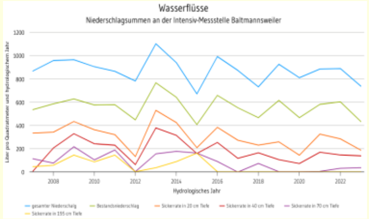
Weg der Daten

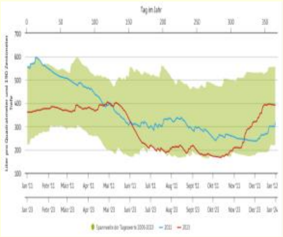
Baltmannsweiler

Weg der Daten

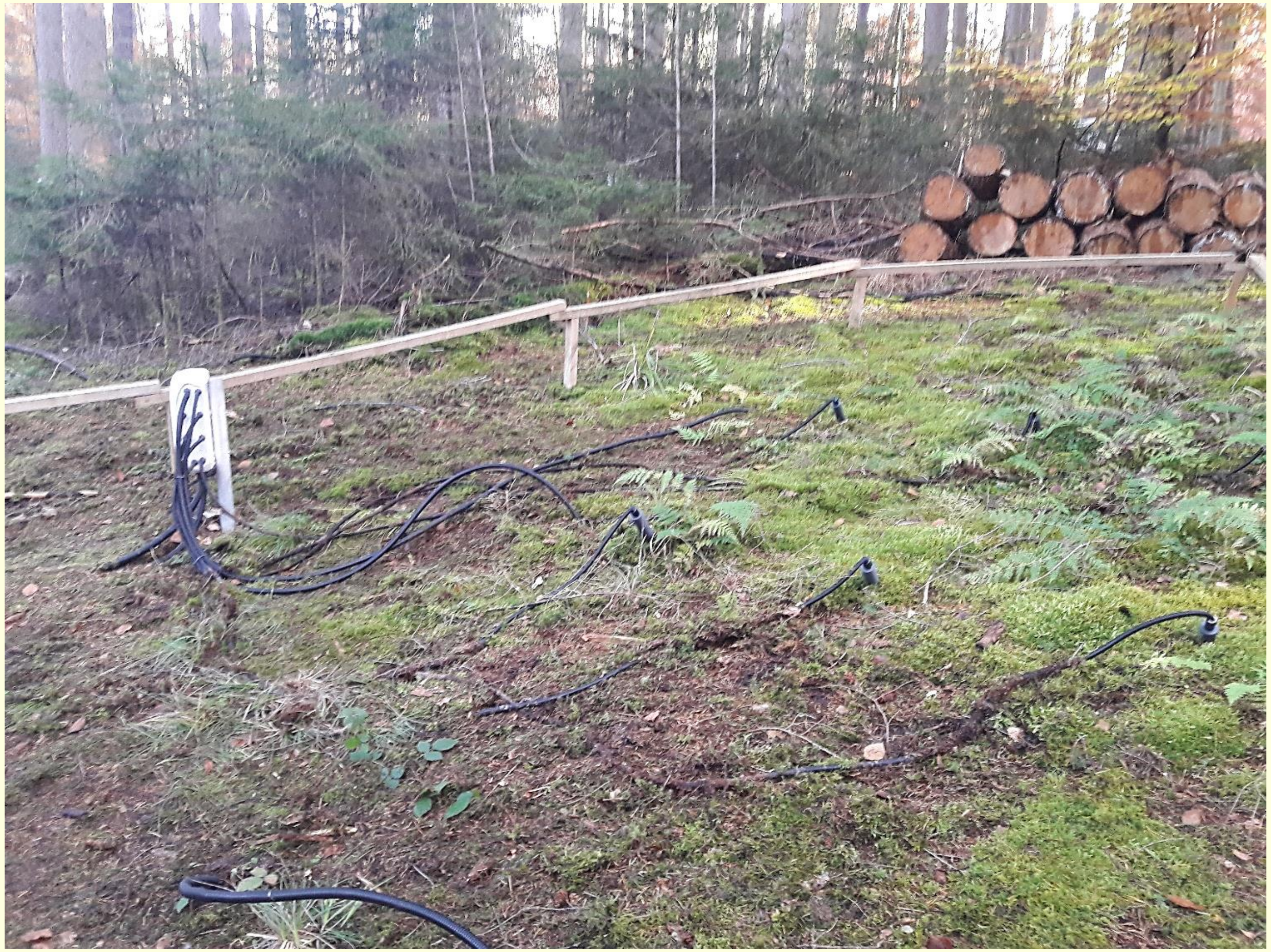


```
'27/11 12:59:35"
'22/01 10:50:20"
'TIMED"
'Channel number   ",31," ",       61," ",       62," ",       16," ",
'Sensor code      ",31," ","     REG"," ","     WS"," ","     THM"," ","
'Label            ",31," ","   Regen"," ","   Wind"," ","FDR_15.1"," ","
'Unit             ",31," ","      mm"," ","    m/s"," ","    Vol%"," ","
'Minimum value    ",31," ",    0.000," ",    0.000," ",    25.66," ",
'Maximum value    ",31," ",    3.555," ",    5.242," ",    29.83," ",
'08/01 12:30:00   ",31," ",    0.000," ",    1.554," ",    25.76," ",
'08/01 13:00:00   ",31," ",    0.000," ",    1.000," ",    25.76," ",
'08/01 13:30:00   ",31," ",    0.000," ",    0.983," ",    25.76," ",
'08/01 14:00:00   ",31," ",    0.000," ",    0.771," ",    25.76," ",
'08/01 14:30:00   ",31," ",    0.000," ",    1.083," ",    25.76," ",
'08/01 15:00:00   ",31," ",    0.000," ",    0.996," ",    25.76," ",
'08/01 15:30:00   ",31," ",    0.000," ",    0.654," ",    25.76," ",
'08/01 16:00:00   ",31," ",    0.000," ",    0.929," ",    25.76," ",
'08/01 16:30:00   ",31," ",    0.000," ",    0.396," ",    25.76," ",
'08/01 17:00:00   ",31," ",    0.000," ",    0.362," ",    25.76," ",
'08/01 17:30:00   ",31," ",    0.000," ",    0.254," ",    25.76," ",
```



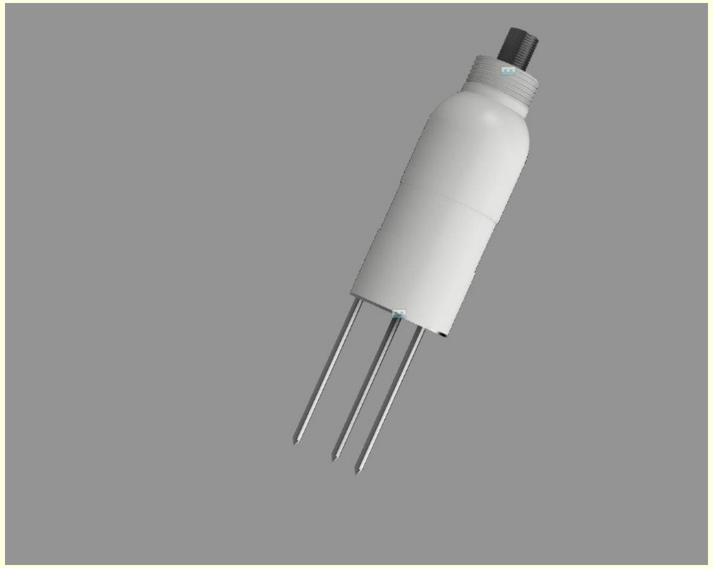


Bodenfeuchte (Vol-%)



FDR

- Frequency Domain Reflectometry
- wie viel Wasser sich im Verhältnis zum Bodenvolumen im Boden befindet



Matrixpotenzial/Saugspannung

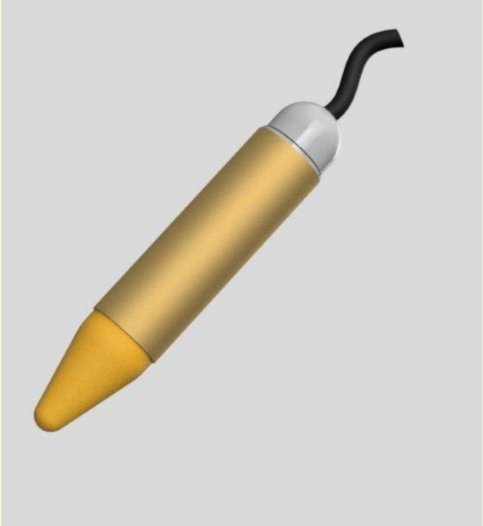
Tensiometer

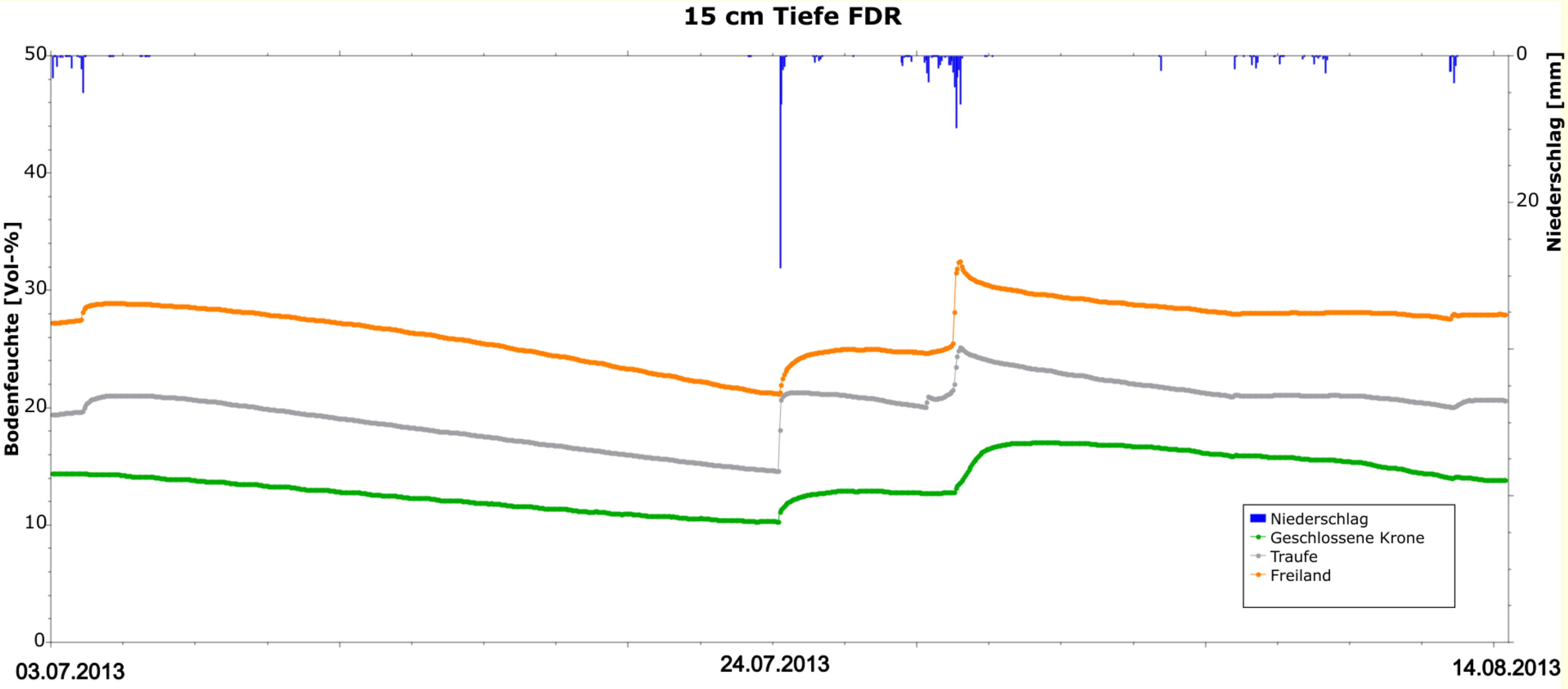
- misst die Kraft mit dem Wasser im Boden zurückgehalten wird
- Kraft, die Pflanzen aufbringen müssen, um Wasser aufzunehmen

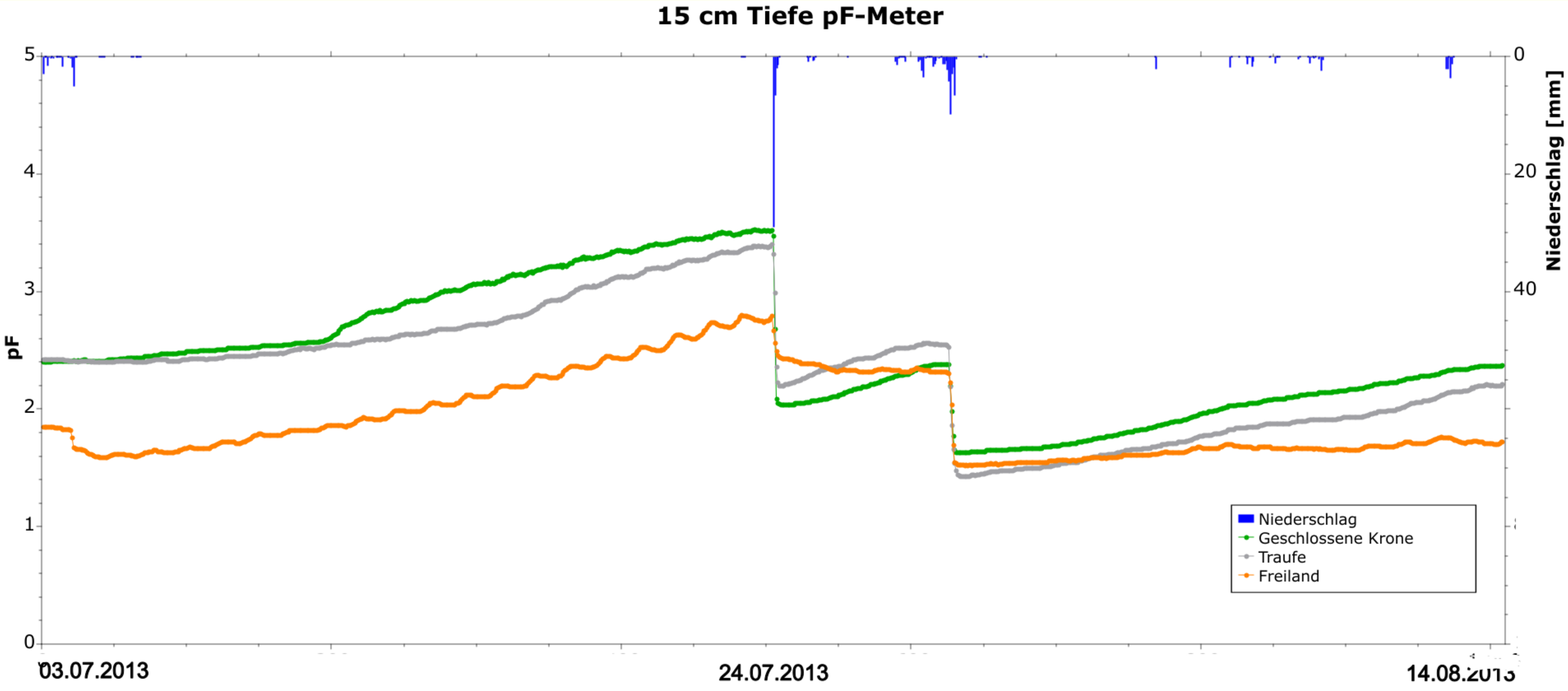
Matrixpotenzial/Saugspannung

Wärmekapazitätssensoren

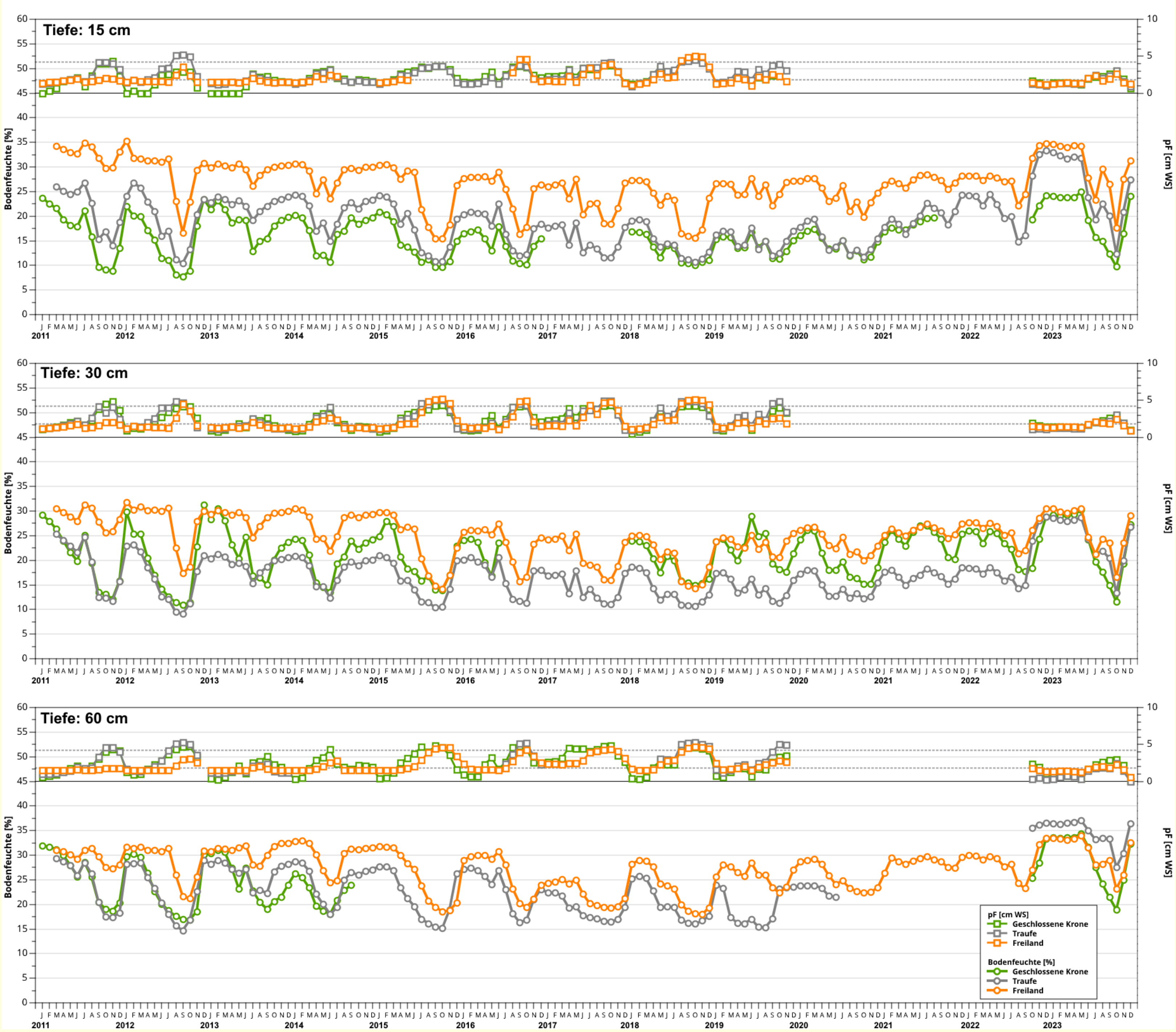
- keine Austrocknung
- thermische Messung



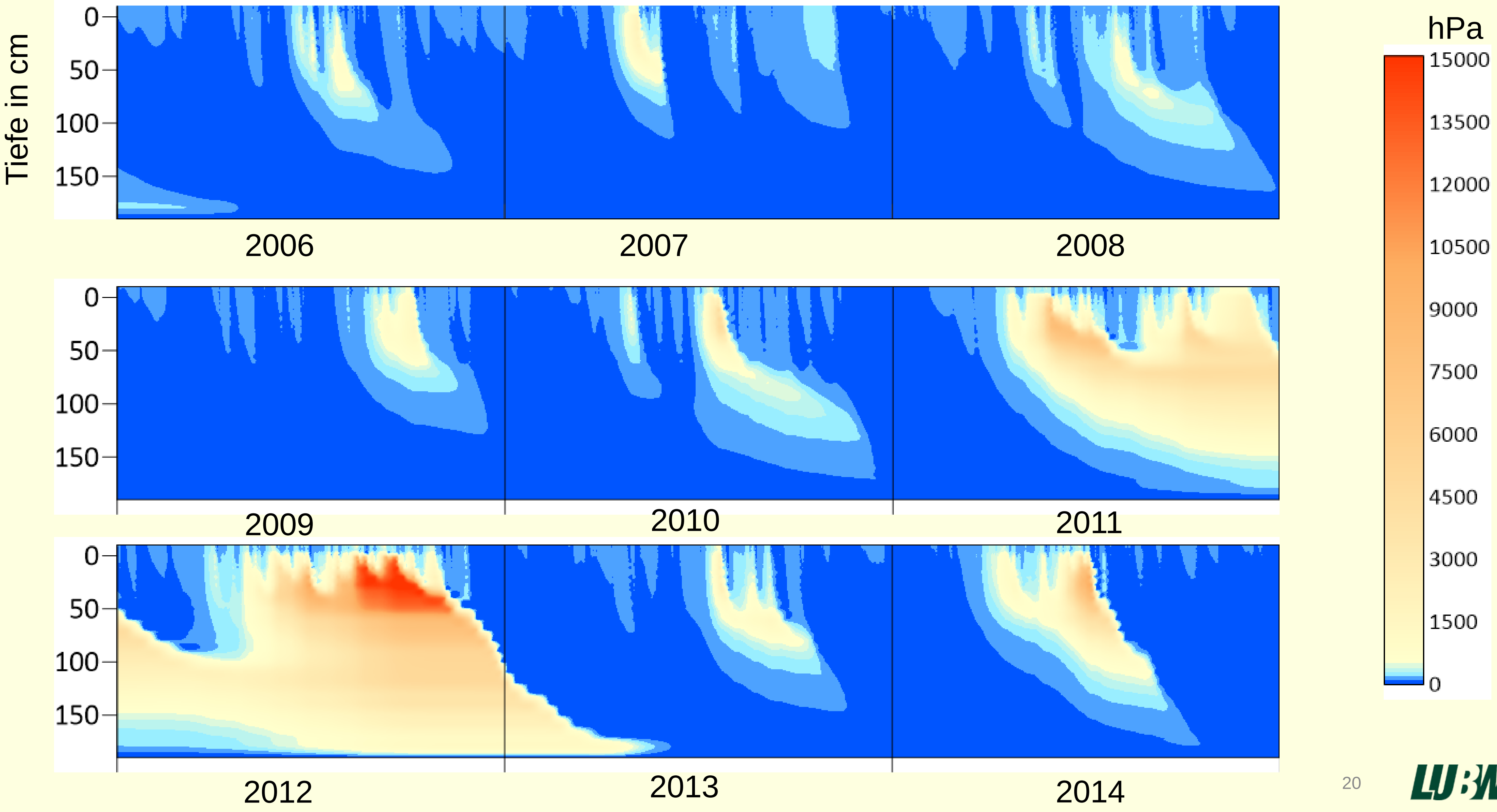

15 cm Tiefe FDR
Bodenfeuchte [Vol-%]
50
40
30
20
10
0
Niederschlag [mm]
0
20
03.07.2013
24.07.2013
14.08.2013
Niederschlag
Geschlossene Krone
Traufe
Freiland

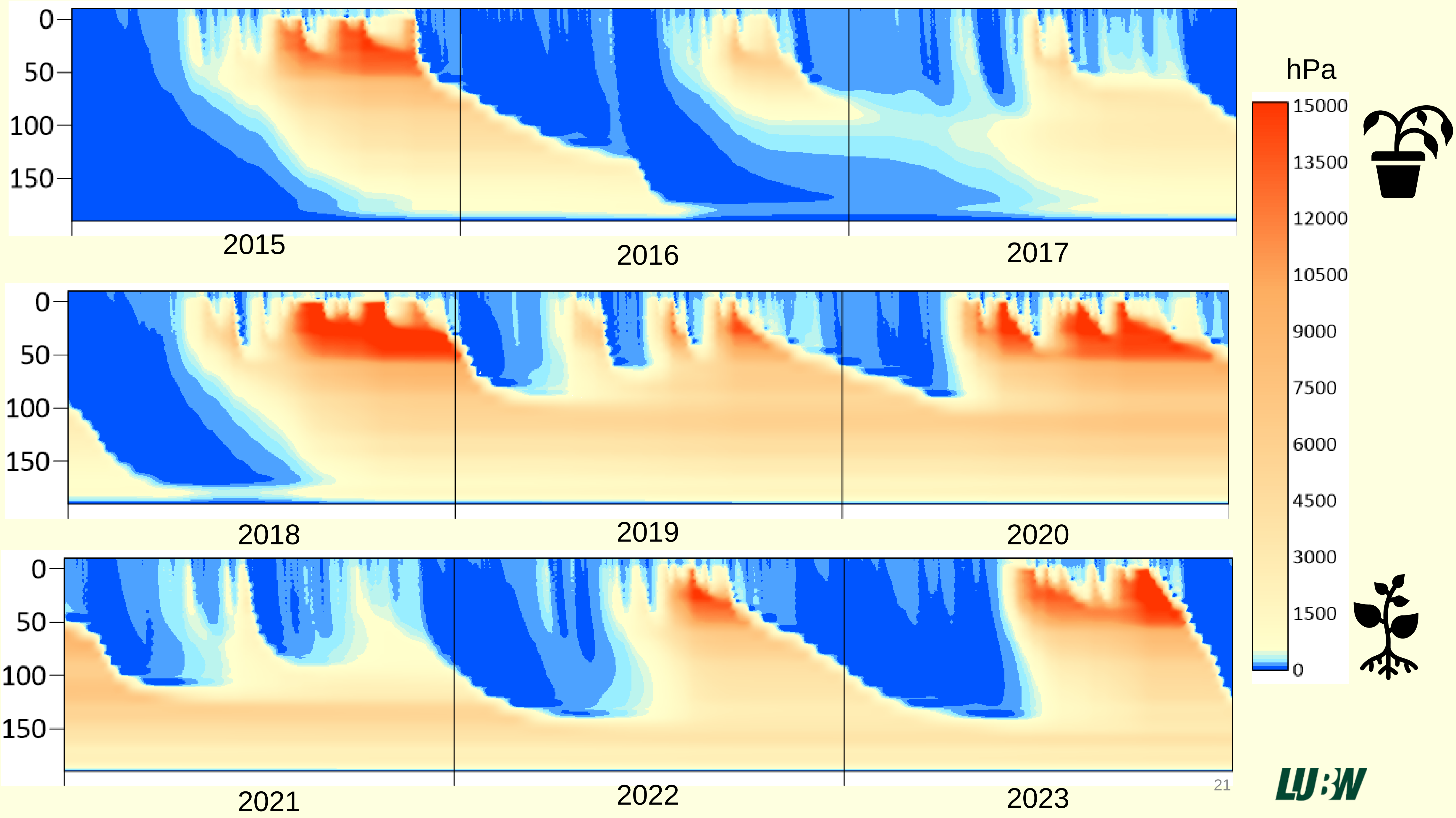

15 cm Tiefe pF-Meter
pF
5
4
3
2
1
0
Niederschlag [mm]
0
20
40
Niederschlag
Geschlossene Krone
Traufe
Freiland
03.07.2013
24.07.2013
14.08.2013

Zusammenhang Bodenfeuchte und pF

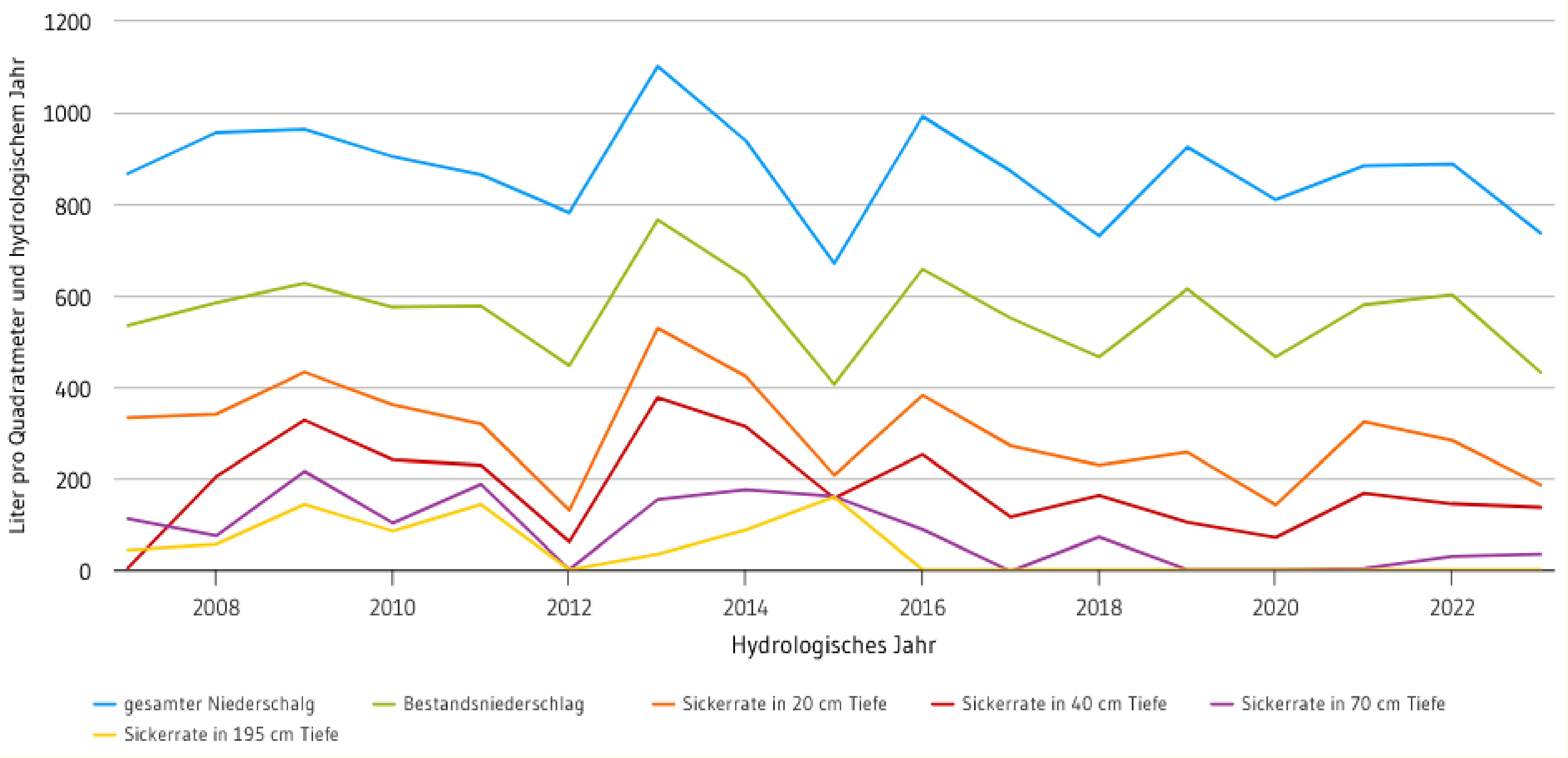


Bodenfeuchte- Saugspannung



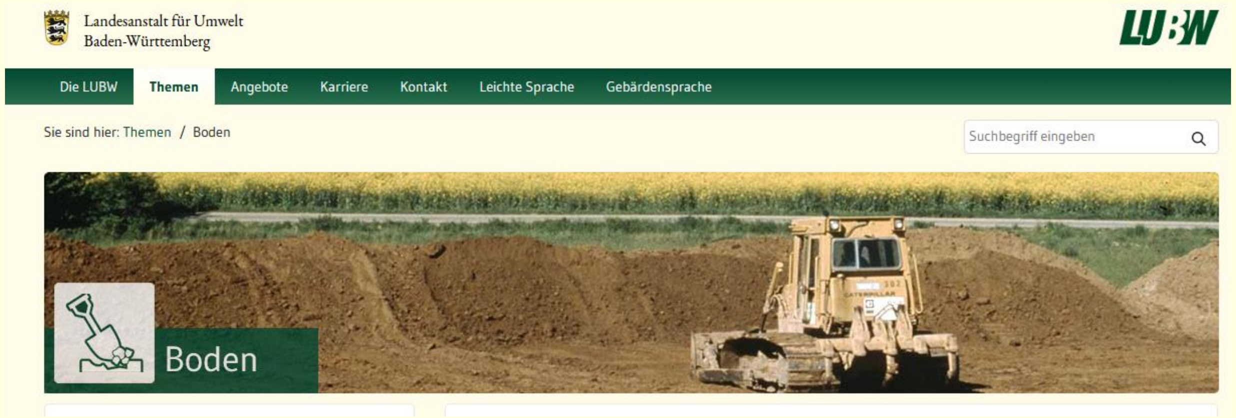

0
50
100
150
2015
2016
2017
2018
2019
2020
2021
2022
2023
hPa
15000
13500
12000
10500
9000
7500
6000
4500
3000
1500
0

Wasserflüsse



Ausblick

Umweltdaten
Baden-Württemberg
2024



Landesanstalt für Umwelt
Baden-Württemberg

LUBW
Die LUBW
Themen
Angebote
Karriere
Kontakt
Leichte Sprache
Gebärdensprache
Suchbegriff eingeben

Sie sind hier: Themen / Boden

Boden

Üb
a
I
Mes en

jährliche Aktualisierung

Darstellung der Daten auf Website

Vielen Dank für Ihre Aufmerksamkeit !