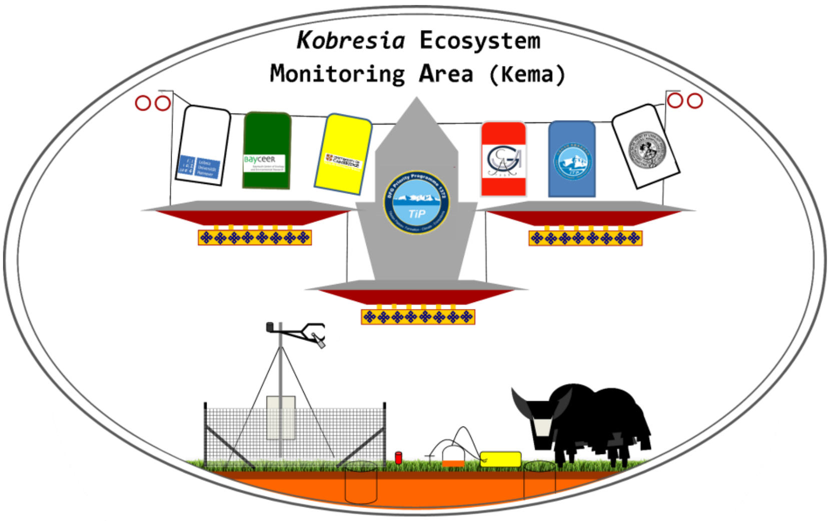
UNIVERSITY OF BAYREUTH

Department of Micrometeorology

Tibet **P**lateau **A**tmosphere-**E**cology-**G**laciology Cluster Joint *Kobresia* Ecosystem Experiment:

Documentation of the 2nd Intensive Observation Period Summer 2012 in KEMA, Tibet



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1. Introduction

This report is documentation about measurements conducted by the TiP Atmosphere-Ecology-Glaciology (AEG) cluster during the second interdisciplinary experiment in the *Kobresia* Ecosystem Monitoring Area (KEMA) on the Tibetan Plateau during the summer monsoon period in 2012. It describes the technical setup and provides details about the time schedule as well. A detailed description of the first experiment in 2010 can be found Biermann and Leipold (2011).

The field site is close to the Naqu Ecological and Environmental Observation and Research Station owned by the Tibetan University (TU), Lhasa, Tibetan Autonomous Region (TAR) and operated by the Institute of Tibetan Plateau Research (ITP), Chinese Academy of Sciences (CAS), Beijing, China. The work was carried out in the framework of the DFG Program SPP 1372 (TiP), with collaborating scientists from the Department of Micrometeorology, University of Bayreuth; the Department of Plant Ecology and the Department of Soil Science of Temperate Ecosystems, University of Göttingen; the Institute of Soil Science, Leibnitz University Hannover and the Senckenberg Museum of Natural History Görlitz. The collaboration partners in China were the Institute of Tibetan Plateau Research (ITP), the Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI) in Lanzhou, the Tibetan University, Lhasa and the Beijing Normal University, which helped with logistical support, provided the accommodation at the research station and participated in the field work.

The research area is located in the center of the major distribution of *Kobresia pygmaea*. The purpose of the experiment is to investigate the energy and matter exchange between soil, plants and atmosphere as well as plant distribution and growth on different land use types on the Tibetan Plateau. For an experiment to quantify the effect of increased grazing on the plateau an area of approximately 100m by 250m was fenced in 2009 to exclude yaks and other livestock, additionally some smaller fences excluding also small mammals on an area of 10x10m were set up in order to quantify their different contribution to the overall grazing effect. To monitor the recovery of the ecosystem when grazing is excluded fences were set up on degraded slopes. Furthermore grazing exclosure plots were set up in the swamps, close to the river. This vegetation type is used as winter pasture and therefore it is of high importance for the local land use. Due to the minor impact of pikas on this vegetation type the setup only contains livestock exclosures and control plots. A second grazing exclosure area was fenced in 2010 for further experiments, since the above mentioned area is quite dry and grazing is reduced in this area due to regulations from local government.

1.1. DFG SPP 1372 Tibet Plateau: Formation-Climate-Ecosystems

The German Science Foundation (DFG) priority program 1372 Tibet Plateau: Formation-Climate-Ecosystems (TiP) studies the Tibetan Plateau focusing on the three interlinked processes, plateau formation, climate evolution and human impact and Global Change. This study is motivated by the importance of the Tibetan Plateau on a global scale comparable to the importance of Antarctica and the Arctic. Its formation had a profound impact on the environmental evolution at regional and global scales and until today directly influences the habitat of billions of people. Moreover, the Tibetan Plateau, like the Polar Regions, proves to be particularly sensitive to anthropogenic Global Change. Within the project the key processes are analyzed with respect to their impact on ecosystems on three different time scales. The first being the Plateau formation, with the uplift dynamics and related climate change during the last millions to several tens of millions of years, he second being the Late Cenozoic climate evolution and environmental response during the last tens of thousands to hundreds of thousands of years with decadal to centennial resolution. And finally the phase of human impact and Global Change is analyzed focusing on the present stage, the past ~ 8000 years, and perspectives for the future.

The TiP Atmosphere-Ecology-Glaciology (AEG) cluster is collaboration within the DFG SPP 1372 with the main focus and resent climate change and human impact on the ecosystem on the TP. Following subprojects are involved

Project		University/Institute
Mesoscale circulations and energy and Gas exchange over the Tibetan Plateau	DFG FO 226/18-1.2	Bayreuth Cambridge
Past and present human impact on *Kobresia* pastoral ecosystems as deduced from soil organic matter studies	DFG KU 1184/14	Göttingen Hannover
Identification of parameters, actors and dynamics of the *Kobresia pygmaea* pastoral ecosystems: Vegetation dynamics, biomass allocation and water consumption of *Kobresia* as a function of grazing and environmental conditions	DFG MI 338/7-2; WE 2601/4-2; LE 762/12-2	Marburg Senckenberg Museum, Görlitz Göttingen
Dynamic response of glaciers on the Tibetan Plateau to climate change	DFG SCHN 680/3-1/2/3, SCHE 750/4-1/2/3 BU 949/20-1/2/3	RWTH Aachen, TU Berlin, TU Dresden

Further information about the cluster: **http://www.bayceer.uni-bayreuth.de/TiP-AEG**
Further Information about the priority program “TiP”: **http://www.tip.uni-tuebingen.de/**

2. *Kobresia* Ecosystem Monitoring Area (KEMA): Setup for Intensive Observation Period (IOP) II

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2.1. Location and permanent setup

The measurement sites (*Kobresia* Ecosystem Monitoring Area, KEMA) are located close to the TU-ITPCAS Naqu Ecological and Environmental Observation and Research Station in the small village Kema, which is about 22 km in the SE of Naqu City and 270 km NE of Lhasa, at an altitude of about 4410 m a.s.l.. It includes different fences installed in 2009 and 2010 to exclude grazing of livestock and in some cases also small mammals. An overview of the complete setup is given in Fig. 2-2, for more details please see Seeber et al. 2011. A detailed overview of the installation for the conducted precipitation manipulation experiment is given in Fig. 2-3. The vegetation monitoring plots (VMP) are labeled according to the treatment; C = control, P = no pikas, Y = no livestock, YP = no herbivores, replicates are numbered from 1-4 starting. The big exclosure from 2009 is labeled Km; replicates are numbered anticlockwise starting at the Western entrance of the exclosure. The fence set up in 2010 on the *Kobresia* pasture is labeled Kp; replicates are numbered anticlockwise starting at the Northeast entrance. The degraded plots are called St, and the plots in the wetlands S.

Based on field observations, a Landsat image (source: Global Land Cover Facility, www.landcover.org) and a Google earth picture from December 2010 the map in Fig. 2-4 was drawn. This map shows the distribution of different land use types and the big exclosures in the research area KEMA. The classification of the land use types follows the degradation of the *Kobresia* mats, starting with mat G and U (exclosures) followed by D1-3 to ruderal. Riverbed is a temporary flooded area. Road and village are permanent constructions. The explanation and photos of the different land use types can be found in Seeber et al. (2011). A more detailed analysis of land cover based on satellite data using RapidEye has been conducted within a Bachelor thesis by Ringler (2013) under the supervision of Prof. Miehe in Marburg. The distribution and density of the vegetation cover is displayed in Fig. 2-5.

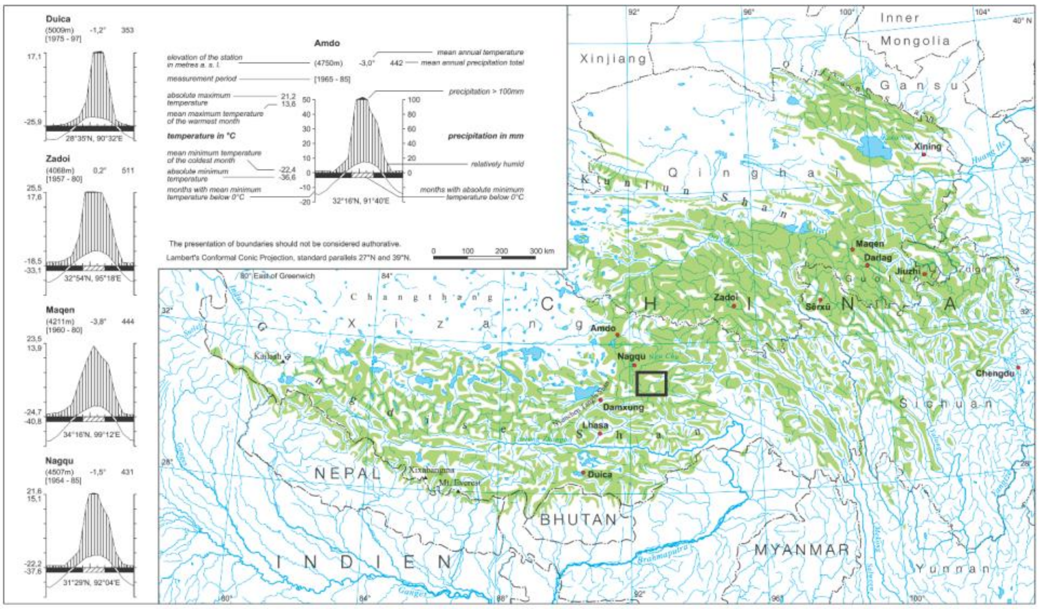

Fig. 2-1 Distribution of *Kobresia* on the Tibetan Plateau. The research area KEMA marked with the square (Miehe et al. 2008)

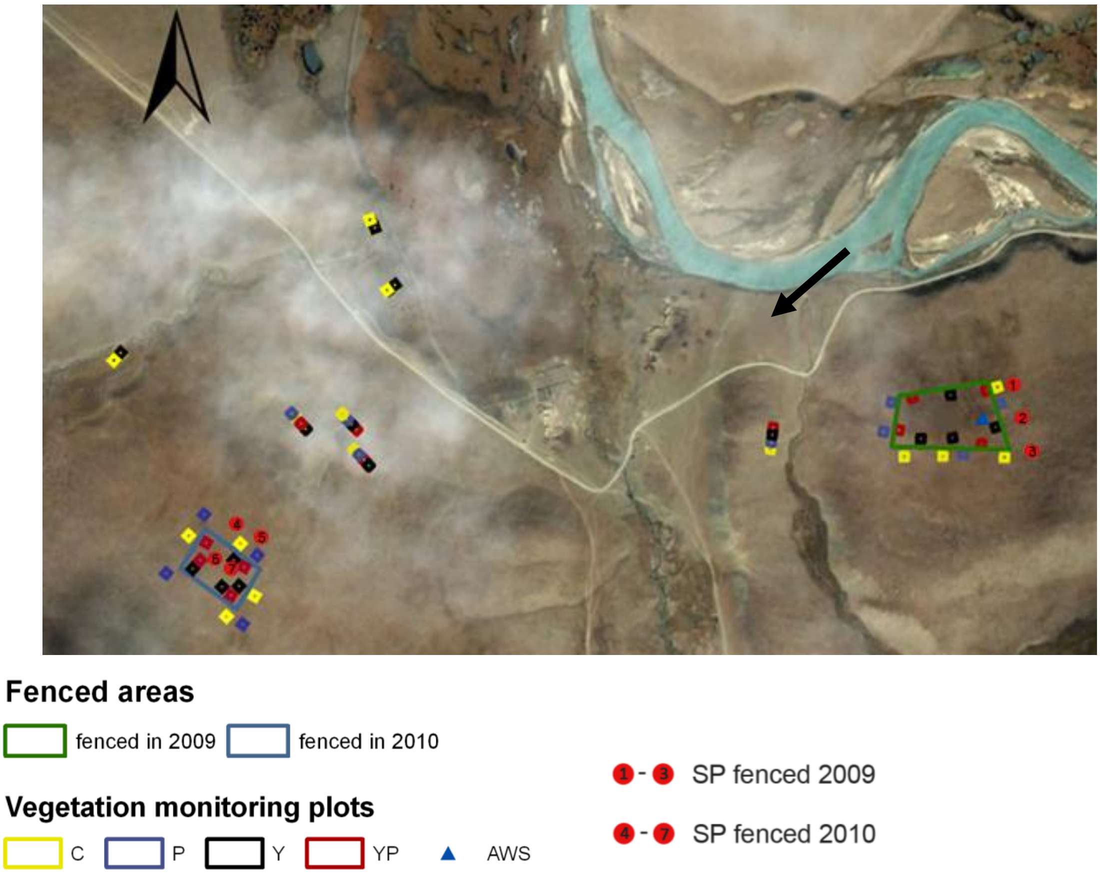

Fig. 2-2 Setup of the permanent vegetation monitoring plots (VMP), the areas fenced in 2009 (Km) and in 2010 (Km). The VMP are labeled according to the treatment; C = control, P = no pikas, Y = no livestock, YP = no herbivores. The position of the research station is indicated by an arrow and the 2012 positions of the Automatic Weather Station (AWS) by a blue triangle. Red circles illustrate locations of recorded soil profiles on 2009 and 2010 fenced sites (see chapter 2.3.2). Background image is taken from Google Earth in Dec. 2010, map modified after Seeber et al., 2011.

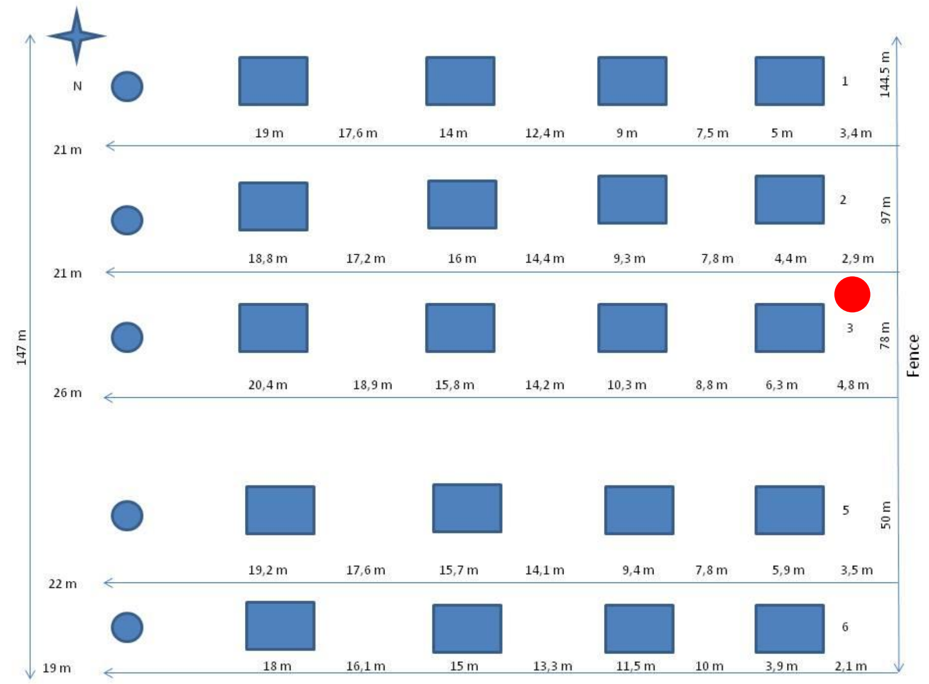

Fig. 2-3: Position and composition of roofs installed for the precipitation manipulation experiment. Squares mark the position of the roof plots and the blue circles mark positions for the CO_2 Flux control measurements with a LICOR Survey chamber, the position for continues soil respiration measurements with the LICOR long term chamber is marked by a red circle mark

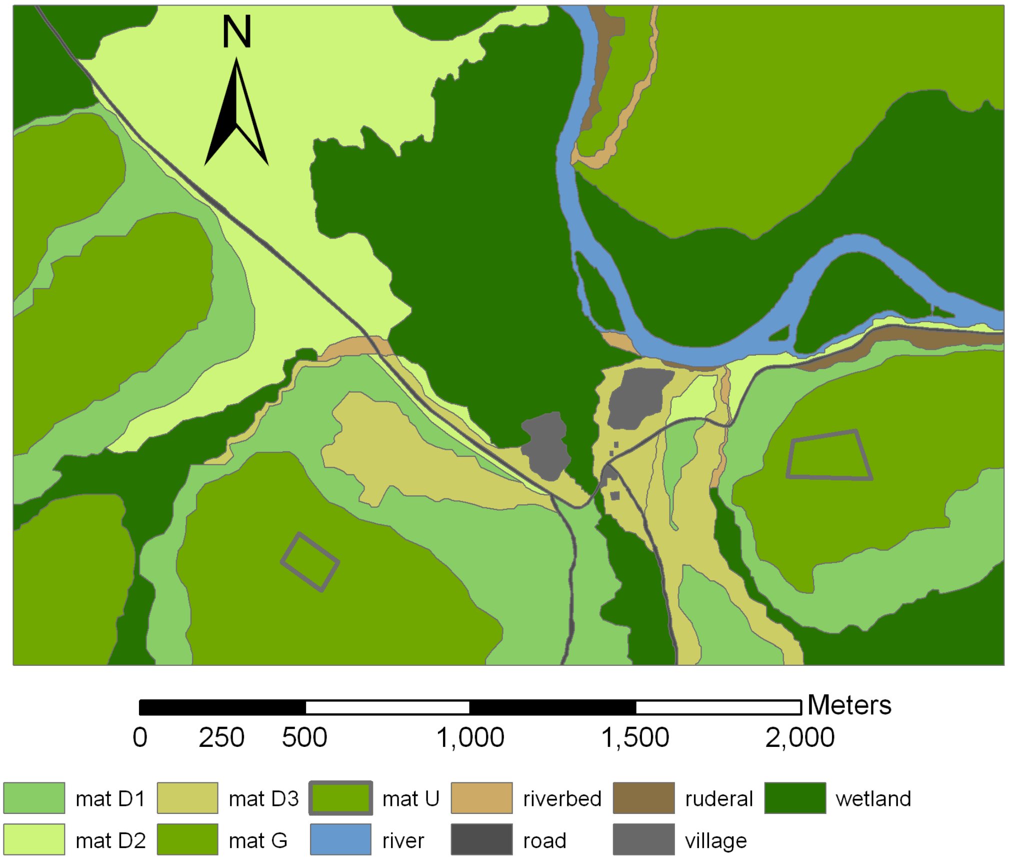

Fig. 2-4: Distribution of land cover classes in the study sites (for explanation of classes see, Biermann and Leipold, 2011). The grey polygons represent the two large exclosures (Seeber et al., 2011)

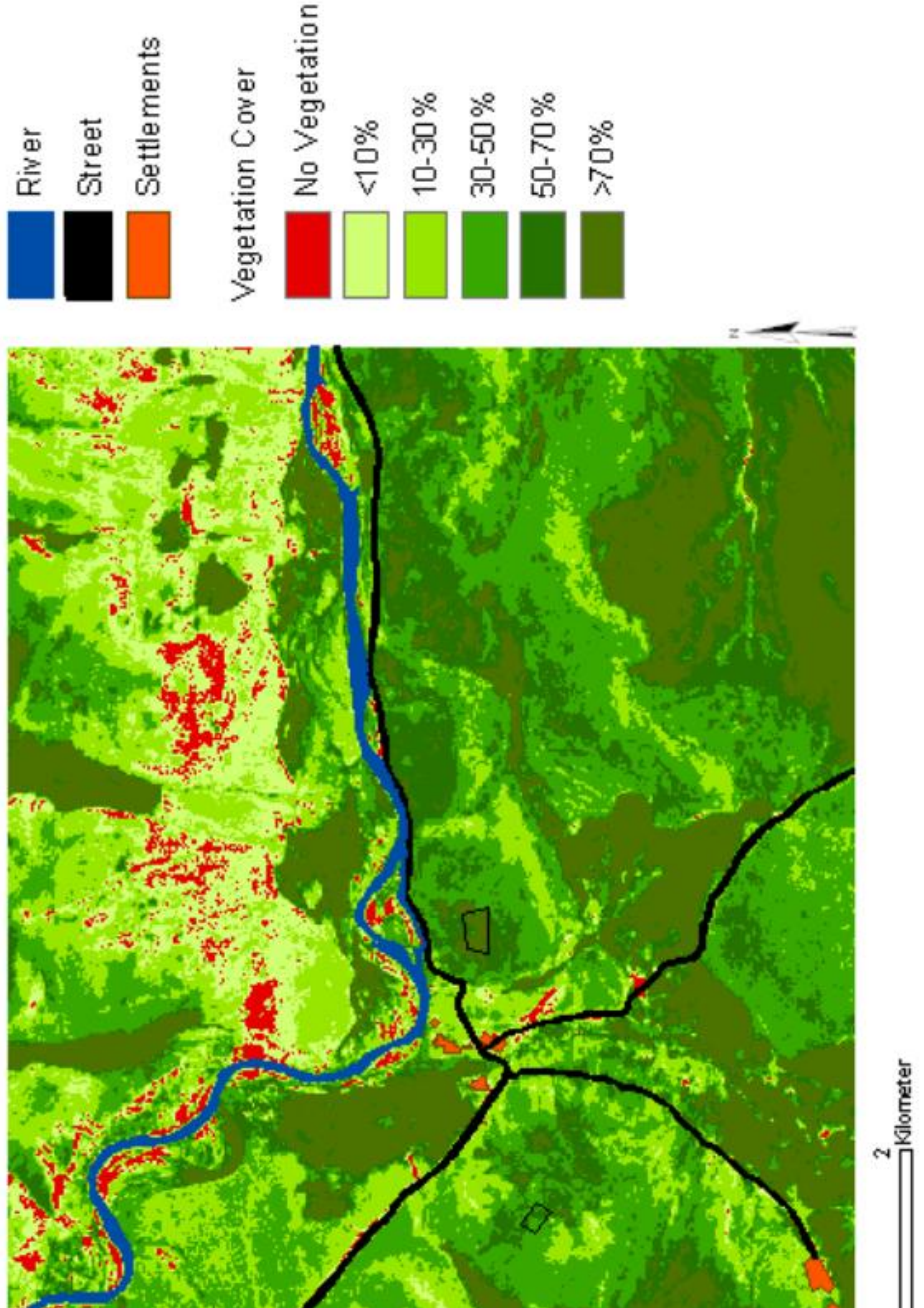

Fig. 2-5: Distribution and density of vegetation for KEMA based on a RapidEye satellite image. The fenced area Km and Kp are marked with black frames (Ringler 2013)

2.2. Measurements during IOP2

During the observation period in summer 2012 two automated weather stations, a long term soil CO_2 flux survey system with a respiration and net ecosystem exchange chamber as well as several lysimeter for evapotranspiration estimation were installed for continuous measurements. Additionally radiation components, soil temperature and moisture were measured discontinuous above and under the corresponding surface types of the long-term CO_2 chamber measurements. A soil respiration survey chamber was used for discontinues measurements over the main surfaces types found within the study site on a rotational base. The soil chambers were operated by the Universities of Hannover and Bayreuth and the lysimeter by the University of Göttingen. Plant and biomass monitoring of former years was continued at the same plots by the Senckenberg Museum of Natural History Görlitz. An overview of all conducted measurements can be found in Table 2-1.

Table 2-1: Measurements during IOP II in 2012 at KEMA

Type of measurement	Duration	Conducted by
Meteorology		
Standard meteorological measurements, Radiation & Precipitation	11.07. 10.09.12	Dept. of Plant Ecology, University of Göttingen
Radiation over vegetation treatments	30.07.-26.08.12	Dept. of Micrometeorology, University of Bayreuth
Weather Observations	25.07.-27.08.12	
Soil		
Soil Temperature profile, Soil Moisture measurements under different vegetation cover	30.07.-26.08.12	Dept. of Micrometeorology, University of Bayreuth
Measurement of soil Respiration and NEE by a LI-8100 Long-term Survey Chamber, Measurement of soil CO_2- efflux by a LI-8100 Soil Survey Chamber,	30.07.-26.08.12	Dept. of Micrometeorology, University of Bayreuth & Institute of Soil Science, University of Hannover
Labeling experiments		Dept. of Soil Science of Temperate Ecosystems, University of Göttingen
Measurement of soil temperature, soil moisture, soil water potential	11.07. 10.09.12	Dept. of Plant Ecology, University of Göttingen
Hydrology		
Evapotranspiration, soil water content (Lysimeter)	18.07-05.09.12	Dept. of Plant Ecology, University of Göttingen
Water balance experiment (roofs)	17.08-10.09.12	
Irrigation experiment	13.07-10.09.12	
Ecology		
Root biomass, necromass, surface area		Dept. of Plant Ecology, University of Göttingen
Soil samples for nutrient analyses	20.08.-25.08.12	Dept. of Botany, Senckenberg Natural History Museum, Görlitz
Vegetation records Harvest of peak standing crop biomass	20.07.-27.08.12	

Surface parameters

2.2.1. Distribution of surface cover

To characterize the vegetation distribution of the main study area we choose the big plot fenced in 2009 and surveyed the vegetation structure along a grid of six rows and 10 columns. We followed the step point method after Evans and Love (1957), by walking along each transect and recording the dominant vegetation in an area of 5x5 cm at the tip of the shoe after a defined number of steps. The percentage is than calculated from the number of occurrence of one vegetation type and the total number of sampling points. We classified the vegetation we found along each transect into following classes: Intact Root Mat, Degraded Root Mat and Bare Soil (Fig. 2-6). The class Intact Root Mat is characterized by the intact turf and a more or less closed vegetation cover which is mainly consisting of *Kobresia pygmaea*, the class Degraded Root Mat still has the turf layer but vegetation is sparse and the surface is mainly covered by crusts of Cryptogams with only occasionally other vegetation cover and Bare Soil are spots were the turf is missing but which occasionally are covered with sparse vegetation, for more details refer to Table 2-2 , and for species composition please see Table 5-1.

Repeating the survey for three times along the same grid but with different number of steps revealed a distribution of 66% Intact Root Mat, 18% Bare Soil and 16% Degraded Root Mat within the Km plot (fenced area from 2009).

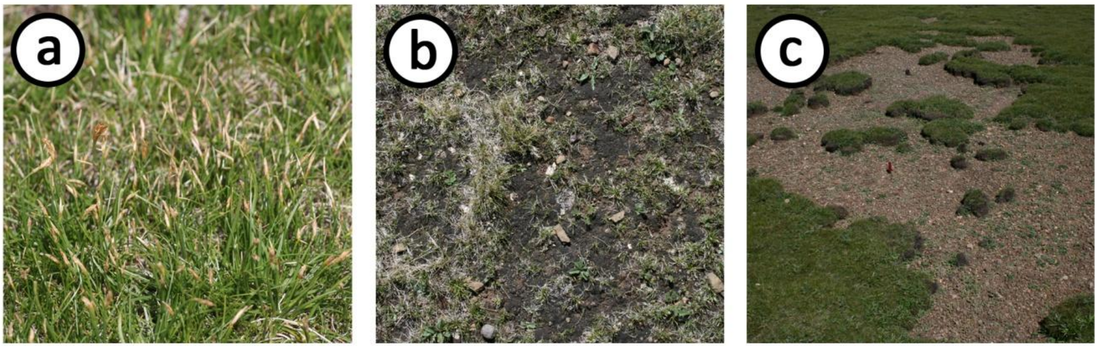

Fig. 2-6: Pictures show the three defined vegetation classes, a) Intact Root Mat, b) Degraded Root Mat and c) Bare Soil

Table 2-2: Criteria for a differentiation of main degradation stages in KEMA

stadium short-name and letter in Fig. 2-6	Intact Root Mat IRM (a)	Degraded Root Mat DRM (b)	Bare Soil BS (c)
proportion of total surface area (%)[1]	64.7	16.6	18.7
mean vegetation cover (%)[2]	87.5 (5.7)[4]	26.4 (9.8)[4]	11.8 (7.9)[4]
maximal vegetation cover (%)[2]	99	65	35
minimal vegetation cover (%)[2]	72	5	0
root mat layer	Yes	Yes	No
mean height difference (cm)[3]	9.4 (2.0)[4]	8.5 (2.0)[4]	-
dominant plant species	*Kobresia pygmaea*	*Kobresia pygmaea*, Lichens, Algae	Annuals e.g. *Axyris prostrata*

[1] n = 2618

[2] n = 100 for IRM, DRM, BS; considered are only “higher graduated plants” (grasses, herbs)

[3] n = 60 for IRM, DRM; BS served as reference height

[4] values in brackets represent standard deviations

2.2.2. Soil properties at KEMA

Table 2-3: Soil profile I with field descriptions for the roof experiment (outside of Km, fenced 2009)

location:	Soil profile 1 (Fig. 2.1) Kema
relief:	slope (middle) gently inclined
date:	12 July 2012
altitude:	4285 m a.s.l.
exposition:	North-east
cartographer:	Per Schleuß


horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-1	0	-	-	root	very high	leaf sheaths
Ah1	1-7	0-1	Ut3	coherent	root/loess	very high	root mat
Ah2	7-14	1-2	Ut3	coherent	root/loess	high	root mat
2Ah3	14-22.5	5-8	Uls	coherent	sandy-clayey gravel	medium	
2Bwg	22.5-37	10-15	Lu	sub-poly	sandy-clayey gravel	low	
2Bwg	37 ++	20-25	Tu3	poly	Clayey gravel	-	stacnic

soil type: stagnic folic Cambisol (WRB)

Table 2-4: Soil profile II with field descriptions for the roof experiment (outside of Km, fenced 2009)

location:	Soil profile 2 (Fig. 2.1) Kema
relief:	slope (middle) gently inclined
date:	12 July 2012
altitude:	4280 m a.s.l.
exposition:	North-east
cartographer:	Per Schleuß


horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-0.5	0	-	-	root	very high	leaf sheaths
Ah1	0.5-8	0-1	Ut3	coherent	root/loess	very high	root mat
Ah2	8-14	1-2	Ut3	coherent	root/loess	high	root mat
2Ah3	14-21	5-8	Uls	coherent	sandy-clayey gravel	medium	
2Bw	21-33	10-15	Slu-Ls2	sub-poly	sandy-clayey gravel	low	stacnic
2Bwg	33 ++	20-25	Lt3	poly	Clayey gravel	-	stacnic

soil type: stagnic folic Cambisol (WRB)

Table 2-5: Soil profile III with field descriptions for the roof experiment (outside of Km, fenced 2009)

location:	Soil profile 3 (Fig. 2.1) Kema
relief:	slope (middle) gently inclined
date:	11 July 2012
altitude:	4275 m a.s.l.
exposition:	North-east
cartographer:	Per Schleuß

horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-1	0	-	-	root	very high	leaf sheaths
Ah1	1-7.5	0-1	Ut3	coherent	root/loess	very high	root mat
Ah2	7.5-15	1-2	Ut3	coherent	root/loess	high	root mat
Ah3	15-30	5	Uls	coherent	sandy-clayey gravel	medium	
2Bw	30-71	5-7	Slu	coherent	sandy-clayey gravel	low	
2Bwg	71-85	20-25	Lt3	poly	Clayey gravel	-	stacnic
3Bw	85 ++	5-8	Su2	granular	sandstone	-	weathered

soil type: stagnic folic Cambisol (WRB)

Table 2-6: Soil profile IV with field descriptions outside of Kp (grazed, fenced 2010)

location:	Soil profile 4 (Fig. 2.1) Kema
relief:	slope (middle) gently inclined
date:	28 August 2012
altitude:	4291 m a.s.l.
exposition:	North-west
cartographer:	Per Schleuß

horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-0.5	0	-	-	root	very high	leaf sheaths
Ah1	0.05-7.5	0-2	Ut3	coherent	root/loess	very high	root mat
Ah2	7.5-16	2-3	Ut3	coherent	root/loess	high	root mat
Ah3	16-21	5-7	Uls	coherent	sandy-clayey gravel	medium	
2Bw	21 ++	7-10	Slu	sub-poly	sandy-clayey gravel	low	

soil type: folic Cambisol (WRB)

Table 2-7: Soil profile V with field descriptions outside of Kp (grazed, fenced 2010)

location:	Soil profile 5 (Fig. 2.1)
	Kema
relief:	slope (middle)
	gently inclined
date:	28 August 2012
altitude:	4290 m a.s.l.
exposition:	North-west
cartographer:	Per Schleuß

horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-0.5	0	-	-	root	very high	leaf sheaths
Ah1	0.5-7	0-2	Ut3	coherent	root/loess	very high	root mat
Ah2	7-15.5	2-3	Ut3	coherent	root/loess	high	root mat
Ah3	15.5-26	5-7	Uls	coherent	sandy-clayey gravel	medium	
2Bw	26++	7-10	Lu	sub-poly	sandy-clayey gravel	low	

soil type: folic Cambisol (WRB)

Table 2-8; Soil profile VI with field descriptions inside of Kp (ungrazed, fenced 2010)

location:	Soil profile 6 (Fig. 2.1)
	Kema
relief:	slope (middle)
	gently inclined
date:	28 August 2012
altitude:	4292 m a.s.l.
exposition:	North-west
cartographer:	Per Schleuß

horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-1	0	-	-	root	very high	leaf sheaths
Ah1	1-7	0-1	Ut3	coherent	root/loess	very high	root mat
Ah2	7-18	1-2	Ut3	coherent	root/loess	high	root mat
Ah3	18-23.5	5	Uls	coherent	sandy-clayey gravel	medium	
2Bw	23.5 ++	5-7	Slu	sub-poly	sandy-clayey gravel	low	

soil type: folic Cambisol (WRB)

Table 2-9: Soil profile VII with field descriptions of Kp (ungrazed)

location:	Soil profile 7 (Fig. 2.1) Kema
relief:	slope (middle) gently inclined
date:	28 August 2012
altitude:	4292 m a.s.l.
exposition:	North-west
cartographer:	Per Schleuß

horizon (WRB)	**depth (cm)**	**skeleton (%)**	**texture**	**structure**	**substance**	**roots**	**remark**
Oi	0-1	0	-	-	root	very high	leaf sheaths
Ah1	1-7.5	0-2	Ut3	coherent	root/loess	very high	root mat
Ah2	7.5-15.5	2-3	Ut3	coherent	root/loess	high	root mat
Ah3	15.5-26	5-7	Uls	coherent	sandy-clayey gravel	medium	
2Bw	26 ++	7-10	Slu	sub-poly	sandy-clayey gravel	low	

soil type: folic Cambisol (WRB)

3. Vegetation monitoring and fertilization experiment

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3.1. Setup and measurements

3.1.1. Grazing experiment

Within each of the permanent fences, a 10 by 10 meter plot was marked for vegetation records. Total percentage vegetation cover was recorded on species level; records were taken annually end of August till mid of September, corresponding to the end of the vegetation period and thus the maximum cover of the vegetation.
Next to each plot per treatment, 25 cm x 25 cm permanent subplots were marked. The number of replicates varied according to the magnitude of small-scale heterogeneity within plots of the different vegetation types: There were 3 plots each at the two *Kobresia* pasture, 4 replicates at the degraded pastures and 4 replicates on each on the hummocks and hollows in the wetlands. Peak standing crop biomass was harvested and differentiated into *Kobresia pygmaea,* other *Cyperaceae*, *Poaceae*, short-lived (annual or biennial) herbs and perennial herbs (except for the swamps).
At the *Kobresia* subplots flower and fruit stalks of *Kobresia pygmaea* were counted annually as proxies for the reproductive success of the most important species under different grazing conditions. In 2012 additional 25x25 cm subplots are marked at about 1 m distance to the permanent subplots. On these plots total biomass is only harvested once and gives the biomass and litter accumulation after a three years period of treatment.

3.1.2. Fertilization Experiment

In September 2009 a fertilization experiment was set up in a randomized block design with 5 treatments á 4 replicates. The aim was to determine soil nutrient limitations to plant growth. The differentially tested nutrients included nitrogen, phosphate, and potassium (Table 3-1).

Table 3-1: Overview of the nutrient addition treatments, the employed fertilizers, and the respective concentrations for the fertilization experiment

Nutrition	**Fertilizer**	**Concentration**
nitrogen, potassium	KNO_3	10 g/m², 34 g/m²
phosphate, potassium	KH_2PO_4	5 g/m², 34 g/m²
Potassium	K_2SO_4	34 g/m²
nitrogen, phosphate, potassium	KNO_3, KH_2PO_4, K_2SO_4	10 g/m², 5 g/m², 34 g/m²
Control		

In September 2009, for each treatment a plot of one square meter was fertilized and protected from grazing with 50 cm high wire cages (Fig. 3-1). The fertilizer was dissolved in 3 liter ground water and applicated with a watering can. This corresponded to an irrigation equivalent to 3 mm, which was also given to the control. The fertilization was repeated in September 2010 and September 2011 on the same plots.
On two subplots (25 cm x 25 cm) flower and fruit stalks were counted annually. Mean standing crop was harvested annually at the same plots end of August 2010, beginning of September 2010, end of August 2011 and beginning of August 2012, to assess the impact of the fertilization on total biomass productivity. Biomass of *Kobresia pygmaea*, other *Cyperaceae*, *Poaceae*, annual or biennial herbs and perennial herbs was harvested separately. In 2012, two additional subplots (25 x 25 cm) were harvested to control for the impact of the annual cutting and litter accumulation.
Additionally, soil samples were taken in August 2010, 2011 and 2012 at the horizons 0-5 cm and 6-20 cm for analysis of (remaining) soil nutrient pools.

Fig. 3-1: Block of the fertilization experiment, protected from grazing by meshed wire cages

3.2. Data availability

Given that we used different numbers of replicates and treatments, data structures differ among experiments. Table 3-2 summarizes the basic characteristics of the respective designs.

Table 3-2: Overview of terminal dates, number of replicates, treatments and subplots per treatment for vegetation samples, biomass harvests and assessments of reproductive success between August and September 2012

Experiment and vegetation type	**Date**	**Number of replicates**	**Number of treatments**	**Number of subplots**
Fertilization experiment, annual biomass *Kobresia* pasture	07.08.2012	4	5	2
Fertilization experiment, reproduction *Kobresia* pasture	07.08.2012	4	5	2
Fertilization experiment, three years biomass accumulation, *Kobresia* pasture	07.08.2012	4	5	2
Grazing experiment, biomass *Kobresia* pasture, fenced 2009	13.08. 2012	4	4	3
Grazing experiment, reproduction *Kobresia* pasture, fenced 2009	13.08. 2012	4	4	3
Grazing experiment, vegetation record *Kobresia* pasture, fenced 2009	24.08.2012	4	4	1
Grazing experiment, biomass *Kobresia* pasture, fenced 2010	16.08.2012	4	4	3
Grazing experiment, reproduction *Kobresia* pasture, fenced 2010	16.08.2012	4	4	3
Grazing experiment, vegetation record *Kobresia* pasture, fenced 2010	27.08.2012	4	4	1
Grazing experiment, biomass Degraded pasture	28.08.2012	4	4	4
Grazing experiment, vegetation record Degraded pasture	27.08.2012	4	4	1
Grazing experiment, biomass Wetland	21.08.2012	4	2	8
Grazing experiment, vegetation record Wetland	28.08.2012	4	4	1

4. Weather observations & meteorological measurements

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4.1. Meteorological measurements

4.1.1. AWS Göttingen GPEaws

Weather data was collected with the help of several sensors assembled together and set up on the in 2009 established field site next to the fence at top end of the plots and hence close to the plots of the precipitation manipulation experiment (Chapter 7). The measured meteorological parameters were air temperature, air humidity, precipitation, total radiation, net radiation, solar radiation (PAR), wind speed and direction. Measured soil parameters were soil moisture, soil temperature and soil water potential.

Table 4-1: Instrumentation of weather station Göttingen

Parameter	**SN**	**Sensor**	**Units**	**Height [m]**	**Angle against north**
Air temperature and humidity	E4412	Campbell CS 215	degC	2	90°
Precipitation	09325	RM Young Tipping Bucket Rain Gauge	mm	0.5	240°
Global radiation	23679	Apogee Pyranometer SP 110	Wm^{-2}	2	180°
Net radiation	00643	Kipp & Zonen NR Lite	Wm^{-2}	2	180°
Solar radiation (PAR)	Q17815	LiCOR LI 190 SB	$\mu mol s^{-1} m^{-2}$	2	180°
Wind speed and direction	12080035	Gill WindSonic 1	ms^{-1};Deg	2.2	
Soil moisture	380076-78	Campbell CS 616	vol%	-0.05, -0.125 -0.25	
Soil temperature	00041-44	Campbell PT 100/3	degC	-0.025, -0.075 -0.125, -0.25	
Soil water potential	63AH533-535	Campbell 257-L	kPa	-0.05, -0.125 -0.25	

4.1.2. AWS Bayreuth UBTMMaws

An automatic weather station (Delta-T, Germany) was mounted at the fenced site established in 2010. Measured parameters were wind speed, wind direction, net radiation, air temperature, relative humidity and precipitation. The weather station recorded data for the mentioned parameters during the whole experimental period.

4.1.3. Radiation complex UBTMMrad

Solar radiation and its long and shortwave properties were measured with a CNR1 Net Radiometer (Kipp & Zonen; Netherlands) and mounted on pole in approximately 2m height. Calibration coefficients and specifications of the setup can be found in Table 4-3. The Radiation components were measured over the surface type corresponding to the underlying surface of the long term CO_2 survey system (Fig.: 4-1). With the first establishment at July 25th measurement began over Bare Soil. At August 16th and 22nd the pole has been relocated to measure over Degraded Root Mat and Intact Root Mat respectively. Data was recorded on a Vaisalla Logger.

4.1.4. Soil measurement complex UBTMMsoil

The soil complex (UBTMMsoil) was installed close to the radiation complex UBT and rotated analog to the long term CO_2 chamber system. With the first establishment at July 25th measurement began under Bare Soil. At August 16th and 22nd soil complex has been relocated to measure underneath Degraded Root Mat and Intact Root Mat respectively (Fig.: 4-2). Table 4-2 contains calibration coefficients and more specifications concerning the used devices. Data was recorded on a Vaisalla Logger. A more detailed discussion of the soil properties can be found in chapter 2.2.2.

Table 4-3: Calibration coefficients of the radiation complex UBTMMrad (rotated together with the long term CO_2 Chamber and UBTMMsoil), installation was done as similar as possible above all surfaces

Parameter	**SN**	**Sensor**	**Calibration factor [µV/Wm²]**
Radiation	CNR1	upper SW	E=(10.93±0.002)
	990197	upper LW	E=(10.86±0.038)
		lower SW	E=(10.80±0.002)
		lower LW	E=(10.91±0.031)

Table 4-4: Instrumentation of soil pit UBTMMsoil (rotated together with the long term CO_2 Chamber system and UBTMMrad)

Parameter	Device	SN	Calibration factor	Calibration/ Conversion	Height [m]
SoilTmp1	Pt100	0054	---	mV to °C in Logger	-0.025
SoilTmp2	Pt100	0055	---	mV to °C in Logger	-0.075
SoilTmp3	Pt100	0057	---	mV to °C in Logger	-0.125
SoilTmp4	Pt100	0056	---	mV to °C in Logger	-0.175
SoilTmp5	Pt100	0053	---	mV to °C in Logger	-0.25
Soil moisture	TDR-IMKO	31148	---	---	-0.1
Soil moisture	TDR-IMKO	31147	---	---	-0.2
Ground heat flux	HP3		227µV/mW/cm²	----	-0.2
Ground heat flux	Hukse-Flux			---	-0.2

4.2. Meteorological site characteristics

Measured observations of wind direction, wind speed, global radiation, relative humidity, air temperature and precipitation are shown in figure 4-3, 4-4 and 4-5. These parameters are recorded at the site fenced in 2009, which was the plot where the main work was carried out during the measuring campaign 2012. Weather observations were done by eye every hour during day time. The recordings of cloud species and cover can be found in Appendix A.

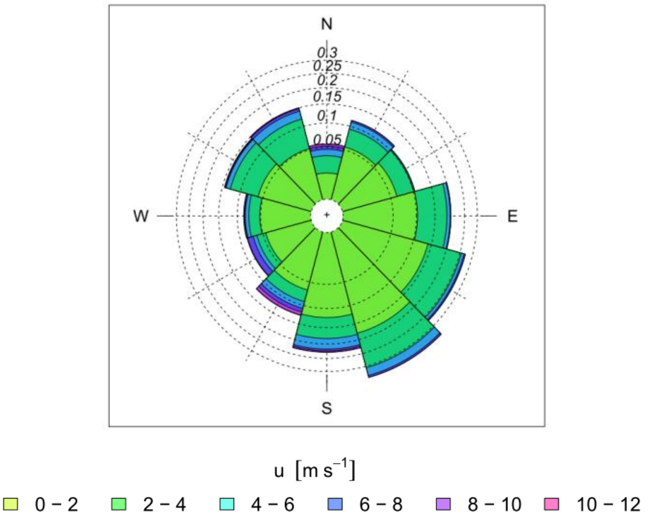

Fig. 4-6: Wind rose displaying the wind direction and wind speed over the whole measurement period in 2012 of GPEaws

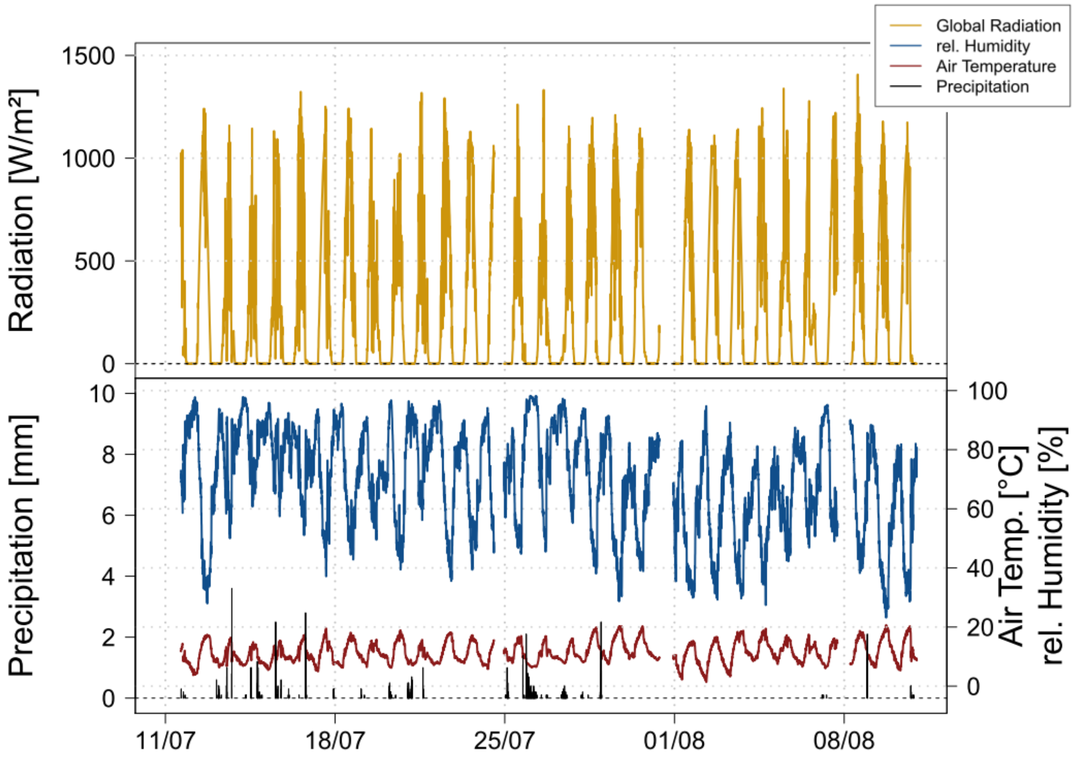

Fig. 4-7: Observations of global radiation, relative humidity, air temperature and precipitation from July 11th till Aug. 9th 2012

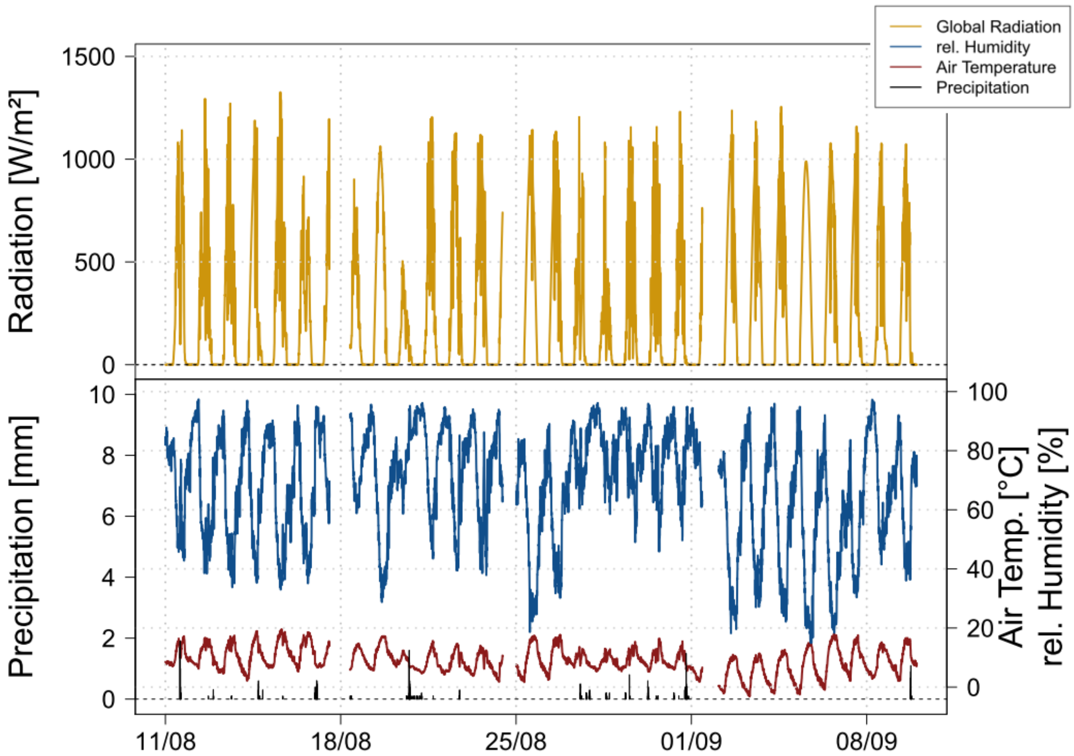

Fig. 4-8: of global radiation, relative humidity, air temperature and precipitation from August 11th till September 10th 2012

5. CO_2 flux measurements with chambers

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5.1. Setup and Measurements

For CO_2 flux measurements a long term chamber system and a survey chamber system from LI-COR Biosciences (Lincoln, NE, USA) were utilized. Both systems are Flow-Through Non-Steady-State chambers coupled with an infra-red gas analyzer (IRGA) for instantaneous estimation of CO_2 concentration, which enables the calculation of CO_2 fluxes with the implemented analytical software. To ensure a sealed sampling and to avoid leaking during the measurement of an ecosystem patch, PVC (polyvinyl chloride) collars with a diameter of 20cm were installed with 5cm headspace into the soil. All the collars have been installed 24h prior the first measurement. Because lack of power from grid due to the remote study area, electricity was provided by solar panels and batteries as described in the user's manual (Li-COR, 2006) by the manufacturer.

The Li-COR long term chamber system contains of a dark chamber measuring ecosystem respiration (R_{eco}) and a transparent one for measuring net ecosystem exchange (NEE). Both chambers were coupled to an automated multiplexing system (Li8150) which is connected to the gas analyzer and enables to measure CO_2 fluxes from both chambers sequentially. During measurement chamber air is circulating between an infrared gas analyzer (IRGA) and the chamber. Due to the closed chamber system CO_2 concentration is supposed to rise or fall respectively. Changing concentration over time (d CO_2/dt) enables the calculation of CO_2-Flux (F_{CO2}) (Li-COR, 2012). The chambers are equipped with a fully automatically rotating arm, which moves the chamber 180° away from the collar and therefore ensures normal patterns of precipitation, temperature and radiation. Furthermore the soil and vegetation itself gets less disturbed by moving the chamber in-between measurements.

The measurements with the long term chamber system over Intact Root Mat (*Kobresia*) and on Bare Soil were conducted inside Km close to the weather station. The measurements over Degraded Root Mat were conducted outside of Km on the south side of the plot.

In addition to the two long term chambers, flux measurements with a Li-COR survey chamber system have been conducted to measure ecosystem respiration. These measurements were made on an additionally established measuring field consisting of in total 33

collars (Fig. 5-4).
Long-term and survey chamber systems were adjusted identically to avoid systematical differences between the systems due to setup settings. The setup settings were set to 2min observation length; 30sec dead band; 74sec purge time. Number of observations during half an hour was set to four for the long term dark and transparent chamber respectively to provide a minimum level of data points for statistical analysis.

It has been seen, that under -or over-pressurization of a chamber leads to over -or under-estimation of fluxes, accordingly (Davidson et al., 2002). Contrarily other studies (Bain et al., 2005; Conen and Smith, 1998) detected systematical errors in CO_2 flux measurements induced by vents recommended by Hutchinson and Livingston (2001), especially under changing and high wind velocities. To encounter this problem Xu et al. (2006) developed a vent, which has the properties to level out pressure differences without biasing CO_2 fluxes at changing wind velocities. These vents are attached (Fig. 5-1; Fig. 5-2; Fig. 5-3) to the used Li-COR chambers to ensure unbiased CO_2 measurements.

Long-term and survey chamber systems were adjusted identically to avoid systematical differences between the systems due to setup settings. The setup settings were set to 2min observation length; 30s dead band; 74s purge time. Number of observations during half an hour was set to four for the long term dark and transparent chamber respectively to provide a minimum level of data points for statistical analysis.

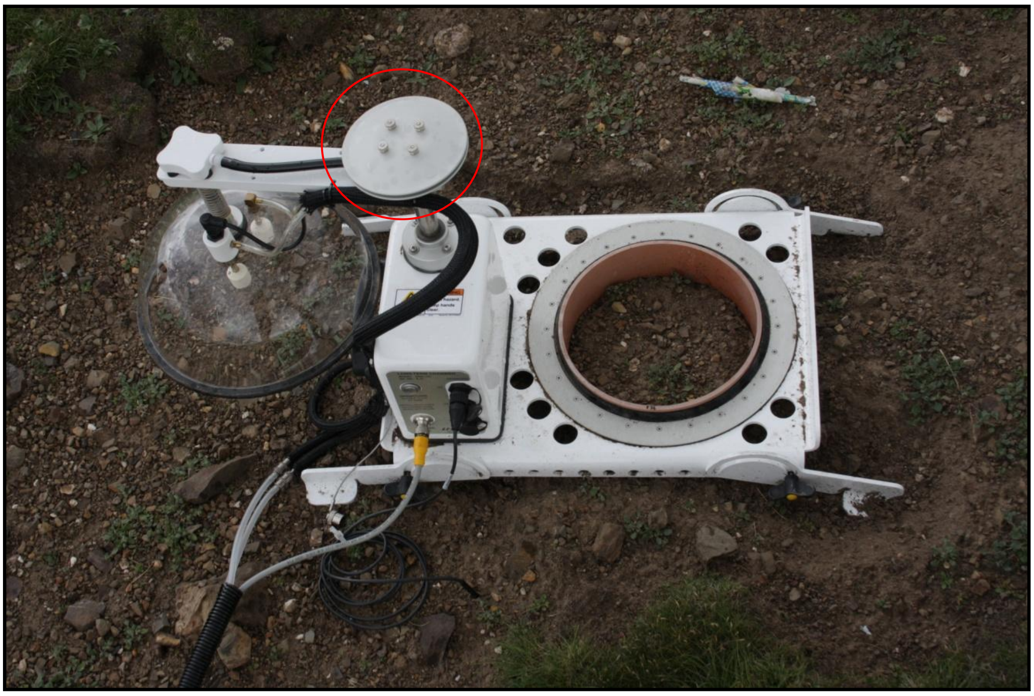

Fig. 5-1: Li-COR Long term CO_2 flux chamber for measuring the net ecosystem exchange. Red circle indicates the venting tube

Fig. 5-2: Li-COR Long term CO_2 flux chamber for measuring ecosystem respiration. Red circle indicates the venting tube

Fig. 5-3: Li-COR CO_2 flux survey chamber for measuring ecosystem respiration. Red circle indicates the venting tube

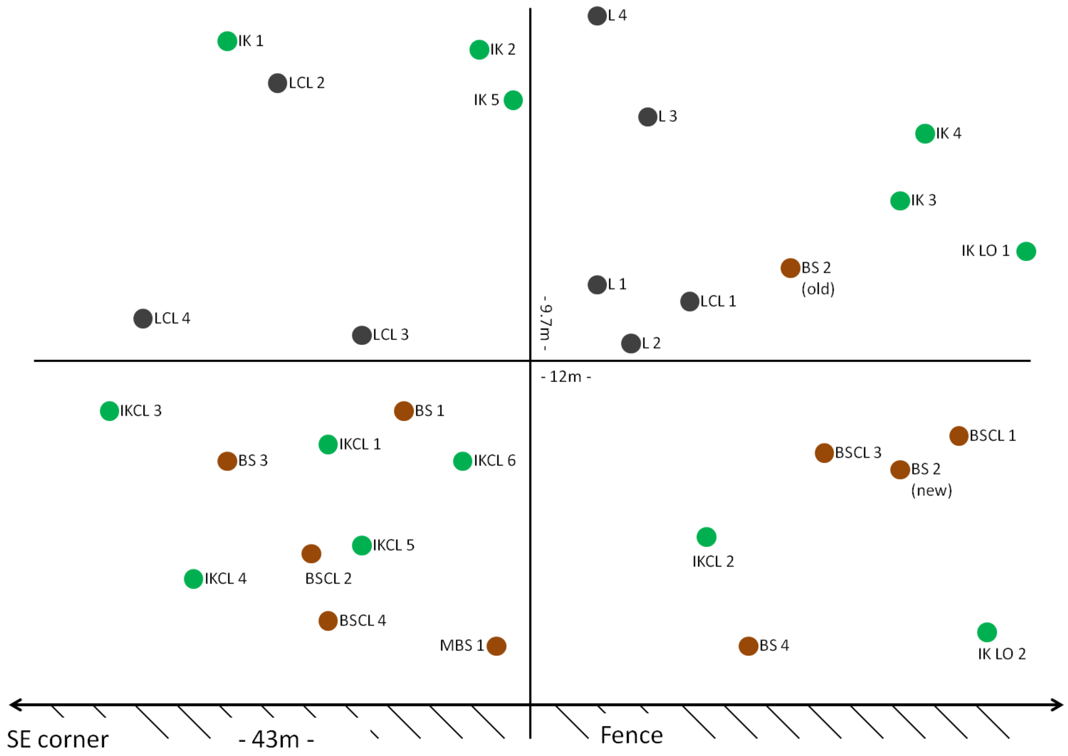

Fig. 5-4: Measuring field for ecosystem respiration measurements with the LI-COR survey system. Treatments: Bare Soil (brown circles); Intact Root Mat (green circles); Degraded Root Mat (dark grey circles). Collars where above ground vegetation has been removed are marked with CL (clipping)

5.2. Data availability

Measurements with the Li-COR long term CO_2 chambers were conducted rotational over intact *Kobresia* turf (Intact Root Mat), spots with missing turf (Bare soil) and over the cryptogam crust (Degraded Root Mat) for about one week respectively (Fig. 5-5).
The survey chamber measurements were conducted randomly distributed, but covering the same period the long term system was running. Additionally nighttime measurements were conducted at selected days (14.08.12 and 19.08.12). Raw data for both survey and long-term chamber can be found on the DVD in the Data archive of the Dept. of Micrometeorology, University of Bayreuth, in the folders “Survey_Chamber” and “Longterm_Chamber”. Data from the long term Chamber of is furthermore subdivided in folders called “Bare Soil”, “Degraded Root Mat”, “Intact Root Mat” and “Comparison”. The folder “Survey_Chamber” is subdivided in folders called “24h_Measurements”, “Additional_Measurements” and “Comparison”. Within the folders, the single files are structured as the following example:
Example: *2.8.BS-2.7*
Where the first two numbers stand for the date, the two letters for the treatment (similar to those used in Fig. 5-4), the second last number for the collar measured and the last number indicates the number of observations of the specific collar at the particular date.

The two folders “Comparison” (for each chamber type) contains data, which was used to compare long-term and survey chamber, since remarkable differences of the calculated fluxes between both systems could be observed. Following investigations of this phenomena conducted by Li-COR, revealed severe deficiencies in the calibration of the survey chamber. Thus leading to the conclusion that measured data of this system must be excluded in further work, whereas the long-term system proved to be an accurate representation of CO_2 fluxes.

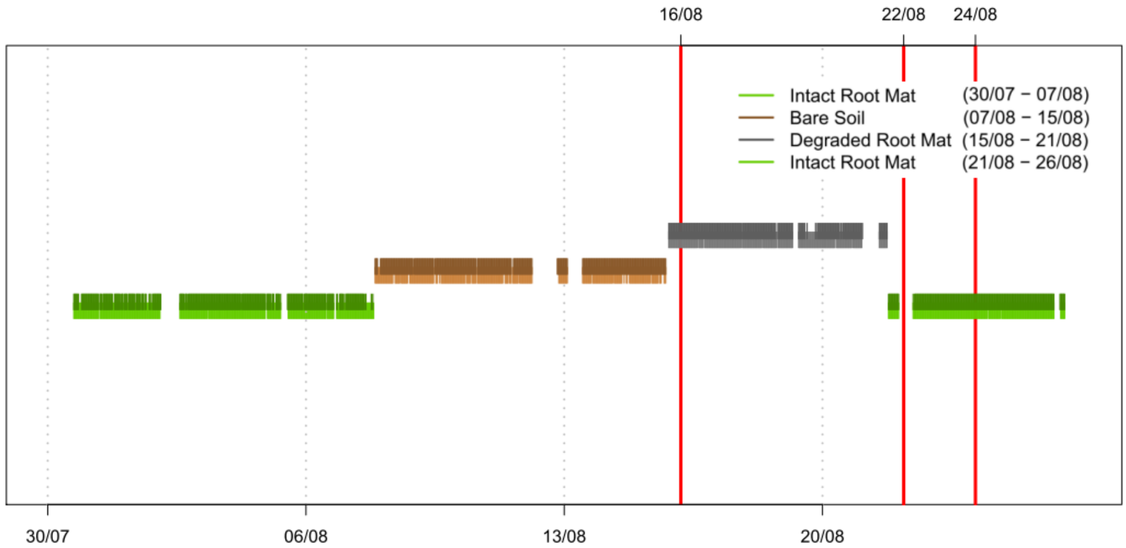

Fig. 5-5: Overview of the four measuring period over the three treatments. Light and dark colored bars indicating NEE and R_{eco} measurements respectively. Notice the gaps, which are mainly due to insufficient power supply. Red bars indicate dates where the soil measuring complex and CNR1 have been relocated to the corresponding surface type

5.3. Vegetation cover

At the end of the measurement period the vegetation within the soil collars of the three different treatments was clipped to estimate the LAI (results are still missing at the time e of print) and species composition. Additionally the coverage with vegetation was estimated.

Table 5-1: Species found within the soil collars of the three different treatments

Species	Intact Root Mat	Degraded Root Mat	Bare Soil
Perennial species			
Aster flaccidus subsp. *glandulosus*	x	x	x
Astragalus tanguticus	x		
Carex ivanoviae	x		
Carex spec.	x		
Elymus spec.	x		
Kobresia pusilla	x		
Kobresia pygmaea	x	x	
Lagotis brachystachya		x	
Lancea tibetica	x	x	x
Poa glauca subsp. *glauca*	x		
Potentilla bifurca	x	x	x
Potentilla plumosa	x	x	
Potentilla saundersiana	x	x	
Saussurea leiocarpa	x	x	x
Sibbaldia adpressa	x		
Stipa purpurea	x	x	
Thalictrum alpinum	x	x	
Veronica ciliata	x		x
Youngia simulatrix	x	x	
Annual species			
Axyris prostrata			x
Draba spec.			x
Chenopodium foetidum			x
Galium exile			x
Koenigia islandica			x

Table 5-2: Coverage of vegetation for the different treatments in percent (mean from soil collars of the same treatment)

Species	Intact Root Mat	Degraded Root Mat	Bare Soil
Kobresia pygmaea	39	21	0
Cyperaceae	1	0	0
Poaceae	18	3	0
Annual herbs	0	1	10
Perennial herbs	31	15	7
Mosses/ Lichens	0	3	0
Degraded Root Mat	1	55	1
Soil/ Stones	1	1	83
Litter	9	3	0

5.4. Soil Respiration measurements within the precipitation manipulation experiment

Within the precipitation manipulation experiment measurements of soil respiration have been conducted with the LiCOR Survey chamber. Details on the precipitation conditions can be found in Chapter 7 and positions of roof and soil collars are displayed in Fig. 2-3. On the different treatments precipitation was manipulation to account for 70; 100 and 130% of natural precipitation. At the end of the experimental time biomass within the soil collars was cut, dried and weighted.

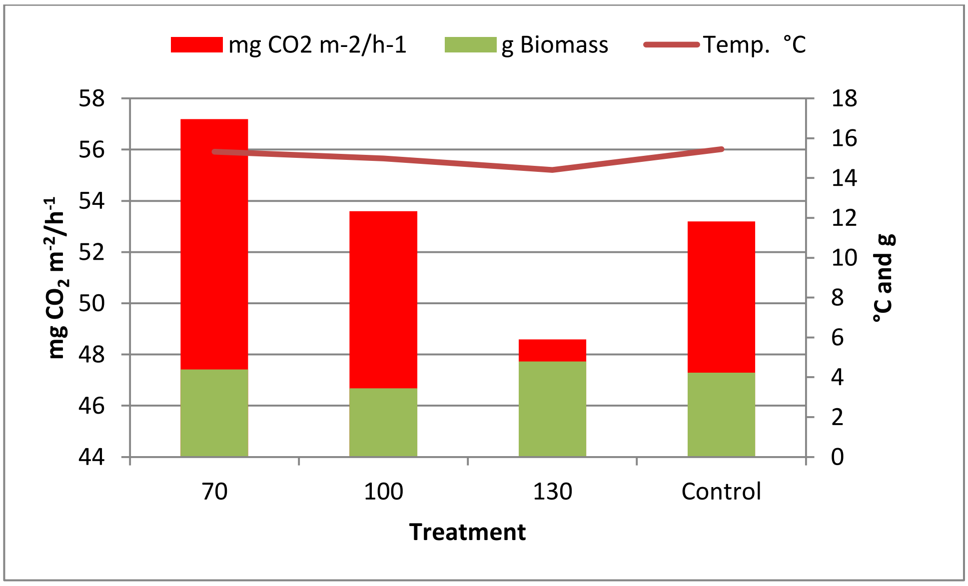

Fig. 5-6 Results of soil respiration measurements (red), dry weight biomass (green) and temperature (red line)

6. Soil Measurements

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The Tibetan Plateau provides the world's largest alpine ecosystem and is dominated by *Kobresia* grasslands, which cover ca. 450,000 km² (Miehe et al. 2008). *Kobresia* pastures are expected to be grazing-induced and are accompanied by sedge-turf varying in thickness between 05 - 30 cm These pastoral root mat ecosystems are of global and regional importance due to its impact on global water, heat and carbon cycles, its high storage of carbon, nitrogen and other nutrients and its provision of important grazing areas, because they protect against mechanical degradation and provide a fast regrowth after heavy grazing events. Yet, less is known about the development and functioning of this *Kobresia* root mats. Hence a few experiments with focus on the plant-soil-system were set up in 2012 during the vegetation period on sites of the KEMA research site.

6.1. N-uptake from different soil depths

The first experiment was set up in July 2012 within the 2009 fenced area. We investigated the nitrogen uptake from different soil depths mainly consisting of *Kobresia* root mat and the N mobilization into the soil-plant-system by localized ^{15}N additions. ^{15}N urea was injected into six soil depths: 0-1 cm, 1-5 cm, 5-10 cm, 10-15 cm, 15-20 cm, 20-25 cm. For each depth four repetitions were selected. Samples of soil, roots and shoots were taken 45 days after labeling. Detailed descriptions of soil profiles were carried out considering basic characteristics of single horizons.

Due to low atmospheric N depositions and due to a high N immobilization in the root mats, the study site is expected to be limited by plant available N. Hence, N uptake efficiency should be generally high and thus highest ^{15}N amounts should be recovered in above- and belowground plant biomass. Moreover, by linking information of localization of N uptake and the morphological description of *Kobresia*-turf profiles, the functional purpose of single horizons can be obtained, which help to understand its successful establishment, its functions and its future trends with regard to change of climate and management.

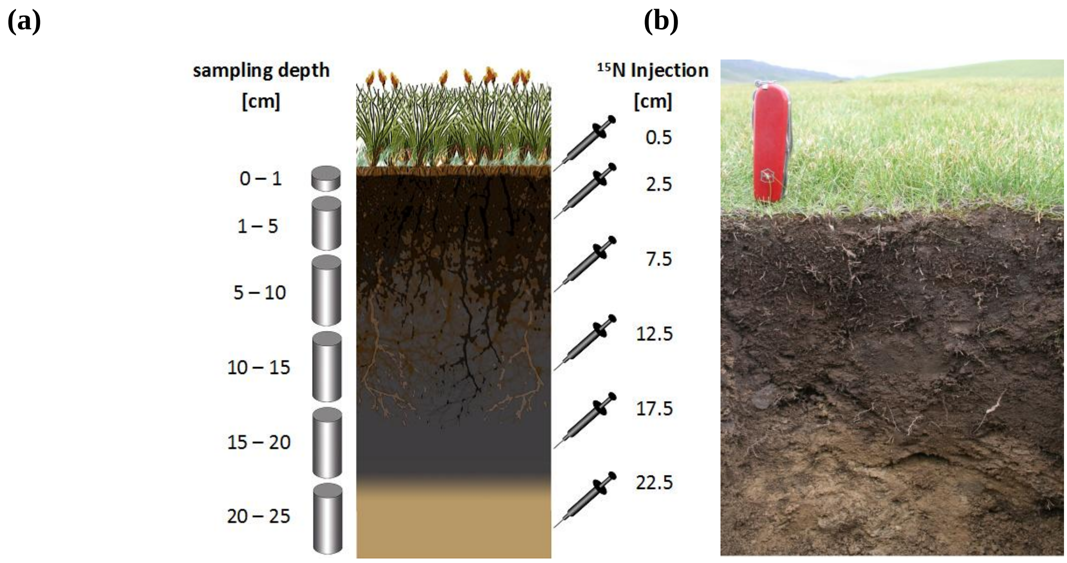

Fig. 6-1: (a) Schematic representation for labeling and sampling and (b) a picture of a typical soil - root mat profile at KEMA

6.2. Effects of grazing on nutrient uptake from different soil depths

A second experiment was performed in July 2012 on the 2010 fenced sites. ^{15}N urea, rubidium chloride and strontium chloride were selected as tracers to reproduce N-, K-, Ca-uptake from different depths and its allocation into the plant-soil-system. Tracers were injected into five soil depths: 0-5 cm, 5-10 cm, 10-15 cm, 15-20 cm, 20-25 cm of grazed and ungrazed sites. For each depth four repetitions were selected Samples of soil, roots and shoots were taken 45 days after labeling. Biomass samples were collected directly on labeled sites and in a distance of 10 cm and 20 cm next to it. They were separated into predominant plant species (*Cyperaceae* and *Poaceae*).

The main objective of this study is to identify important soil and root depths for nutrient uptake depending on predominant plant type (*Cyperaceae* and *Poaceae*). It is assumed that highest amounts of ^{15}N will be recovered in above and belowground biomass due to a generally high N uptake efficiency. Differences between grazed and ungrazed sites are assumed, because higher belowground investments of C, N and nutrients are expected as a consequence of increasing grazing pressure. Contrary, an absence of grazing might initiate the plants to invest more resources for aboveground biomass.

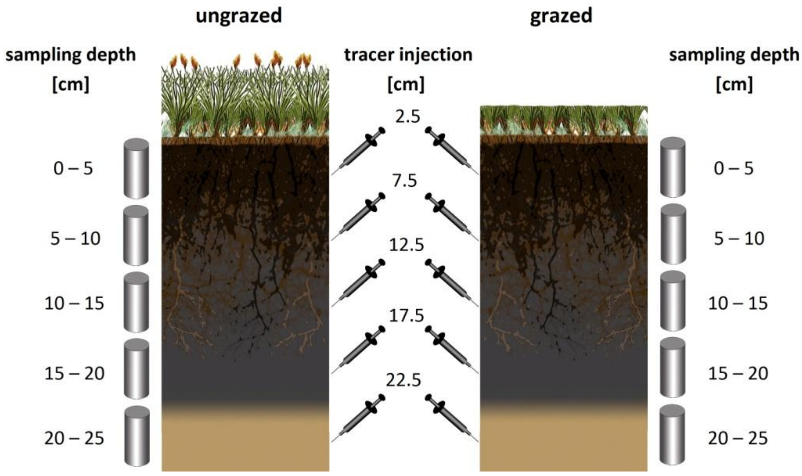

Fig. 6-2: Schematic representation for labeling and sampling on grazed and ungrazed sites of the KEMA research station

6.3. *Kobresia* root mat degradation and morphology

The *Kobresia* root mats is a specific organic horizon consisting of subhorizons allowing excellent adaption to protect against heavy grazing and trampling and contribute to fast recovery of pasture after overgrazing. As prerequisite for further studies on its development, degradation and functions precise morphological descriptions of *Kobresia* root mats are necessary. On this reason soil profiles along a false time chronosequence of degradation stages (6 stages, 4 repetitions) were selected in 2012 at sites of the KEMA research area. The subhorizons of the root mats and the top mineral soil horizons of each degradation stage will be prepared in detail to describe the morphology of the subhorizons including the visual morphological characteristics, separation of living and dead root biomass, C and nutrient (N, P, K, S) contents, natural abundance of ^{13}C & ^{15}N, pH, bulk density, and root density. In addition biomarker studies will be implemented for three degradation stages considering soil samples, living and dead roots and shoots.

The study aimed to identify major drivers for root mat degradation. It is based on the hypothetical idea that undisturbed root mats (1) will be affected by freezing and thawing processes, which cause initial ice cracks (2). As a consequence decomposition of root mat layers will be accelerated (3a) and present cracks will be enlarged. Moreover, small mammals (*Ochotona curzoniae*) will get easy access into the root mats (3b) and thus support an increase of present cracks itself. Finally, cracks will be enlarged by water and wind erosion (4 and 5) until bare soil surface areas without root mat horizons occur (6). The morphology can also help to understand functions of individual root mat layers and allows predicting future changes and degradation by increasing grazing intensity.

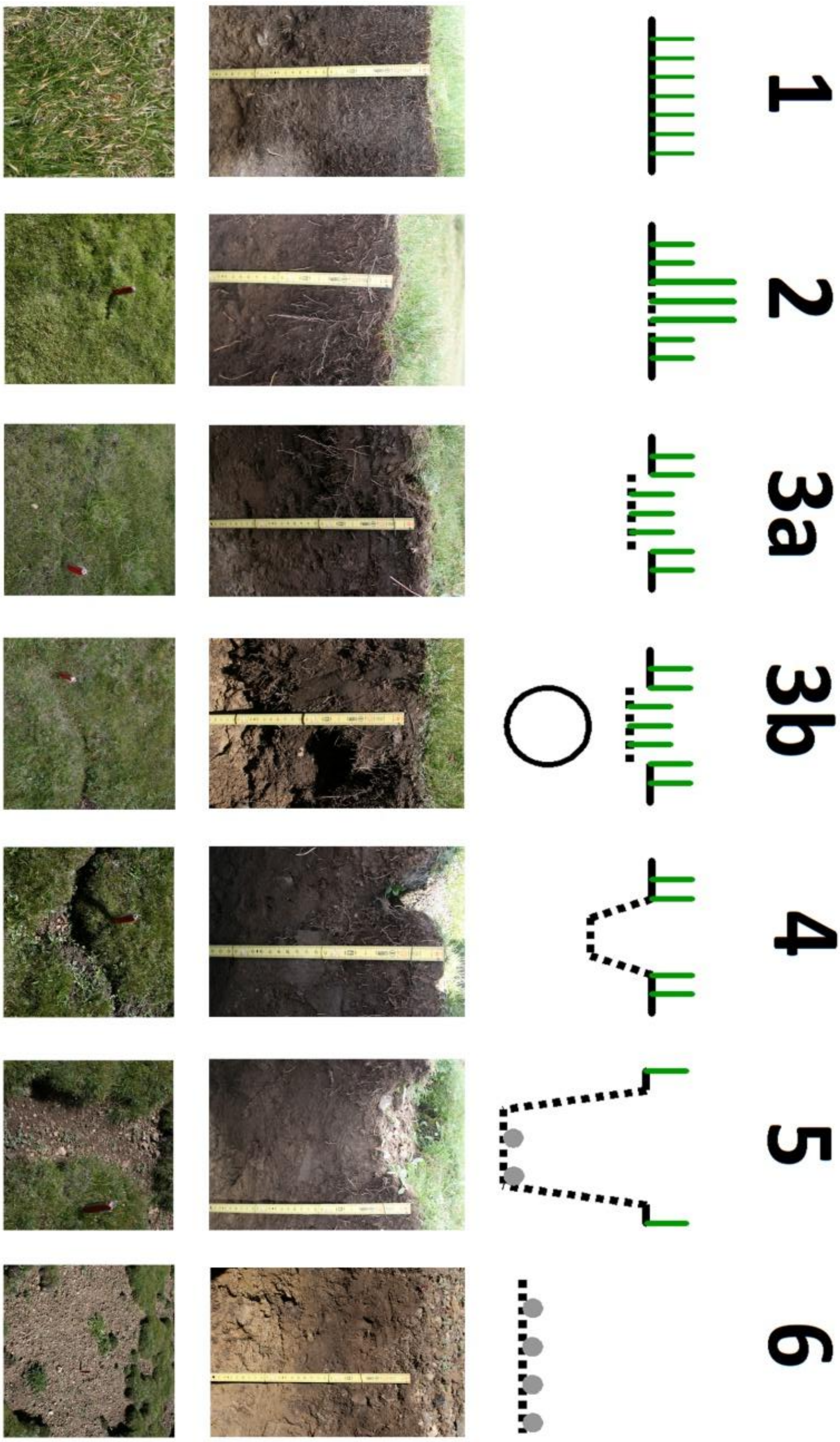

Fig. 6-3: False time degradation sequence of *Kobresia* rot mats on sites at KEMA

7. Soil-Plant water balance & Precipitation manipulation experiment (roof experiment)

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7.1.1. Setup

In 2010, a total of 36 small weighing lysimeters were installed in- and outside the in 2009 fenced area. Out of this 36 lysimeters, 18 were monitored again during the field season in 2012 and 12 were monitored as part of the irrigation experiment conducted in 2012 (chapter 8).

Additional to the already installed lysimeters, in 2012 50 new lysimeters were installed outside the fenced area as part of the precipitation manipulation experiment (roof experiment). Small weighing lysimeters were used to monitor evapotranspiration and infiltration of the *Kobresia pygmaea* vegetation as well as bare soil spots. The lysimeter consist of a Plexiglas tube (15 cm diameter) with a Plexiglas plate glued to the bottom. The bottom plate is covered with a spread bundle of 20 glass wicks (2 mm diameter) leading through a 10 cm long downward pipe (15 mm diameter) into a plastic bottle (Fig. 7-1). Via this hanging water column a suction of 10hPa is applied to soil monolith, thus maintaining a constant drainage.

The gutter roofs of the precipitation manipulation experiment consist of v-shaped Plexiglas sheets, adjusted to a flexible frame allowing the roofs to be swung open for experiments. The roofs were installed 30 cm above ground and hence above the lysimeters. Due to the aim of the experiment, 3 different levels of precipitation were to be simulated: 100% precipitation = control = passage of the complete precipitation; 130% = more precipitation simulated = additional watering to reach 130% of precipitation; 70% = reduced precipitation = due to the orientation of the gutter roof, precipitation was reduced by 30% (Fig. 7-2). The precipitation intercepted by the 70%-roofs was collected in buckets. Around each roof plot, a 10 cm deep trench was dug to keep runoff water away from the lysimeters. Under each roof, 4 subplots were set up, whereupon in 3 subplots lysimeters were installed (Fig. 7-3). Due to the experimental setup, infiltration and evapotranspiration were to be measured and compared between fertilized, unfertilized (control plot) *K. pygmaea* vegetation plots and bare soil. Hence, under each roof one lysimeter each monitored unfertilized und fertilized *K. pygmaea* vegetation as well as bare soil. In total, 20 roofs with 50 lysimeters were installed, their position and dimensions is illustrated in Fig. 2-3. Additional irrigation was done every day of the experiment, additional to the natural occurring precipitation estimated from data from Naqu Weather Station, Chinese Weather Service. Weighing of the lysimeters was conducted six times during the experiment period. The precipitation manipulation experiment ran from August 14th to September 10th 2012. A longer experiment period is planned for the field season 2013.

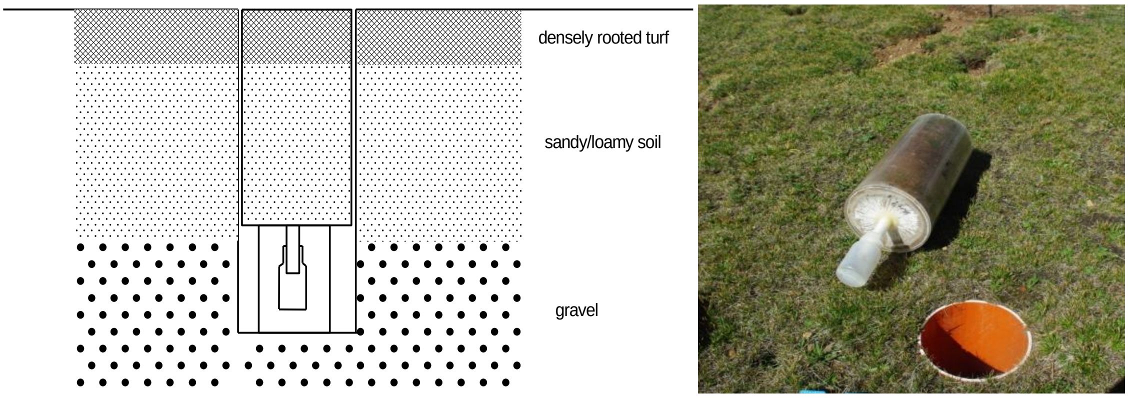

Fig. 7-1: Design and photo of a small weighing lysimeter in normal position. The undisturbed soil monolith is in its original position

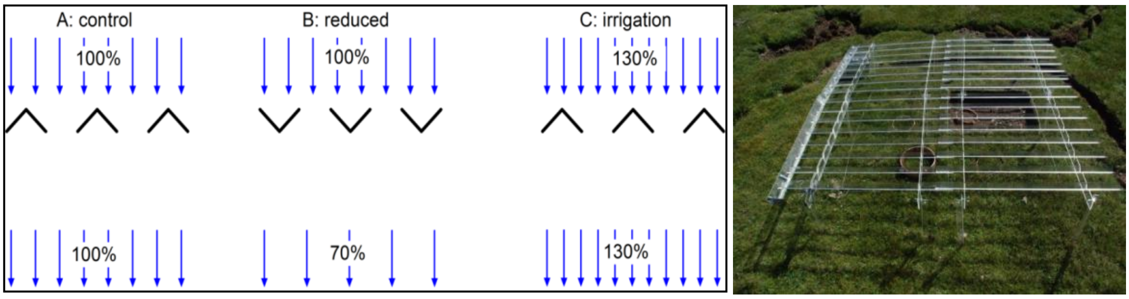

Fig. 7-2: Design and photo of the gutter roofs

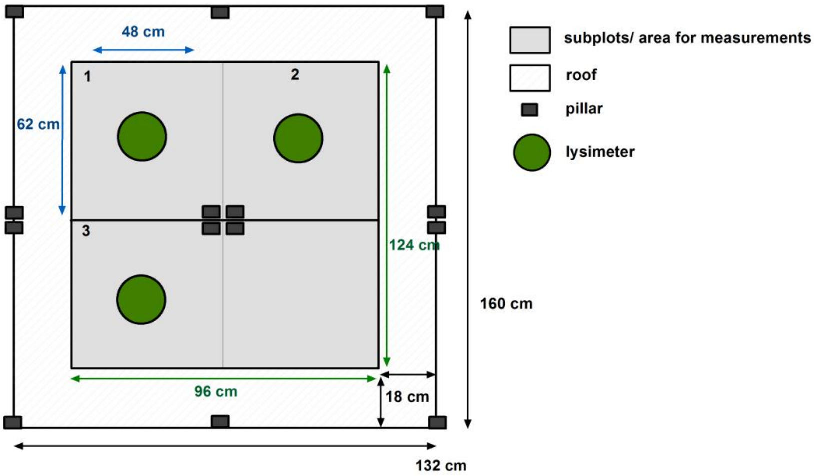

Fig. 7-3: Design and dimensions of the roofs (plots and subplots)

7.1.2. Measurement of the lysimeters installed in 2010

During field season 2012, 18 out of the 36 lysimeters installed in 2010 were monitored and weighed to determine infiltration and evapotranspiration rates. 15 lysimeters were situated in intact *K. pygmaea* vegetation spots outside the fence (control), in Pika exclusion plots, Yak exclusion plots, Yak and Pika exclusion plots to compare different grazing intensities. In order to investigate the evapotranspiration from disturbed soil patches in comparison to undisturbed soil, 3 lysimeters installed in bare soil spots (Yak and Pika exclusion plots) were monitored as well.

Control	4 lysimeters
Yak exclusion	4 lysimeters
Pika exclusion	4 lysimeters
Yak and Pika exclusion	3 lysimeters
Bare soil	3 lysimeters

7.2. Additional Measurements

From August 12th to September 10th 2012, 16 iButtons Thermochrons were installed in the soil in depths of 0 cm, 2.5 cm, 7 cm and 12.5 cm, 4 under each roof type and 4 in the open vegetation as control. Additionally, 4 iButtons Hygrochron were installed as well, 3 under roofs (each roof type 1 iButton) and 1 not under a roof.

7.3. Above and below ground biomass

Above and below ground biomass (necromass and roots) was harvested at the end of the precipitation manipulation experiment in September 2012. Above ground biomass was harvested on all 50 lysimeters under the roofs as well as on the 18 lysimeters installed in 2009. Soil cores (3.3 cm in diameter) for the determination of the root biomass were taken next to the lysimeters under the roofs for depths of 0-5 cm, 5-15 cm and 15-30 cm. All roots in each sample were rinsed from soil particles keeping small root fragments by means of a stack of fine sieves. The root fragments were divided into living and dead roots under a stereo microscope, a method originally developed in the Department of Plant Ecology in Göttingen for separating living and dead tree fine roots.
Before determining necro- and biomass by drying, the root surface area of subsamples was measured with an optical system (WinRhizo, Regent Inc., Quebec, Can).

7.4. Data availability of lysimeter measurements

In 2009 installed lysimeters were weighed at the following days:

18.07.12 11:30	Start
23.07.12 12:00	
26.07.12 13:30	
02.08.12 09:15	
14.08.12 11:35	
03.09.12 10:00	

Lysimeters of roof experiment were weighed at following days:

17.08.12 11:00	Start
22.08.12 11:40	
25.08.12 12:25	
02.09.12 10:50	
07.09.12 11:20	
10.09.12 10:30	

8. Irrigation Experiment 2012

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8.1. Setup and Measurements

On a Yak and Pika exclusion plot, a joint irrigation experiment was established in 2010 in a random block design with 3 treatments and 4 blocks (Coners et al. 2011). In 2012, the irrigation experiment was continued for the lysimeters installed on the plot. All together, 12 lysimeters with intact *K. pygmaea* vegetation were monitored and weighed to determine evapotranspiration and infiltration. Again, 3 treatments were applied, with 4 replications each. The lysimeters were irrigated manually on a daily basis, with 0 mm, 2.5 mm or 5 mm, in addition to the natural the natural occurring precipitation, estimated from data from Naqu Weather Station, Chinese Weather Service. The irrigation experiment started at July 18th and ran until August 30th 2012.

At the end of the experiment, the above ground biomass was harvested and soil cores for root biomass (same depths as precipitation manipulation experiment 7) determination were taken.

Lysimeters of irrigation experiment were weighed at following days:

23.07.12 15:00	Start
26.07.12 12:20	
29.07.12 09:20	
31.07.12 09:25	
05.08.12 10:00	
10.08.12 13:25	
14.08.12 11:00	
19.08.12 12:05	
24.08.12 16:15	
30.08.12 12:10	

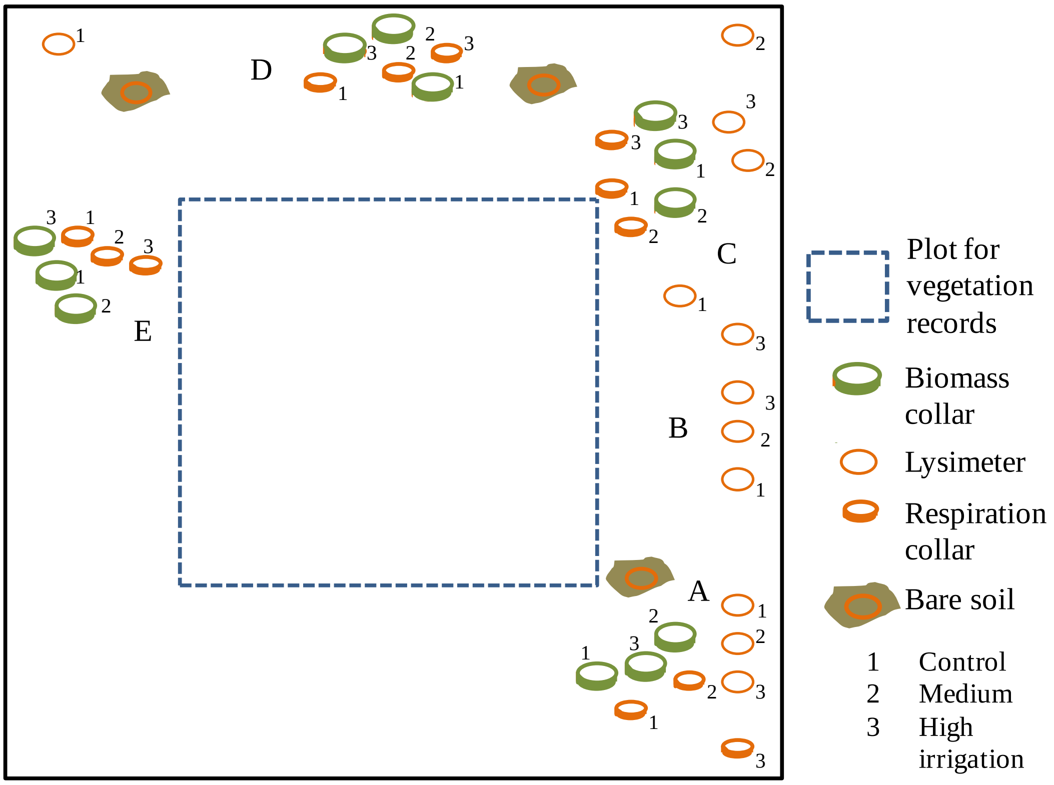

Fig. 8-1: Block design of the irrigation experiment on one of herbivore exclosure plot (Coners et al. 2011)

Fig. 8-2: Photo of the irrigation experiment with 12 lysimeters

9. Data Storage and access

For access to the data and additional information please contact:

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Appendix

A. Weather observations

Weather conditions, cloud amount and cloud species were observed approximately every hour by eye.

Datum	Uhrzeit	Bewölkung	WW-Code	East	South-East	South	South-West	West	North-West	North	North-East
24.07.	17:30	3/8	3	CuM; CiU; CiF	CuM; CiU; CiF	CuC	CuC; Cb	Cs; CuM	CuH	CiU	CiU
25.07.	10:00	6/8	3	AcS; Sc	Cb virga	Sc	Sc	Ci/Cs; Ac; Cu	Ci/Cs; Ac	Ac; Ci	Ac
	11:00	7/8	1	Sc	Sc; Ac/As	Ac/As	Ci; CuC; Ac	Ac/As; Ci	Ac/As	Ac/As	Ac/As
	12:00	6/8	3	Sc; As	Ci; Ac	Ci; Cu	Ci; Ac; Cu	Cu; As	As; Cu	Ci; Sc; As; Cu	Ci; Ac/As
	13:00	6/8	3	CuM; Ci	Sc	Sc	Ac/As; Sc	As; Sc	Cb	Ci; CuC; Cb	CuM; Ac
	14:00	7/8	3	CuC; As	CuC	Ac/As	Ac/As	Nb; Ac/As	Nb; Cu	As; Cb	Cb
	15:00	7/8	3	As/Ac	Ac/As; Cu	Cu; Ci; Ac	CuM; Ac; Ci	CuM; Ac; Ci	Ac/As	Ac	Ac
	16:00	7/8	3	Cb virga	Cb	Cb	As; CuM	As; CuM	CuM virga	CuM	As
	17:00	8/8	3	CuC	Cb	Cb	Cb	Cb	Cb	Cb	Cb
	18:00	8/8	92	Cu	Cb	Cb	Cb	Cb	Cb	As	As
	19:00	8/8	80	Cb	Cb	Cb	Cb	Cb; As	Cb; As	Cb; As	Cb; As
	20:30	8/8	21	Cb	As; Cu	As; Nb	Ac/As	Cb	Cb	Cu; As virga	As; Cu
26.07.	09:00	7/8	0	As; Cu	As	As	As; Sc	Sc	Sc; Ac	Sc; As	Sc; As
	10:00	7/8	20	As virga	As; Cb	As; Cb	Cu	Ac; Cu	Cu; As	Ac/As	Ac/As
	11:00	7/8	20	As; Sc	Ns	Ns	Ns	Ns	Ns	Ns	As
	12:00	8/8	20	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	13:00	7/8	20	Cb	Cb	Cb	Cb	Cu; Ac	Cb	Ns	Ns
	14:00	7/8	3	Ac	Ac/As	Ac/As	Ac/As	Cu; As	Cu; Ns; As	Cu; As; Ns	Ns
	15:00	7/8	3	CuM; As	CuM	CuM; Ac	CuM	Ns	Ns	Ns	Cc
	16:00	6/8	3	CuM	CuM; Ci	CuM; Ci; As	CuM	CuM	Ns	Ns	Cu; Ci; Ac
	17:00	8/8	81	CuM; Ac	CuC	Cu	Cu	Ns	Ns	Ns	CuM; Ac
	18:00	8/8	80	Ns	Ns	CuM; Ns	Ns	Ns	Ns	Ns	Ns
	19:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	20:00	7/8	3	As; Sc virga	As; Sc	As; Sc	Ac/As	Cb mama	Sc	Sc	Sc
27.07.	09:00	8/8	61	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	10:00	8/8	20	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	12:00	8/8	20	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	13:00	8/8	20	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	14:00	8/8	60	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	15:00	6/8	61	CuC; Ci	CuC	CuC	Sc	Ac; CuM	CuM	As; Cu	CuM
	16:00	5/8	3	CuM; Ci	As; Cu	Ci; Cu; As	Cu; Ci	CuC; As	CuM; As	CuM; As	CuM; As; Ci
	17:00	3/8	3	Cu; CuC; Ci	As; Cu	CuC; Ci; As	CuC; Ci; As	Cu; As	CuM	Ci; Cu	Ci; Cu
	18:00	7/8	3	Cu; As; Ci	As	Cu; Ci	CuC virga	CuM; As	Cu; Ac/As	Cu; As	CuM; Ci
	19:00	7/8	3	Cu; As	Ac/As	CuC	CuC	CuC; Cu	Cu; Ac/As	Ci; Ac/As	CuC
	20:00	7/8	3	CuC; Ac	CuC; Cu	Ns	Ns	CuC; As	Ac/As	CuC; As	Ac/As; Cu
28.07.	08:00	6/8	0	As	Ac; Ci	Ac	Ac; Ci	Ac/As	Ac	Ac	Ac
	09:00	5/8	3	Ac	Ac; Ci	Ci; Ac; Cu	Cu; Ac	Ac	As; Ci	Ci; Ac	Ac
	10:00	4/8	3	Ac; CuM	CuM	CuM; Ci	Cu; As	Ac	Ac	CiF; Ac	CuC; As
	11:00	6/8	3	Sc	Sc	Sc	CuC	CiF; Cu	CuM; As; Ci	CuM; As; Ci	CuM; Ci
	12:00	7/8	3	Sc	Sc	Sc	Sc	CuC; Ac	CuC; As	Ac; CuC	Ac
	13:00	6/8	3	Sc	Sc	Sc	Sc	CuM; CuC	CuM; Ci; Ac	CuM; CuC; Ci; Ac	CuM; Ac
	14:00	4/8	1	CuM	CuM	CuM	CuM	CuM	CuM; CuC	CuC	CuM
	15:00	3/8	1	CuM	CuM	CuM	CuM	CuM	CuM	CuM	CuM
	16:00	2/8	1	CuH	CuH	CuH	CuH	CuM	CuM	CuM	CuM
	17:00	3/8	3	CuM	CuM	CuM	CuM	CuH	CuH; Ci	CuH	CuH; Ci
	18:00	3/8	3	CuM	CuM; CuC; Ci	CuC; Ci	CuC; Ci	CuC; CuM; As	CuH; As; Ci	Cu; Ci; As	Cs; Cu
	19:00	4/8	3	Ci	Ci; Cu	Cu; Ci	CuC; Ci	Ci	Ci	Ci	Ci
	20:00	7/8	20	Cu; CuC; As	Cu; As	Cu; As	As	Cb ambos	Cb; Cs	CuC; CiF	CuC; Ci
29.07.	11:00	1/8	0	CuH; Ci	CuH; Ci	CuH; Ci	CuH; Ci	CuH; Ci	CuH; Ci	CuH; Ci	CuH; Ci
	12:00	1/8	3	CuH	CuH	CuH	CuM; Ci	CuH; Ci	CuH; Ci	CuM; Ci	CuH
	13:00	2/8	3	CuM	CuM	CuH	CuC	CuH	CuM	CuM; Ci	CuM
	14:00	2/8	2	CuM	CuM	CuM	CuH	CuM	CuM	CuM	CuM
	15:00	1/8	3	CuM	CuH	CuM; CuH	CuM	CuC; CuM	CuM	CuM; Ci; As	CuM
	17:00	1/8	3	CuH; CiF	CuM; CiF	CuM; CiF	CuM; CiF	CuM; CiF	CuM; Ci; As	CuM; Ci; As	CuM; As
	18:00	1/8	2	CuM	CuM	CuC	CuC	CuC	CiF; As; CuH	Ci/Cs	Cu; Ci
	19:00	3/8	3	CuC; CuM	CuM; CuC	CuH; CuC	CuH; CuC	CuC; Ci; As	As; Ci; Cu	Ci; As	Cu; Ci
	20:00	4/8	3	CuC; Ac	Cu; Ac	Ac	CuC	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac
30.07.	09:00	3/8	0	Ac; Ci	Ac; Ci	Ci	Ac	Ac	Ci	Ci	
	10:00	4/8	3	Ac; Cu; Ci	Ci; Cu	Ci; Cu	Ac; Ci	Ac; Ci	Cs; Ac	Cs; Ac	Ac
	11:00	4/8	3	CuM; Ci	CuC; Ci	Ci; Cu	Cu; Ci	CuC; Ci	As; CuM	As; Cu	Ci; Cu
	12:00	3/8	2	CuM; Ci	CuM; Ci	Ci; CuM	CuM; Ci	CuM; Ci	CuM	CuM; Ci	CuM; Ci
	13:00	3/8	3	CuM	CuM	CuM	CuM; Ci	CuM; Ac; Ci	CuM; CuC	CuM; Ci	CuM
	14:00	2/8	3	CuM; CI	CuM; Ci	CuM; Ci	CuM; Ci	CuM; CuC	CuM; Cs	CuM; Cs	CuM; Cs
	15:00	6/8	3	CuM; Cu	CuM; As; Cs	CuC; Cs	CuC; Ci; As; Ac	CuC; CuM; As; Ac	CuM; As	CuM; As; Ci	Cu; As
	16:00	7/8	3	CuC; As	CuC; As	CuC; As	CuC; As	CuC; As	CuM; As	CuM; As	CuM; As
	17:00	7/8	3	CuM; As; Ci	CuM; As; Ci	CuM; As; Ci	CuC; Ns	CuC; As	CuC; As	CuC; As	CuM; As
	18:00	8/8	20	CuC; Ns	CuC; Ns	CuC; Ns	CuC; Ns	CuC; Ns	CuC; Ns	CuC; Ns	CuC; Ns
	19:00	x	x	x	x	x	x	x	x	x	x
	20:00	8/8	3	CuC; As	CuC; As	CuC; As	CuC; As	CuC; As	Ns	As; Ac	Ac; Ns

31.07.	09:00	8/8	0	As	As	As	As	As	As	As	As
	10:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	11:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	12:00	8/8	3	As	As	As	As	As	As	As	As
	13:00	7/8	3	Cu; As	As; Cc	As; Cu	As	Cu; As; Ci	Cu; As	Cu; Ci	
	14:00	8/8	3	Cu; Ac; As	Cu; Ac; As	Cu; Ac; As	Cu	As; Ac, Cu	CuH; As; Ac	CuH; As; Ac	
	15:00	8/8	2	Cu; Ac	As	As; Cu	Cu; Ac	Cc; Ac	CuC; As	Ac	
	16:00	7/8	3	Cu; Ac	Ac/As	Ac; Cu	Cu; Ac	Cu; Ac	Cu; Ac; As	Cu; Ac	
	17:00	6/8	3	CuM; Ac	CuM; Ac; Cc	Cu; Ac	CuM; As; Ac; Ci	CuH; Ac	Cu; Ac len; Ci	Cu; Ac len; Ci	
	18:00	6/8	3	Ac Lent.; Ci	Ac; CuC	Ac; Ci	Ac; Ci; Cu	Ac; Ci	Ac; Ci; CuH	Ac; Ci	
	19:00	6/8	3	Ac; Ci	Ac; As	Ac; Ci	Ac; Ci	Ac; Ci; CuH	CuH; Ci	Ci	
	20:00	4/8	3	CuH; Ci	Ci	Ci fib; vert.	Cs; Ci fib	Cs; Ci fib	Ac	Ci; CuH	
01.08.	08:00	0/8	0	-	-	-	-	-	-	-	-
	09:00	1/8	3	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci
	10:00	1/8	2	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci	Cc; Ci
	11:00	1/8	3	Cc	Cc	Cc; Ci	CuH; Ac	Ac; CuH	CuH; Ci	CuH; Ci	CuH; Ci
	12:00	1/8	2	CuH	CuH	CuH	CuH	CuH	CuH	CuH	CuH
	13:00	1/8	2	CuH	CuH	CuH	CuH	CuH	CuH	CuH	CuH
	14:00	1/8	3	CuH	CuH	CuH	CuH; Ac lent.	Cu; Ac lent.	CuM	CuH	CuH
	15:00	2/8	3	CuM	CuM	CuM	CuM; Ac	CuM	CuM	CuM	CuM
	16:00	3/8	3	CuM	CuM; Ac	CuM	CuM; Ac frac.	CuM	CuM; CuC	CuM	CuM
	17:00	3/8	2	CuM	CuM; Ac	CuM	CuM; Ac frac.	CuM	CuM; As	CuM	CuM
	18:00	2/8	1	CuH	CuM	CuM	CuM; CuH	CuH; CuM	CuM; As; Ac	Ac; CuH	CuH
	19:00	1/8	2	CuH	CuH	CuH	CuM; CuH	CuC; CuM	CuM	CuH	St; CuH
	20:00	1/8	2	Ac	-	CuH	CuM	CuM	St	CuM	CuH
	21:00	1/8	1	Ac	-	-	Ac	CuM	Ci; Ac und.; As	Ac	Ac
02.08.	08:00	0/8	0	-	-	-	-	-	-	-	-
	09:00	1/8	3	-	-	-	-	Ac	-	-	-
	10:00	1/8	3	Cu	-	-	-	-	Ac	-	Ac
	11:00	1/8	3	CuM			Ac	Ac	Ac	Cu	
	12:00	1/8	3	CuM	CuM	CuM	Ac	CuH	CuH; Ac	CuH; Cc	CuH
	13:00	3/8	3	CuH	CuH; Ci	CuH; Ci; Sc	CuH	CuH	CuM	CuM; CuC; Ac	CuH; CuC; Ac lent
	14:00	2/8	3	CuH	CuC	CuH	CuM	CuH; Ac	CuM	CuM	CuH; CuC
	15:00	3/8	3	CuC; CuH; Ac	CuC; Ac	CuH	CuH	CuM; CuH	CuM; CuH; Ac	CuC; CuM	Ac; CuH; CuC
	16:00	3/8	3	As; CuH	As; CuH	CuH	CuH	CuH; As; Ac	CuM; As; Ac	CuC	Cs neb.; As; Ac
	17:00	x	x	x	x	x	x	x	x	x	x
	18:00	3/8	0	As; Ac	Ac; CuH	CuH, Ac	Cc; CuH	CuC vir.	CuM; CuC vir.	Ac; CuH	CuC; Ac
	19:00	3/8	3	Cu; Ac	Ac	Ac	CuH	Ac vir.	Ac; CuH	Ac	Ac
	20:00	3/8	2	Cu; Ac	Ac	Ac	As	Ac vir.	Ac	Ac	Cu
03.08.	10:00	1/8	0					Ci			
	11:00	1/8	3	Cu	Cu	Cu	Cu	Cu; Ci	Cu; Ci		
	12:00	2/8	3	CuH	CuH	CuH	CuH	Cu	Cu; Ci	CuH	CuH
	13:00	2/8	3	CuH	Cu	CuH	CuC	CuC	CuM	CuM	Cu
	14:00	3/8	3	CuC	CuH; CuC	CuH	Cb	CuC	CuM	CuH	CuH
04.08.	10:00	6/8	0	Sc	Sc	Sc	Sc	Sc	Sc	Sc	Sc
	11:00	5/8	2	Cu; Ci	Cu; Ci	Cu; Ci	Cu; Ci	Cu; Ci	Cu; Ci	Cu; Ci	Cs; Cu
	12:00	4/8	2	CuC; Ci; As	CuC; As; Ci	Cu; Ci	Cu; Ci; As	CuC	Cu	Cu; Ci; As	Cu; Ci; Ac
	13:00	7/8	3	CuC; Ci; As	CuC; Ci; As	CuM; Ci; As	Cu; Ci; As	CuC	CuC; Ac; Ci	Cs; CuH; Cu	CuC; Ci
	14:00	6/8	3	CuC; As	CuC; As	CuC; Ci	Cu; Ci	CuC; Ci	CuM; CuC	Cu; Ac; Cs	CuC
	15:00	6/8	3	CuC; Ac	CuC; Ci	Ci; Cs; Ac	Ac; Ci; CuM	CuM; Ci; As	CuM; CuC vir.	CuC; Ci	CuC; Ci
	16:00	7/8	3	Cu; As; Ac	St; As; CuC	Cs; Ac; CuC	CuC; Ci; Ac; Cs	CuM; Cs	CuM; Cs	Ac; As	CuC; As
	17:00	7/8	3	Ac; As	Ac; As	Cu; Cs	CuC; Ci; Ac	CuC; Ac; Cs	Cu; Ci; Ac	CuC; Cs	As; Ac
	18:00	7/8	3	As	Ac; As; Cu	As; Cu	Ci; CuC; As	CuC; As	Cu; Ci; As	CuC; Ci	As; Ac
	19:00	7/8	3	As	CuC; As	Ac; Cs	CuC; Ac; Cs	Cu; Ac; Cs	Ac; Cs	CuC; As; Ac	As; Ac
	20:00	7/8	3	As; CuC	Ac; CuC	As; Cu	Cu; As	Cu; As	As; Cu	CuC; As	CuC; Ac
05.08.	08:00	3/8	0	Ac, Cu; Ci	Cu; Ci	Ac	Ac	Ac; Ci	As	As; Ci	Ac
	09:00	3/8	3	Ac; Ci	Ac	Ac	Ac, Cu	Ac, Ci; Cu	Ac; Ci; Cu; As	As; Ci	Ac; Ci
	10:00	6/8	3	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As
	11:00	7/8	80	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As
	12:00	7/8	3	Ac; As	Ac; As	Ac; As	CuC; As; Ac; Ci	Ac; CuC; Ci	Ac, CuC; Ci	Ac; Cu	Cu; Ac
	13:00	7/8	2	Ac; As	Ac; As	Ac; As	CuC; As; Ac; Ci	CuC; Ci; Ac	Cu; Ac, As	Ac; Cs	Ac; As vir.
	14:00	7/8	2	Ac; As	Ac; As	Ac; As	Ac; As; Ci	Ns	Ac; As	CuC; Ac	Ac
06.08.	10:00	5/8	0	Ac; Cu; As	Ac; As	As; Cu	Cu; Ac	Cu;	Cu; Ac; Ci	As	Ac; As
	11:00	3/8	2	Cu; Ci	Cu; Ci	Cu; Ci	Cu	Cu	Cu; As; Ci	Ci; Cu	Cu; Ac
	12:00	4/8	3	Ci unc.; Ac len; CuC; CuH	Ci fib.; CuC; CuH	Ci fib; CuC; Sc	CuH; CuC; Ci fib	Sc vir; CuH; CuC	Ac lent; Ci fib; CuC	Ci fib; CuH; CuC	CuC
	13:00	5/8	3	Ac; Cs; CuH	Ci fib; CuC; Ac	Sc; CuC	Cb vir, preacip	CuH; CuC; Cs	Cs; CuH; CuC	Ci fib; CuH; CuC; Ac	CuC;
	14:00	8/8	3	As; Cu	As; Ac	As; Ac; Cu	As; Ac	As; Ac	As	As	As; Ac
	15:00	8/8	2	As; Ac; Cu	As; Ac	As; Ac; Cu	As; Ac	As; Ac	As	As	As; Ac
	16:00	7/8	1	CuC; Ac; As	Sc; Ci	Ci; Ac	Cc; Ci; Ac; CuC	As vir	As; Cu; Ac	As	As
	17:00	7/8	3	Ac; Ci; As	Cu; As; Ci	Ci; Cu	CuC; Ci	As	As; Cu	As	As
	18:00	6/8	1	Ac; As; Cs	Ci; CuC; St	Ci; CuC; Ac	Ac; Cs	As; Ac	As; Cu	Ac; Cs	Ac; Cs
	19:00	8/8	3	Ac; As; Cu	Cs; Ac; Cu	Cu; Ac	As; Cu	As; Cu	As; Cu	Ac; Cs	Ac; Cs
	20:00	8/8	2	Cs; Ac	Cs; Ac	Cu; Cs; Ac	Cu; As	As; Cu	As; Cu	Cs; Ac	As; Cs

07.08.	09:00	6/8	0	Cu; Ac; Ci	Cu; Ci	Ac; Cs	Cu; Ac; Cs	Ci; Ac	Cu; Ac; Ci	Ci; Ac	Ci; Ac; Cu
	10:00	7/8	3	CuC; Ci	Cu; Ci	Cu; Ac; Ci	Cu; Ci	Cu; Ci	Cu; Ci	Ci; Cu	Cu; Ci
	11:00	6/8	2	Cu; Ci	Cu; Ci	CuM; Ci	CuM; Ci	CuH; Ci	CuH; Ci	CuH; Ci	CuH; Ci
	12:00	5/8	3	CuC; Ci unc.	CuM;	CuC; Ci fib	CuC; Ci fib	CuM; CuC; Ci fib	CuM; CuC; Ci	Cs fib; CuM; CuC	Cs fib.; CuM; CuC
	13:00	4/8	2	CuC	CuC; Cs fib	CuC; Ci fib	CuC; Ci	CuM; CuC	CuM; CuC; Ci	CuM; CuC; Ci	CuC
	14:00	5/8	3	CuC	CuC	Cb	CuC	CuM; CuC; Ci	Cb; CuM; Ci	CuC	CuC
	15:00	7/8	3	Cu; Cs	Cu; Ci	Cb; Cu; Ci	Cu; Ci	Cu; Ci	Cu; Ci	CuC	CuC
	16:00	7/8	2	Cu; Cb	Cu; Ci	Cb	Cb	Cb	Cb; Cu	Cb; Cu	Cb
	17:00	7/8	3	CuC; As	CuC; Ci	Cb	Cb; Cu	Cb; Ac	Ac; As	Ac; As	Ac; As
	18:00	7/8	3	Ac; Cu; Ci	Ac; As	Ac; As	As neb; Ac	Ac; As opa.	Ac; Cb	Ac; As	CuC; Cs fib; As
	19:00	8/8	3	Cu; As	Ac; As	Ac; As	Ac; As	Ac; As	Ns; Ac	Ac; As	Ac; As
	20:00	8/8	2	Ac; As	Ac; As	Ac; As	CuC; Ac; As	Ac; As	Ac; As	Ac; As	Ac; As
09.08.	09:00	1/8	0	Ci	Ci	Ci	Ci	Ci	Cs; Ac	Ci	Ci
	10:00	1/8	3	Ci; CuH	Ci; CuH	Ci	Ci	Ci	Cs; CuH; CuC	Ci	Ci
	11:00	1/8	3	Ci fib; CuC	Ci fib; CuH	Ci fib; CuH	Ci; CuH	Cs; Ci; CuH	Cs; Ci; CuM; CuC; CuH	Cs; CuH	Ci; CuH
	12:00	1/8	2	Ci fib; CuC; CuH	Ci fib; CuH	Ci fib; CuH	Ci; CuH	Cs; Ci; CuH	Cs; Ci; CuM; CuC; CuH	Cs; CuH	Ci; CuH
	13:00	2/8	3	CuC; Ci fib; CuM	CuC; Ci	Ci; CuH; CuM	Ci; CuH; CuC	Ci; CuM	Cs; Ci; CuM; CuC; CuH	CuC; Ci; Cs	CuM; CuH; Ci
	14:00	2/8	3	CuH; CuM; CuC	CuM	CuM; Ci fib	CuM; Ci fib	CuM	CuH; Ci; CuM	Ci	CuH; CuM; Ci
	15:00	3/8	3	CuM; CuH; Ci	CuM; Ci	CuM; Ci	CuM	CuM; CuC; Ci	CuM; Ci	Ci; CuH; CuC	CuC; CuH; Ci
	16:00	3/8	3	CuM; CuH	CuC; Ci; CuH	CuM; CuH	CuM	CuC; CuM; CuH	Cs; CuC; CuH	CuH; CuM; Ci	CuM; Ci
	17:00	3/8	3	CuM; CuC	CuM; CuH	CuC; CuM	CuC; CuM; CuH; Ci	CuM; Cs; CuC	CuM; CuH	CuM; CuH	CuM; CuH
	18:00	3/8	3	CuH	CuM	CuM	CuM; Ci	CuM	CuM; Ci	CuM; Ci	CuM
	19:00	3/8	3	CuM; CuH; Ci	CuH	CuM; CuH; CuC	CuH; CuM	CuM; CuH	CuM; Ci; CuH	CuH; Cs	Cs; CuH
10.08.	08:00	1/8	0	-	-	Ci fib	Ci fib	Ci fib	Ci fib	Ci fib	Ci fib
	09:00	1/8	3	Ci	Ci	Ci	Ci	Ci	Cs	Ci	Ci
	10:00	1/8	2	Ci	Ci	Ci	Ci	Ci	Cs	Ci	Ci
	11:00	1/8	3	CuH; Ci	CuH	CuH; Ci	Cu	Ci	Ci; CuH	Ci	Ci
	12:00	1/8	3	CuH	CuH	CuM	CuM	CuH; Ci	Ci; CuM	CuH; CI	CuM; Ci
	13:00	1/8	2	CuH	CuH	CuM	CuM	CuM	CuM; CuH	CuH; CuM; Ci	CuM; Ci; CuH
	14:00	3/8	3	CuM; CuH	CuC; CuH	CuM; CuC	CuM; CuC	CuM; CuH	CuM; CuH; Ci	Cb; CuH	CuM; CuH
	15:00	1/8	1	CuM; CuH	CuH; Ac	CuC; CuH	Ac; CuC; CuM	CuM; CuH	CuM; CuH; Ci	Ci; CuH	CuH; CuM; Ci
	16:00	2/8	3	CuM	CuC	Cb	Cb	CuC; CuC	CuH; CuM	CuH	CuH; Ac
	17:00	5/8	3	CuM; Ac; As	Ac; As; CuH	Cb vir	Cb; Ac; As; Cu	Ac; CuM	CuC; CuM; CuH	Ci; CuH	CuC; Ci; CuH
	18:00	7/8	65	CuM; Ac; As	Ac; As; CuH	Ac; As	Ns	Ns	CuM; CuH; As	Sc	As
	19:00	7/8	2	CuM; Ac; As	Ac; As; CuH	Ac; As	Ns	Ns	CuM; CuH; As	Sc	As
	20:00	7/8	3	Ns	Ns	Ac; As	Ac; As	Ns	CuM; Ac	Ac; As	Ac; As
11.08.	08:00	7/8	0	Ac	Ac	Ac	Ac	Ac; CuH	Ac; CuH	Ac	Ac vir
	09:00	7/8	3	Ac; As	Ac	Ac	Ac	Ac; As	Ac; As	Ac	Ac
	10:00	5/8	2	CuM; Ci; Ac	Ci; Ac	Cu; Ci; Ac	Cs; Ac	Ci; Ac	Ac; Cs	Ac	Ac
	11:00	3/8	2	CuM; Ci; Ac	Cu; Ac; Ci	Cu; Ac	Ac; Cu	Cu	CuM	Cu; Ac	CuH; Ac
	12:00	5/8	3	CuM; Ci; Ac	Cu; Ac; Ci	Ci; Cu	Cu; Ci	CuH; Ac	Ac; Cu; Ci	Cu; Ac	CuM; Ac
	13:00	6/8	3	CuM; Ac; Ci	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac; Ci	Cu; Ac	Cu; Ac	Cu; Ac; Ci
	14:00	7/8	81	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	15:00	7/8	20	CuC; Ac	Cb	Cb	Ns	Ns	Ns	Ns	Cu; Ac; As
	16:00	3/8	2	CuC; Cb; Ac	Cb	CuC	Cb	Cb	Cb; Ac	Cu; Ac	Cu; Ac
	17:00	x	x	x	x	x	x	x	x	x	x
	18:00	7/8	3	As; Ac	Ns	Ns	Ns	CuC; As		Ac; As; Ns	CuC; As; Ac
	19:00	8/8	3	Ns	Ns	Ns	Ns	Ns	As; Ac; Cu	Ns	Ns
13.08.	09:00	1/8	0	Ac	Ac	Ac	Cu	Ac	As	-	-
	10:00	2/8	3	Ac; Cu	Ac; Cu	Ac; Cu	Cu	Ac; Cu	CuM; Ac; As	Ac	-
	11:00	5/8	3	CuM; Ac	Ac; Cu	Ci; Cu	Cu	Cu	Cu	Cu	Cu
	12:00	6/8	3	CuM; Ac	Ac; Cu	Cu	Cu; Ac	CuM	CuM	Cu	Cu
	13:00	6/8	80	x	x	x	x	x	x	x	x
	14:00	7/8	3	Sc	CuC; Ac	CuC	CuM	CuC; CuH	CuM	CuC	Cb
	15:00	7/8	2	Sc	CuM	Cb	CuM; Sc	Cu; Ac	Sc	Cb	Cu; Ac
	16:00	x	x	x	x	x	x	x	x	x	x
	17:00	5/8	3	CuM; CuC	CuM; CuC	Ac; CuC	CuC; Cu	CuM; CuC	Cu; As	CuH; CuC; Ci	CuC
	18:00	5/8	3	CuM; CuC vir	CuC vir	CuH; CuC	CuC	Ci; CuC	Cb	CuH	Cu vir
	19:00	5/8	2	CuM; CuH	CuC vir	CuH; CuC	CuC virga	Cb	Cb	CuH	Cu vir
	20:00	5/8	2	CuH; CuM	CuH		Cb	Cb	Cb	Cu	CuC
14.08.	09:00	1/8	0	Ac	-	-	-	Ac	Ac	-	-
	10:00	1/8	3	Cu	Ac	Ci; Cu	Cu	Ac	-	-	-
	11:00	1/8	3	Ci; Cu	Cu	CuC; Ci	CuC; Ci	CuH	Cu	Ci	Ci
	12:00	1/8	3	Cu	CuH; CuC	Ci; Cu	Cu	CuH; Cu	CuH; CuC	Ac; CuH	CuC; CuH
	13:00	2/8	2	CuC; Ac	Ac; CuC	CuC	CuH; CuC	CuH; CuM	CuM; CuC; Ac	CuH; CuM	CuC; CuH
	14:00	2/8	2	CuC	Ac; CuC	CuC vir; Ac	Ac, CuC	CuH; CuM	CuC; CuM	CuC; CuH	CuC
	15:00	4/8	3	CuC	CuC	CuC vir; CuM	CuC; Cu	Cb; CuM	CuM	CuM; CuH	CuC; CuH
	16:00	5/8	3	CuC	Cb	Cb	Cb	Cb	Cu; Cb; Ac	CuM; CuH	Cu; Ci; CuH
	17:00	7/8	95	CuC	Ac; Cb	Cu; Ac	Cu; Cb	Cb	Cb; Ac	Cb; Cu	Cb; Cu
	18:00	7/8	3	Cu; Cb	Cu	Cb	Cb	Cb; Ac	Cu; Ac	Cb	Ac; Cu
	19:00	7/8	2	CuC	Cb	Cb; Ac	Ac; Cb	Cb	Ac, As	CuC; As	Cb; Ac
	20:00	7/8	2	As; Ac	As; Ac	As; Ac	As; Ac; Ci	Cb vir	Ac; As	As; Ac; Cu	Cu; As; Ac; Ci

15.08	10:00	1/8	0	-	Ac; Ci	Ci	CuH	CuH; Ac	Ac	Ac; CuH	Ci
	11:00	1/8	3	-	CuH	CuH; Ci	CuH; Cu	CuM	Ac; CuH	Ac; CuH	Ac; CuH
	12:00	2/8	3	CuH	CuH	CuH; CuM	CuM	CuM	CuM; CuC; CuH	CuM	Ac; CuM
	13:00	3/8	3	CuC; CuH	CuC; CuH	CuC; CuH; CuM	CuM; CuC	Ac; CuM	CuM; CuC vir; CuM	CuC; CuH	CuH; CuC
16.08.	10:00	6/8	0	Cu; Ci; Cs	Ci	Ci	Ci; Ac	Ci	Ci; Ac	Ci	Ci
	11:00	6/8	3	Cs; CuH;	Ci; Cu; Ac	CuC; Ci	CuC; CuH;Cs	Ci; Ac	Cu; Ac; Ci	Ci	Cs
	12:00	6/8	3	Cs; CuH;	CuC; Cb; Cs	Cb; CuC; Ci	CuC; Ci	CuM; Ci	CuC; CuM; Ci	Ac; CuC; Ci	Cb; CuC; Cu; Ci
	13:00	7/8	3	CuC; Cs	Cb	Cb; Cu	Cb vir; Cu	CuM; Cs	Cb; CuH; Ci	Cb; Ci; CuH	Cb; Ci; CuH
	14:00	8/8	3	CU; Ac; Cs	Cb; Ac	Ac vir; Cs	Cb vir	Cb vir.	CuM; As	CuH; Cs; CuC	Cb vir
	15:00	7/8	3	Cu; Ac; Cs	Ac	Cu; Ac	Cu; Ac	Cu; Ac	CuM; Ac	Cu; Ci	Cu; Cs
	16:00	x	x	x	x	x	x	x	x	x	x
	17:00	5/8	3	Cu; Ac	Cu; Ac	Cu; Ac	Ac	Ci; Ac	CuM; Ac	Cu	Cu; Ac
	18:00	x	x	x	x	x	x	x	x	x	x
	19:00	7/8	3	As; Cu	Cu; As	Cu; As	Cu; Ac	Cu; Ac	CuC; Ac; Ci	Cu; Ac	Cu; Ac
	20:00	8/8	3	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Ac; As	Cu; As; Ac	As; Ac
17.08.	10:00	7/8	0	Cu; Ac	Ac	Cu; Ac	Cu; Ac	Ac	Ac; Cu	Ac	Ac
	11:00	7/8	3	Cu	Ac	CuC; Ac	Cu; Ac	CuH; Ac	CuM; Ci; Ac	Ac	Ac
	12:00	6/8	3	Ac; Cu	Ac; Cu	CuC; Ac	Ac; CuM	CuC	CuM	Ci; Cu	CuM; Ci
	13:00	7/8	3	CuC; CuM; Ci	Ac; Cu	CuC	CuC	CuC; Cb vir	CuM	CuC; CuM	CuM
	14:00	6/8	3	Cu; Ci	Ac; Cu	CuC; CuH	CuC; Ci	CuM; CuH; CuC	CuM	CuM	CuC; CuM
	15:00	7/8	3	Ac; Sc	As; Cu	As; Cu	Cu; As	Cu; As	CuM; Ci; CuC vir	CuC	CuC
	16:00	7/8	2	Sc	As; Cu	As; Cu	Cu; As	Cu; As	CuM; Ci; CuC vir	CuC	CuC
	17:00	8/8	3	CuC vir	Ns	CuH; As	As; Cu	As; Cu	Sc	As; Cu	CuC
	18:00	8/8	2	Cu; Ns	Ns	Ns	As; Cu	Ac; Cu	Cu; Ac	As; Cu	Ns
	19:00	8/8	58	Ns	Ns	As; Ac	As; Ac	As; Ac	Ns	Ns	Ns
	20:00	8/8	58	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
18.08.	08:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	09:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	10:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	11:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	12:00	7/8	1	Ns			As; Ac				
	13:00	7/8	3	Sc	Sc	Sc	Cu; Sc	Sc	Sc	Sc	Sc
	14:00	x	x	x	x	x	x	x	x	x	x
	15:00	7/8	3	Sc;	Cu	Cu	Sc	Sc	Sc	Sc	Sc
	16:00	7/8	3	Cu; Ac	Sc	Sc	Sc	Sc	Cu; Ac	Sc	Sc
	17:00	7/8	3	Cu; As	Cu	Cu	Cu	Cu	Cu	Sc	Ac; As
	18:00	7/8	3	Ac; Ci	Cu; Ci	Cu	Cu	Cu	As; Cu	As; Cu	Cu; As
	19:00	8/8	3	Ac; Cs	Ac; Cs	Ac; Cs; Cu	Ac; Cs; Cu	Ac; Cs; Cu	Cu; As	Ac; Cs	Cs; Ac
	20:00	8/8	3	Cs; Ac	Cs; Ac	Cs; Ac; Cu	Cs; Ac; Cu	Cs; Ac	Cu; As	Ac; Cs	Cs; Ac
	21:00	6/8	2	Ac; Ci	Ac; Ci	Ac; Ci	Ac; Ci	Ac; Ci	Ac; Ci	Ac; Ci	Ac; Ci
19.08.	08:00	1/8	0	-	Ci	Ac; Cs	Ac	-	-	-	-
	09:00	1/8	2	-	-	-	CuH	CuH	CuH	-	-
	10:00	1/8	3	CuH	Ci	CuH; Ac; CuC	CuH; CuC	CuH; Ci	CuH	CuH	CuH
	11:00	2/8	3	CuH	-	CuC; CuH	CuC; CuH	CuH; Ci; CuC	CuM	CuH	CuC
	12:00	2/8	2	Cu; Ci	Ci; Cu	CuH; CuC; Ci	CuH; Ci	CuH; Ci	CuM	CuH	CuC
	13:00	2/8	3	Cu	Ci; Cu	CuH; Ci	Cu; Ci	Cu	CuM	CuM	CuH
	14:00	2/8	2	-	CuH	CuH; CuC	CuH; Ci	CuH; Cs	CuM; CuH	Cs; CuH	Ci; CuH; CuC
	15:00	3/8	3	Cc	-	CuC	CuH	CuC; CuH	CuH; CuM; Cs	Cs; CuH	Ci; CuH
	16:00	3/8	3	Cs	CuC; Cu frac	CuC; Ac; CuH	Cc; Cu	CuH; Cs	Ci; Cs; CuH; CuM	Ci; CuH	CuH; Cs
	17:00	3/8	2	Cs; CuH;	CuC; Ci	CuC; Ci	Cu; Ci	CuH; Cs	Ci	Ci; CuH	CuH; Ci
	18:00	3/8	3	Ci	Ci; Cu	Ci; CuH	Ci; CuC; Cuh	CuC; Ci	Ci; CuH	Ci; CuH	Ci
	19:00	3/8	3	Ci; Ac	Ci	Ac; Ci	Ac; Cu; Ci	Cs, CuH	Ac; As; Ci	Ac; Ci	Ci
20.08.	09:00	8/8	0	Sc	Sc	Sc	Sc	Sc	Sc	Sc	Sc
	10:00	8/8	2	Sc	Sc	Sc	Sc	Sc	Sc	As	Ac
	11:00	8/8	2	Sc	Sc	Sc	Sc	Sc	Sc	As	Ac
	12:00	8/8	2	Cu; As	Cu; As	Cu; As	Cu; As	Cu; As	Cu; As	Cu; As	Cu; As
	13:00	8/8	2	Cu; As	Cu; As	Ac; As	As; Cu	Ns; Cu	Ns; Cu	Cu; As	Cu; As
	14:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	15:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	16:00	8/8	81	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	17:00	8/8	81	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	18:00	8/8	80	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	19:00	8/8	60	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	20:00	8/8	60	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns

21.08.	08:00	7/8	3	Ns; Sc	Ns; Sc	Ns; Sc	As	Ns; Sc	Ns; Sc	Ns; Sc	Ns; Sc
	09:00	8/8	1	Ns; Sc	Ns; Sc	Ns; Sc	Ns; Sc	Ns; Sc	Ns; Sc	Ns; Sc	Ns; Sc
	10:00	7/8	2	Sc	Sc	Ac; Cu	Ac; Cu	Cu	Ac; Cu	Ac; Cu	Ac; Cu
	11:00	7/8	3	Cu; Ac; Ci	CuC; Ci	Ci; Cc; Ac	As; Cu; Cc	Sc	CuM	CuM	CuH; Ac
	13:00	6/8	2	Cu; Ci	Ci; CuH; CuC	Ci; CuH	Ci; CuH; CuC	CuM	CuM; CuC	CuC; Cu frac	CuC; Cu frac
	14:00	5/8	2	CuH; Ci; CuC	Ci; CuH	Cs; Ci; CuH; CuC	CuH; CuC; Ci fib	CuC; CuM	CuM; CuC	CuC; Cu frac	CuC; Cu frac
	15:00	5/8	2	Ci; CuH	Ci; Cs; CuH	Cs; Ci; CuM; CuC	CuM; Ci	Ci; CuM	CuM; Cb vir	CuC; CuH	CuC; CuH
	16:00	6/8	3	CuC	CuH; Ci	Ci; CuC; CuM	CuM; Ci	CuC; CuM	Ac; CuM; Ns	Ac; CuC	CuC
	17:00	7/8	60	CuC	CuC; Ci	CuC	CuC	CuC; Ac	CuC; Ac; Ci	Ci; Cu	Cu; Ci
	18:00	7/8	3	Ac; CuC; Ci	CuH; Cs; Ci	Ns; Cb	Ns; Cb	Cb	Ac; CuC; Ci	Ci; Cu	Cu; Ci
	19:00	7/8	3	Ac; Cu	Ac; Ns	Ac; As	As	Ac; As	Ac; As	Ac	Ac
	20:00	7/8	3	Ac; Cu; Ci	As; Ns; Ci	Ns	As; Cu	Cu; As	CuC	Ac	Ac
22.08.	08:00	5/8	0	Cu; Ac	Ac	Ac, Cs	Ci; Ac	Ac; Cs	Ac lent	Ac lent	Ac
	09:00	7/8	3	Sc	Sc	Sc	Sc	Sc	Sc	Sc	Sc
	10:00	6/8	2	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac	Ac; Cu
	11:00	7/8	3	CuC; Cu	Cu; Ac	Cu; Ac	CuC	CuH; Ac	CuM	CuM; CuC	CuM
	12:00	5/8	21	CuC	CuC	CuC	CuM; Ac	CuM	CuM; Ac	CuM; Ac; CuC	CuM; CuC
	13:00	5/8	2	CuC	CuC; Ac	CuC	CuC	CuM; CuH	CuM; Ac	CuC; CuH	CuC; CuH
	14:00	5/8	2	CuC	CuC; Ac	CuC	CuC	CuM; CuH	CuM; Ac	CuC; CuH	CuC; CuH
	15:00	7/8	3	CuC; CuM; Cc	CuC; CuH; Cc	CuC; Sc	Sc; CuC	Cs; CuC	CuC; Ac; Cc	CuH; Cc; CuC	CuH; CuC
	16:00	7/8	3	CuC; Ac; Ci	CuC, Cs	Ac; CuC; CuH	Sc	CuC; CuH; Cs	CuC vir	CuC; CuM; CuH; Ac	CuC; Cc
	17:00	7/8	81	Cu	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	18:00	6/8	3	Ns	Ns	Ns	Ci; Ac; Cu	Ci; Ac; Cu	CuM; Ci	Ci; Ac; CuC	Ns; Ac; CuC
	19:00	3/8	1	Cb	Ac; Cb	Ac	Cc	Ac	Ci; CuM; CuC	CuC; Ac	Cb; Ac
	20:00	1/8	1	Ac	CuC	Ac	Ci	Ci	CuC; Ac		Cb
23.08.	08:00	7/8	0	Ac	Ns	Ns	Ns	Ns	As; Ac	Ac	Ac
	09:00	6/8	2	Cu; Ac	Ac	Cu; Ac	Ac	Ac	Ac	Ac	Ac
	10:00	6/8	3	Cu; Ac	Ac	Cu; Ac	Cu; Ac	Cu; Ac	Cu; Ac	Ac, CuM; Ci	Ac; Cu
	11:00	6/8	3	CuC; Ac	Ac; Cu	CuC	CuC	As; Cu	CuM; Ac	CuM; Ac; CuC	Ac; Ci
	12:00	5/8	3	CuC; Ac	CuC; Ac; Ci	Cu; Ac, Ci	CuC; CuM	CuC; CuM	CuM; Ci	CuM; Ci	CuM; Ci
	13:00	5/8	3	CuC; CuH	CuC; Ci; CuH	CuC; Ci	CuH; CuM	Cb; CuH	CuH; Cb	CuC; CuH	CuH; CuC
	14:00	7/8	3	CuC; CuH	Ci; CuC; CuH	CuC; CuH	Cc; CuC	Cb	Cb; CuCM; Ac	Cb vir	CuC
	15:00	7/8	3	Cb	Cb; CuC	As; CuC	As; CuC	Ac, Cc; Cs	Cc; Ac; CuC	CuC; Ac	Cb
	16:00	2/8	2	Cu	CuC; Ci floc	Ac, CuC	Ac; CuC	Cu; CuC	Cb		Cu; Ci
	17:00	7/8	60	CuC	Cb	Cb	Cu	Cb			
	18:00	3/8	1	Ac; Cc	Ac	CuC; Ac	Ac; CuC; Cb	CuC; CuH;	CuM; Ac	CuC; Ac	CuC; Ci; Ac
	19:00	2/8	1	Cc	CuH; Ac	Ac	CuC; Ac	CuC; Ac	Ac, CuM	CuC; Ac	CuH; CuM
	20:00	1/8	1	-	-	-	Ac	CuH; Ac	Ac vir	CuC	Ac; CuC
24.08.	08:00	1/8	0	CuH	-	-	-	-	-	-	Ac
	09:00	2/8	3	CuH; Ac	Cu	-	-	-	-	-	-
	10:00	1/8	1	CuH	-	-	-	Ac	-	-	-
	11:00	1/8	3	-	-	CuC; CuH	CuH	CuH	Ac, CuM	CuH; CuC	CuH
	12:00	2/8	3	CuH	CuC; CuH	CuC	CuC	CuH; Ac; CuC	Ac; CuH; CuM	Ac; CuC; CuH	CuH
	13:00	4/8	3	CuH; Ci; Ac	CuH; CuC	CuC; CuH; Ac	CuH; CuC	CuC; CuH	Sc; Cb vir	Cb vir	CuH; CuC
	14:00	6/8	3	Ac; CuC	CuC	CuC; CuH	Ac; CuC	CuC; Ac; As	Sc; Cb vir	CuC; Ac; As	CuC; Ac
	15:00	5/8	1	Ac	Ac; Ci; CuH	CuC; Ac	Ac; CuC	CuC; Ac	CuM; Ac	Ac; CuC	CuC; Ac
	16:00	3/8	1	Ac; CuM; CuH	CuC; CuH	CuH; CuC	CuC; Ac	CuM; Ac	Ac; CuM	CuC; Ac	CuC
	17:00	x	x	x	x	x	x	x	x	x	x
	18:00	3/8	3	Ac; As; CuH	Ac; As; CuC	CuH	CuC; CuH	Ac	Ac; CuC	Ac; CuC	Ac; CuH
	19:00	2/8	1	Ac	Ac	Ac	CuC; Ac	-	CuH; Ac	Ac; CuH	Ac; CuH
	20:00	2/8		Ac	-	-	Ac	Ac	Ac	Ac	Ac
25.08.	09:00	1/8	0	Ac	-	-	-	-	-	Ac	Ac
	10:00	1/8	3	Ac; Cu	-	Cu	-	-	-	Ac	Ac
	11:00	1/8	3	CuH	Cu	Cu	Cu	Cu	Ac; Cu	Ac; Cu	Ac; Cu
	12:00	1/8	3	CuH; CuC	CuC	Ac; CuC	CuH	CuH	Ac; CuC	Ac; CuC	Ac; CuH
	13:00	3/8	3	Ac; CuM	CuC; CuH	CuM	CuM	CuC; CuH	CuC; CuH	CuM; Ac	CuH
	14:00	3/8	3	Ac; CuM	Ac; CuM	CuC; CuH	CuM	CuH	CuM	CuM	CuM
	15:00	3/8	2	CuM	CuH; CuC	CuH	CuM	CuM	CuM	CuM	CuH; CuC
	16:00	3/8	2	CuM	CuM; CuH	CuH; CuM	CuM	CuM; CuH	CuM	CuM	CuM; CuH
	17:00	3/8	2	CuM	CuM; CuH	CuH; CuM	CuM	CuM; CuH	CuM	CuM	CuM; CuH
	18:00	2/8	2	CuM	CuC	CuH	CuH	CuH	CuM	CuH	CuM
	19:00	1/8	1	-	CuH	CuH	CuH	-	CuM	-	CuH
	20:00	1/8	1	-	-	CuH	CuH	-	CuH	-	-
26.08.	08:00	1/8	0	Ac	-	-	Cu	-	Cu	-	-
	09:00	1/8	2	Ac	-	-	-	-	Cu	-	-
	10:00	2/8	3	Cu	Cu	Cu	Cu	Cu	Cu	-	-
	11:00	1/8	3	CuC; CuH	CuC; CuH	CuC; CuH	CuC; CuH	CuC; CuH	CuM; CuC		CuH
	12:00	3/8	3	CuH	CuC	CuC	CuC	CuM; CuC	CuM; CuC	Ac; CuH	CuH
	13:00	4/8	60	CuC	CuC	CuC	CuC	CuC	CuM; CuC	Ac; CuH	CuM
	14:00	6/8	3	CuC	Cb	CuC	Cb	CuC; CuM	CuM; CuC	CuM	CuM
	15:00	5/8	3	Ci; CuC	Sc; Cb	Cb	Cb	CuM	CuM; Ci; Cb	Ci; CuM	Cb; Ac
	16:00	5/8	3	Ci; CuC	Cb; Ac; Ci	Cu	Cb;	CuM; CuC	Cb	Ci; CuC	Ci; Cu
	17:00	5/8	3	Ci; Ac	Ci; Cb	Cb; CuH	Cb; CuC	Ci; Cc; CuH	Ci; CuM	Cb	Cb
	18:00	x	x	x	x	x	x	x	x	x	x
	19:00	6/8	3	CuH; Cs	Ac, Cs; CuH	Cb; CuH	CuH; Ci	CuM; Ac	CuM; Cb	CuH	Ac
27.08.	11:00	6/8	3	CuC	CuC; Ci	CuC	CuC	CuC; Ac	Sc	Sc	Sc
	12:00	6/8	2	As	CuC	CuC	CuC; Ci	CuC	CuM	As; CuH	As; CuH
	13:00	8/8	regen	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
	16:00	7/8	regen	Ns	Ns	Ac; As	CuC	CuC	CuC	CuC	CuC

Latin name	Description	Abbreviation
Cloud genera		
Cirrus	High fleecy cloud	Ci
Cirrocumulus	High fluffy cloud	Cc
Cirrostratus	High misty cloud	Cs
Altocumulus	Rough fluffy cloud	Ac
Altostratus	Middle high misty cloud	As
Nimbostratus	Rain layer cloud	Ns
Stratocumulus	Layer heap cloud	Sc
Stratus	Lower layer cloud	St
Cumulus	Heap cloud	Cu
Cumulonimbus	Thundercloud	Cb
Cloud species		
fibratus	fibrous	fib
uncinus	hook-shaped	unc
castellanus	turreted	cas
floccus	fluffy, baggy	flo
stratiformis	layer-shaped	str
nebulosus	nebular	neb
lenticularis	lentoid, almond-shaped	len
fractus	disrupted	fra
humilis	low	hum
mediocris	moderate developed	med
congestus	high-piled	con
calvus	bare	cal
capillatus	hairy	cap
Sub species		
undulatus	wavelike	un
radiatus	radial, parallel bands	ra
duplicatus	two or more layers	du
perlucidus	see-through (gaps)	pe
translucidus	transparent	tr
opacus	close, dark	op
Concomitant clouds		
incus	with ambos	inc
mamma	bag-like outgrowth at the bottom side of the clouds	mam
virga	visible rain bands	vir
praecipitatio	with rain	pra
Remark	mixture of hum, med, con	spec

B. Vegetation of soil collars

Vegetation coverage within the soil collar of the CO_2 flux measurements with the LI-COR chambers

Soil collar	Kob pygmaea	*Cyperaceae*	*Poaceae*	annual	perennials	Lichens & moss	crust	litter	Rocks & soil
IK1	10	0	37	0.5	50	0	1	1	0.5
IK2	25	1	19	0	46	0	1	6	2
IK3	28	1	45	0	22	0	1	1	2
IK4	20	1.5	40	0	35	0	1.5	0.5	1.5
IK5	47	1	25	0	19	0	0.5	4	3.5
L1	15	0	0	0	15	1	68	0.5	0.5
L2	18	0	3	0	16	1.5	59	2	0.5
L3	16	0	11	1	17	2	52.2	0.8	0
L4	25	0	3	0	12	3	54.5	2	0.5
BS1	0	0	0	7	12	0.8	4	0.2	76
BS2	0	0	0	9	0	0	0	0.5	90.5
BS3	0	0	0	6	23	0	0	0	71
BS4	0	0	0	1.2	5.5	0	0	0	93.3
LiCOR Original1	38	2	4	0	44	0	1	10	1
LiCOR Original2	70	0	2	0	11	0	1	15	1
L_Nee	25	0	0	2	20	5	42	5	1
L_Resp	25	0	1	0.5	9	6	53	5	0.5
IK_NEE	45	8	2	0	25	0	1	19	0
IK_NEE_2	42	0	10	0	46	0	1	0.8	0.2
IK_NEE_2	42	0	10	0	46	0	1	0.8	0.2
IK_Resp	50.5	0	1	0	20	0	0.5	25	3
IK_Resp_2	50	0	14	0	22	0	0.5	12	1.5
BS_NEE	0	0	0	16	0.5	0	0	0	83.5
BS_Resp	0	0	0	18	0	0	0	0	82

Species composition within the soil collar of the CO_2 flux measurements with the LI-COR chambers (p: perennial; a: annual; b: biennial)

	Kobresia Kobresia pygmaea	*Kobresia pusilla*	*Carex ivanoviae*	*Carex* spec.	*Potentilla saundersiana*	*Potentilla plumosa*	*Potentilla bifurca*	*Sibbaldia adpressa*	*Saussurea leiocarpa*	*Aster flaccidus* subsp. *glandulosus*	*Astragalus tanguticus*	*Thalictrum alpinum*	*Poa glauca* subsp. *glauca*	*Elymus* spec.	*Veronica ciliata*	*Youngia simulatrix*	*Lancea tibetica*	*Lagotis brachystachya*	*Stipa purpurea*	*Axyris prostrata*	*Lancea tibetica*	*Galium pauciflorum*	*Koenigia islandica*	*Chenopodium foetidum*	*Veronica ciliata*	*Potentilla bifurca*	*Saussurea leiocarpa*	*Aster flaccidus* subsp. *glandulosus*	*Draba* spec.
	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	a/ b	p	p	p	a	p	a/ p	a	a	p	p	p	p	a
IK1	x				x	x	x	x			x	x	x		x	x	x		x										
IK2	x				x	x	x	x	x			x	x		x		x		x										
IK3	x		x							x		x	x				x		x										
IK4	x	x			x		x	x				x			x		x		x										
IK5	x				x	x		x				x	x				x		x										
IK_Resp_2	x				x		x					x					x		x										
IK_NEE_2	x				x		x			x	x	x	x				x		x										
LiCOR Original1	x		x	x	x	x	x		x			x					x		x										
LiCOR Original2	x									x		x					x		x										
L1	x					x	x		x								x	x											
L2	x				x		x		x			x							?										
L3	x						x		x							x	x		x										
L4	x				x	x	x			x		x							x										
L_Nee	x						x		x			x				x		x											
L_Resp	x				x	x			x			x				x			x										
IK_NEE	x	x			x	x							x				x												
IK_Resp	x		x		x	x				x			x	x			x												
BS_NEE																				x	x	x	x						
BS_Resp																				x		x	x	x					
BS1																				x	x	x	x		x	x	x	x	x
BS2																				x			x	x					
BS3																					x		x			x		x	
BS4																					x		x			x		x	

Volumes in the series ,University of Bayreuth, Department of Micrometeorology, Arbeitsergebnisse

Nr	Author(s)	Title	Year
01	Foken	Der Bayreuther Turbulenzknecht	01/1999
02	Foken	Methode zur Bestimmung der trockenen Deposition von Bor	02/1999
03	Liu	Error analysis of the modified Bowen ratio method	02/1999
04	Foken et al.	Nachfrostgefährdung des ÖBG	03/1999
05	Hierteis	Dokumentation des Experimentes Dlouhá Louka	03/1999
06	Mangold	Dokumentation des Experimentes am Standort Weidenbrunnen, Juli/August 1998	07/1999
07	Heinz et al.	Strukturanalyse der atmosphärischen Turbulenz mittels Wavelet-Verfahren zur Bestimmung von Austauschprozessen über dem antarktischen Schelfeis	07/1999
08	Foken	Comparison of the sonic anomometer Young Model 81000 during VOITEX-99	10/1999
09	Foken et al.	Lufthygienisch-bioklimatische Kennzeichnung des oberen Egertales, Zwischenbericht 1999	11/1999
10	Sodemann	Stationsdatenbank zum BStMLU-Projekt Lufthygienisch-bioklimatische Kennzeichnung des oberen Egertales	03/2000
11	Neuner	Dokumentation zur Erstellung der meteorologischen Eingabedaten für das Modell BEKLIMA	10/2000
12	Foken et al.	Dokumentation des Experimentes VOITEX-99	10/2000
13	Bruckmeier et al.	Documenation of the experiment EBEX-2000, July 20 to August 24, 2000	01/2001
14	Foken et al.	Lufthygienisch-bioklimatische Kennzeichnung des oberen Egertales	02/2001
15	Göckede	Die Verwendung des Footprint-Modells nach Schmid (1997) zur stabilitätsabhängigen Bestimmung der Rauhigkeitslänge	03/2001
16	Neuner	Berechnung der Evaporation im ÖBG (Universität Bayreuth) mit dem SVAT-Modell BEKLIMA	05/2001
17	Sodemann	Dokumentation der Software zur Bearbeitung der FINTUREX-Daten	08/2002
18	Göckede et al.	Dokumentation des Experiments STINHO-1	08/2002
19	Göckede et al.	Dokumentation des Experiments STINHO-2	12/2002
20	Göckede et al	Characterisation of a complex measuring site for flux measurements	12/2002
21	Liebethal	Strahlungsmessgerätevergleich während des Experiments STINHO-1	01/2003
22	Mauder et al.	Dokumentation des Experiments EVA_GRIPS	03/2003
23	Mauder et al.	Dokumentation des Experimentes LITFASS-2003, Dokumentation des Experimentes GRASATEM-2003	12/2003
24	Thomas et al.	Documentation of the WALDATEM-2003 Experiment	05/2004
25	Göckede et al.	Qualitätsbegutachtung komplexer mikrometeorologischer Messstationen im Rahmen des VERTIKO-Projekts	11/2004
26	Mauder & Foken	Documentation and instruction manual of the eddy covariance software package TK2	12/2004
27	Herold et al.	The OP-2 open path infrared gas analyser for $CO_2$and H_2O	01/2005
28	Ruppert	ATEM software for atmospheric turbulent exchange measurements using eddy covariance and relaxed eddy accumulation systems and Bayreuth whole-air REA system setup	04/2005
29	Foken (Ed.)	Klimatologische und mikrometeorologische Forschungen im Rahmen des Bayreuther Institutes für Terrestrische Ökosystemforschung (BITÖK), 1989-2004	06/2005
30	Siebeke & Serafimovich	Ultraschallanemometer-Überprüfung im Windkanal der TU Dresden 2007	04/2007
31	Lüers & Bareiss	The Arctic Turbulence Experiment 2006 PART 1: Technical documentation of the ARCTEX 2006 campaign, May, 2nd to May, 20th 2006	07/2007
32	Lüers & Bareiss	The Arctic Turbulence Experiment 2006 PART 2: Visualization of near surface measurements during the ARCTEX 2006 campaign, May, 2nd to May, 20th 2006	07/2007
33	Bareiss & Lüers	The Arctic Turbulence Experiment 2006 PART 3: Aerological measurements during the ARCTEX 2006 campaign, May, 2nd to May, 20th 2006	07/2007

34	Metzger & Foken et al.	COPS experiment, Convective and orographically induced precipitation study, 01 June 2007 – 31 August 2007, Documentation	09/2007
35	Staudt & Foken	Documentation of reference data for the Experimental areas of the Bayreuth Center for Ecology and Environmental Research (BayCEER) at the Waldstein site	11/2008
36	Serafimovich et al.	ExchanGE processes in mountainous Regions (EGER) – Documentation of the Intensive Observation Period (IOP1), September, 6th to October, 7th 2007	01/2008
37	Serafimovich et al.	ExchanGE processes in mountainous Regions (EGER) – Documentation of the Intensive Observation Period (IOP2), June, 1st to July, 15th 2008	10/2008
38	Siebicke	Footprint synthesis for the FLUXNET site Waldstein/Weidenbrunnen (DE-Bay) during the EGER experiment.	12/2008
39	Lüers & Foken	Jahresbericht 2008 zum Förderprojekt 01879- Untersuchung der Veränderung der Konzentration von Luftbeimengungen und Treibhausgasen im hohen Fichtelgebirge 2007 - 2013	01/2009
40	Lüers & Foken (Ed.)	Proceedings of the International Conference of "Atmospheric Transport and Chemistry in Forest Ecosystems" Castle of Thurnau, Germany, Oct 5 to Oct 8, 2009	10/2009
41	Biermann et al.	Mesoscale circulations and Energy and gaS exchange Over the Tibetan Plateau Documentation of the Micrometeorological Experiment, Nam Tso, Tibet 25th of June – 08th of August 2009	11/2009
42	Foken & Falke	Documentation and Instruction Manual of the Krypton Hygrometer Calibration Instrument	01/2010
43	Lüers & Foken	Jahresbericht 2009 zum Förderprojekt 01879 - Untersuchung der Veränderung der Konzentration von Luftbeimengungen und Treibhausgasen im hohen Fichtelgebirge 2007 – 2013	07/2010
44	Biermann & Leipold (Ed.)	Tibet Plateau Atmosphere-Ecology-Glaciology Cluster Joint *Kobresia* Ecosystem Experiment: Documentation of the first Intensive Observation Period (IOP 1) summer 2010 in Kema, Tibet	01/2011
45	Zhao et al.	Complex TERRain and ECOlogical Heterogeneity (TERRECO);WP 1-02: Spatial assessment of atmosphere-ecosystem exchanges via micrometeorological measurements, footprint modeling and mesoscale simulations ; Documentation of the Observation Period May 12th to Nov. 8th, 2010, Haean, South Korea	03/2011
46	Mauder & Foken	Documentation and Instruction Manual of the Eddy-Covariance Software Package TK3	05/2011
47	Serafimovich et al.	ExchanGE processes in mountainous Regions (EGER)- Documentation of the Intensive Observation Period (IOP3) June, 13th to July, 26th 2011	11/2011
48	Hübner et al.	Documentation and Instruction Manual for the Horizontal Mobile Measuring System (HMMS)	12/2011
49	Lüers et al.	The Arctic Turbulence Experiment 2009 - additional laser Scintillometer measurement campaign 2009 at the Bayelva catchment on Svalbard: Technical documentation and visualization of the near surface measurements during the ARCTEX-2009 campaign, August, 10th to August, 20th 2009	02/2012
50	Foken	Klimawanderweg auf der Landesgartenschau in Bamberg 2012	05/2012
51	Ruppert et al.	Whole-air relaxed eddy accumulation for the measurement of isotope and trace-gas fluxes	05/2012
52	Foken	Jahresbericht 2010-11 zum Förderprojekt 01879 - Untersuchung der Veränderung der Konzentration von Luftbeimengungen und Treibhausgasen im hohen Fichtelgebirge 2007 – 2013	12/2012
53	Gerken et al.	Documentation of the atmospheric Boundary Layer experiment, Nam Tso, Tibet, 8th of July - 8th August 2012	04/2013
54	Biermann (Ed.)	Tibet Plateau Atmosphere-Ecology-Glaciology Cluster Joint *Kobresia* Ecosystem Experiment: Documentation of the 2nd Intensive Observation Period (IOP 2) summer 2012 in KEMA, Tibet	05/2013