

JOANNEUM



RESEARCH

JOANNEUM RESEARCH Forschungsgesellschaft mbH

Partner of

Economy

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INNOVATION aus TRADITION



RESEARCH STATION „WAGNA“

Implementation of a monolithic
high precision weighing lysimeter
on grassland

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Investigation Goals

- Measurement of water balance parameters using a high precision weighing lysimeter

*For every time step:
(eg. 10 Minutes)*

$$P - ET - D - \Delta S = 0$$



- P, ET, ΔS**
direct
determination
from lysimeter
weight data
- D** weighing of
seepage water
amount

Investigation Goals

- Measurement of meteorologic parameters to compare
ET₀ (reference evapotranspiration) to
ET_c (measured gras evapotranspiration)

$$ET_0 = \frac{0.408 \Delta (R_n - G) + \gamma \frac{900}{T + 273} u_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

T temperature
rH relative humidity
V wind speed
R net radiation

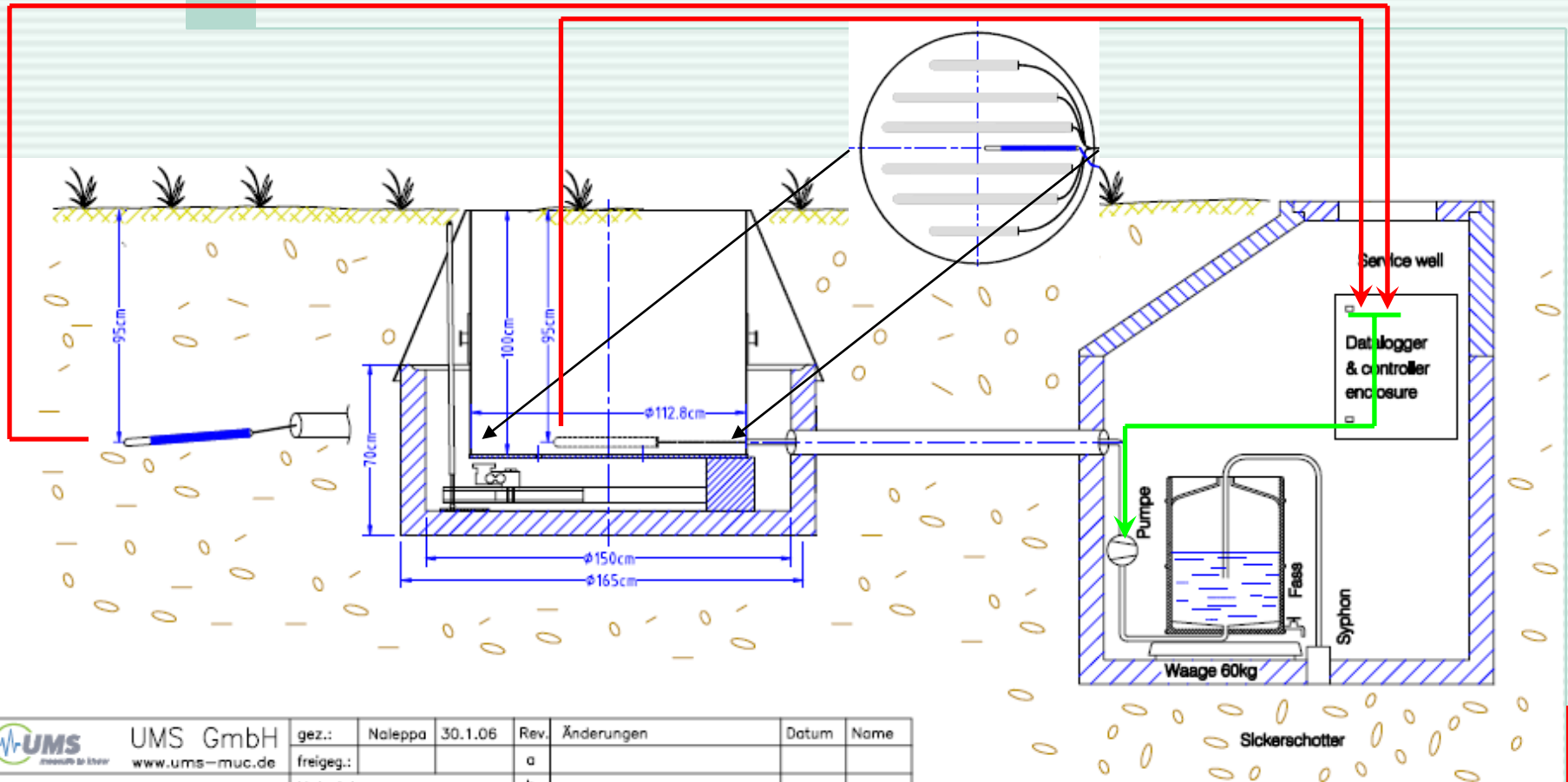


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Investigation Goals

- **Water consumption of grasland at a thin sandy soil cover (0.2 m) on a gravelly / sandy aquifer**
 - ➔ Evapotranspiration amount and dynamics
 - ➔ Seepage water amount and dynamics
 - ➔ Soil water storage dynamics
- **Self eutrophication of a mulch system**
 - ➔ No fertilization of the grasland since 1987
 - ➔ Analizing seepage water on nitrogen components will give information
 - on athmospheric nitrogene input if the system is equilibrated
 - on the risks of mulch systems to seepage water (and groundwater) quality

Lysimeter concept



 UMS GmbH www.ums-muc.de Hydrologie–Lysimeter Projekt: Wagna, Dr. Fank	gez.:	Naleppa	30.1.06	Rev.	Änderungen	Datum	Name
	freigegeben:			a			
	Material:			b			
	Maßstab:	ca. 1:30		c			
	Zeichnung:			d			
© Eigentumsverbehalt: Die Zeichnung ist Eigentum der UMS GmbH und darf nicht an Dritte weitergegeben werden				e			

Implementation

Monolith cutting and excavation



Implementation

soil profiles at the excavation pit



Implementation

installation of the suction cup strip on the bottom of the lysimeter column



Implementation

installation of the lysimeter column on the weighing system



Implementation installation of the steering tensiometer



Implementation

installation of the service well close to the lysimeter



Implementation

refilling of the excavation pit



Implementation installation of the weather station





Implementation

cutting of the grass on the lysimeter
12 cm high



Implementation instrumentation of the service well



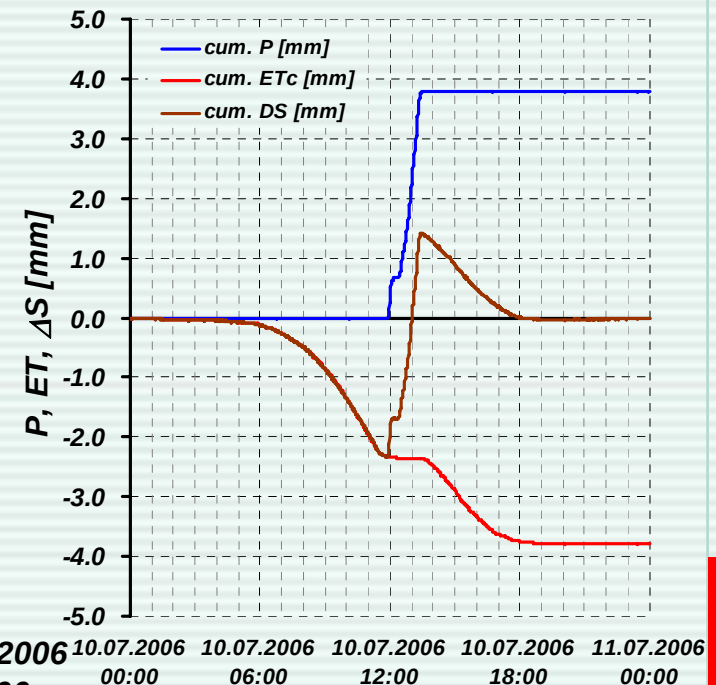
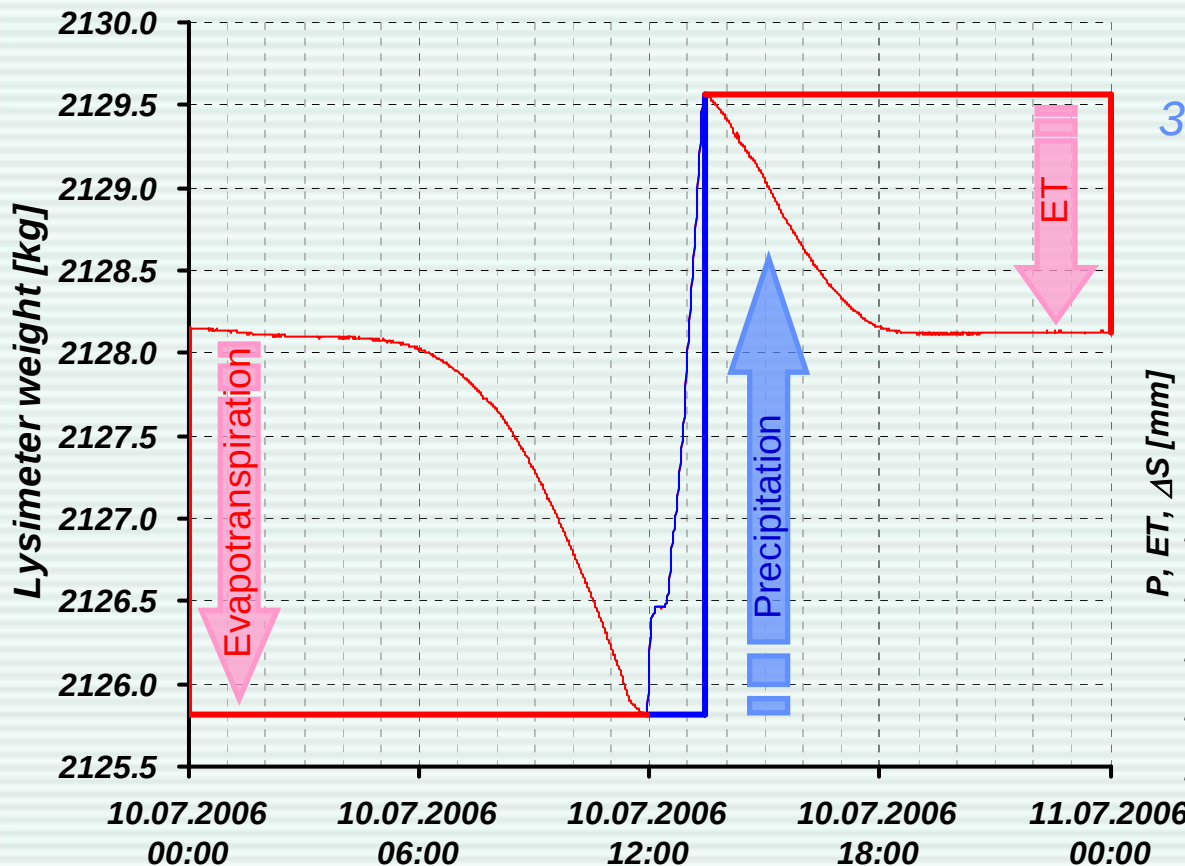
determination of water balance parameters from lysimeter weight data

Evaluation

Daily water balance

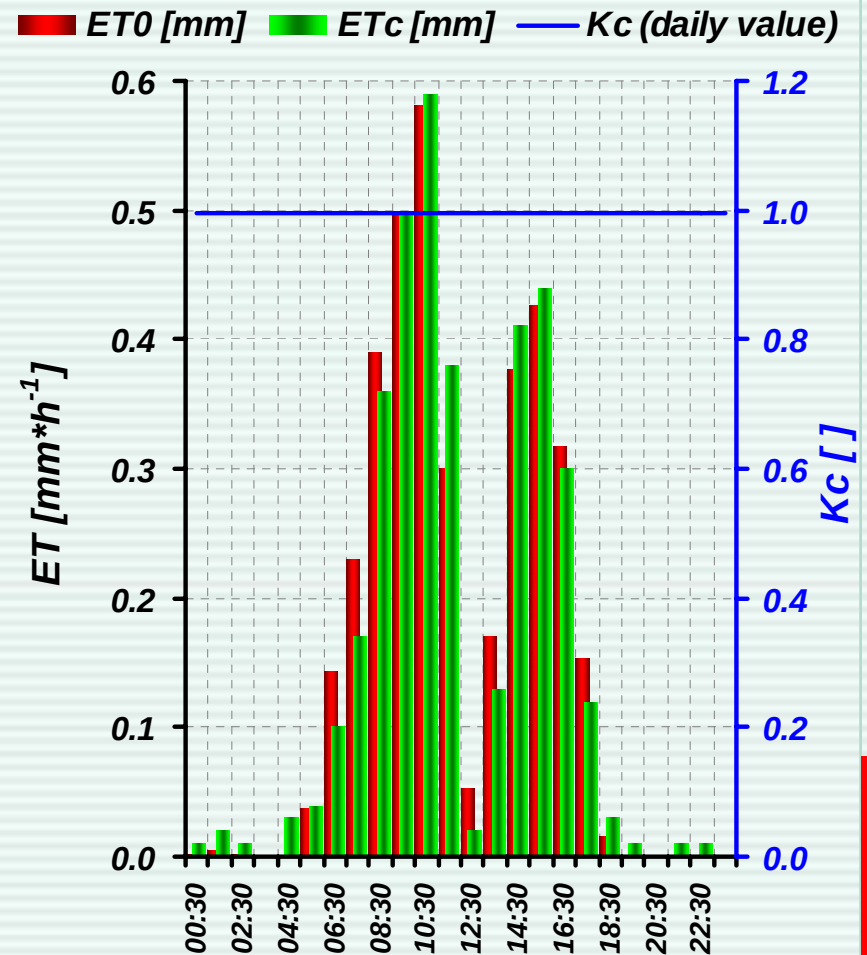
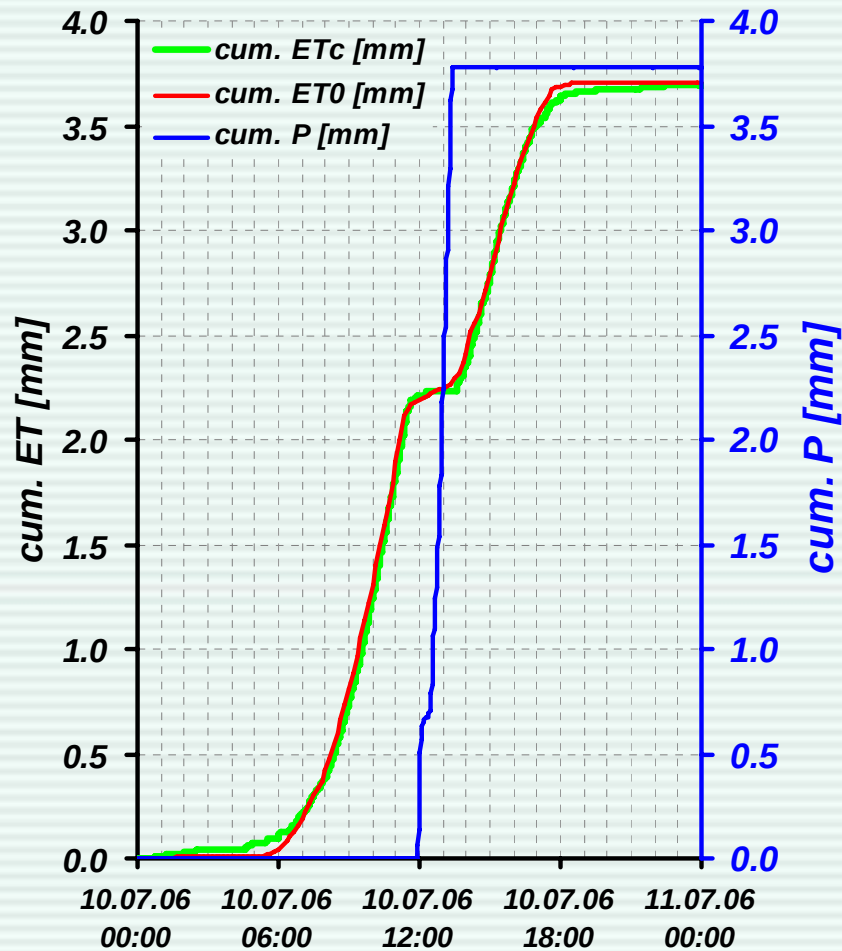
$$P - ET - D - \Delta S = 0$$

$$3.78 - 3.76 - 0.00 - 0.02 = 0$$



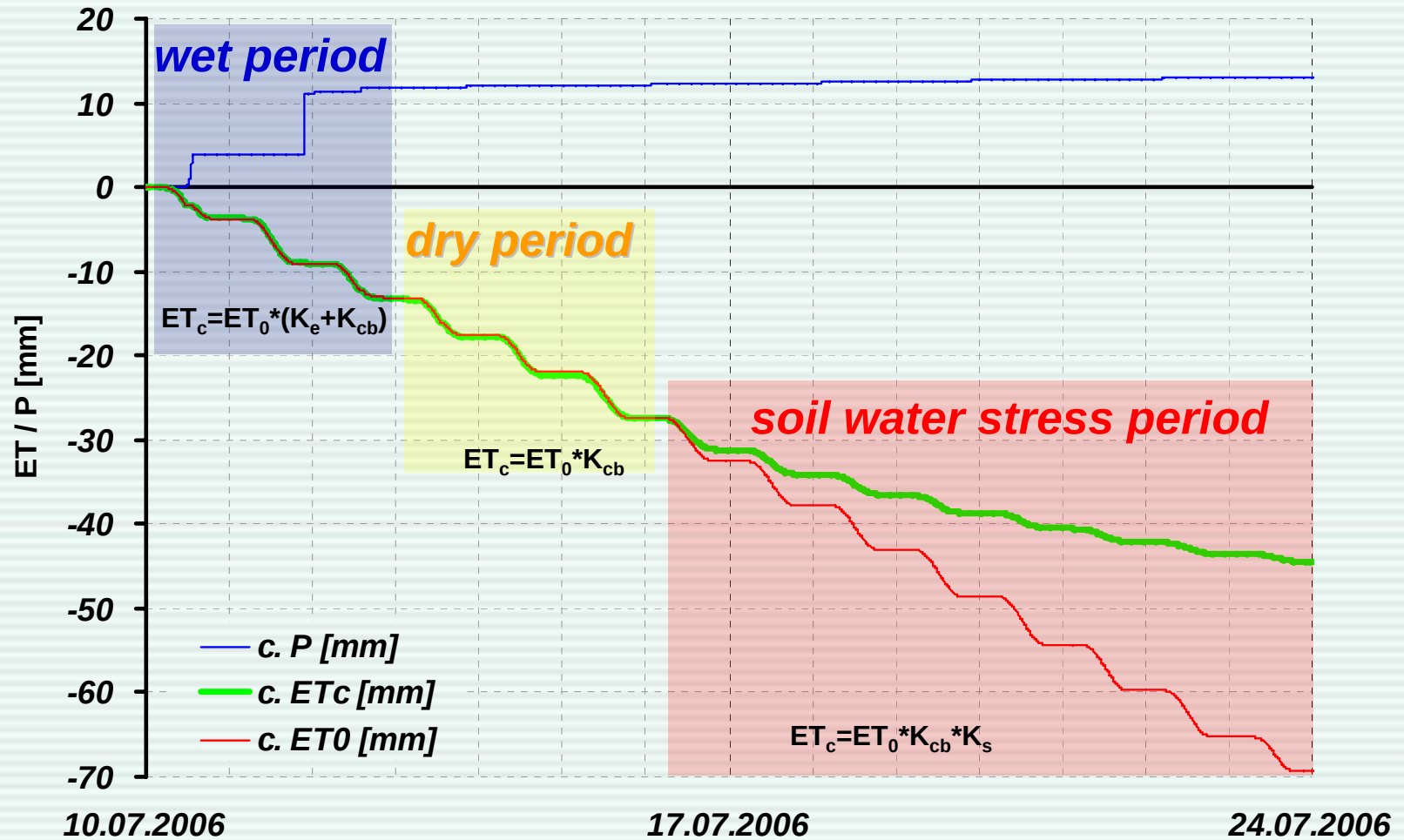
Evaluation

comparison of calculated ET_0 and measured ET_c



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Evaluation of crop factors and soil water stress factors



Evaluation

dependency of crop factors and soil water stress factors on crop and soil

