ADA Meeting December 2014

Spatial simulation of crop conditions in response to drought

Project AgroDroughtAustria (ADA)

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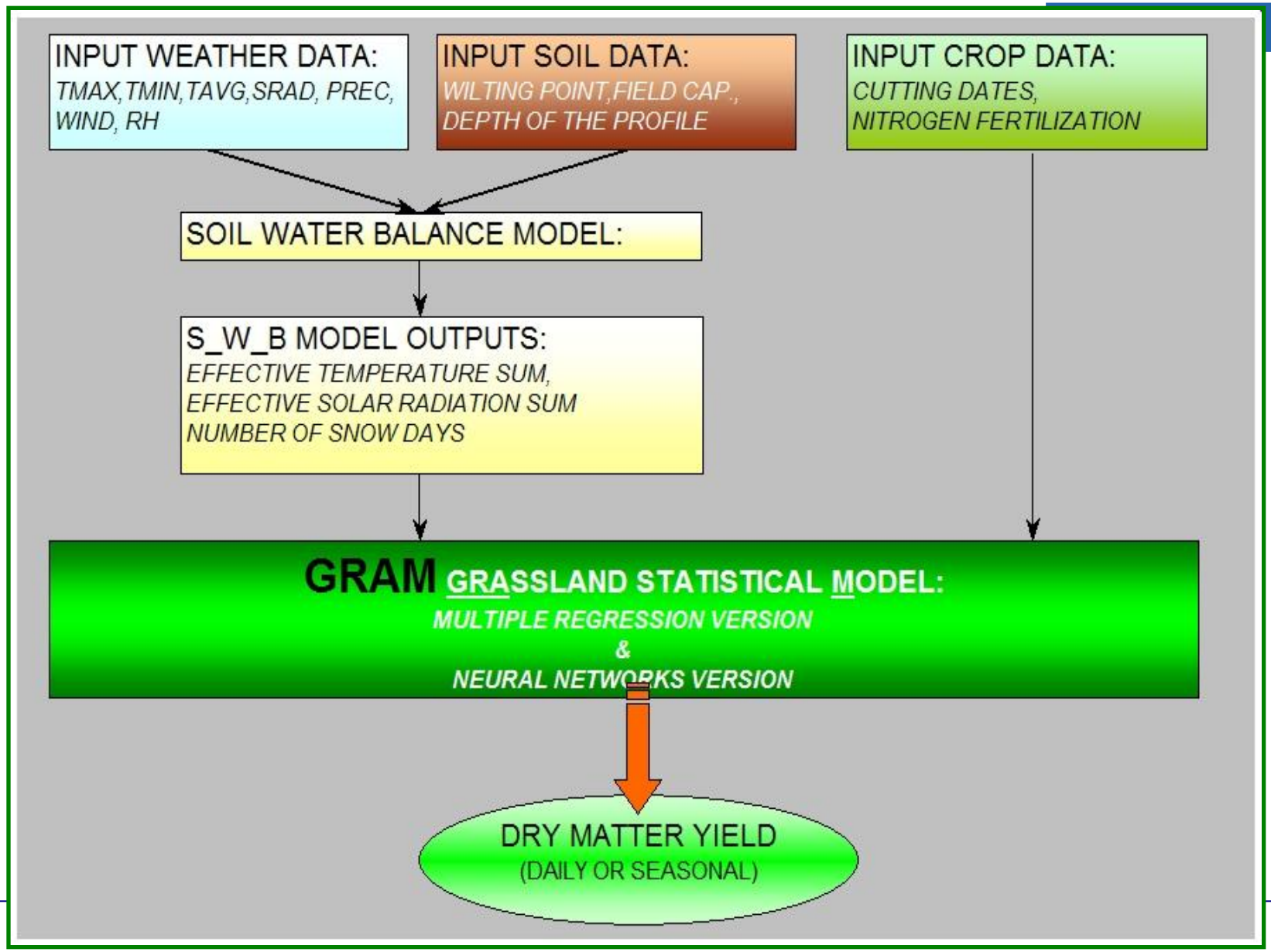
Pre – projects

GRAM: GIS-based Grassland simulation

CLIMSOIL: GIS-based soil temperature model

The basic GIS based yield model concept

M. Trnka, J. Eitzinger (2009)



ADA - *Drought monitoring system for Austrian agriculture*

The aim of the project (2013-2016) is to develop and test a crop specific drought monitoring and forecasting system for agriculture in Austria.

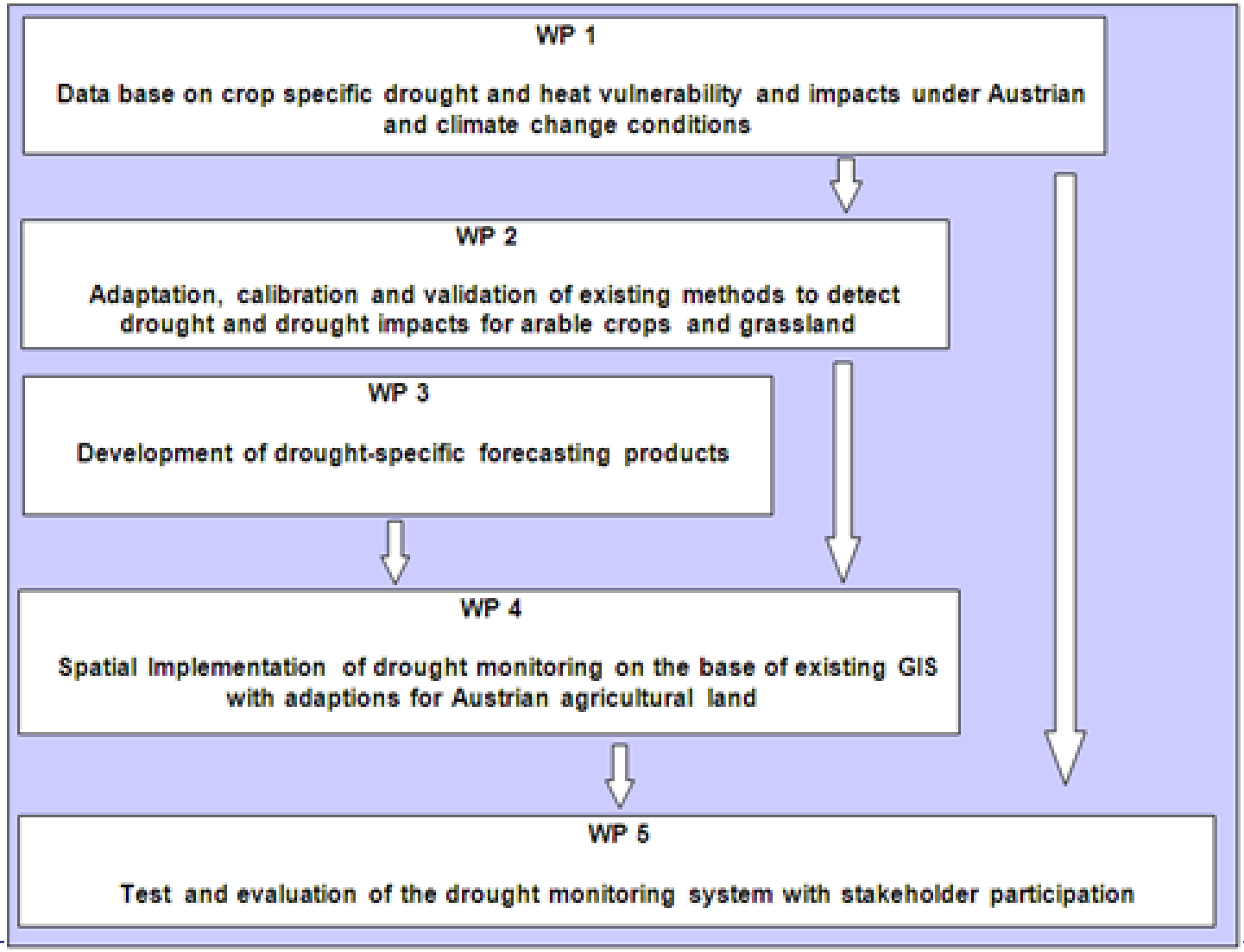
Objectives:

1)Establish a data base and develop methods for crop drought stress detection

2)Establish a now- and forecasting approach modelling drought occurrence

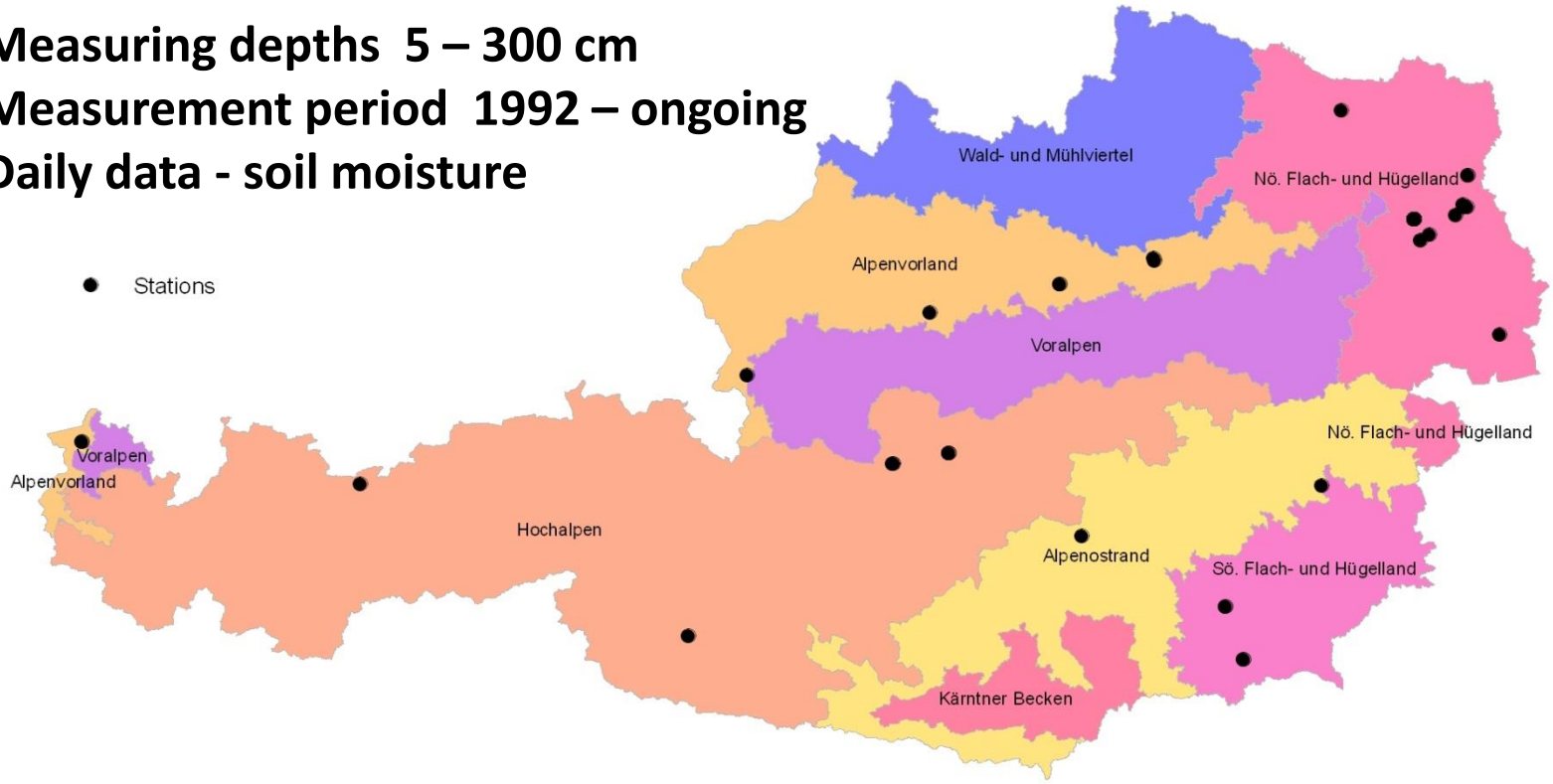
3)Adapt and validate methods and test the crop specific drought monitoring system for operational use

ADA – Work packages



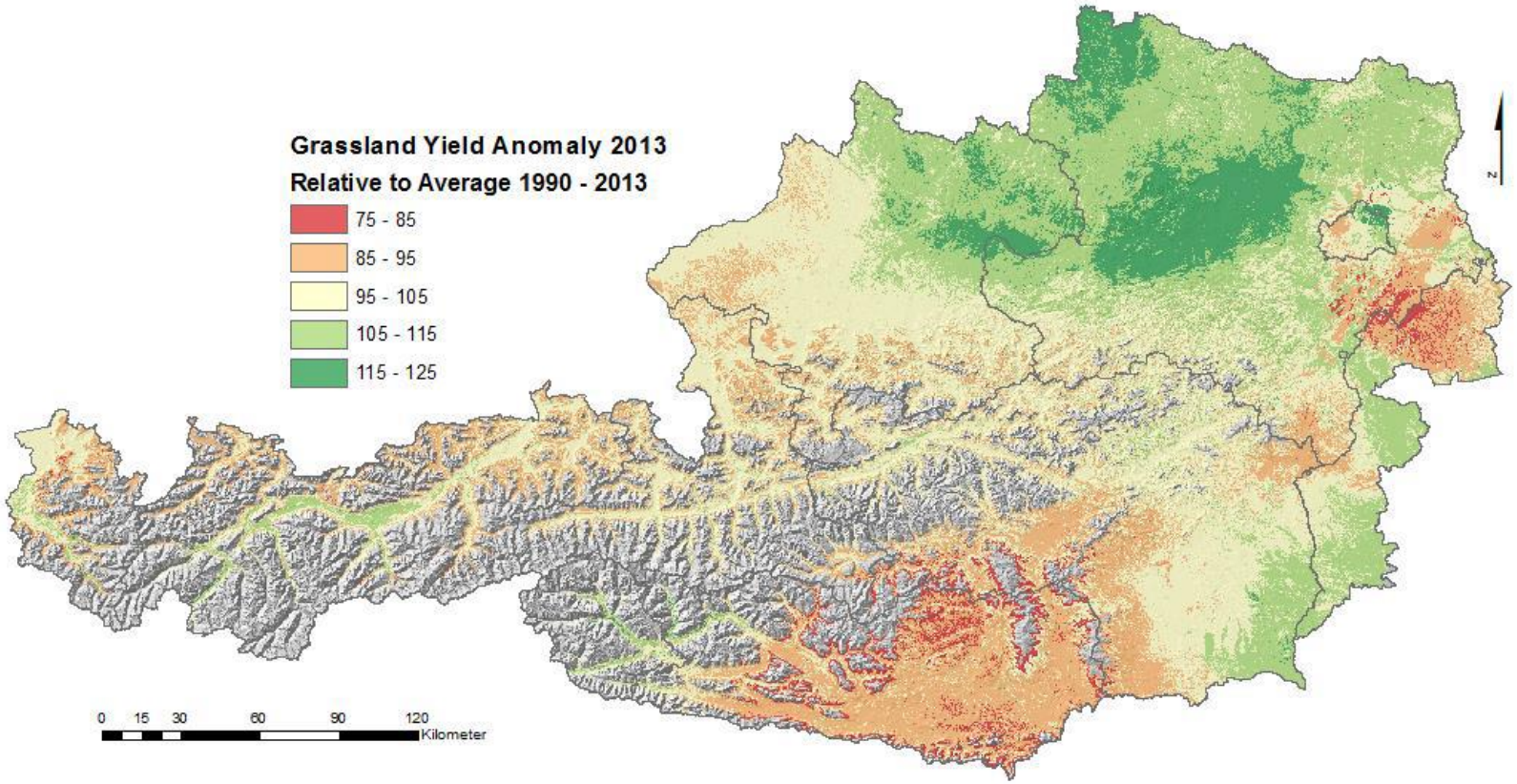
Available Soil Water Stations & Main Production Areas

21 Locations **69 plots**
17 grass land **48 arable land** **4 forest**
Elevation **150 - 1912 m**
Measuring depths 5 – 300 cm
Measurement period 1992 – ongoing
Daily data - soil moisture



Krammer, 2013

ADA – *Examples from 2013 (GRAM+aridity index)*



Schaumberger, 2014

ADA – *Actual focus of WP1/WP2*

1) **Development/implementation of crop phenology model (Kc model)**

2) **Development and test of drought and heat impacts on yield risk (indicator) and yield level (potential yield depletion)**

Crop Coefficient Model for ADA (proposed by BOKU)

Reference Evapotranspiration (ET0) for December, January and February is a constant value of **0.2 mm.**

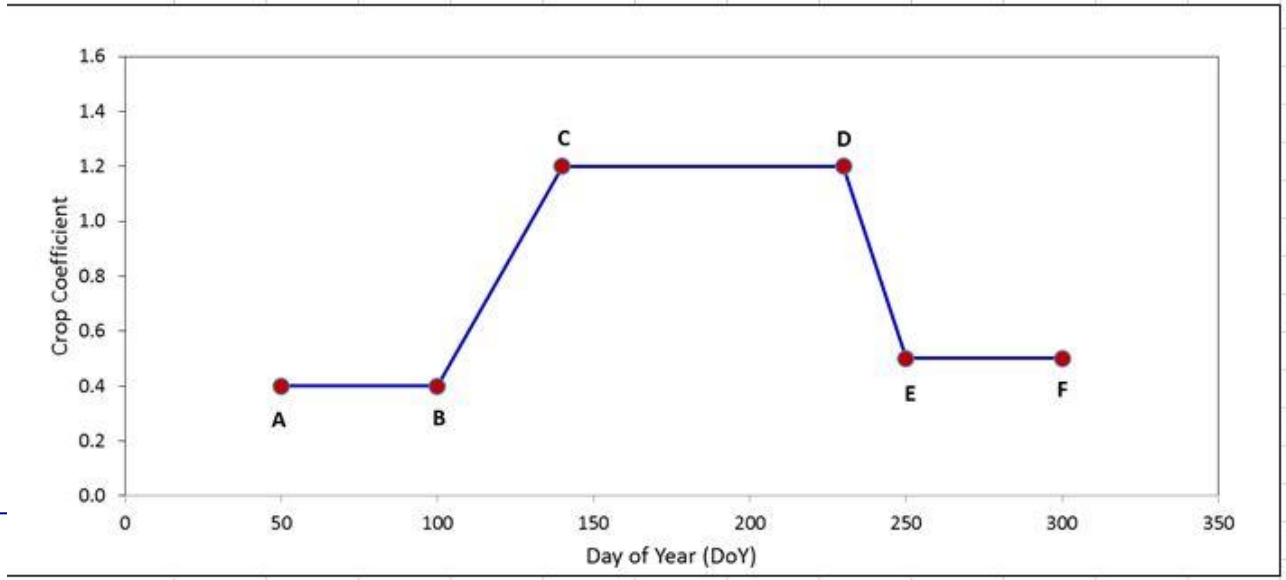
Start of Growing Season (SGS): **First day of 5 consecutive days with daily mean temperatures above 5°C**

Start of Growing Season for Maize (SGS-M): **First day of 5 consecutive days with daily mean temperatures above 10°C**

Base temperature for calculation of degree day temperature sum (BT): **5 °C**

Base temperature for calculation of degree day temperature sum for Maize (BT-M): **8 °C**

Culture	Initial (Evaporation)		Crop Development		Mid-Season		Late Season		End of Growing			
	Entry of A		Entry of B		Entry of C		Entry of D		Entry of E		Entry of F	
	Kc	Time	Kc	Time (GDD)	Kc	Time (GDD)	Kc	Time (GDD)	Kc	Time	Kc	Time
Grassland (3-cut)	Will be done by LFZ Raumberg-Gumpenstein (according to Schaumberger, 2011)											
Winter Wheat	0.4	01.03.	0.4	SGS	1.2	592	1.2	953	0.5	+14 days	0.5	30.11.
Spring Barley	0.4	01.03.	0.4	SGS	1.2	816	1.2	767	0.5	+14 days	0.5	30.11.
Spring Maize	0.4	01.04.	0.4	SGS-M	1.2	572	1.2	2063	0.5	+14 days	0.5	30.11.
Sugar Beet	0.4	01.04.	0.4	500	1.2	2500	1.2	15.10.	0.2		0.2	



For Discussion:

Impact of drought and heat on crop stress (risk indicators) and yield level (potential yield depletion – absolute)

A. General approaches (without crop specific vulnerability calibration)

1. Water stress factor (actual and accumulated)
(linear increasing stress beyond 30% AWC depletion)

2. Heat stress factor (actual and accumulated)
- number of days above 35°C
-Duration above critical T:
Accumulated hourly indicator for day N: (Sum(T_hourly-34.9)^2)

3. Heat stress x water stress factor
(way of combination of ad 1+2; i.e. reduction of heat stress factor above 50% AWC ?)

4. Effective global radiation daily (SOILCLIM based)

B. Crop specific approaches

1. Crop specific heat and drought stress risk (ad. A3) and/or potential yield depletion (implementation of relative sensitivities in combination with crop phenology)
Calibration/validation with crop yield data

Outlook

Further risks could be implemented

I.e. frost risk without snow cover, late frost risk, risk of lodging, risk of water logging

Potential for an operational multiple agricultural risk monitoring and forecasting tool