

1. Introduction

Daisy: A model for plant production and environmental protection

Daisy: A mechanistic, deterministic simulation model

Daisy: A soil, crop and atmosphere model

<http://www.dina.kvl.dk/~daisy/>

daisy@dina.kvl.dk

Per Abrahamsen

Copenhagen University, Department of Life Science

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Scientific disciplines in Daisy

- Agronomy
- Hydrology
- Soil Science
- Plant biology
- Microbiology
- Microclimatology
- Meteorology
- Soil chemistry

My background

- Computer science
- Mathematics

3. Useful models?

“All models are wrong, but some are useful” – Nils Toft

The scientific method:

1. Observe
2. Make hypothesis
3. Test hypothesis against new observations

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4. Daisy world

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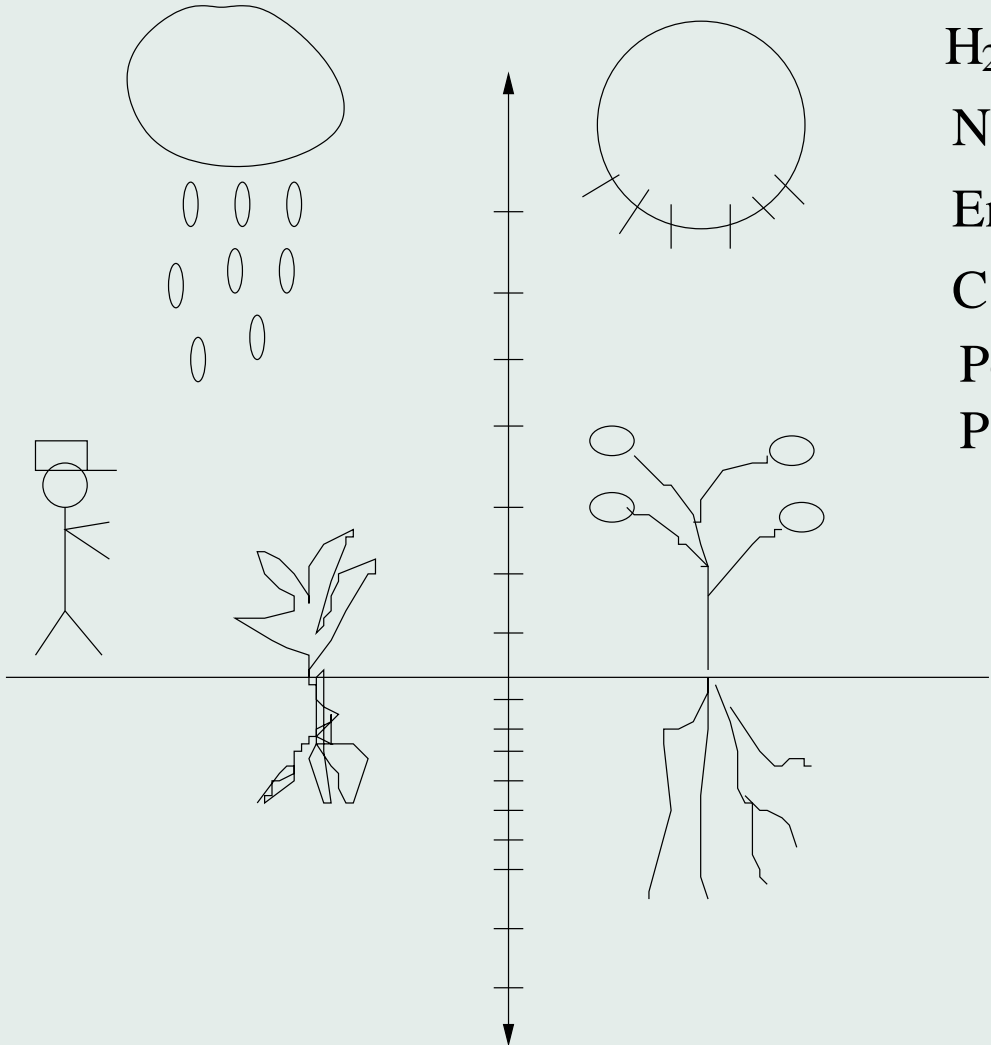
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H₂O
N
Energi
C
Pesticider
P

5. Daisy history

Historie.

- Action Plan for the Aquatic Environment
- Validation
- Desire to use
- Dina rewrite
- UNCERSDSS (EU)
- RSMODEL (Space agency)
- Organic farming (FØJO)
- Daisy Standardization (Counties)
- FertOrgaNic (EU)
- SAFIR (EU)
- Pesticide in drain pipes (Environmental Agency)

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6. Daisy users

Daisy is used by:

- Law makers
- Scientists.
- Teaching.
- Administrators

We would like also:

- Production planning
- Precision farming

Two dimensions:

- Specific vs. general (in time and space)
- Environment vs production

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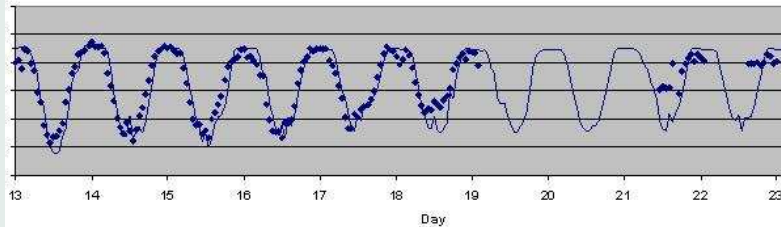
KVL

Spring Barley at Foulum (RS-Model)

Spring Barley sown at April 28, 1997

CO₂ flux

CO₂ flux, July 1997



8. Large scale

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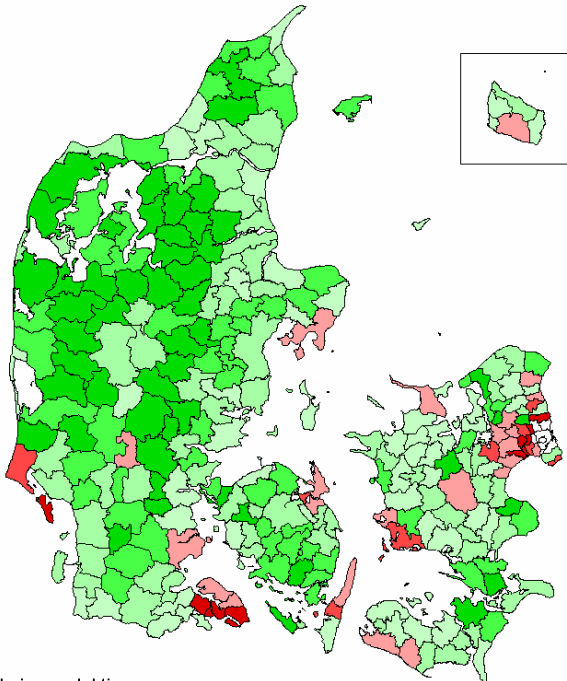
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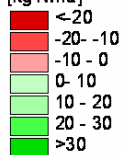
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Ændring i udvask N fra det dyrkede areal for perioden 1985-2000



udvaskningsreduktion
[kg N/ha]



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Weather

Field

Column

Bioclimate

Snow

Evapotranspiration

Stress

Vegetation

Crops

Surface

Soil

Water

Matrix

Macro

Heat

Organic Matter

Nitrification

Denitrification

NH_4^+

NO_3^-

Pesticides

Groundwater

Output

Manager

10. Daisy components

Daisy consist of

- Componenter (physical processes)
- Models
- Parameterisations

Sample parameterisation:

```
(defcrop "Spring Barley" simple
  (LAIvsTS ( 150.0 [dg C d] 0.0 [m^2/m^2])
           ( 850.0 [dg C d] 3.6 [m^2/m^2])
           (1620.0 [dg C d] 0.5 [m^2/m^2])))
(potential_N 120.0 [kg N/ha]))
```

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Models consist of

- Code and formulas
- Parameter names and types
- Default values

Parameter types includes

- Numbers (+ units)
- Functions (piecewise linear)
- Components

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- To much flexibility
- Daisy plug-in wrong, too early
- Non-integrated GUI's
- Testsuite

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- Experiments targeted for models
- Free access for data
- Less duplication of work
- Money
 - between projects
 - for general software
 - for GUI
 - for phosphorous (1.5 M DKR)