

Modeling of plant uptake and application in science and engineering

PhD-course, 17-21 June 2013, Technical University of Denmark, Kgs. Lyngby, DK

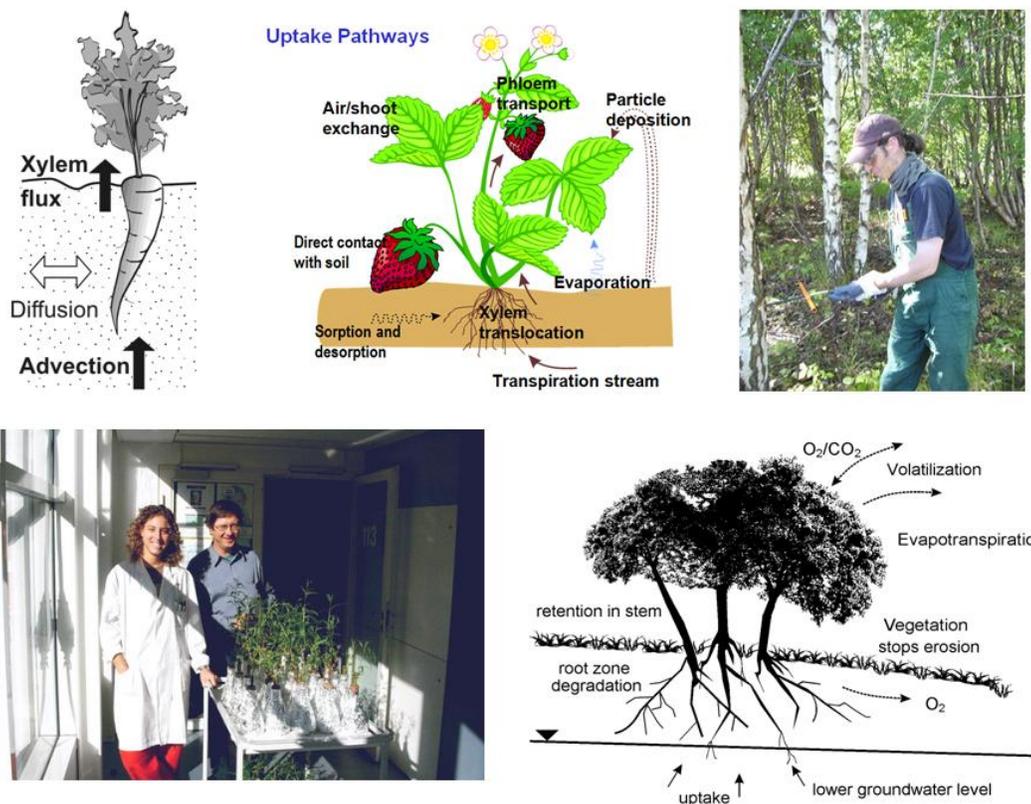
Stefan Trapp, Charlotte Legind and invited teachers

This course aims at giving a theoretical and practical introduction to chemical uptake into plants and its relevance for science and engineering. The focus is on mathematical modeling and its application. The course will cover the plant physiological and mathematical basics of plant uptake. Simple and advanced models will be taught, and the source code with documentation is available for all participants. The models are applied to study plant uptake of pesticides, persistent organic pollutants, emerging pollutants (incl. medical drugs), ionic compounds and heavy metals. Examples are from a variety of fields, among them risk assessment, pesticide design, dietary exposure, contaminated sites, urban gardening and phytoremediation. Students will have hands-on practice on all models during exercises. Also the tree core sampling method for the delineation of subsurface plumes will be exercised. The course will finalize with the preparation of an own model and a short project report.

The course is given at the Technical University of Denmark by local and international teachers and is credited with 5 ECTS points. The course material will be electronically available in advance from the course homepage at homepage.env.dtu.dk/stt/teaching.htm

The course is free of charge for registered PhD students. The course fee for professionals is 800 € but can be reduced by interesting presentations from their work. Housing can be on the Campus (ca. 50 €/day), the DTU kitchen and kantine is close by.

Please contact Stefan Trapp sttr@env.dtu.dk for further information or to sign-up. Info about DTU at www.dtu.dk.



Course content (draft)



Week before: reading (will be provided)

Day 1: Standard model
Plant anatomy and physiological bases
Physico-chemical principles
Regressions and equations
Standard model for plant uptake

Exercises: Chemical risk assessment, persistent organic pollutants

Day 2: Crop-specific models
Introduction to root model, potato model, fruit tree model and others
Dietary human exposure
Contaminated sites

Exercises: Urban gardening, pro and cons, dietary human exposure

Day 3: Dynamic modeling
Mathematical principles of systems science
Multi-cascade model
Coupled model for solute transport in soil and plant
Heavy Metals

Exercises: Pesticide optimization, field scale simulations, sensitive parameters

Day 4: Models for ionizable compounds
Physico-chemical principles
Cell model
Standard model for ionics
Dynamic simulations on field scale

Exercises: Pesticide optimization, field scale simulations, sensitivity analysis

Day 5: Practical studies
Tree coring
Phytoremediation
Uncertainty analysis

Week 3: homework (4-page report on model application)

Denmark in summer, that means:
- long days, blue sea, beautiful beaches
- Copenhagen is a modern, pulsing metropolis
www.copenhagen.dk/en/

See you in Lyngby this June - it's the week with white nights



Stefan, Charlotte and team