

FELLOWSHIP SUMMARY REPORT

General

Name: Prof. Gerardo SEVERINO, Division of Water Resources Management and Bio-System Engineering, University of Naples (ITALY)

Research fellowship title: Water flow and solute transport in soil-root systems

Host Institution: Department of Mechanical and Aerospace Engineering, University of California, San Diego (USA)

Host supervisor: Prof. Daniel M. TARTAKOVSKY, Department of Mechanical and Aerospace Engineering, University of California, San Diego (USA)

Period covered by the fellowship: March 1st, 2012 – May 31st 2012

I give the permission to post such a scientific report on the Co-operative Research Programme's website

Relevance

- The research project has provided a new model to get important physical insights on the processes regulating water uptake.
- The results of the present research will enable one to estimate the transpiration flux as well as the efficiency of the rooting system to clean-up polluted soils.
- The present research represents a useful tool to take in a scientifically-based manner decisions related to the sustainable use of natural resources and the rational management of agricultural practices.

Objectives of the fellowship

Modelling of water flow and solute transport in the close vicinity of a rooting system.

Major achievements

- The uptake of water increases with the ratio of the saturated hydraulic conductivities of the root, and the ambient soil.
- The transpiration flux increases with the water uptake. This situation is favoured by both minimal resistance in the soil and maximal driving force in the root.
- The capacity of the root to clean up a polluted soil increases as the infiltration rate decreases relative to the uptake of water.

Follow-up

A paper has been already submitted for possible publication in Journal of Fluid Mechanics (see the file "Paper(Severino).pdf" attached to this report).

This project was also a very useful start-up for a fruitful collaboration between UCSD and University of Naples in the areas of research and education (at the graduate/postgraduate level). Indeed, Prof. Tartakovsky will visit Dr. Severino from July 20 till August 10, 2012. The plan is to continue on developing research projects on topics of mutual interest. We hope to provide new and useful physical insights which will improve managing of water irrigation and the use of pesticides in Agriculture.

Satisfaction

- Did your fellowship conform to your expectations? *Yes.*
- Will the OECD Co-operative Research Programme fellowship increase directly or indirectly your career opportunities? *Yes, since it could have an impact upon my academic carrier advancement.*
- Did you encounter any practical problems? *Unfortunately, I had an housing issue with the owner of the first place where I stayed.*
- Please suggest any improvements in the Fellowship Programme. *Such a program should cover larger periods in order to give the opportunity to come up with more definite and established scientific results.*

Advertising the Co-operative Research Programme

- How did you learn about the Co-operative Research Programme? *Thanks to a colleague who got the fellowship in the past.*
- What would you suggest to make it more “visible”? I strongly suggest as mandatory to require publications in top journals. I believe that this is the only way to obtain a scientifically-based feedback proving the usefulness of the fellowship.
- Are there any issues you would like to record? *No.*