



## Pre-Conference SHORT COURSE 1

### Process-based mathematical modelling of bio-morphodynamics

Trento, September 15 – 16, 2017

#### Course aims:

The course is meant as an introduction for researchers who are interested in developing and using mathematical models to study quantitatively eco-geomorphic interactions in river systems

At the end of the course, participants should:

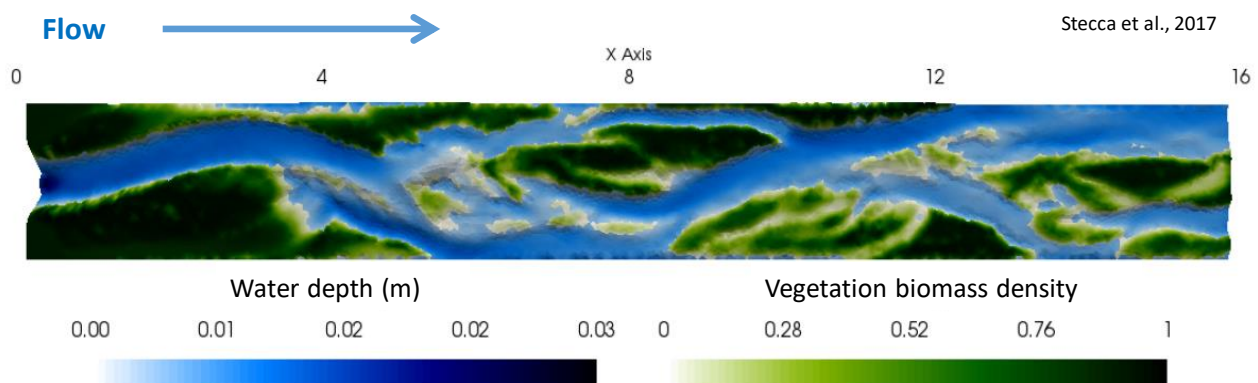
- have learned the basic phenomenology of the main biophysical processes governing the interaction among flow, sediment transport and riparian vegetation in river and estuarine environments,
- have acquired the basic tools to develop their own modelling research on biomorphodynamic interactions in rivers

#### Anticipated participants

PhD students, post docs, young researchers with interest in biomorphodynamic modelling

#### Instructors

Paolo Perona, University of Edinburgh, UK; Walter Bertoldi, University of Trento, IT; Carlo Camporeale, Politecnico di Torino, IT, together with seminar inputs (G. Stecca, F. Caponi, A. Siviglia, M. Toffolon)



**Figure:** example outcome from a numerical biomorphodynamic model simulating the mutual interactions among flow, sediment transport and riparian vegetation

#### Course structure



The course is composed by four half-day modules:

- 1) Key biophysical processes of interaction among flow, sediment transport and riparian vegetation (W. Bertoldi)
  - a. Phenomenological, process-based description
  - b. Relevant time and spatial scales of river morphodynamics and riparian vegetation growth and decay
  - c. Mathematical laws (effect of vegetation on sediment mobility and flow roughness; effect of channel morphology and hydrology on riparian vegetation dynamics)
  
- 2) Principles of stochastic modelling (C. Camporeale)
  - a. General concepts on stochastic processes
  - b. Noise-driven dynamical systems
  - c. Three examples of applications in the stochastic modeling of riparian vegetation
  
- 3) Belowground biomass and uprooting by flow (P. Perona)
  - a. Introduction on below-ground biomass dynamics in riverine corridors
  - b. Root growth and response to perturbation
  - c. Mechanical anchoring and resistance to uprooting
  - d. Uprooting by flow and related modelling
  - e. Lab and field scale experimental techniques
  
- 4) Examples of analytical and numerical ecomorphodynamic models and their applications
 

Guest seminars:

  - a. G. Stecca (University of Trento, IT, and NIWA, NZ): *Modelling vegetation-driven morphodynamics in braided rivers*
  - b. F. Caponi, A. Siviglia (VAW – ETHZ, CH): *Feedbacks between plant roots and river morphodynamics: a modelling approach*
  - c. M. Toffolon (University of Trento, IT): *Modelling ecogeomorphological feedbacks in tidal systems*

#### Venue

The course will take place at the Department of Civil, Environmental and Mechanical Engineering of the University of Trento: <http://www.dicam.unitn.it/en>

#### Registration and fees

To register, follow the link on the registration page of the RCEM website:

<http://events.unitn.it/en/rcem17/registration>

The registration fee is 170 Euro, and includes:

- Course material and lectures
- Lunches and coffee breaks for the 2 days of the course
- Bus transfer to Padova on Sunday, September 17, which will foresee field visits in the catchment of the braided Piave River.