CSIC
Consejo Superior de Investigaciones Científicas
IAS
Institute for Sustainable Agriculture

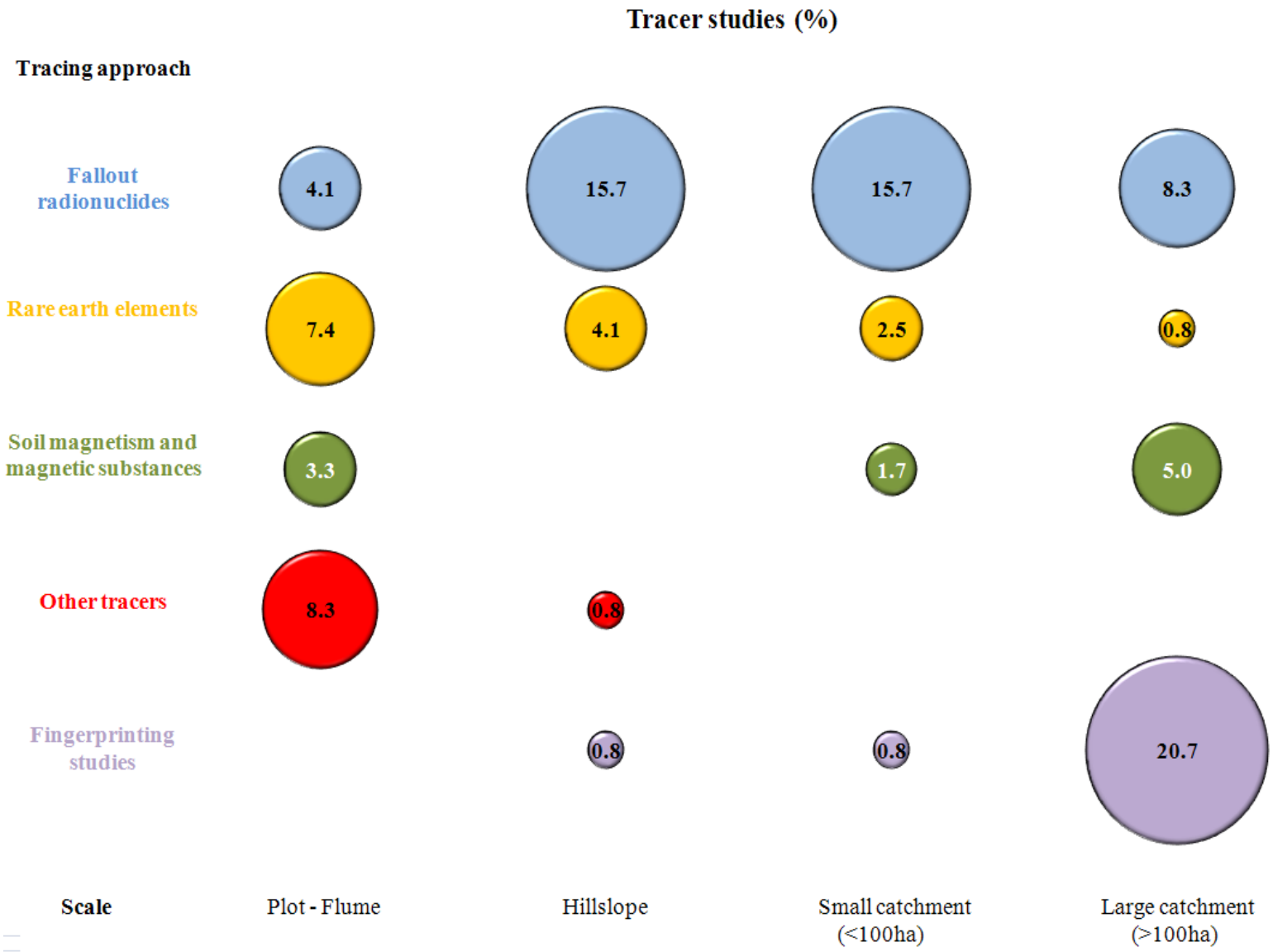
European Geosciences Union-General Assembly 2013

SSS2.9 Innovative techniques for data acquisition in soil erosion studies in catchments

Tracing and modelling water and sediment dynamics in a conventional irrigated ridges-furrows system under different scenarios

G Guzmán, A Laguna, JC Cañasveras, H Boulal,
H Gómez-Macpherson, V Barrón, JV Giráldez, JA Gómez

Sediment tracers



See poster R417 (Session HS9.4/GM7.14)

Sediment tracers

Magnetite

Hematite

Goethite

For calculating…

Soil erosion rates

+

Soil redistribution

↓

Magnetic susceptibility, χ

Diffuse reflectance spectroscopy

Source of sediment

$$\chi_{sed} = \chi_u f_u + \alpha \chi_t f_t$$

$$f_u + f_t = 1$$

Field site

Córdoba

Fluvisol

clay (%)	11.5 ± 0.2
silt (%)	46.3 ± 0.7
sand (%)	42.2 ± 0.6

Rotation maize-cotton

Sprinkler irrigation

slope (%) 0.8

Conventional tillage 1296 m^2
with traffic (+T)
without traffic (-T)

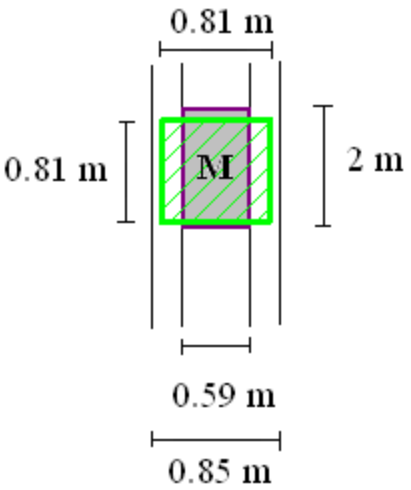
Micro-plot scale simulations

Rainfall simulations

60 mm/h

1 hour

Plan view



March 2009

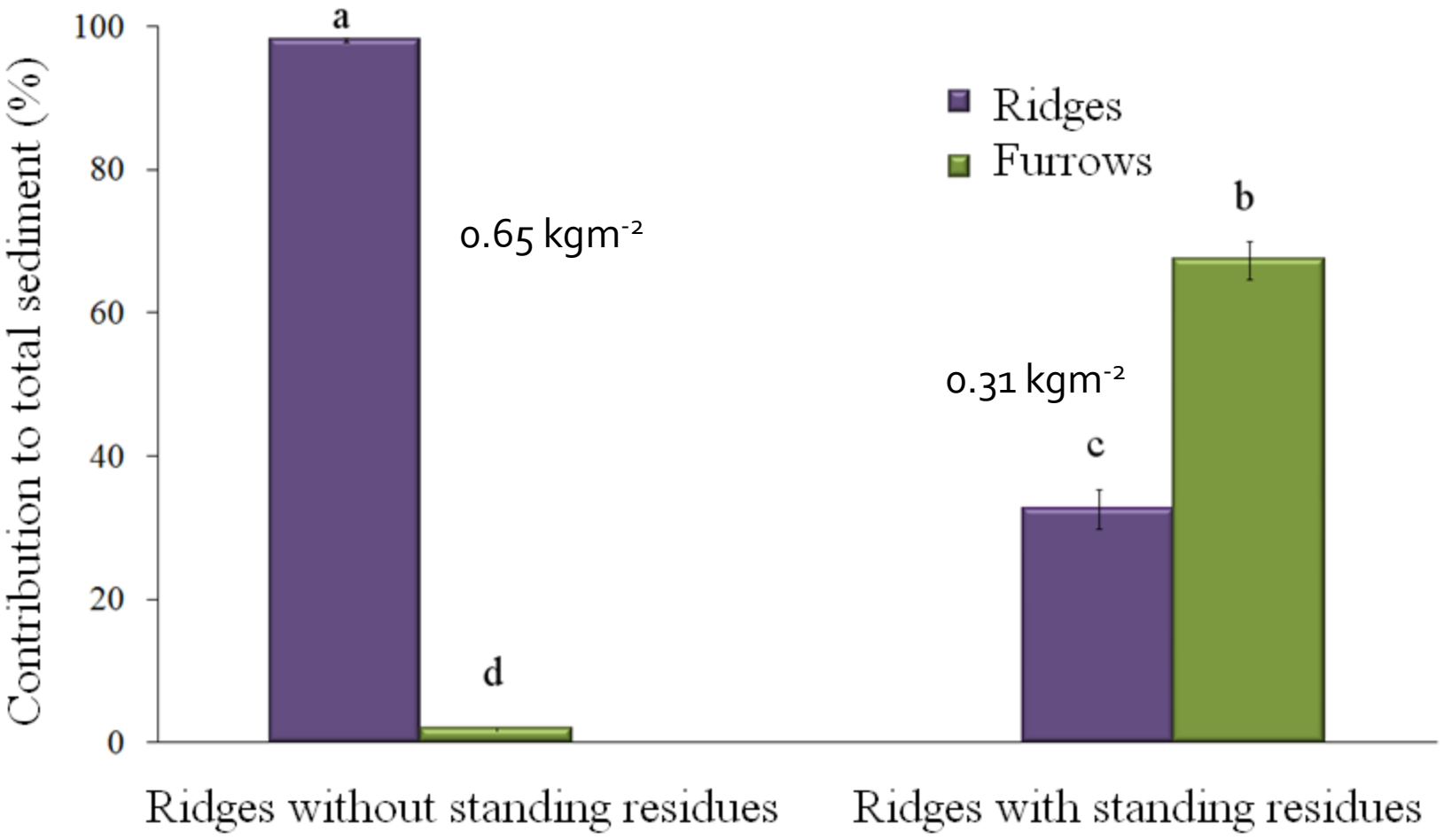
Ridges without standing residues

March 2010

Ridges with standing residues

Micro-plot scale simulations

Micro-plot scale simulations



Irrigation test

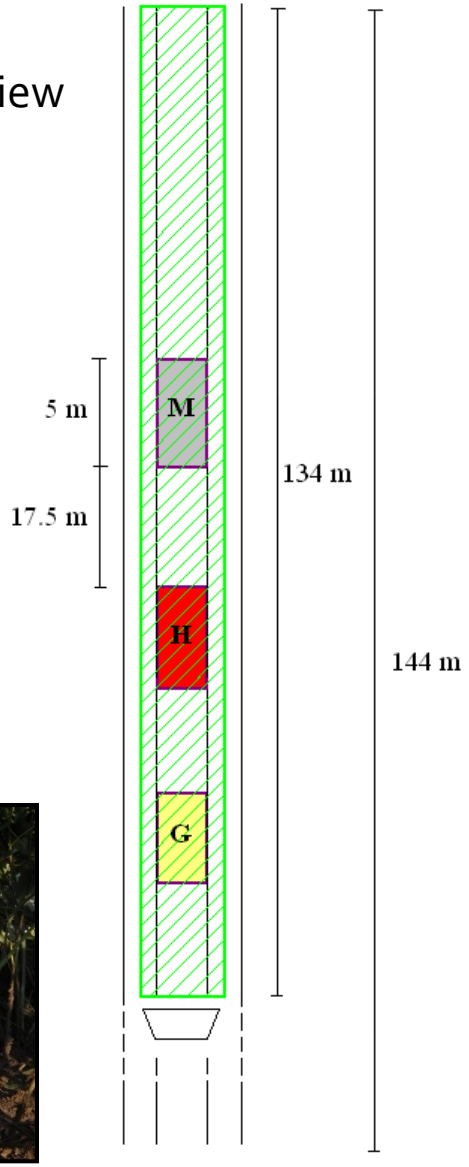
Sprinkler irrigation

18 mm/h

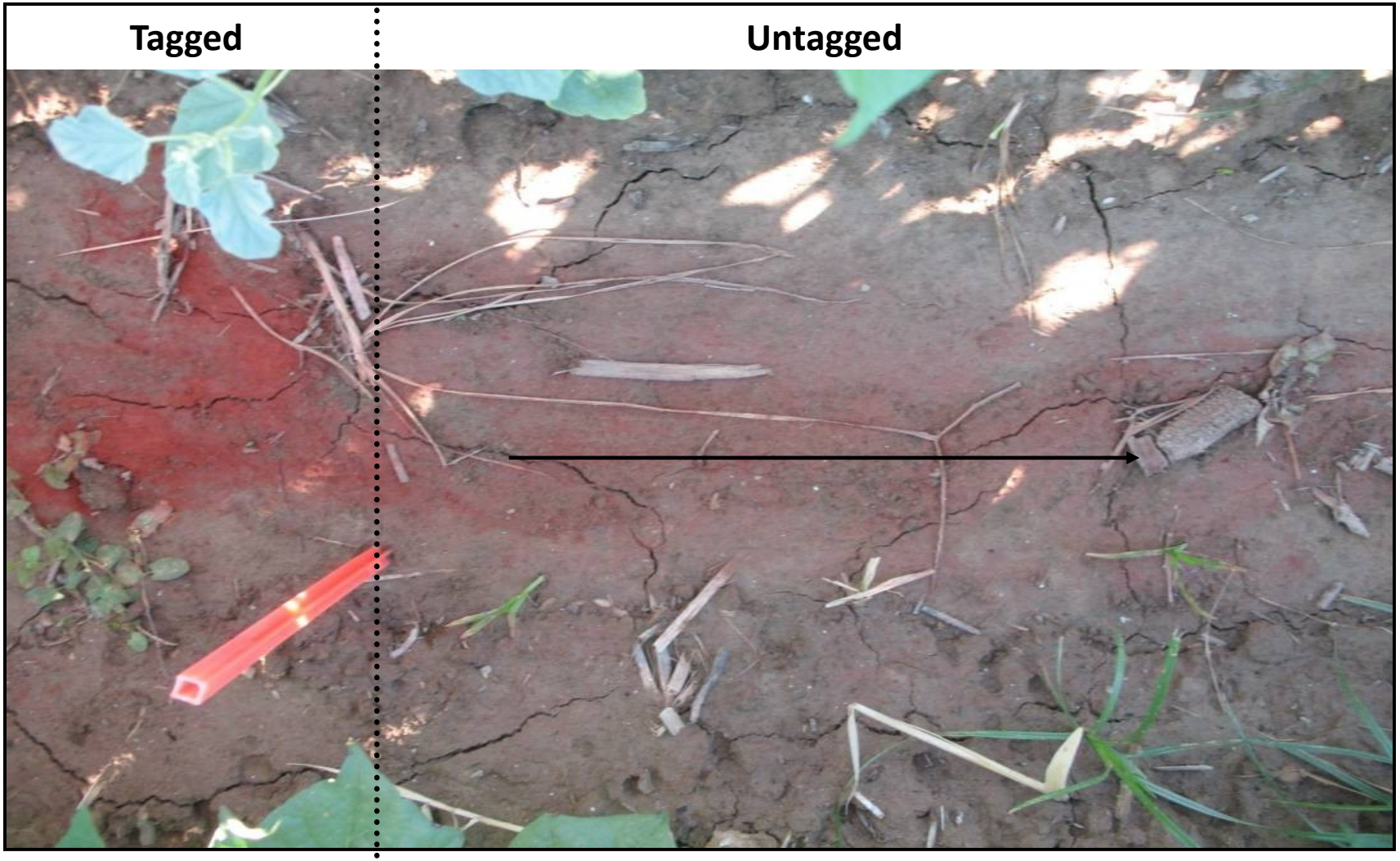
8.5 hours

July 2009

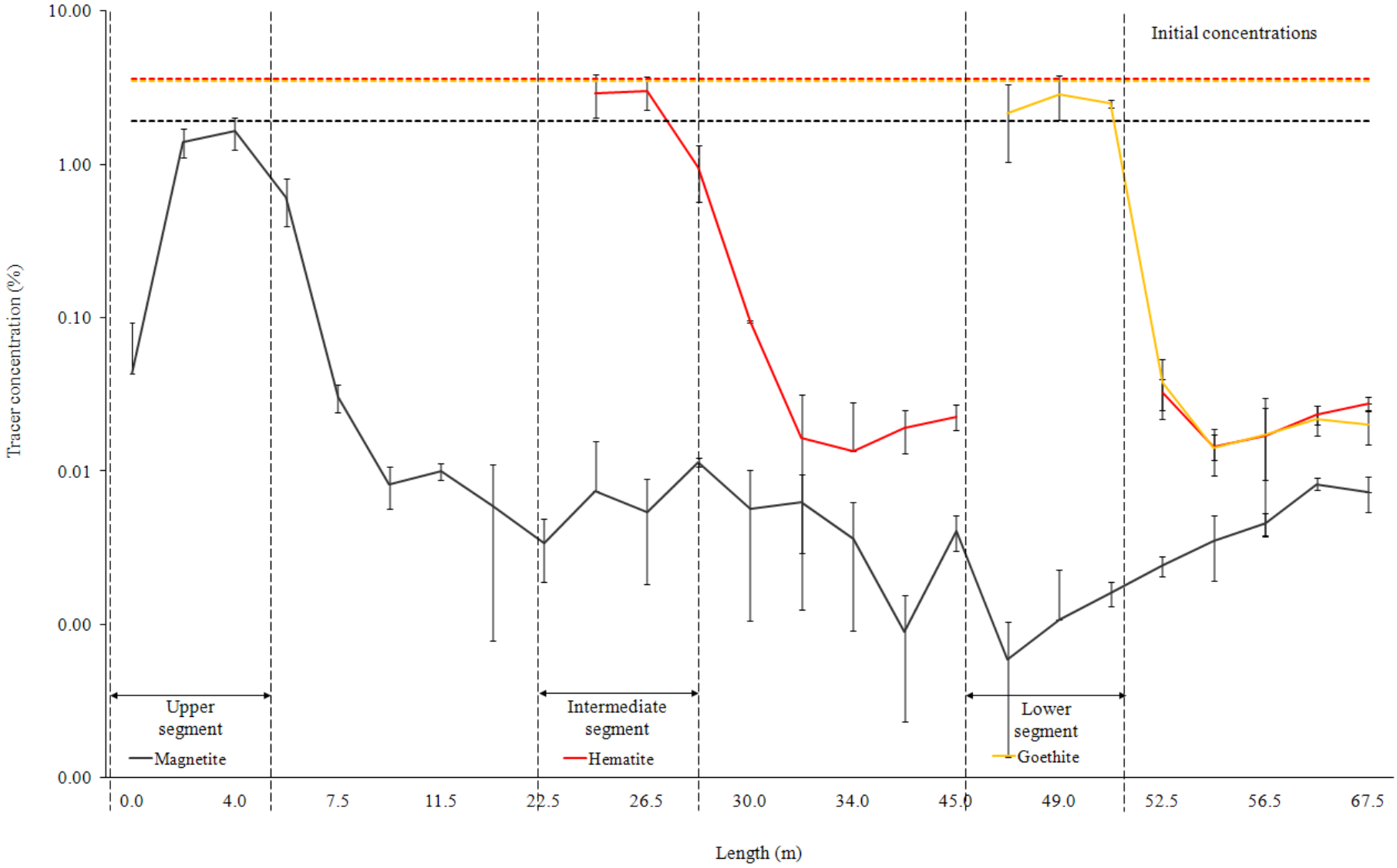
Plan view



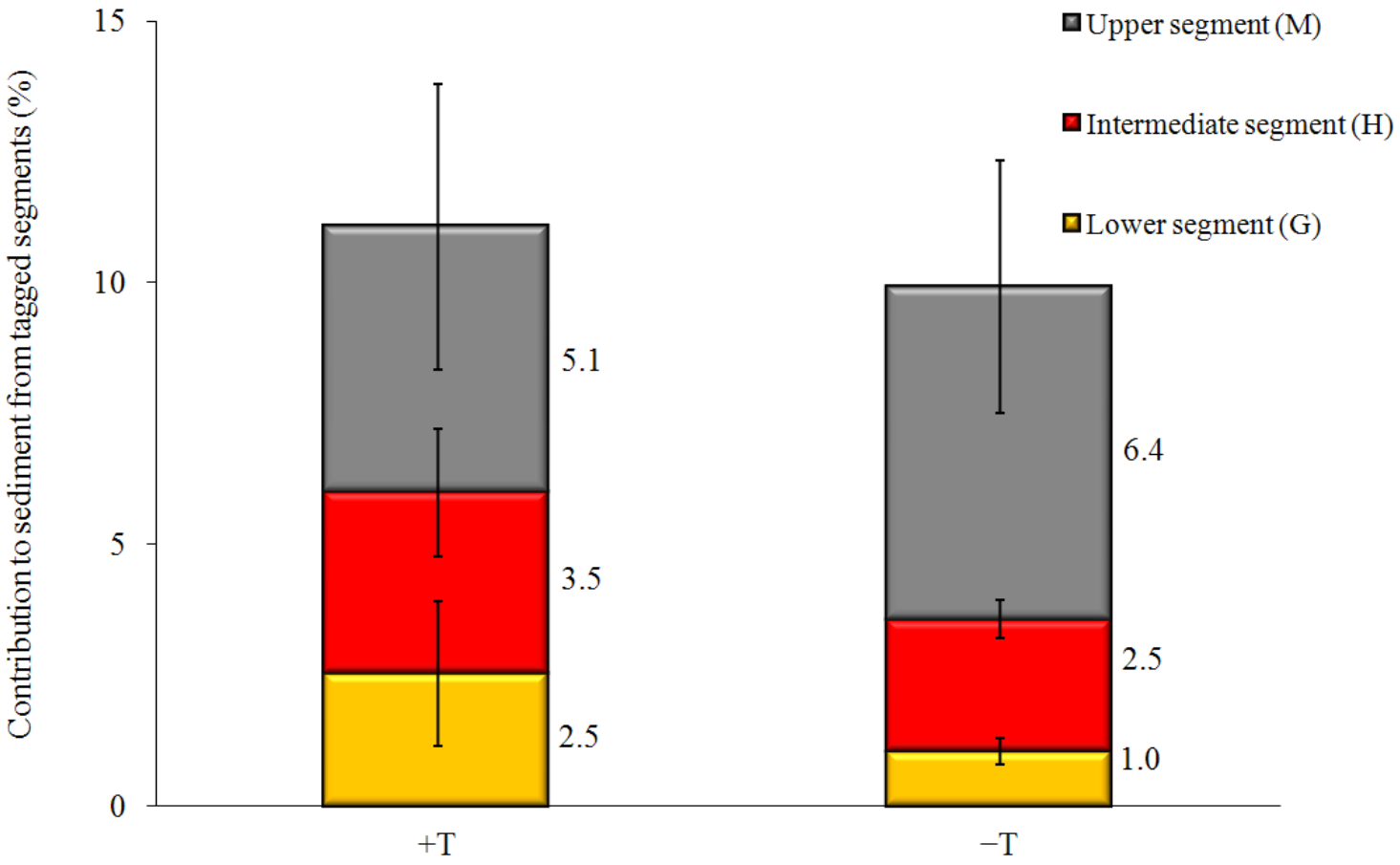
Irrigation test



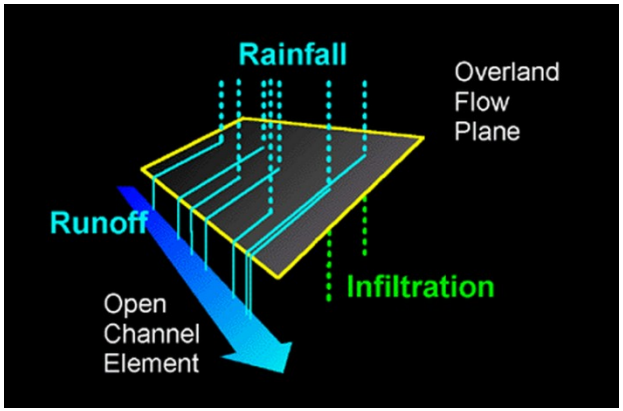
Irrigation test



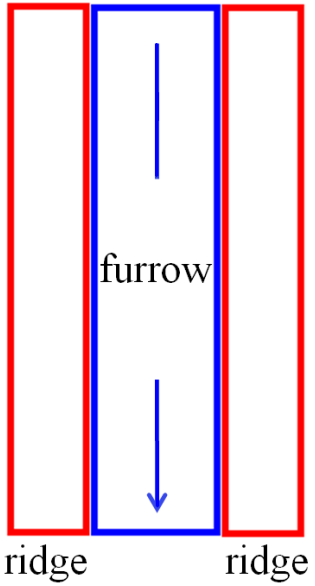
Irrigation test



Soil erosion model



http://www.tucson.ars.ag.gov/kineros/



$$\frac{\partial}{\partial} + \frac{\partial}{\partial} = \cdot - = \cdot_e$$

Mass balance equation for water

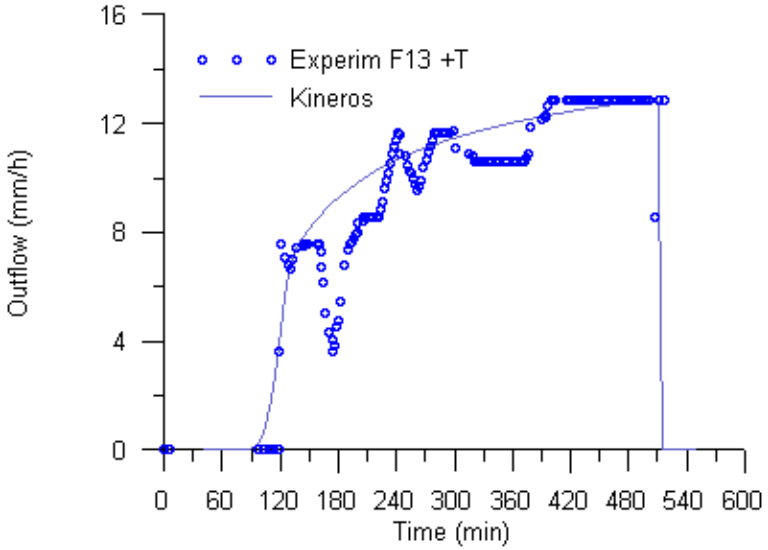
$$\frac{\partial}{\partial}(ch) + \frac{\partial}{\partial}(qc) = Br_e + \; ^{n}(k - \; ^{\cdot})$$

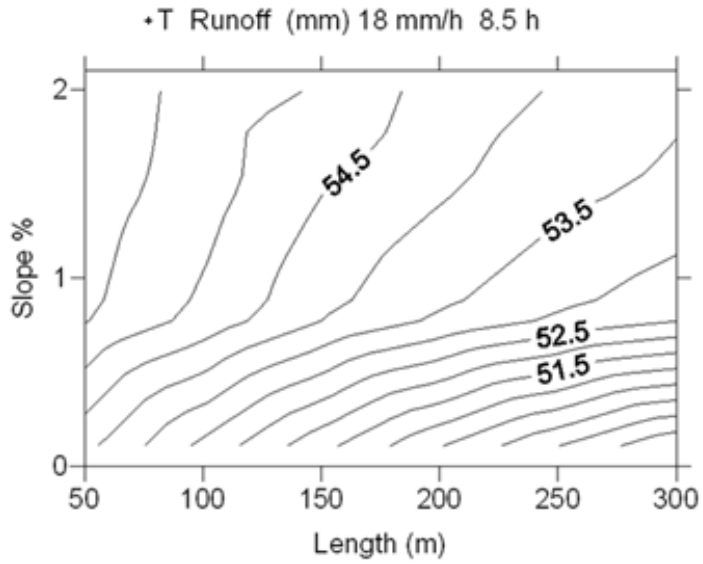
Mass balance equation for sediment concentration

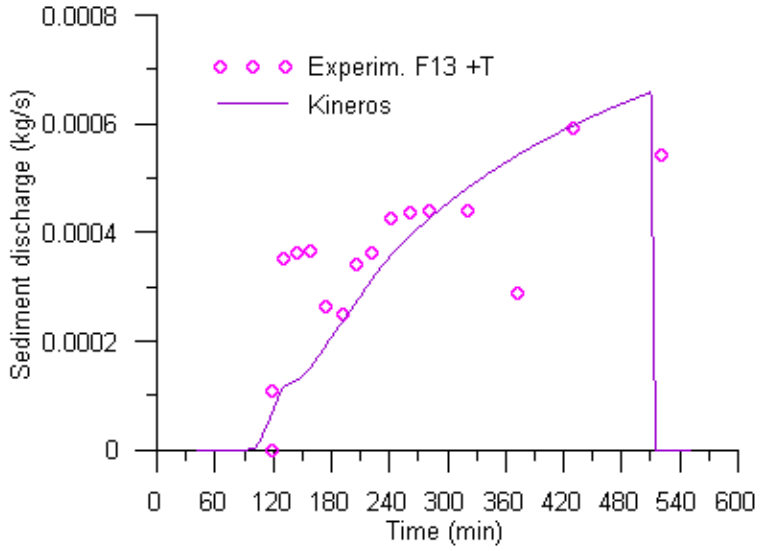
$$q = \; ^{n}$$

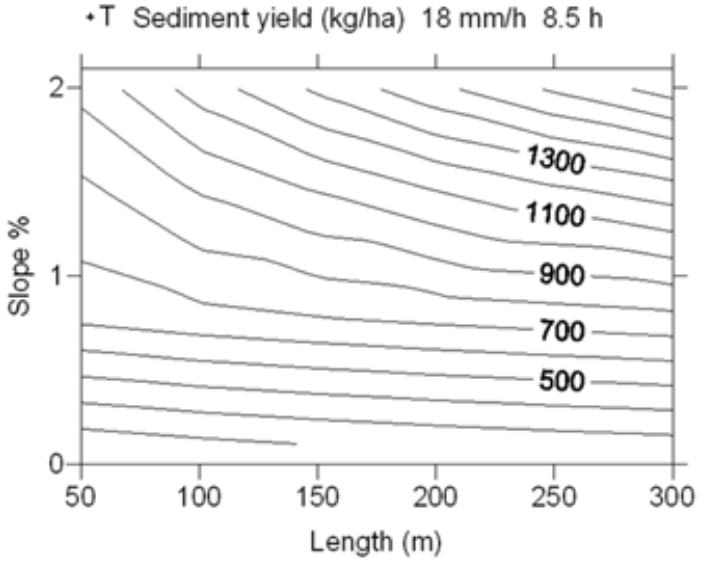
Equation of the conservation of the momentum for water

Soil erosion model









Thank you for your attention

This work was funded by Spanish Ministry of Science and Innovation (Projects AGL2006-10927-C03-01, AGL2006-10927-C03-02 and AGL2009-12936-C03-01) and FEDER funds