

Requirements for future development of small scale rainfall simulators

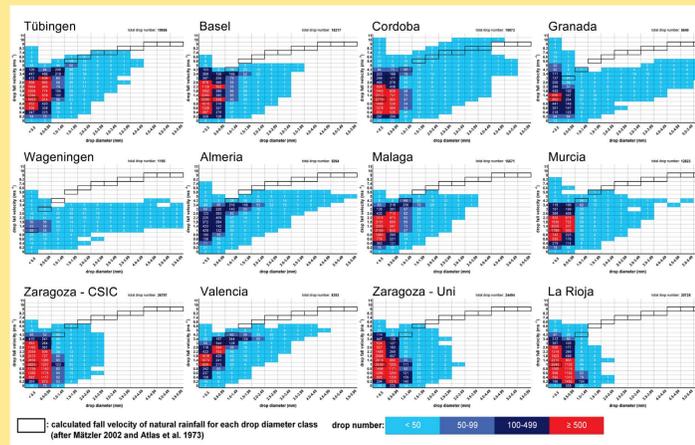
What we have now: Small scale rainfall simulators in Europe

Following the outcomes of the project “Comparability of simulation results of different rainfall simulators as input data for soil erosion modelling (*)” and the “International Rainfall Simulator Workshop 2011” in Trier, the necessity for further technical improvements of simulators and strategies towards an adaption of designs and methods becomes obvious.

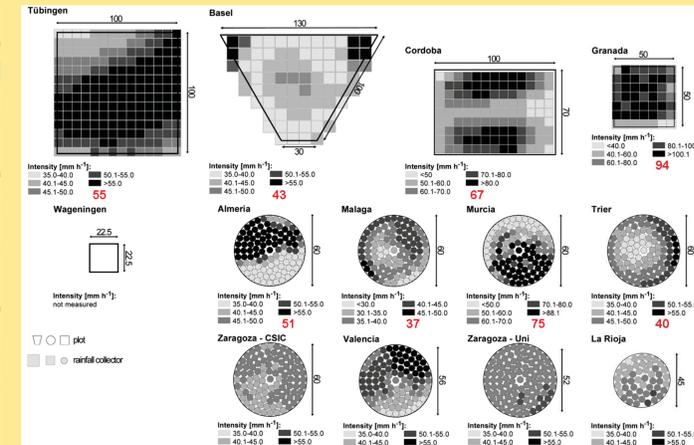
(*) DFG-Project Ri 835-6



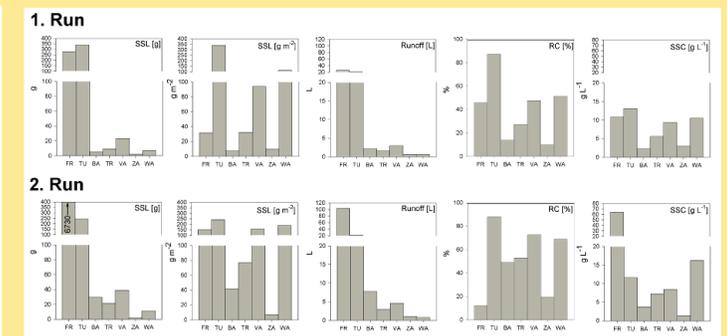
- 1 - Freiberg (Uni)
- 2 - Tübingen (Uni)
- 3 - Cordoba (CSIC)
- 4 - Basel (Uni)
- 5 - Granada (CSIC)
- 6 - Wageningen (Uni)
- 7 - Almeria (CSIC)
- 8 - Malaga (Uni)
- 9 - Murcia (CSIC)
- 10 - Trier (Uni)
- 11 - Zaragoza (CSIC)
- 12 - Valencia (Uni)
- 13 - Zaragoza (Uni)
- 14 - La Rioja (Uni)



Drop Spectra – drop size vs drop fall velocity measured with Laser-Precipitation-Monitor.



Spatial Rainfall Distribution (red: mean Intensity (mm h⁻¹)).



Comparative measurements on uniform bare fallow land: Bar charts of total suspended sediment load (SSL) per plot and per m² as well as total runoff amount, mean runoff coefficient (RC) and mean suspended sediment load concentration (SSC) per run. (Fr=Freiberg, Tu=Tübingen, Ba=Basel, TR=Trier, Va=Valencia, Za=Zaragoza, Wa=Wageningen)

- A large number of different rainfall simulator types is available
- Each of the devices produces a different rainfall (Intensity, drop spectra, spatial rainfall distribution)
- Plot sizes are also variable, as well as the experimental simulation procedures

As a consequence, differing erosion results are produced



Different pumps (gasoline, electric driven...)



Different capillaries and nozzles



Different plot sizes and designs

What we need:

General Requirements

- Low water consumption for use in areas with water shortage
- Easy handling and control of test conditions
- Homogeneous spatial rainfall distribution
- Best possible drop spectrum (physically)
- Good mobility and easy installation for use in remote areas and in regions where highly erosive rainfall events are rare or irregular.
- Reproducibility and knowledge of spatial distribution and drop spectrum
- Easy and fast training of operators to obtain reproducible experiments

Standard Rainfall Simulator Technique

Standard rainfall (nozzle, fall height, flow control)

- Two different intensities
- Standard plot size and -design
- Round, rectangular or trapezoid

Standard test procedure

Standard characterisation of parameters

Universally applicable and low-priced

References

Iserloh, T., Ries, J.B., Arnaez, J., Boix Fayos, C., Butzen, V., Cerdà, A., Echeverría, M.T., Fernández-Gálvez, J., Fister, W., Geißler, C., Gómez, J.A., Gómez-Macpherson, H., Kuhn, N.J., Lázaro, R., León, F.J., Martínez-Mena, M., Martínez-Murillo, J.F., Marzen, M., Mingorance, M.D., Ortigosa, L., Peters, P., Regúés, D., Ruiz-Sinoga, J.D., Scholten, T., Seeger, M., Solé-Benet, A., Wengel, R., Wirtz, S. (in review): European small portable rainfall simulators: a comparison of rainfall characteristics. Catena.

Iserloh, T., Ries, J.B., Cerdà, A., Echeverría, M.T., Fister, W., Geißler, C., Kuhn, N.J., León, F.J., Peters, P., Schindewolf, M., Schmidt, J., Scholten, T., Seeger, M. (2013): Comparative measurements with seven rainfall simulators on uniform bare fallow land. Zeitschrift für Geomorphologie 57(1), 11-26.

Ries, J.B., Iserloh, T., Seeger, M., Gabriels, D. (2013): Rainfall simulations - constraints, needs and challenges for a future use in soil erosion research. Zeitschrift für Geomorphologie 57(1), 1-10.

Iserloh, T., Fister, W., Seeger, M., Willger, H., Ries, J.B. (2012): A small portable rainfall simulator for reproducible experiments on soil erosion. Soil and Tillage Research 124, 131-137.

Zeitschrift für
Geomorphologie
Annals of Geomorphology
Annales de Géomorphologie

A journal recognized by the International Association of Geomorphologists (IAGG)
Neue Folge
Volume 57 Supplementary Issue 1

Rainfall simulation experiments
with small scale simulators

edited by Johannes B. Ries & Thomas Iserloh

Now online
www.borntraeger-cramer.de/jzdg
Gebrüder Borntraeger · Berlin · Stuttgart