EGU General Assembly 2011

THE EFFECTS OF DIFFERENT LAND USE CONDITIONS ON SEDIMENTOLOGICAL (DIS)CONNECTIVITY IN A SMALL AGRICULTURAL CATCHMENT

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HS9.2/GM3.4/SSS2.10
Erosion and sediment delivery in agricultural landscapes: monitoring, modelling and management

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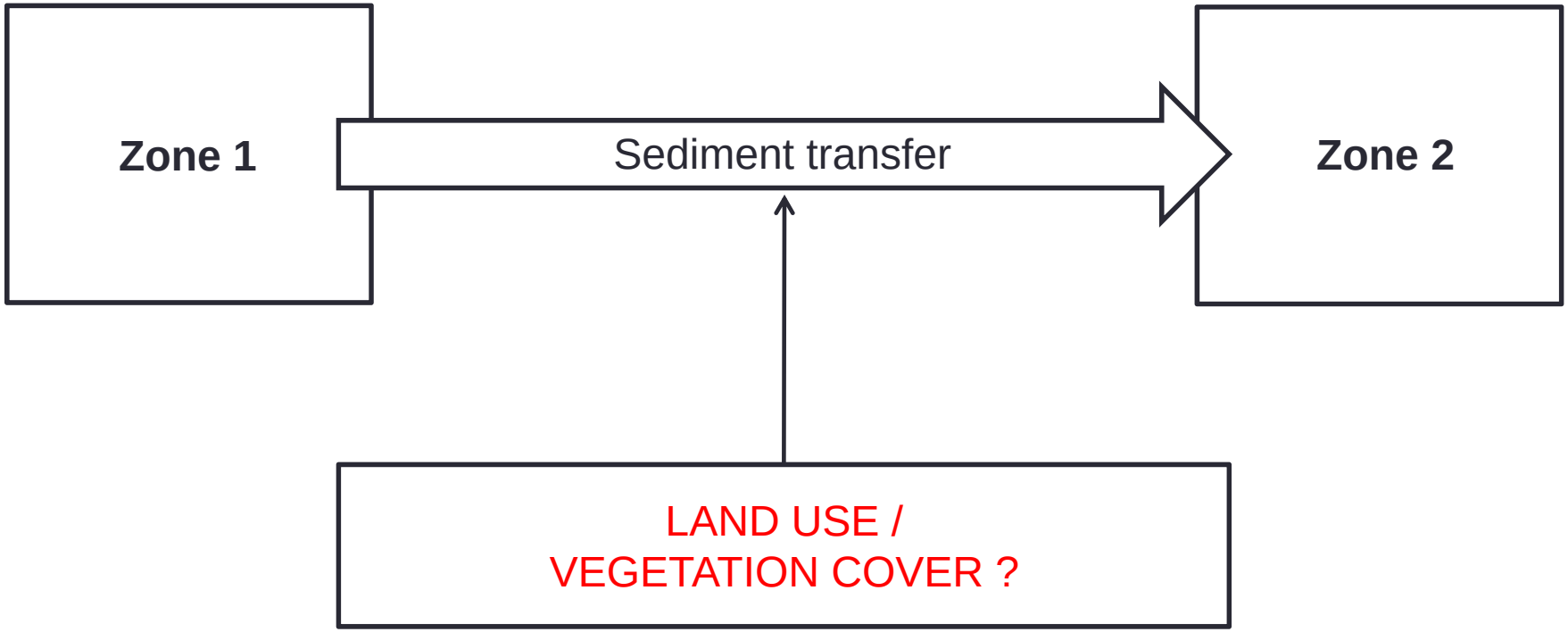
ENGAGE
Geomorphological Systems & Risk Research

AUSTRIA GEOMORPHOLOGIE UMWELTWANDEL

Landscape connectivity in Geomorphology

Landscape connectivity = “transfer of *sediment* from one zone or location to another, and the potential for a specific particle to move through the system” (Hooke 2003)



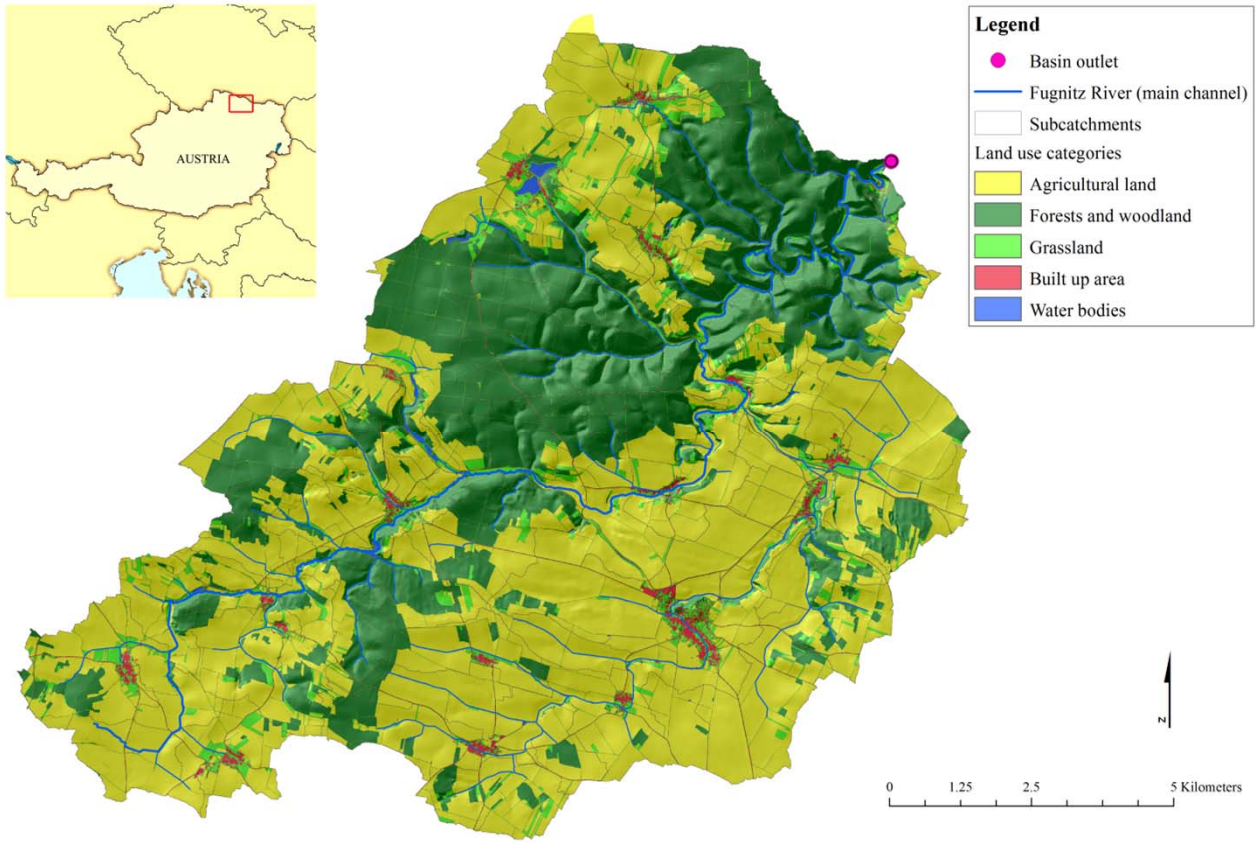
Objectives

Qualitative assessment of land use (LU)- induced sedimentological (dis)connectivity and geomorphic effects using a multi-methodological approach on different spatial scales.

No information on temporal changes or quantitative information about area-specific sediment yields is given.

Study area

Catchment name: Fugnitz
Location: Bohemian Massif, Austria



<u>Main characteristics</u>

Catchment area: 138.4km²

Annual prec.: 500–600mm

Lithology: Crystalline super-imposed by loess layers

Soils: Cambisols

Tillage: conventional with autumn ploughing

Methodology I

Workflow

(A) Land use mapping (recent aerial photographs)

(B) Sediment source area delineation: agricultural areas (3 spatial scenarios)

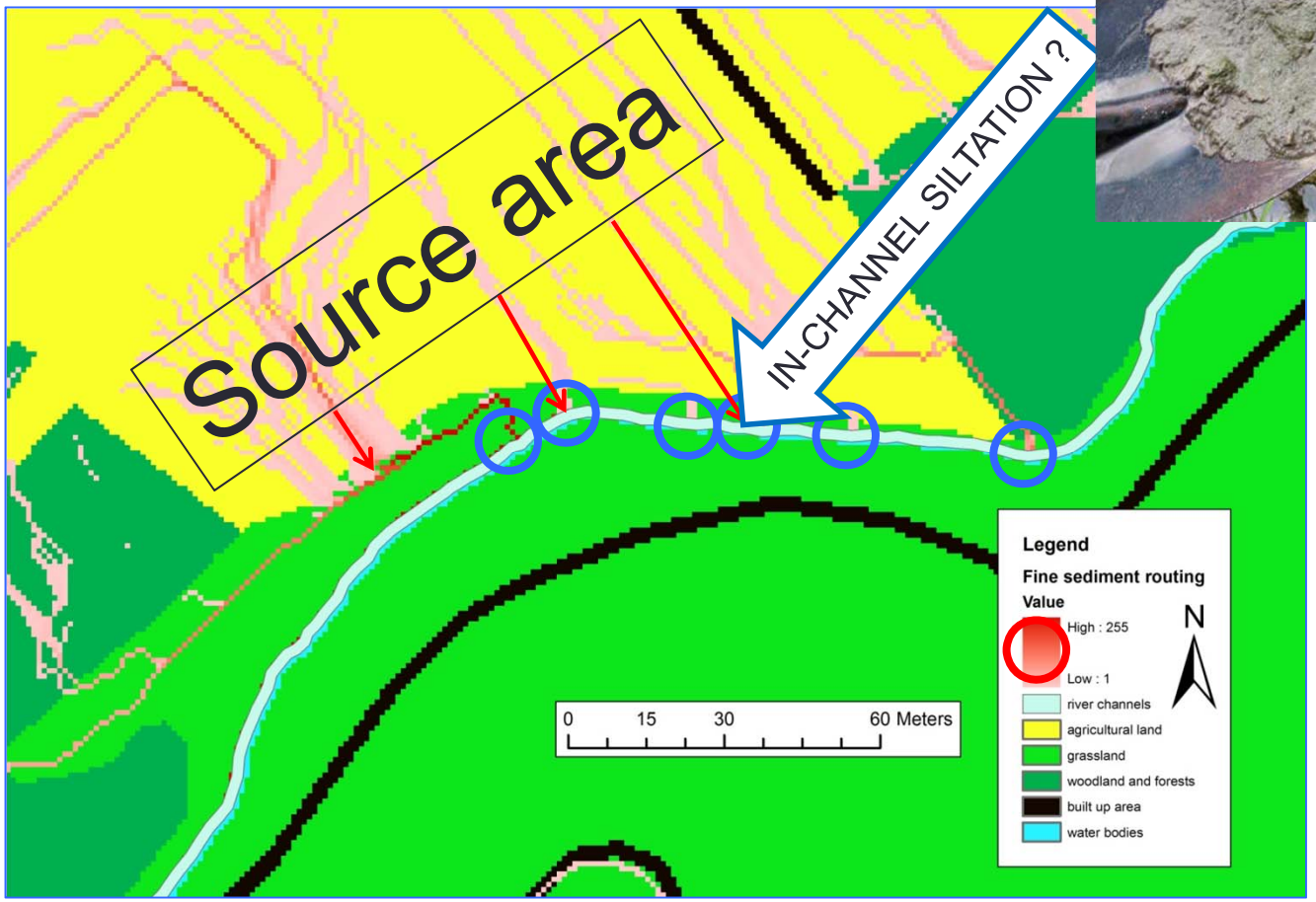
(C) Flow routing model: overland flow f. sediment source areas → river channel

(D) Fluvio-geomorphological mapping: flow routes (riparian zone) + river channel

(E) Flow route statistics: lengths per LU unit, geomorphological parameters

(F) Multivariate statistics: logistic regression model

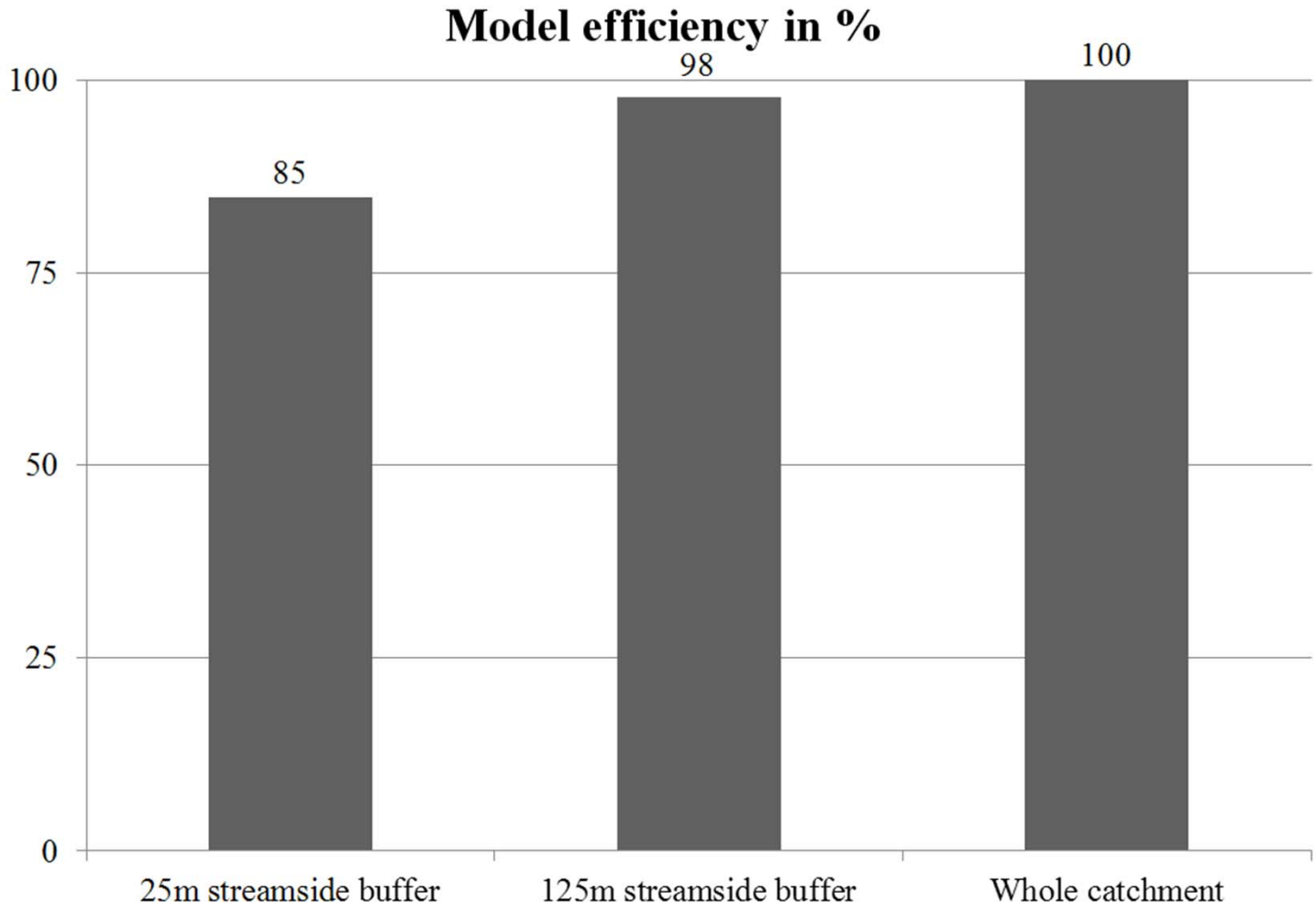
Methodology II



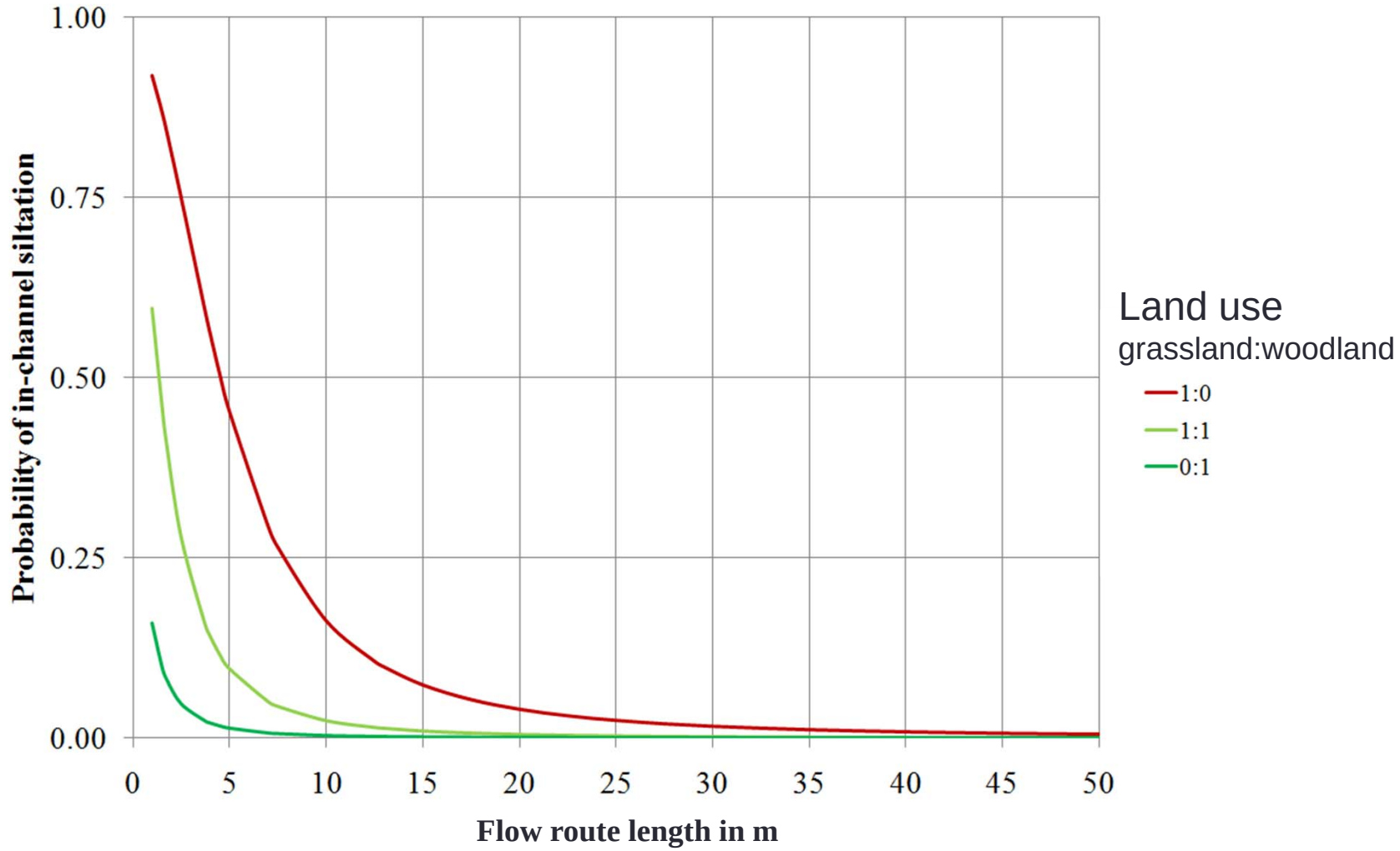
…(multiple) flow routing + flow route statistics (LU + geom. parameters)

…fluvio-geomorphological mapping (model valitation + geomorphic effects)

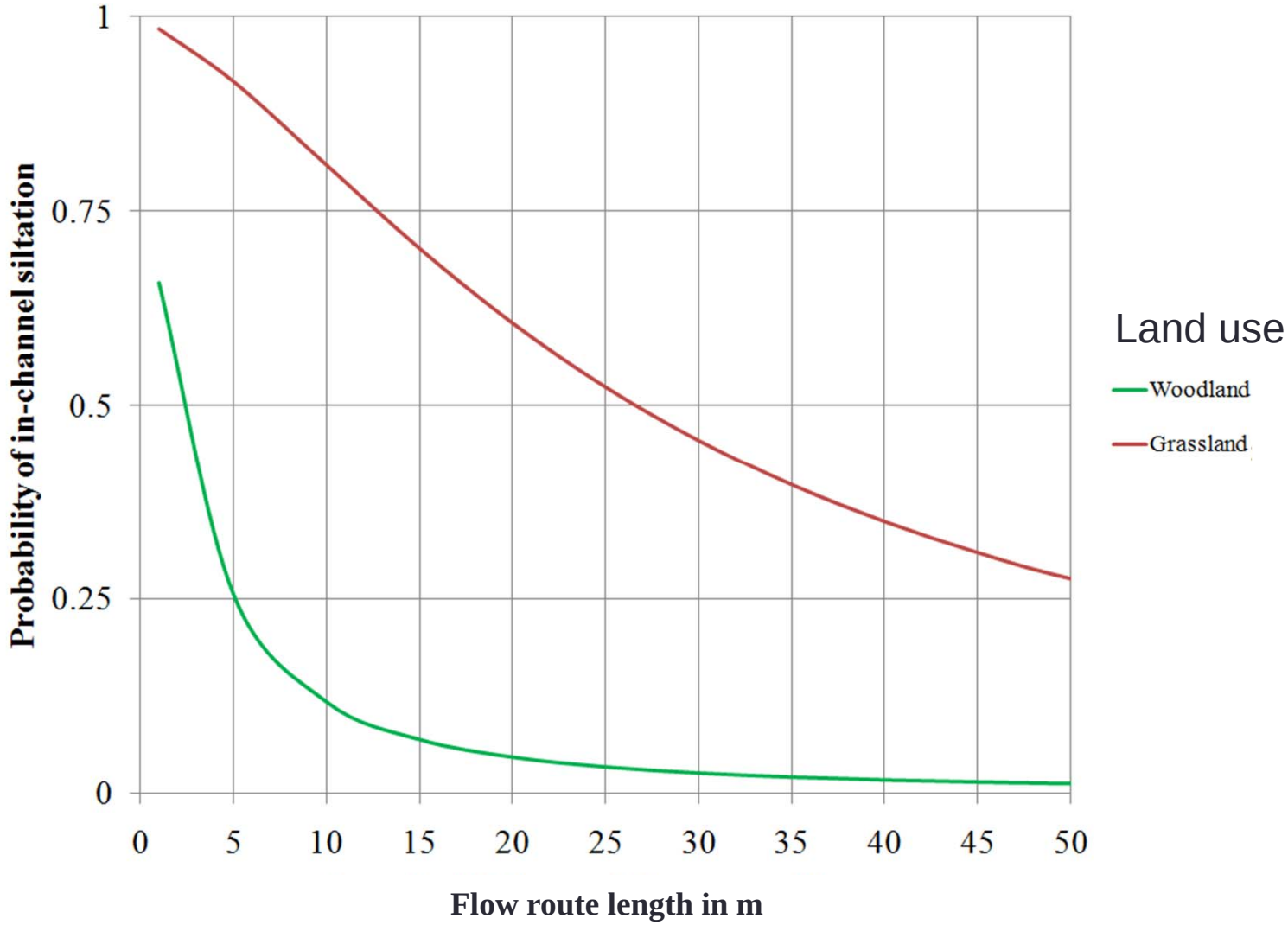
Flow routing model validation and spatial scale



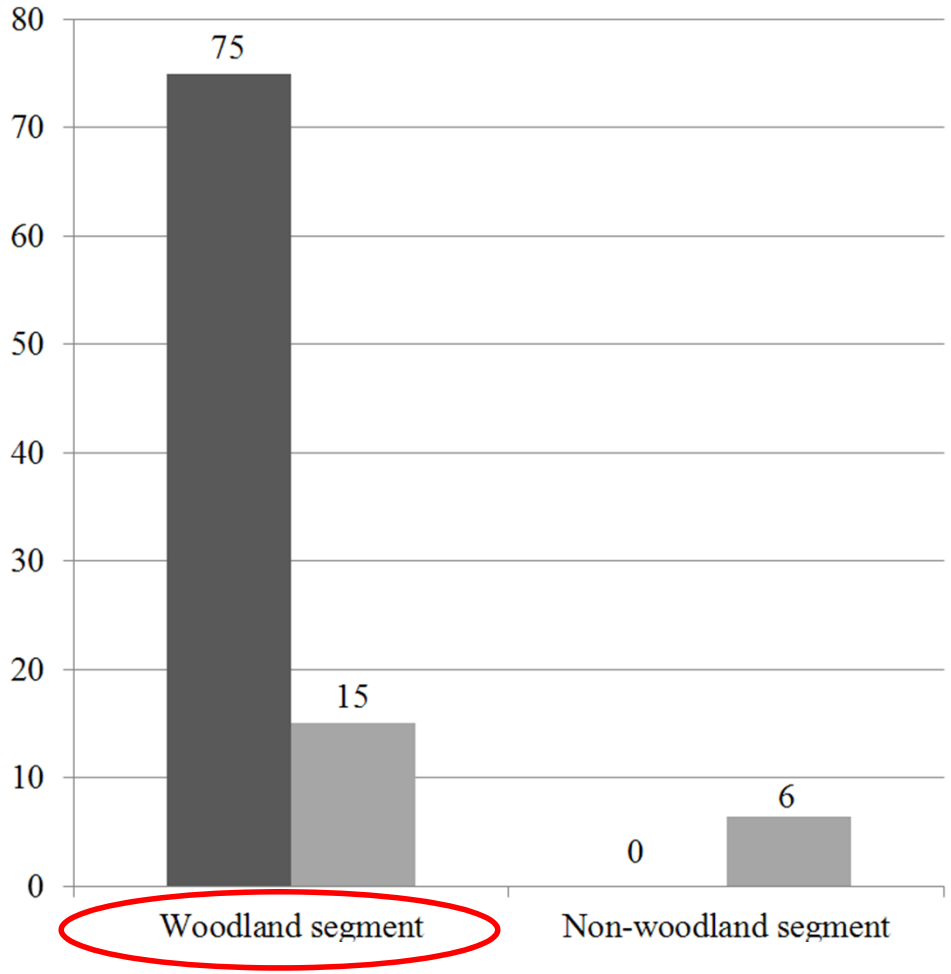
(Dis)connecting effects of land use/vegetation cover I



(Dis)connecting effects of land use/vegetation cover II



(Dis)connecting effects of land use/vegetation cover III – Geomorphic effects



$$\sqrt{\quad}$$

Cu... Surface curvature

Root damming effects → „hummocky“ landforms → high surface „hilliness“

Conclusions and outlook

- Sedimentological (dis)connectivity relationships are spatially scale-dependent
- Sedimentological (dis)connectivity = *f* (flow route length, land use/vegetation cover)
- Woodland is a more effective sedimentological disconnector than grassland (e.g. due to geomorphic effects: „root damming“)

→Land use / vegetation cover is substantially influencing sedimentological (dis)connectivity relationships

→The factor of land use / vegetation cover needs to be integrated into the concept of landscape connectivity in Geomorphology

Thanks for your attention!

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References

Poeppl, R.E., Keiler, M., Elverfeldt, K.v. and Glade, T. (submitted, 2011): The role of land use and vegetation cover for sedimentological (dis)connectivity and geomorphic response in a small agricultural catchment. *Geografiska Annaler, Series A.*

Hooke, J.M., 2003. Coarse sediment connectivity in river channel systems: a conceptual framework and methodology. *Geomorphology* 56: 79-94.