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Predicting the impact of climate change on river channel patterns in North-European Russia

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There is growing empirical evidence of the impacts climatic changes have on the fluvial morphology of the northern rivers that ultimately may lead to the transition between different channel patterns. We used three geomorphological models developed by Van den Berg (1995), Leopold and Wolman (1957), and Romashin (1968) to predict potential transitions between the two generalized types, single- and multi-thread channels, under the projected for the future climate and runoff. Models are based on the stream power concept and employ different criteria and empirical thresholds to distinguish between the channel types under prescribed environmental conditions.

Calculations were made for 16 sites on North-European Russian rivers where the runoff and climatic data were available. These data were overlaid with the projected changes of climatic parameters und runoff derived from the GCMs and predictive hydrological model.

According to the Van den Berg's model, 5 of 16 tested sites are potentially vulnerable to the future climatic change. By mid-21st century two sites on the river Ukhta near the city Ukhta and on the river Pizma near the village Borovaia are likely to start undergoing the transition from a single- to multi-thread channel type, while three other sites (on Kubena, Vuchegda and Ust'ia rivers) will reach close proximity to the threshold, beyond which such changes are possible. Leopold and Wolman's model predict more conservative fluvial patterns with only one site (Ukhta) potentially undergoing single- to multi-thread transition. Contrasting these results, Romashin's model predicts stable channel patterns at all sites except for the Vuchegda river in the vicinity of Suktyvkar, where changes of the river channel type are possible.

Divergences between the predicted channel patterns indicate inconsistency of methodologies used in the western (Van den Berg, Leopold and Wolman) and Russian (Ro-

mashin) studies that complicates the comparison of results. Further efforts are needed to develop appropriate empirical criteria and thresholds that account for the major factors governing the potential transition between different channel types under changing climatic and environmental conditions.