Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06399, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06399
EGU General Assembly 2008

The Drainage System of the European Eastern Alps: Constraints on Formation and Implications on the Orogenic Evolution

J. Robl (1), S. Hergarten (1), K. Stüwe (1) and L. Evans (2)

(1) Department for Earth Sciences; University of Graz, (2) School of Earth Sciences; University of Melbourne

The drainage system of the European Eastern Alps is known to be strongly linked to the topographic evolution of the orogen from the onset of the indentation of the Adriatic plate into Europe to the present day situation. Evidence for the reorganization of the drainage system in the light of orogen scale deformation is given by the sedimentary record of the northern foreland and by the Augenstein formation on top of the Northern Calcareous Alps. Beside of that, the drainage systems itself contain a variety of detailed information on the tectonic evolution of the Eastern Alps, including Miocene east lateral escape and post Miocene uplift. The impact of the Holocene glaciations on the Alpine drainage system can be explored by comparing properties of rivers that drained in a proximal (e.g Salzach River) and distal (e.g. Mur River) position relative to the large alpine ice shield. Numerical modelling studies have been used to constrain aspects of the landscape evolution in the Himalaya, the western US and others. However, for the European Eastern Alps there is no quantitative interpretation of the drainage system in terms of fault activity and late orogenic uplift. A numerical approach to model the dynamic development of the drainage system on top of the actively deforming European Alps in plan view is still missing and will be presented here. Therefore we follow a two folded approach to study aspects of the landscape evolution of the Eastern Alps with particular focus on the development of drainages. First we explore the modern drainage system and interpret longitudinal channel profiles and the “Stream Power” of the drainage network in terms of gradients in the recent uplift rate and try to explain local non-equilibrium channel segments by late captur-

ing events, watershed migration and glacial impact. Regions of high stream power coincide largely with regions of highest topography and largest uplift rates, while the northern and southern foreland as well as the Pannonian basin are characterised by a significantly lower stream power. Beside of the latest reorganisation of the drainage pattern, it is obvious that a variety of dominant features of the drainage system (e.g, inneralpine orogen parallel rivers) are inherited from past tectonics or dramatic base level drops. To stress this aspects of the drainage system evolution the second part of this study attempts to clarify abnormal features of the recent drainage system like wind gaps, sudden changes in the flow direction or the drainage of rivers against the overall topographic gradient by applying a new numerical model. This model couples thin viscous sheet deformation for large strains, mode II faults and a landscape evolution model based on fluvial incision. It can be shown that the first order features of the drainage system can be explained very well in terms of crustal thickening, east lateral escape and the dramatic base level drop during the Messinian salinity crisis.