Geophysical Research Abstracts, Vol. 9, 09144, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09144

Basin-mountain coupling in transpressive settings: the North-Alpine front of Alps vs. the northeastern Tibet-Qaidam-Tarim system

F. Neubauer (1), J. Genser (1), Y. Liu (2), S. Ren (3)

(1) Dept. Geography and Geology, University of Salzburg, Hellbrunner Str. 34, A-5020 Salzburg, Austria (franz.neubauer@sbg.ac.at; fax: ++43-662-8044-621); (2) College of Earth Sciences, Jilin University, Jianshe Str. 2199, 130061 Changchun, China; (3) Strategic Research Center of Oil & Gas Resources, Ministry of Land & Resources, Beijing, China

Along a mountain front, an orogenic wedge overrides in general a peripheral foreland basin filled with thick molasse-type sediments. The mountain front often comprises a number of distinct structures including triangle zones, passive roof thrusts within the lower plate, and floor thrusts and folds within the upper plate due to duplex formation in lower plate rocks.

This contribution describes structures, which formed as a result of oblique convergence on the examples of the North-Alpine front in Alps, and compares these structures with such of the northeastern Tibet-Qaidam-Tarim system. The difference between these examples is that the North-Alpine front is the result of continent-continent plate collision, the northeastern Tibet-Qaidam-Tarim system formed due to ongoing intra-continental convergence in a double-vergent orogenic system.

The E-trending North-Alpine peripheral Molasse basin displays a significant variation in width along strike, with a minimum width of ca. 9 km in front of the Bohemian Spur, where the basin turns around the Bohemian indenter and extends into the NE-trending Carpathian foredeep. The principal structure at the North-Alpine front is the presence of a triangle structure within the Molasse basin at the outboard steep front of the orogenic wedge, which commonly occurs above fault-controlled steps from the rifting stage. The steep upper plate front implies a wedge shape of the deformed peripheral foreland basin. Thin remnants of basin sediments can be traced minimum 40 km beneath the upper plate orogenic wedge. Triangle structures are modified and af-

fected by sinistral splays of the orogen-parallel wrench system within the orogenic wedge. At the Bohemian Spur, the triangle structure is seemingly replaced by a shallow, flat-lying thrust and no lower plate wedge can be recognized. In the NE adjacent Carpathian foredeep, a late-stage ramp-anticline developed in the footwall of the upper-plate floor thrust, which also passively folded rocks of the upper plate. The location of the anticline is controlled by normal faults of the rift stage, too. Consequently, it seems that structural associations along the North-Alpine front are mainly controlled by rheology of foreland sediments and inherited structures from the rift stage as well as by the amount of shortening.

As a result of India-Asia convergence, at the northeastern Tibet-Qaidam-Tarim system, a double-vergent transpressive orogenic wedge developed along the Altyn fault with Akasay/Tarim basin along its northern margin and the Qaidam basin in the south. Along the northeastern margin of the Qaidam basin, the Altyn orogenic wedge branches into the South Qilian Mountains. At the pro-wedge front, the Akasay basin is interpreted to represent a peripheral foreland basin merging to the west with the Tarim basin. In Tarim basin sectors, sediments dip to the north, so that Altyn basement rocks likely indented into the basin. In the retro-wedge front, the Qaidam basin took much of convergence by folding of the up to 8 km thick Tertiary basin sediments. This implies a stiff basement beneath the Qaidam basin, its crustal-scale folding as well as some overriding of the Qaidam basin basement by the Altyn orogenic wedge. The Qaidam/Altyn margin displays a basin-ward dip of Tertiary sediments, folding of basin sediments by oblique shortening and modification by the orogen-basin boundary by strike-slip faults. In the retro-wedge front of Qilian Mountains, tight folds within the Qaidam basin developed in front of Qilian Mountains, and possibly also thick-skinned fold structures. These structures imply that most shortening occurred within the basin.

Consequently, the structural architecture of the northeastern Tibet-Qaidam-Tarim system can be interpreted as an early stage of convergence, where no full decoupling occurred between upper and lower plate successions. In contrast, the North-Alpine displays wide thrusts and full decoupling of upper and lower plate rocks. Depending on amount of shortening, a sequence of possible structures can be postulated, therefore, for transpressive orogen-basin settings: (1) initial shortening by folding of a peripheral foreland type basin, (2) basement indentation into the basin, (3) thick-skinned thrusting of upper plate rocks onto the weak foreland basin sediments, (4) ongoing shortening of the basin fill and formation of a triangle structure, and (5) final overriding of the triangle structure by flat-lying thrusts due to ongoing convergence.