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Editorial: Style of deformation, sedimentation, kinematic and thermal evolution of thrust-top basins: From natural examples to models

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Editorial on the Research Topic
Style of deformation, sedimentation, kinematic and thermal evolution of thrust-top basins: From natural examples to models

Thrust-top basins (or "piggyback", "wedge-top", or "structural" basins) are a fairly common feature in the accretionary and orogenic wedges worldwide. The formation of thrust-top basins provides information on compressional deformation history in various subduction-collisional settings, and was mainly controlled by the kinematics of competing growth fault-related fold and thrust sequences. The aim of this Research Topic was to assemble geoscientists interested in thrust-top basins, spanning a broad array of different tectonic settings, geographical locations, and geological times. This Research Topic presents a Research Topic of some of the diverse research that is being carried out on this topic. We believe that these studies contribute to a better understanding of orogenic processes in foreland basin systems.

Alania et al. have combined field geological, seismic, and borehole data to build a new 64-km-long regional balanced cross-section across the Rioni foreland fold-and-thrust belt (RFFTB). The balanced cross-section shows that structures within RFFTB are represented by a set of fault-propagation folds, duplexes, and triangle zones, and the synclines within the study area are filled by the Middle Miocene-Pleistocene shallow marine and continental syn-tectonic sediments, forming a series of typical thrust-top basins. Using end-member thrust sequence models, the authors suggest that the thrust-top basins within RFFTB are divided into: Type I-piggyback basins; Type II-break-back basins; and Type III-formation of thrust-top basins characterized by bi-vergent geometry and related to combined, piggyback and piggyback back-thrust sequences.

Li et al. have presented new field observations and novel zircon U-Pb age, Hf isotope, and whole-rock geochemistry data, indicating the Precambrian tectonic evolution of the lower Lesser Himalaya Sequence (LHS). The authors have distinguished two groups of metasedimentary rocks within an imbricate duplexing system of the lower LHS. According to the obtained data, the first group of rocks, which are schists, paragneiss of ca. 1800 Ma, has been interpreted as a result of sediment deposition in the proximity of an immature Japanese-type arc spatially isolated from the northern Indian Craton. The second rock group, which are calc-silicate rocks, quartzite ca. 1,600 Ma, indicates their deposition in the back-arc or fore-arc

basins of an Andean-type arc developed on the northern margin of the northern Indian Craton. The authors hypothesize that the two arcs were juxtaposed either in the Paleoproterozoic or Cenozoic time, and were finally imbricated during the Cenozoic duplexing.

Meng et al. have investigated the Early Mesozoic tectonic evolution of the Western Yangtze Block, from the Early to Late Triassic period. Based on the new U–Pb ages of detrital zircons, paleocurrent data, and sandstone composition analysis of Lower Triassic and Upper Triassic sandstones from the Northwestern Sichuan Basin (NWSB), the authors suggest that: 1) Uplifted Khamdian Paleoland probably supplied the majority of materials for the NWSB during the Early Triassic, with a small amount from the southern North China Block and Qinling orogenic belt; 2) during the Late Triassic, the Qinling orogenic belt served as the major source region for the northern part of the Sichuan Basin, as well as for the uplifted Longmenshan thrust belt, whereas the Songpan-Ganzi terrane provided the majority of sediment for the central and southern parts of the NWSB.

Khalimov et al. have investigated the petrogenesis of Paleozoic magmatic rocks from the Middle Tianshan of the Southwestern Altaids and their geodynamic evolution. An integrated study of U–Pb zircon geochronology and geochemical Lu–Hf isotopic compositions for the Late Paleozoic shoshonitic Chorukhdairon pluton and quartz porphyry rocks in the southern Chatkal–Kurama terrane, western Middle Tianshan, has been carried out. On the basis of obtained data, the authors have concluded that the flat-slab subduction probably occurred beneath the Middle Tianshan during the Middle Devonian to Early Carboniferous, and, following the end of the flat subduction, the southeastward slab roll-back occurred during the Middle Carboniferous to the Early Permian.

Author contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and have approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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