Tectonics

Supporting Information for

Tajik Basin and Southwestern Tian Shan, Northwestern India-Asia Collision Zone: 1. Structure, Kinematics, and Salt-tectonics in the Tajik Fold-thrust Belt of the Western Foreland of the Pamir

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Introduction

This file provides Supporting Information S1 and the descriptions of the Supporting Information Figures.

Supporting Information S1

The base for our geologic and structural interpretations are the Soviet-time geological maps of the USSR at a scale of 1:200,000. They were issued by the Russian Geological Research Institute (GRI), Nedra, Moscow, in Russian. In the text, we reference the used map sheets as GRI (1961-1984). In detail these include:

Bekker, Y. A, & Babkov, K. V. (1962). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XV*, Russ. Geol. Res. Inst., Nedra, Moscow.

Bezgulov, E., Nikitina, O. N., Starshinin, D. A., & Gusev, V. L. (1984). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-VIII*, Russ. Geol. Res. Inst., Nedra, Moscow.

Burmakin, A. V., Starshinin, D. A., & Likhachev, V. I. (1961). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XI*, Russ. Geol. Res. Inst., Nedra, Moscow.

Filonov, A. I., Korol, A.N., & Solun, V. I. (1962). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XVI*, Russ. Geol. Res. Inst., Nedra, Moscow.

Kuznecov, N. N, & Solun, V. I. (1961). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XXIII*, Russ. Geol. Res. Inst., Nedra, Moscow.

Kuznecov, N.N, & Solun V. I. (1964a). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XXII*, Russ. Geol. Res. Inst., Nedra, Moscow.

Kuznecov, N.N, & Solun V. I. (1964b), *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XXVIII*, Russ. Geol. Res. Inst., Nedra, Moscow.

Lyoskind, S. Y., Novikova, L. A., & Dolgonos, L. G. (1963). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XVII*, Russ. Geol. Res. Inst., Nedra, Moscow.

Melnik, V. E., Begishev, K., & Babkov, K. V. (1962). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XX*, Russ. Geol. Res. Inst., Nedra, Moscow.

Molchanov, A. P., & Babkov, K. V. (1961). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XXI*, Russ. Geol. Res. Inst., Nedra, Moscow.

Muftiev, Z. Z., Shadchiniev, A. S., Averyanova, V. B., Breyvinskoy, V. M., Volkova, V. V., Ismailova, K. I., Hasanova, A. K., & Kukhtikov, M. M. (1962). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-X*, Russ. Geol. Res. Inst., Nedra, Moscow.

Rubanov, D. A., Puniklenko, I. W., Rubanov, A. A., & Alfyorov, G. Y. (1963). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-XIV*, Russ. Geol. Res. Inst., Nedra, Moscow.

Vinogradov, P. D., Minakov, A. I., Ovchinikov, S. K., Tarasenko, A. T., & Markovsky, A. P. (1962). *Geological map of the USSR of 1: 200 000 scales, Sheet J-42-IX*, Russ. Geol. Res. Inst., Nedra, Moscow.

Supporting Information Figures

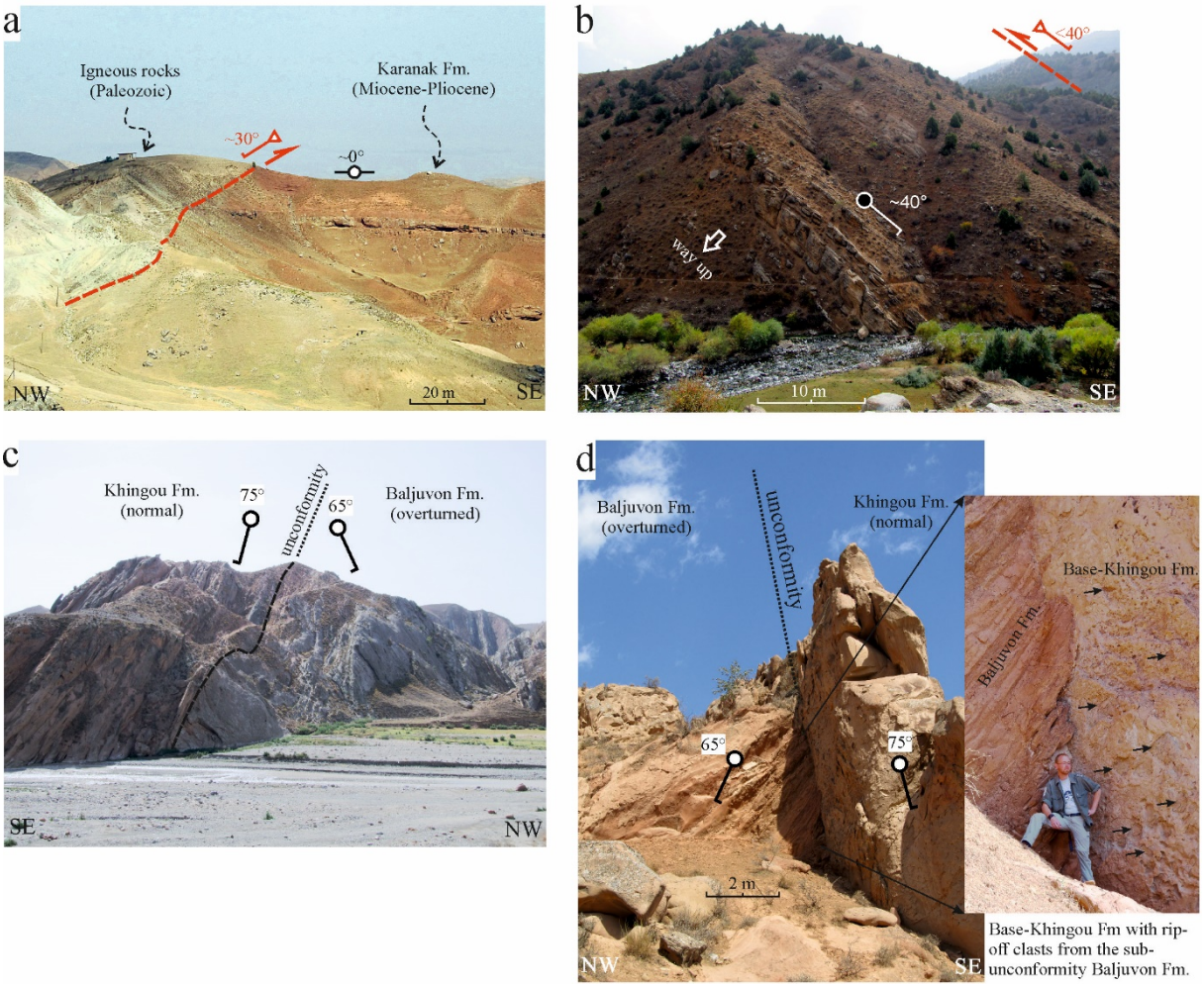

Figure S1. (a) Low-angle thrust displacing the crystalline core of the Tchulbair anticline over the foreland-basin strata of the Sangardak anticline; no footwall syncline present. (b) Flank of a footwall syncline overturned to ~40° dip; the bedding dip constrains the upper limit of the thrust dip. (c) and (d) Unconformity between the Baljuvon and Khingou Fms in the footwall of the Tchulbair anticline.

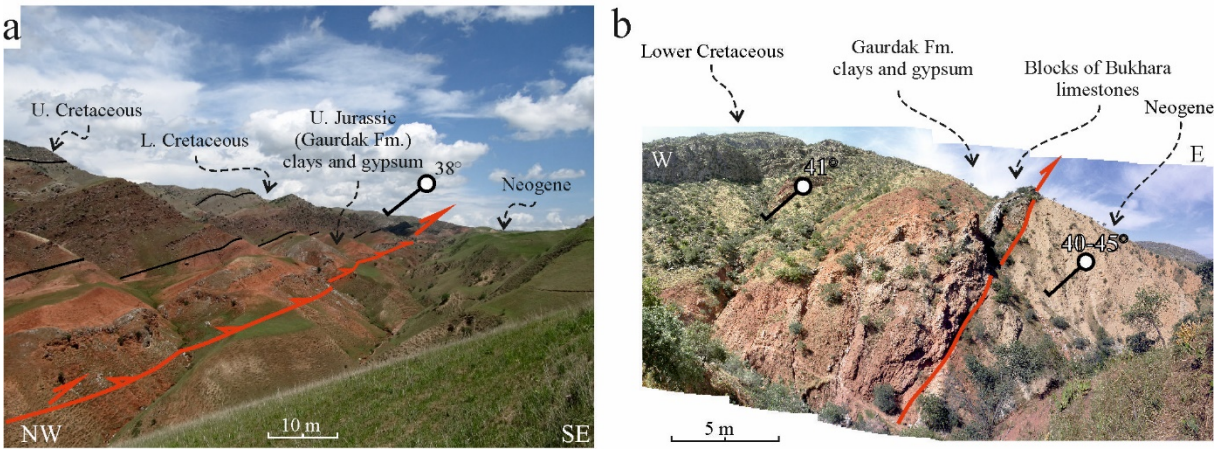

Figure S2. (a) Homoclinal front of the Rengan thrust sheet, exposing the ~100 m-thick Gaurdak Fm; here, evaporites (gypsum) are subordinate to mudstones and shales. (b) Sole thrust of the Gardyanushti thrust sheet with a thin layer of evaporites and homoclinal hanging-wall.

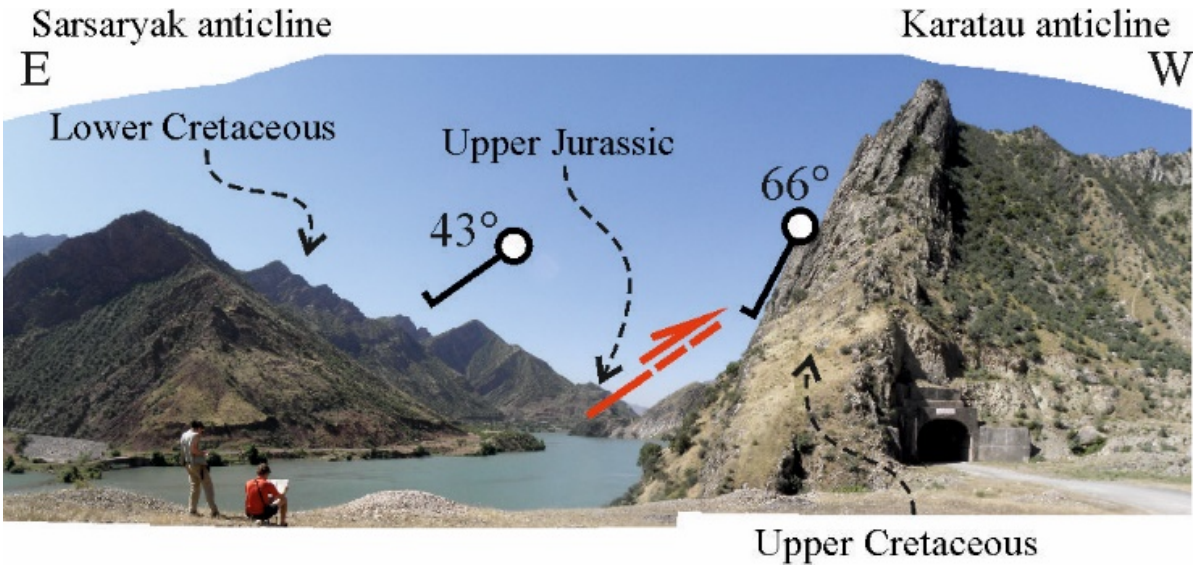

Figure S3. The Sarsaryak sheet thrusts over the Karatau sheet. The homoclinal Sarsaryak thrust sheet has a lower dip angle than the backlimb of the Karatau thrust sheet hanging-wall anticline, indicating a break-back thrust succession.

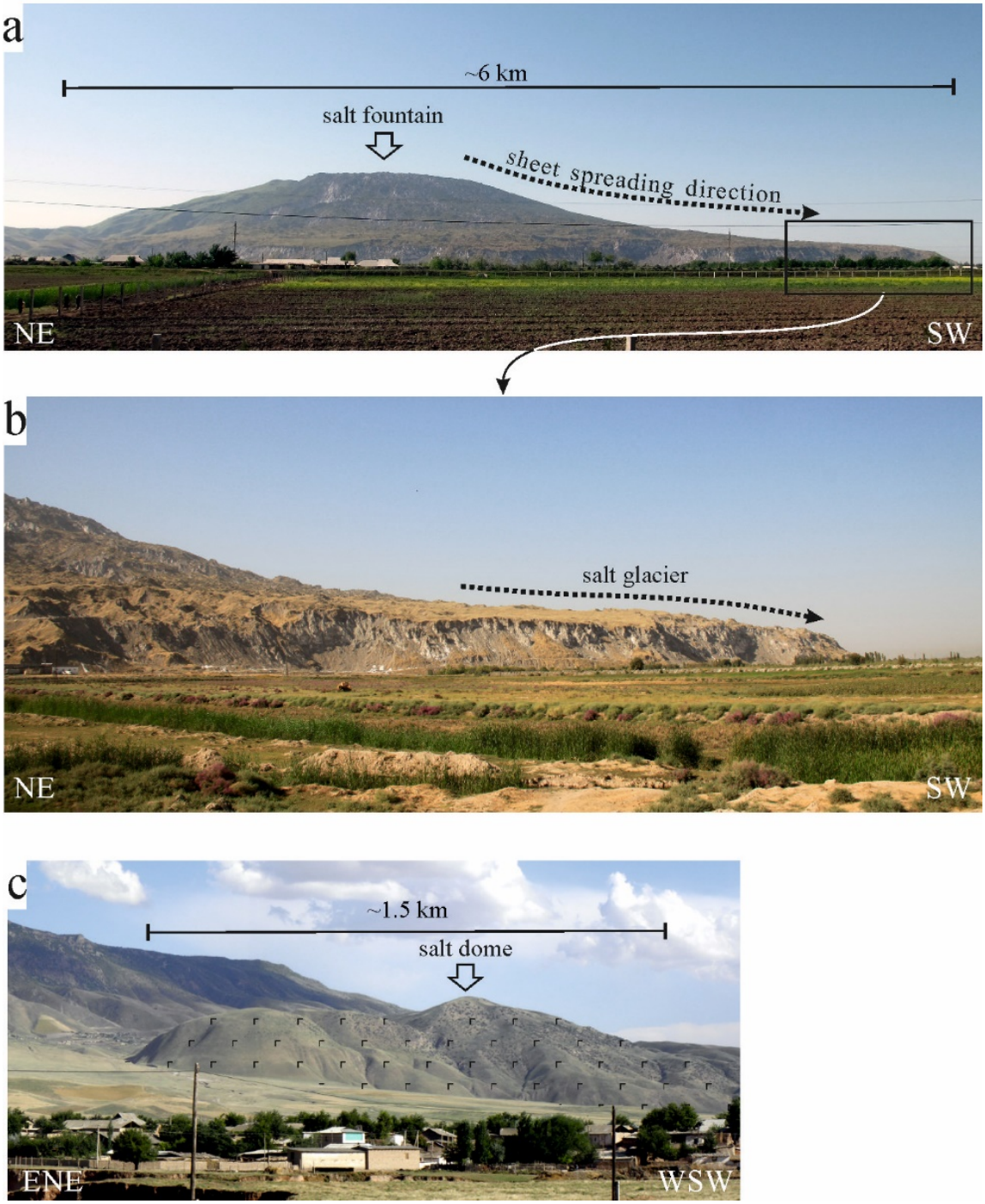

Figure S4. Salt extrusions. (a) General view of the Hoja Mumin salt sheet. Salt-fountain geometry indicates ongoing salt extrusion and sheet spreading. (b) Detail of the advancing front of the Hoja Mumin salt sheet. (c) Salt plug along the frontal thrust of the Dhilanytau anticline (marked 'P' in Figure 11).

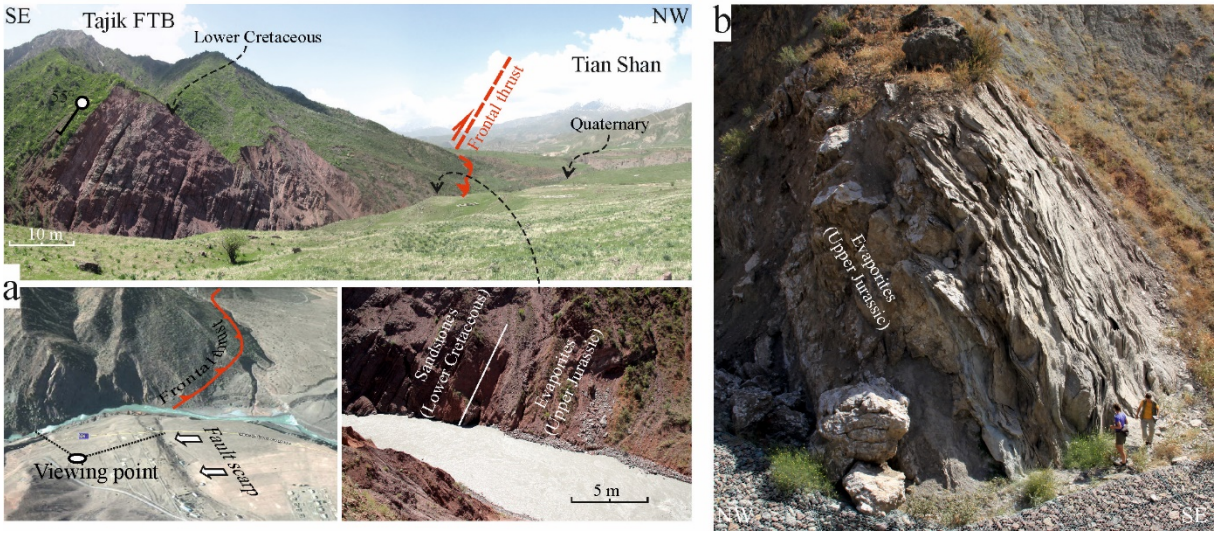

Figure S5. Thrust front of the northeastern Tajik fold-thrust belt (FTB). (a) Outcrop in the Obikhingou valley. Evaporitic sole of the FTB dips at ~55°. Its modern activity is evidenced by a fault scarp affecting a river terrace (Google Earth image). (b) Outcrop at 39°00.231’ N, 070°20.474’ E at the mouth of a small tributary to the Surkhob river. Evaporites and hanging cataclasites of the Tajik FTB sole thrust; steep dip of the sole thrust may result from buttressing by the Tian Shan.

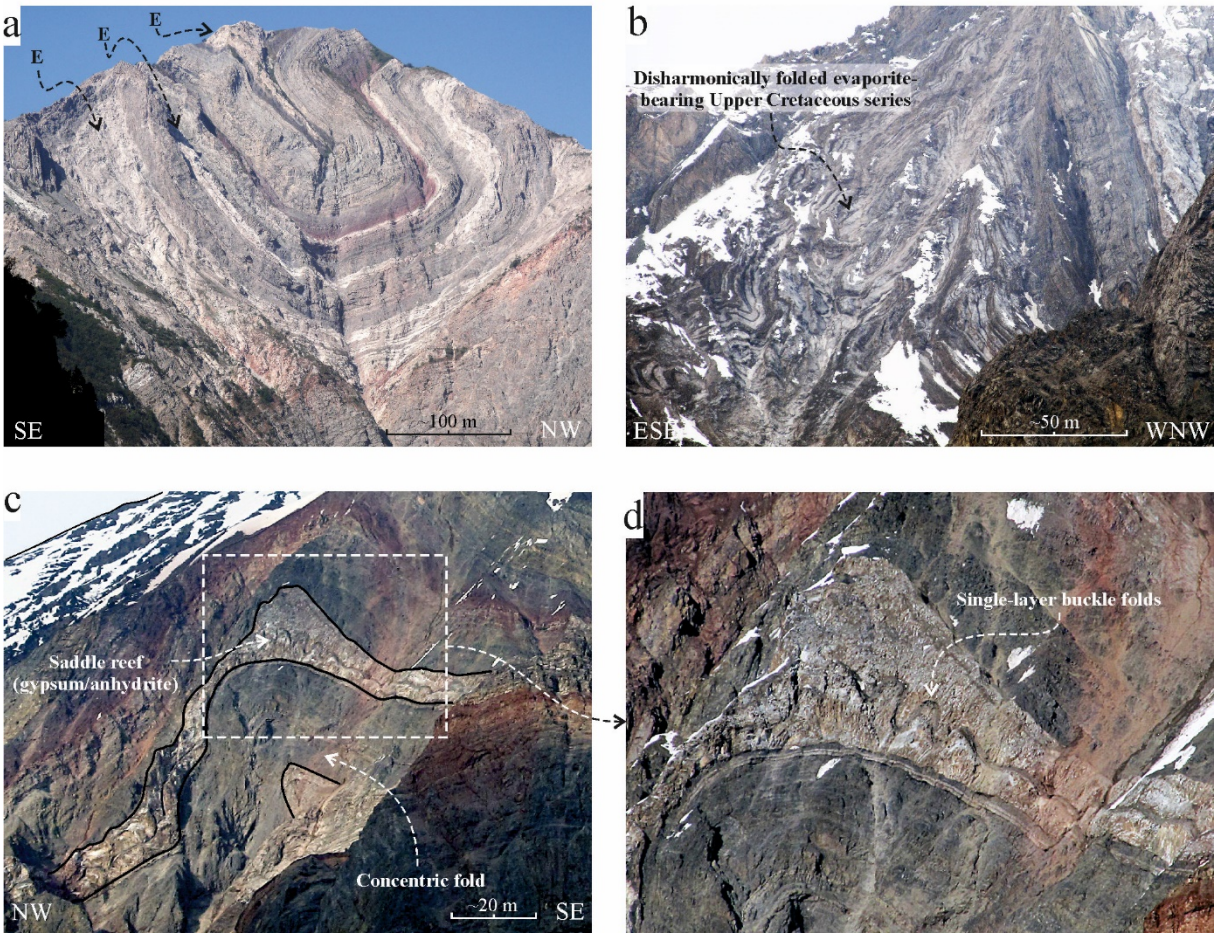

Figure S6. Intermediate décollement in the Upper Cretaceous-Paleogene strata in the core of the Yafuch syncline. (a) 'Stone Flower' Mountain with multiple evaporite levels (marked 'E') accommodating isoclinal folding of the syncline core. (b) Disharmonic folding in Upper Cretaceous gypsum/anhydrites. (c) and (d) Gypsum/anhydrite filled saddle reef with single-layer buckle folds.

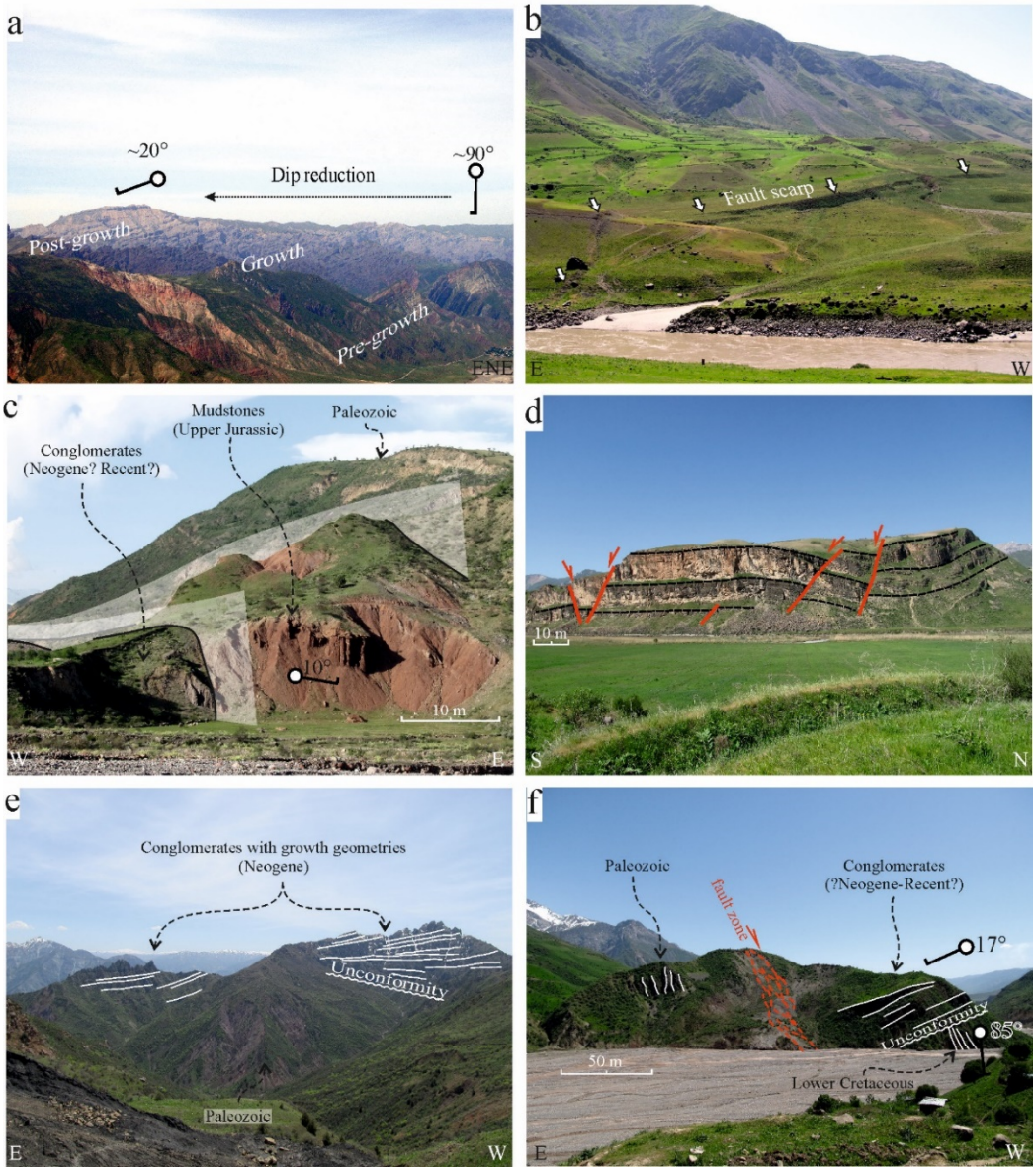

Figure S7. Structural and depositional geometries across the Darvaz fault zone in the Shurobod area. (a) Panorama of the Mesozoic (foreground) to Neogene (background) section along the eastern margin of the Tajik basin. Neogene growth strata accommodate a drastic dip change between the pre- and post-growth series. (b) Fault scarp across a modern fluvial terrace in the Darvaz fault zone, indicating normal and sinistral strike-slip displacements. (c) Subvertical strands of the Darvaz fault zone, juxtaposing Upper Jurassic series against the Paleozoic basement on one side and likely Neogene conglomerates on the other. (d) Normal faults in the axial part of the Darvaz fault zone. These are interpreted as marking a releasing bend of the Darvaz fault zone (compare Figure 15a). (e) Likely Neogene conglomerates in a transgressive position on top of Paleozoic basement of the Pamir. Note growth geometry. (f) Tilted, likely Neogene conglomerates in the axial part of the Darvaz fault zone.

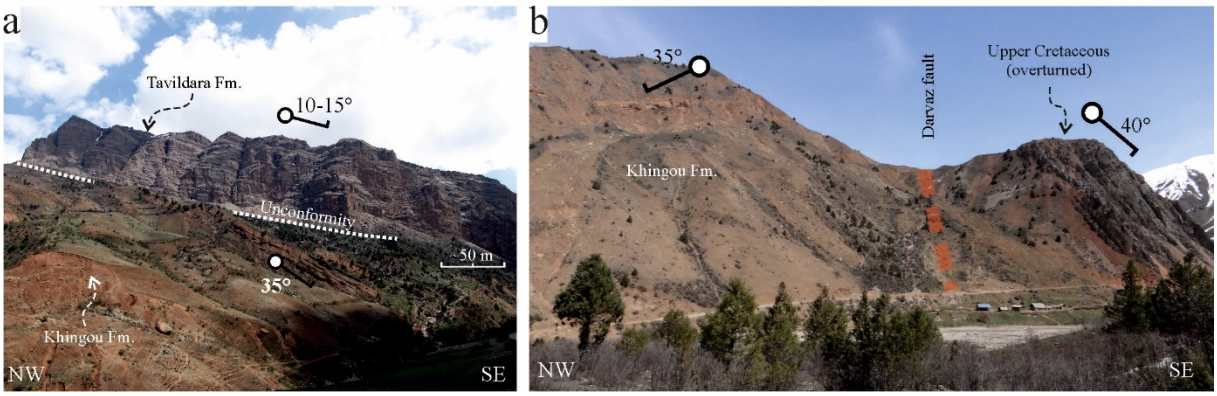

Figure S8. (a) Low-angle unconformity between the sandstone-dominated Khingou Fm (bottom) and conglomeratic Tavildara Fm (top). (b) Contact between the Neogene Khingou Fm and overturned Upper Cretaceous strata across the northern strand of the Darvaz fault zone.