

Interactive comment on “Pull-apart basin tectonic model is structurally impossible for Kashmir basin, NW Himalaya” by A. A. Shah

Anonymous Referee #2

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The manuscript is mostly concentrated in the confutation of what proposed by other authors on the tectonic origin of the Kashmir Basin (e.g. this manuscript bears the record of use of the word “impossible” among all the papers/manuscripts I read since now - 18 times, including figure captions in a 4 page manuscript). I do not intend to enter in the debate on its origin. As far as I understand, both interpretations may derive from not-sufficient, yet necessary evidences. And this strikes the right point. The aim of the manuscript is wrong following Popper: to prove a theory you require a sufficient evidence, yet you can get only necessary evidences that become sufficient only when you collect the total of them (that is, their number becomes infinite). On the other hand, one single evidence is sufficient to completely refuse a hypothesis. By considering the complexity of geological subjects (that Popper, for this reason, had difficulty in considering a science. . .) it is very easy to find exceptions on any proposed

C1

theory/model/application. Due to this point, articles should always be propositive .The author is invited to propose, prove, and discuss an alternative model. In this way, both title and content do not arrive to any new/different conclusion and miss this point. Anyhow, in the following few observations on the weaker points of the manuscript are suggested. The title should be propositive. The confutation of the pull-apart model is forced to a very rigid interpretation and some possible indications (dashed lines) from the previous authors are interpreted as definitive sentences (e.g. Fig. 3). The confuted pull-apart is interpreted in a very rigid and surface way, without considering its extension at depth. I am sure that the author is well aware that pull-apart, as in the case of half-graben geometry, does not prosecute to the center of the Earth or until a ductile layer to absorb the displacement. Again, I am sure that the author knows well that a pull-apart structure most unlikely absorb/ re-equilibrate the entire displacement of a strike-slip fault. On the other hand, the generated structures/sediments should relatively migrate with the fault movement in the case of a complete displacement transfer. The presence of a limited zone of sediments is intrinsically an evidence of a dislocation along the basin borders. In a complex field as the Earth Science I would be very caution before stating “structurally impossible” without providing some quantitative evidence. The “piggyback basin” is used in the literature with slightly different situations and in this way it is generically applicable to many geological settings. In this case it was applied in 1982-83 and new evidences are required to update/confirm this interpretation. Its association with the attribute “classical” does not increase its reliability (as the “classical” Tolemaic model – of the sun orbiting around the Earth - with respect to Copernicus/Galilei ideas. . .) The pull-apart structure can be indifferently applied to left-lateral or right-lateral movements depending on the side you link to the strike-slip segments. A possible solution to the debate on the Kashmir Basin is that its origin might depend by mechanisms, an extension and a strike-slip component along a major fault due to a strain partitioning process, as often observed in other collisional chains (Alps). Many description looks like over-interpretations, e.g. “oval shaped basin” in page 1, line 27 (ref. to Fig. 1!). This is not so evident. Pag. 2 line 12 “structurally impossible” also

C2

at depth? It is a 3D structure. Refer to previous comment on subsurface prosecution of the structure. Page 2, line 15 Warning: sinsedimentary faults do not necessarily have surface evidence, since they might be levelled by the youngest sediment deposition. The evidence is only when the displacement is faster than the sedimentation rate, and this might not be the case of Kashmir Basin, where continental sedimentation is produced by the faulting offset. Page 2, line 18 The author force the fault to be planar (I assume he intends also vertical!) and then describe the impossibility for a pull-apart to develop. You know that pull-apart can develop along transcurrent faults along zone of tilting of their dip and still maintaining their general strike. As mentioned, you can play by properly linking the strike-slip segments to the normal/transtensional faults and derive a right-lateral or a left-lateral sense of motion. Page 2, line 20 I agree with the author: interpretation of those minor faults as a horse-tail setting is difficult. Yet beware that horse-tail structures commonly consist of a set of normal faults. Page 3, line 14 Refer to the previous point on evidence from sin-depositional faults. In conclusion, the manuscript in its present form is not acceptable for publication. Hope that my suggestions will help in the preparation of a suitable manuscript.

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