



Research Institute for Earth Sciences
Geological Survey of Iran

Meraj Ave., Azadi Sq.
P.O.Box 13185-1494
Tehran, Iran
Tel. & Fax: (21)66070505

Prof. RNDr. Bohuslav Gaš, CSc.
Dean of the Faculty
Univerzita Karlova v Praze
Charles University in Prague
Faculty of Science
Albertov 6, 128 43 Pargue 2,
Czech Republic

Dear Prof. Bohuslav Gaš,

December 16, 2009

Many thanks for your letter dated November 27th, 2009 regarding inviting me as one of the reviewers of the Ph.D. thesis of Mr. Mahmoud Rahmati-Ilkhchi.

I have read through the thesis, and I have attached below my comments to clarify and improve the thesis. I evaluate the thesis a major contribution to a better understanding of geological evolution of an important part of Iran within the Tethyside belt that extends between Europe and Asia. According to my review I consider Mr. Rahmati's thesis to have the qualifications appropriate for the Ph.D. level degree; I also consider it to be appropriate for the defense.

I will send you my original letter and the copy of thesis with my minor comments on it via courier mail ASAP.

Looking forward to having further scientific collaborations between the Charles University and the Geological Survey of Iran.

Yours truly,

Dr. Mohammad R. Ghassemi, Ph.D.
Assistant prof. at Research Institute for Earth Sciences,
Deputy Director for Geology,
Geological Survey of Iran,

Azadi Sq., Meraj Ave.
Tehran, Iran
P.O. Box: 13185-1494

Fax (Phone): (9821)66070505
e-mail: m.r.ghassemi@gsi-iran.org

Comments on the "Metamorphism and geotectonic position of the Shotorkuh complex, Central Iranian Block"; a Ph.D. Thesis submitted by Mahmoud Rahmati

1. In 1.2.1 and 1.2.2 the "southern and central units" are not already defined in the text.
2. The units are not correctly defined in Fig. 4 as well: A is in the east but is called the southern unit, and the area is called "southern unit" in the text (1.2.1). Units I-L and B, H are in the north but are called "central units". Letters indicating the units are not referred to in the text (at the beginning).
3. Some maps do not include coordinates and (linear scale).
4. Notes on 1.2.3 are too short: The rocks in Aghdarband erosional window are Devonian to Triassic in age, and are deformed and metamorphosed in Eocimmerian event.
5. Page 20: Cimmerian events were not just related to closure of the Neotethys but they were mostly related to the closure of Paleotethys.
6. Table 1 should be better presented and organized, for example continuations of the tables have no header. Same applies to Table 1 in chapter 2.
7. Your Mid Jurassic closure age for the Neotethys is the oldest suggested age so far!
8. You may call Shotor Kuh a tectonic window just if the contact between the complex and the overlying rocks is a thrust (or detachment) fault.
9. You should be careful in using the term metagranite: do you really see metamorphism of the granites or they are just deformed?
10. Abbreviations such as a.p.f.u. are better to be explained somewhere.
11. The 165 Ma metamorphic event is amphibolite facies in rocks older than Shemshak, and it is lower greenschist in Shemshak (1st paragraph in p41), while pebbles of orthogneiss and amphibolite are present in Mid Jurassic conglomerate. There should be a tectonic contact between the amphibolite facies and greenschist facies rocks in such a short distance. The second (low grade) metamorphic event should be post Mid Jurassic, while an erosional (exhumation) phase occurred between Shemshak and the Mid Jurassic conglomerate sedimentation.
12. Greenschist facies is retrograde in basement rocks but prograde in Shemshak and Mid Jurassic rocks?!
13. Two different things are combined here; magmatic arc and accretionary prism, evidence of which is not presented in the study area, and Early Cimmerian orogeny, which is of Late Triassic age, not Mid Jurassic.
14. I would suggest Fig. 14 to include information that are more related to the Shotorkuh area: a) subduction of Prototethys and development of related granitoids in Central Iran, b) opening of Paleotethys in Silurian c) closure of Paleotethys in Late Triassic, and subduction of Neotethys that may have resulted in deformation, metamorphism and later exhumation of rocks.
15. Page 65 which type of heating can produce such a sharp gradient in crustal temperatures?
16. Are not the needed structural analysis done by yourself?
17. Are not the sedimentary cover rocks of greenschist facies?
18. Why you call the sequence pre-Middle Triassic everywhere while overlying unit is Upper Triassic-Lower Jurassic Shemshak formation?
19. It is also useful to show metamorphic facies/grade in a separate column in Fig. 2 page 76.

20. It is good to have some estimation of unit thickness according to field studies and the cross sections.
21. Micaschist between the gneisses and pre-mid Triassic rocks should be Precambrian (pre 547Ma) sedimentary rocks in which the granitoids intruded.
22. Fig. 4 implies that D1 and D2 affected all units up to Shemshak Fm. Than they should be younger than this Fm.
23. Fig. 5b shows a S-C fabric.
24. Overprinting relationship referred to in Fig. 7 is not well explained in the text.
25. Fig. 8 apparently shows that S2 is a crenulation foliation, but it is not cited in the text.
26. Looking direction of field photos are not indicated.
27. Evidence for lower grade (contact) metamorphism (page 90) suggest that the PT path should be anticlockwise while Fig. 12 is suggesting clockwise paths (see the thermal event in the same Fig.).
28. It would be good if you could show any of deformation events 1 to 4 on the PT diagram.
29. Why direction in Fig. 13 section 2 from above is differernt?
30. To have sinistral strike-slip movements on NE striking fault (Fig. 13) the shortening direction should be either N-S or NE-SW.
31. Many lines of evidence suggest a metamorphic core complex scenario for the area, why it is not cited? Also please discuss Hassanzadeh's idea on core complexes in the region.
32. Which was the ocean that existed between the Iranian and Arabian plates prior to opening of the Neotethys Ocean?!
33. Mid-Jurassic extension may be postulated for the region synchronous with backarc opening of the South Caspian Basin (see Brunet et al., 2003).
34. Could D1 be the compressional event related to Late Triassic Eocimmerian orogeny? In this case the Mid to Late Jurassci age for the micas may show the cooling age recorded in the rocks on their upward passage through closure temperature in the crust. In this way you may also estimate the exhumation rate between Late Triassic and Middle to Late Jurassic.
35. Varsican event is too old for the amphibolite facies metamorphism. I would suggest the above-mentioned Eocimmerian event.
36. Eocimmerian orogeny occurred in Late Triassic therefore could not end in Early to Middle Triassic.