



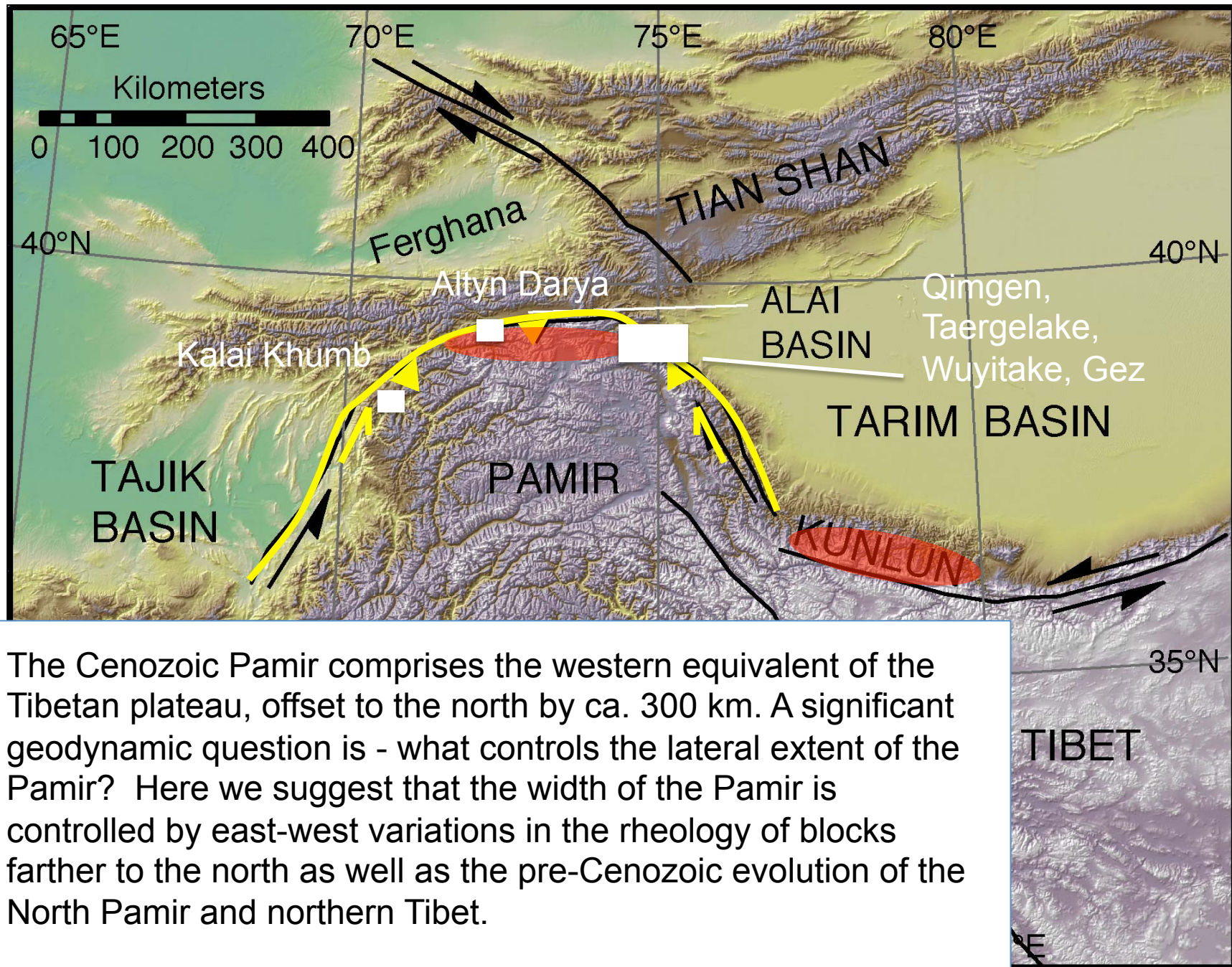
# Control of pre-existing crustal architecture on Cenozoic formation of the Pamir



Edward R. Sobel, Johannes Rembe, Jonas Kley,  
Renjie Zhou, Baiansuluu Terbishalieva, Chen Jie

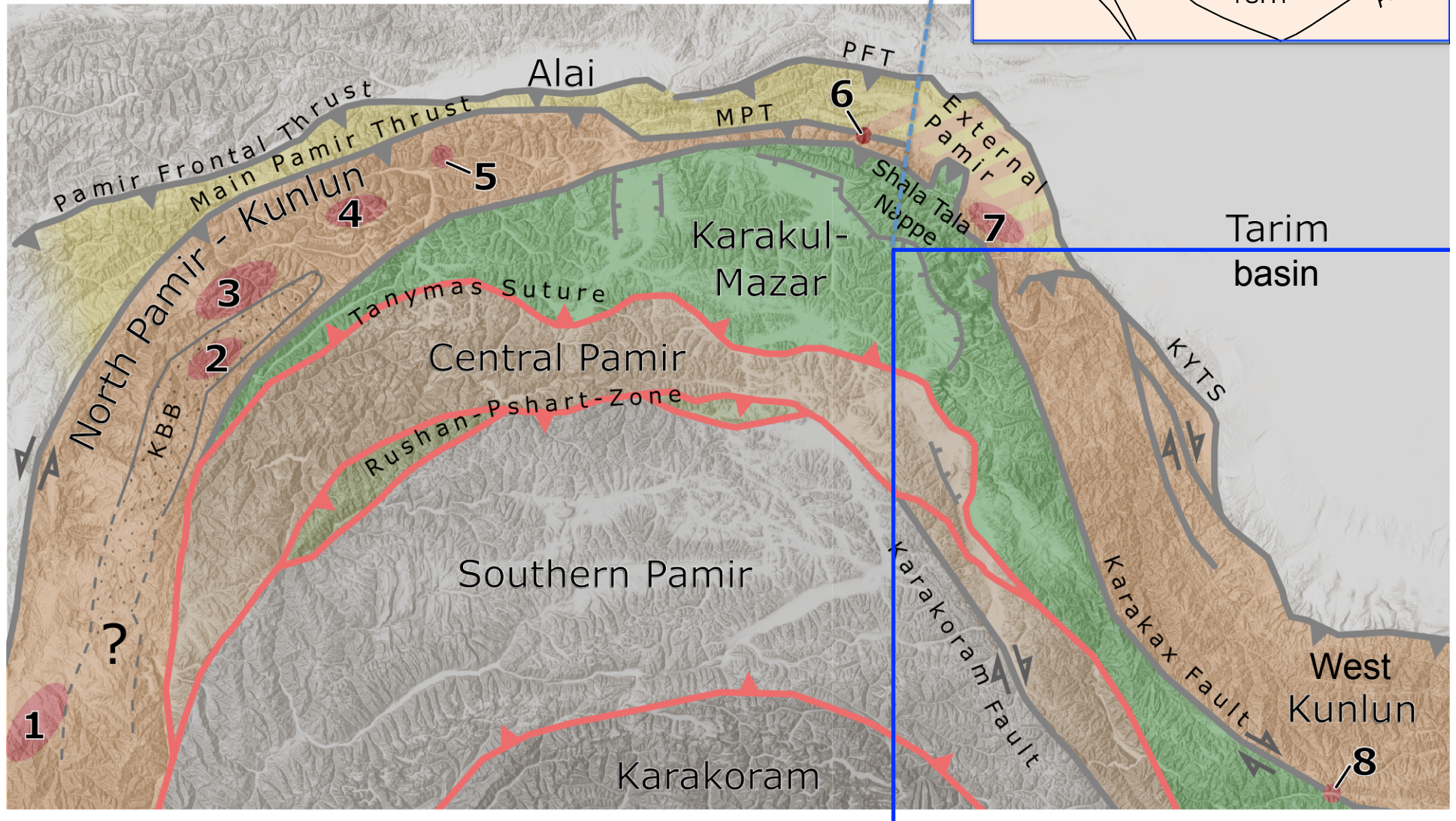


North Pamir study areas are in white





Subdivisions of the Pamir (below) and  
West Kunlun (inset – divided into North  
and South Kunlun Terrains)





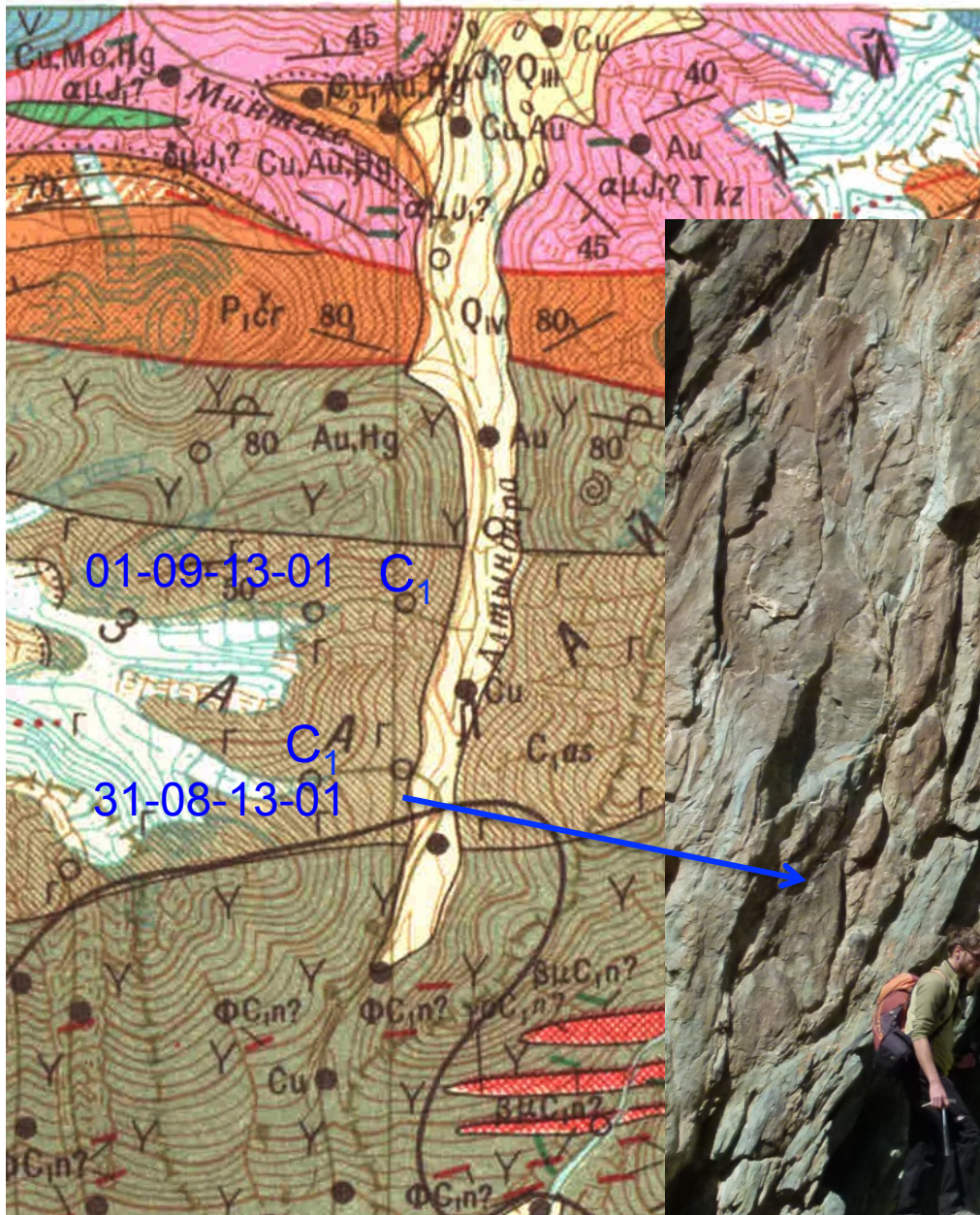
**What is the nature of the basement of the North Pamir?  
Kalai Khumb (~400 km west of Qimgen)**

**Lower  
Carboniferous ( $C_1$ )  
pillow basalts**





## Altyn Darya (225 km west of Qimgen)



$C_1$  meta-pillow basalts





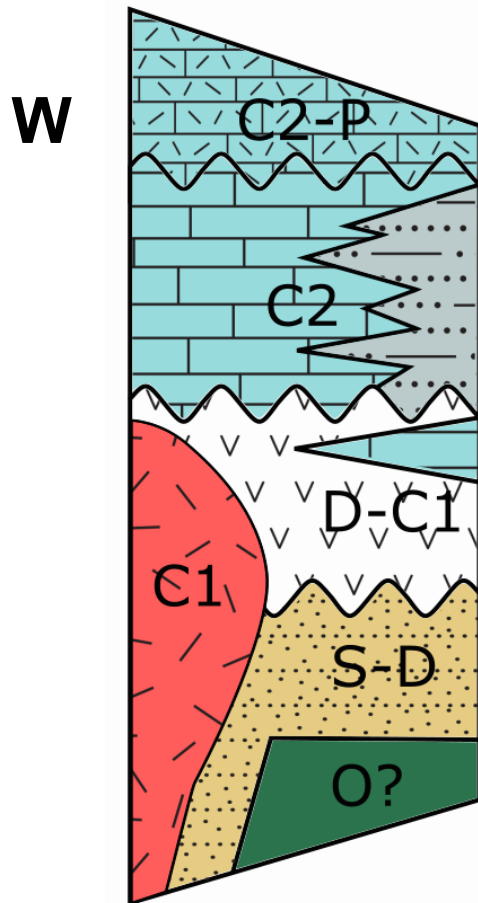
Qimgen  
C<sub>1</sub> pillow basalts





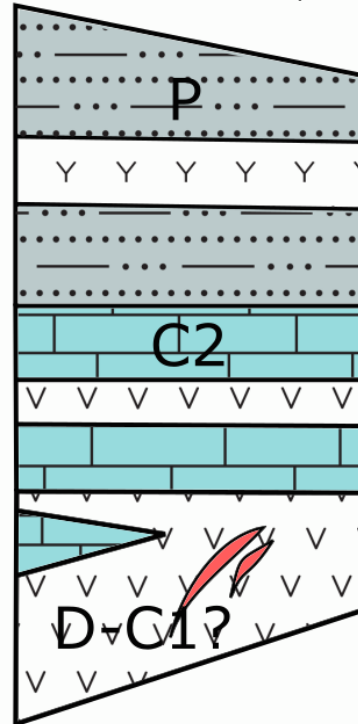
## Kalai Khumb

(after Levin et al., Stratigr.  
Geol. Correl., 2012)

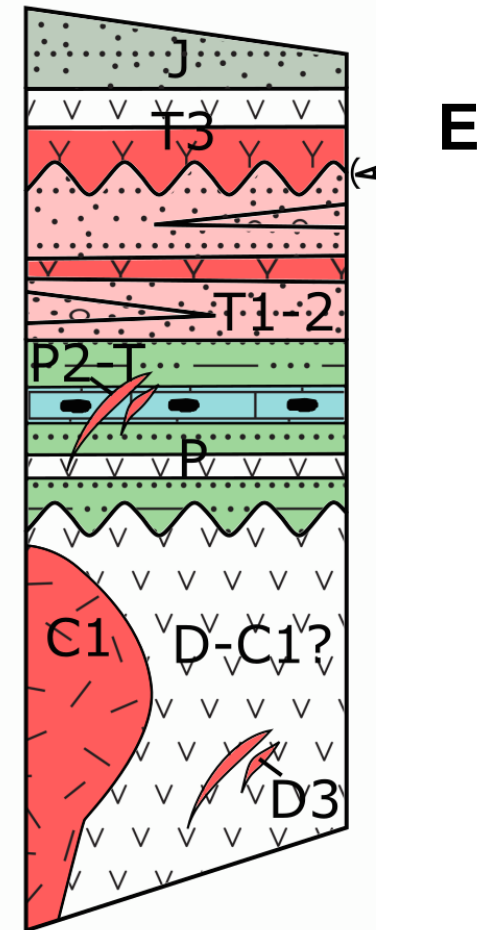


## Altyn Darya

(after Schwab et al. Tectonics,  
2004; Levin et al., Stratigr.  
Geol. Correl. , 2013)



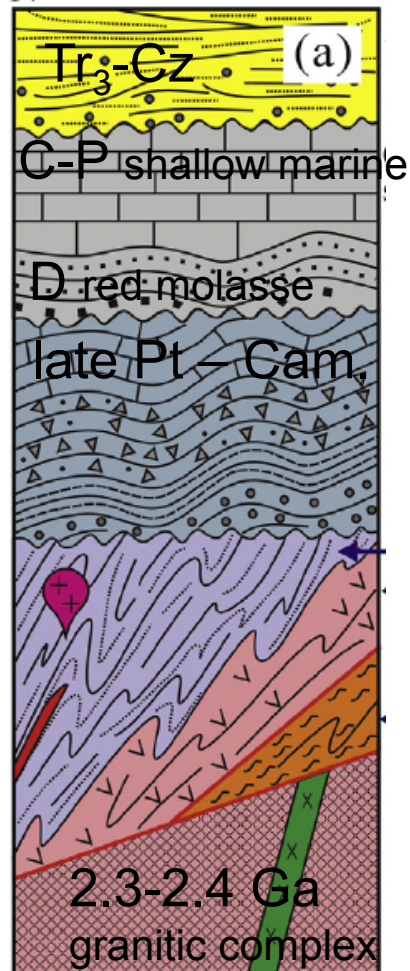
## Qimngan/Akqi/Gez



The **North Pamir Carboniferous** deep marine units are unconformably overlain by upper Carboniferous and lower Permian shallow marine units at the eastern and western ends of the North Pamir, suggesting a contractile episode; the contact appears to be conformable in the central part. The lower Permian is overlain by an uppermost Permian - Triassic back-arc basin or rift, which stretches ca. 500 km east-west.

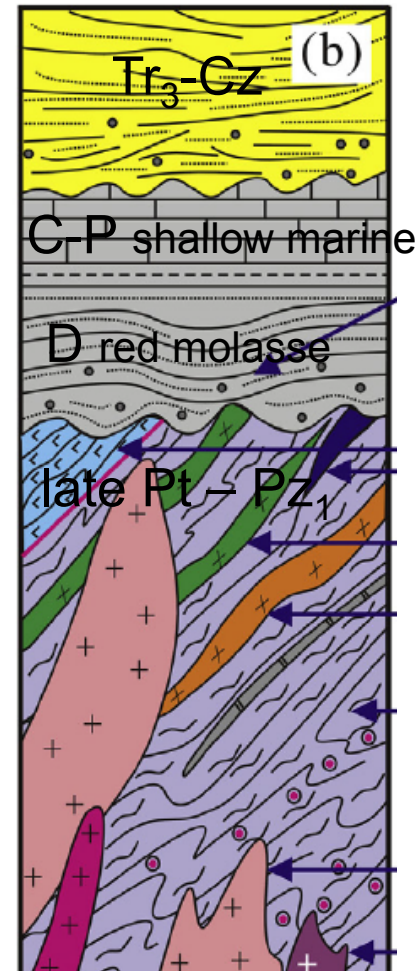


## North Kunlun Terrain



Kudi  
suture

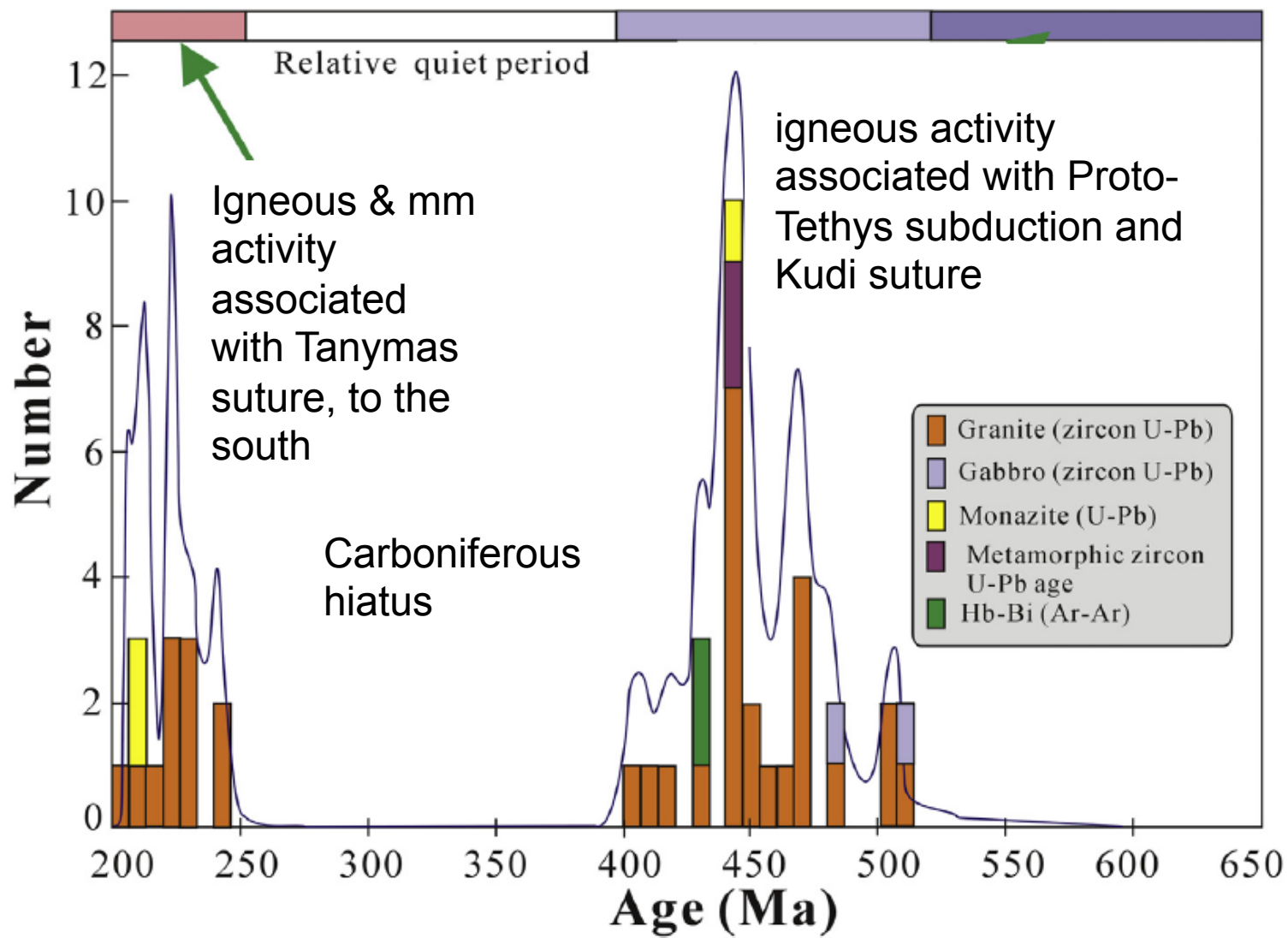
## South Kunlun Terrain



Modified from  
Zhang et al.,  
Geosci.  
Frontiers, 2019

The northern part of the **Western Kunlun** comprises Proterozoic Tarim basement; such rocks are unknown on the northern margin of the Pamir. In the late Ordovician or Silurian, the Kudi suture formed, representing the consumption of the Proto-Tethys and the collision of Tarim with the southern Kunlun terrain. Although the Western Kunlun has been considered to be the lateral equivalent of the North Pamir, the Kudi suture does not appear to be preserved in the Pamir.

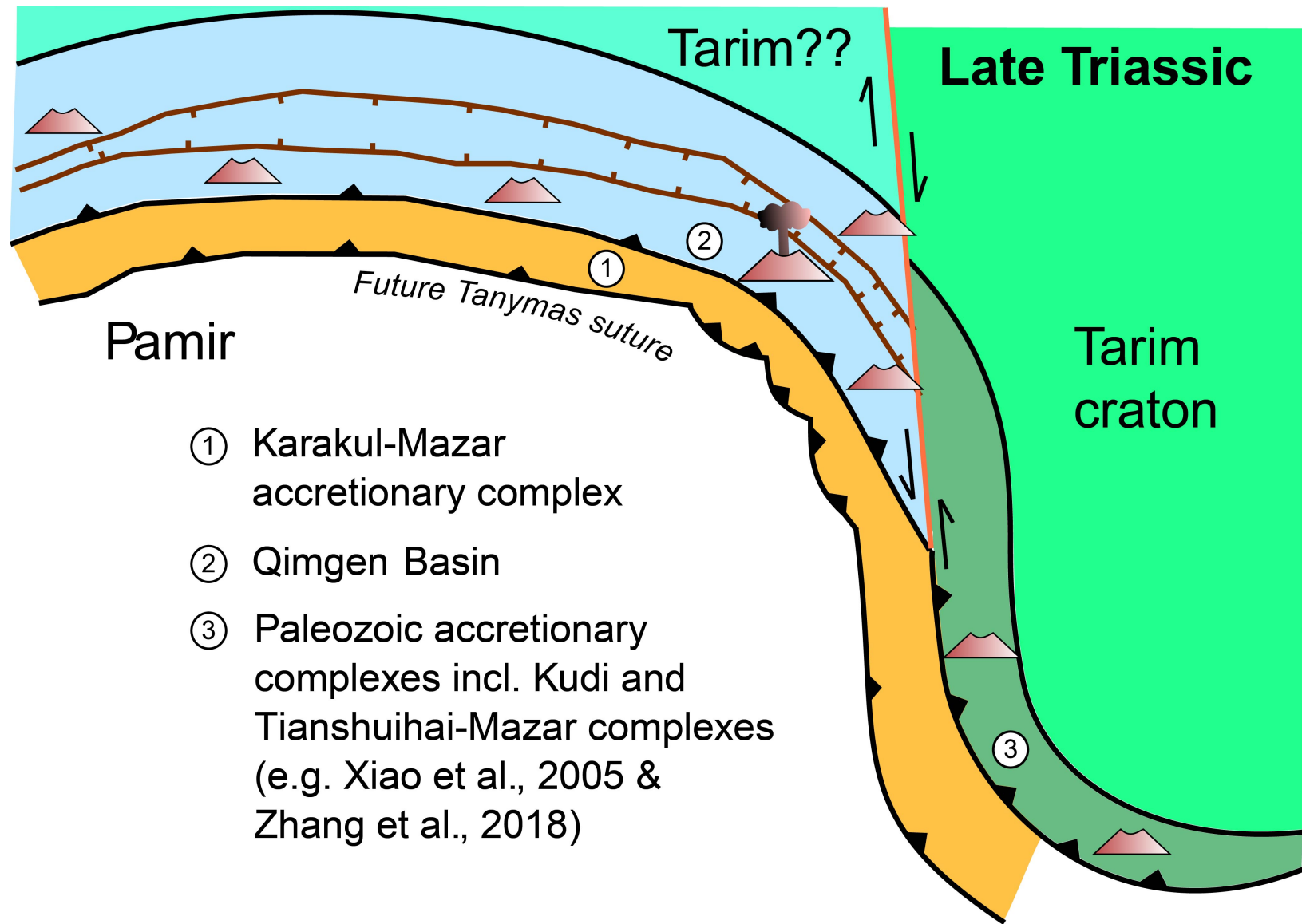




Modified from  
Zhang et al.,  
Geosci.  
Frontiers, 2019

Histogram of intrusive and metamorphic ages from the South Kunlun Terrain. Note Carboniferous hiatus. There is no evidence that the Carboniferous oceanic basin observed in the North Pamir extended east into the South Kunlun.





The Qimgen uppermost Permian - Triassic back-arc basin or rift stretches ca. 500 km east-west. It is built on the Carboniferous North Pamir oceanic basin; neither extend into the West Kunlun. Therefore North Pamir and West Kunlun have not been colinear since at least the Triassic.



The location of the Cenozoic North Pamir corresponds to the extent of both Carboniferous oceanic crust and Permo-Triassic extended or oceanic crust.

This implies that the magnitude of Cenozoic indentation of the Pamir with respect to Tarim is not constrained. Kley et al. (later this session) suggest that there was only ~80-100 km of shortening between the North Pamir and the Tien Shan.

We suggest that the differences between the Paleozoic – Mesozoic histories of the Western Kunlun Shan and the North Pamir reflect the presence and absence, respectively, of the rigid Tarim block to the north. Although it has been suggested that the geometry of the Pamir reflects the geometry of a promontory at the northwest corner of the Indian indenter; this seems highly improbable given the pre-Cenozoic history. Rather, we suggest that differences in the evolution of the Pamir and Tibet are first-order consequences of the different rheologies of the northern crustal backstops of these two regions as well as differences in the basement of the North Pamir and the Western Kunlun.