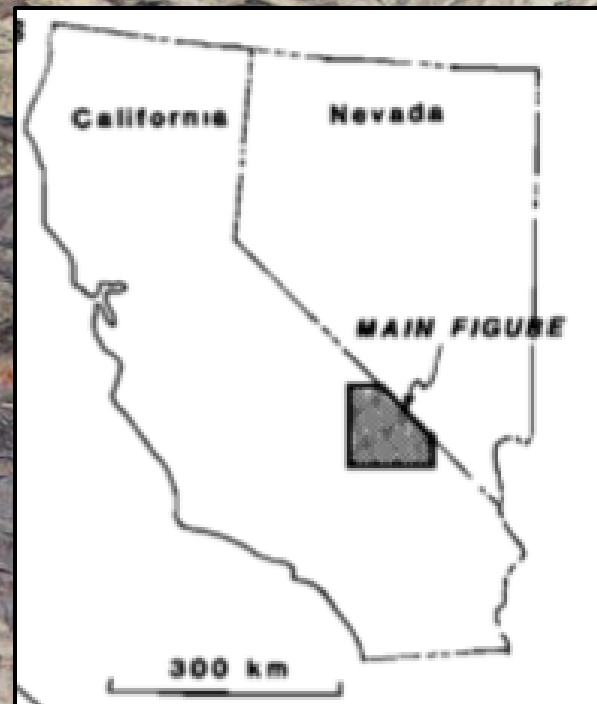


Geology of Panamint Valley-Saline Valley Pull-Apart System, California: Palinspastic Evidence for Low-Angle Geometry of a Neogene Range-Bounding Fault

Research by : Burchifel et al., 1987

Presented by: Ruben Underwood-Aguilar

Hunter
Mountain



Scope of Research

- Panamint Valley and Saline Valley interpreted to be a **paired pull-apart basin**
- Hunter Mountain Fault Zone (HMFZ) accommodates slip on these basins
- Saline Valley formed as closely spaced high-angle normal faults that rotated
- Panamint Valley formed by movement on shallow crustal low-angle faults
 - **Controversial interpretation!**
- Together, suggests shallow crust accommodated extension in two different ways



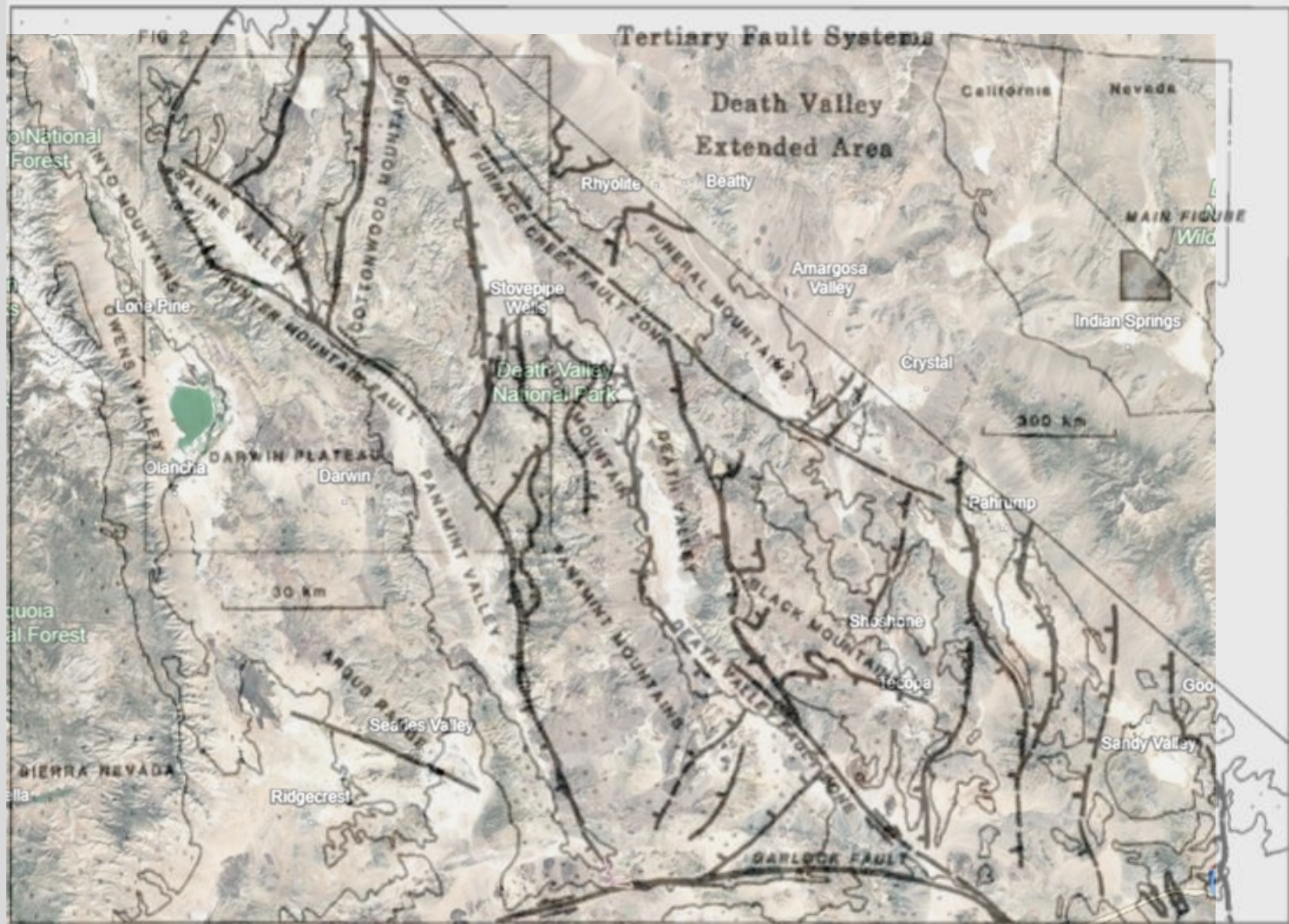


Fig. 1. Major faults of the Death Valley extended area and location of the northern Panamint Valley and Saline Valley paired pull-apart basins. Location of Figure 2 is shown.

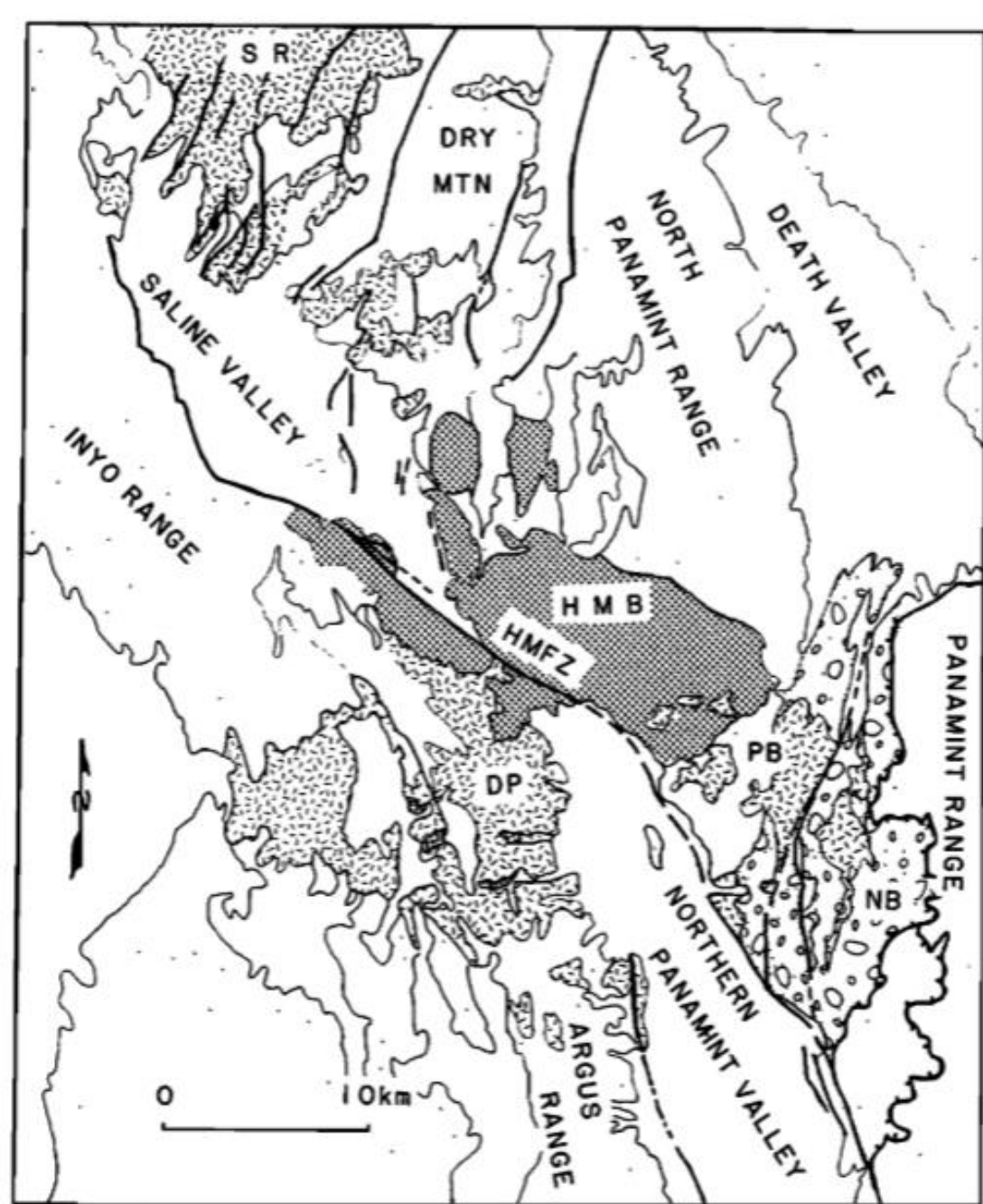
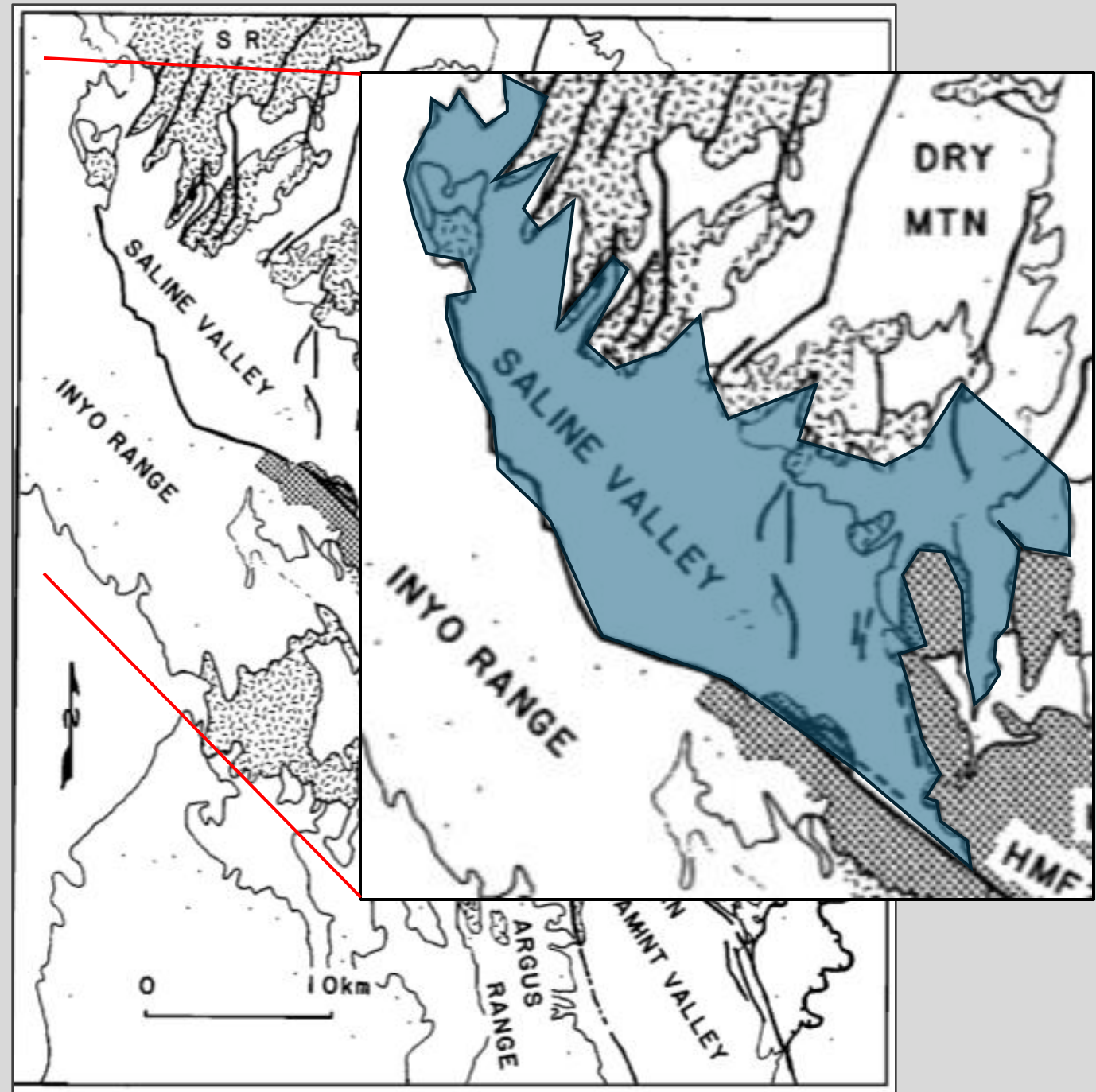


Fig. 2 General geological framework of the northern Panamint Valley and Saline Valley area. HMB, Hunter Mountain batholith; HMFZ, Hunter Mountain Fault Zone; DP, Darwin Plateau; PB, Panamint Butte; SR, Saline Range; NB, Nova Basin. Random dash pattern covers area of late Cenozoic volcanic rocks.

Saline valley

- Contains Basalts 3.8-1.7Ma
 - Did not start extending until oldest basalt extruded
- Bounded by HMFZ to the south.
- Normal-right-slip faults (NE-trend) to the east
 - Parallel to active faults
- Contains a high angle intrusive contact between the Hunter Mt Batholith (HMB) and overlapping basalts offset by the HMFZ




Panamint Valley


- HMB intrudes into basalts on DP
 - Strikes $N7^{\circ}E$ contact with HMZF
- Panamint Butte contains an old valley (Nova Basin),
 - Youngest basalts 4-4.3 Ma (K-Ar) unconformably on pre-Cenozoic rocks.
 - Same in age to DP area





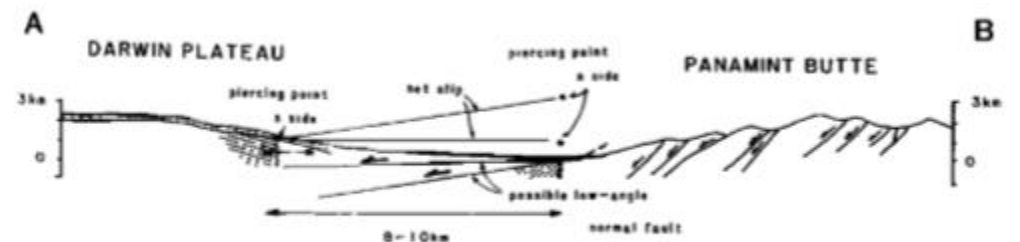
Teakettle
Junction

Hunter
Mountain 

Panamint Butte 

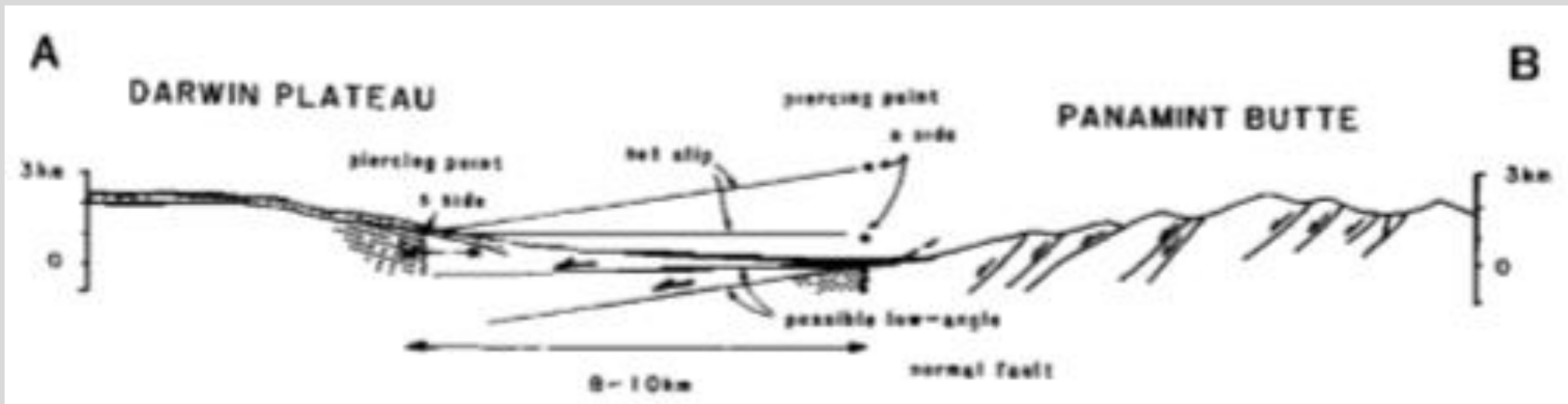
A tale of two valleys

- 8-10km of right-lateral offset, 0-2km of down-to-south offset
- NPV and Saline valley result in late Pliocene to recent extension connected by HMFZ
 - Zone does not extend east beyond PV and west beyond SV
 - No evidence for pre-late Cenozoic extension
 - Age of Saline valley corresponds to NPV if opened by 2-3.2mm/yr of slip on the HMFZ



Evidence for shallow detachment

- NPV can only be explained by extension along low-angle normal faults
- Shallow basin (113m) (drill hole)
- No basalt underlays NPV (HW completely removed—geophysical data)
- NPV bounded by 42° W dipping faults implying listric geometry.



Conclusions

- Extension in the uppermost crust accommodated in two different ways
 - Saline valley → Rotated high angle normal faults, deep basin
 - NPV → Low angle detachment, shallow basin
- Both Contain a volcanic/intrusive contact offset by the HMFZ
- Offset of the HMF matches the amount of extension of both valleys, indicating synchronous development.