RETRACING POST-SUBDUCTION HISTORY: A PRELIMINARY PALINSPASTIC AND PSEUDO-PALINSPASTIC RECONSTRUCTION OF PRE-PLIOCENE FRANCISCAN COMPLEX ARCHITECTURE, NORTHEASTERN DIABLO RANGE, CALIFORNIA

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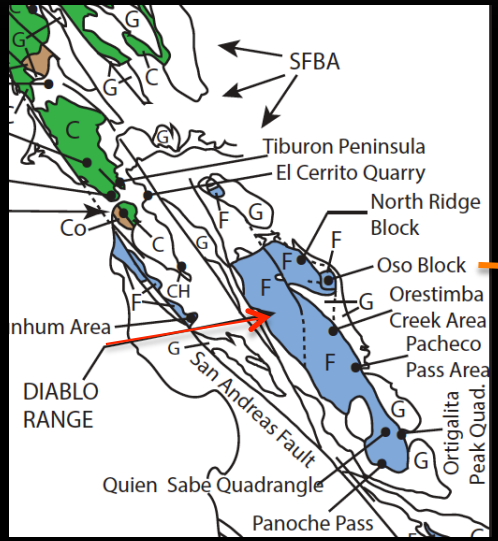
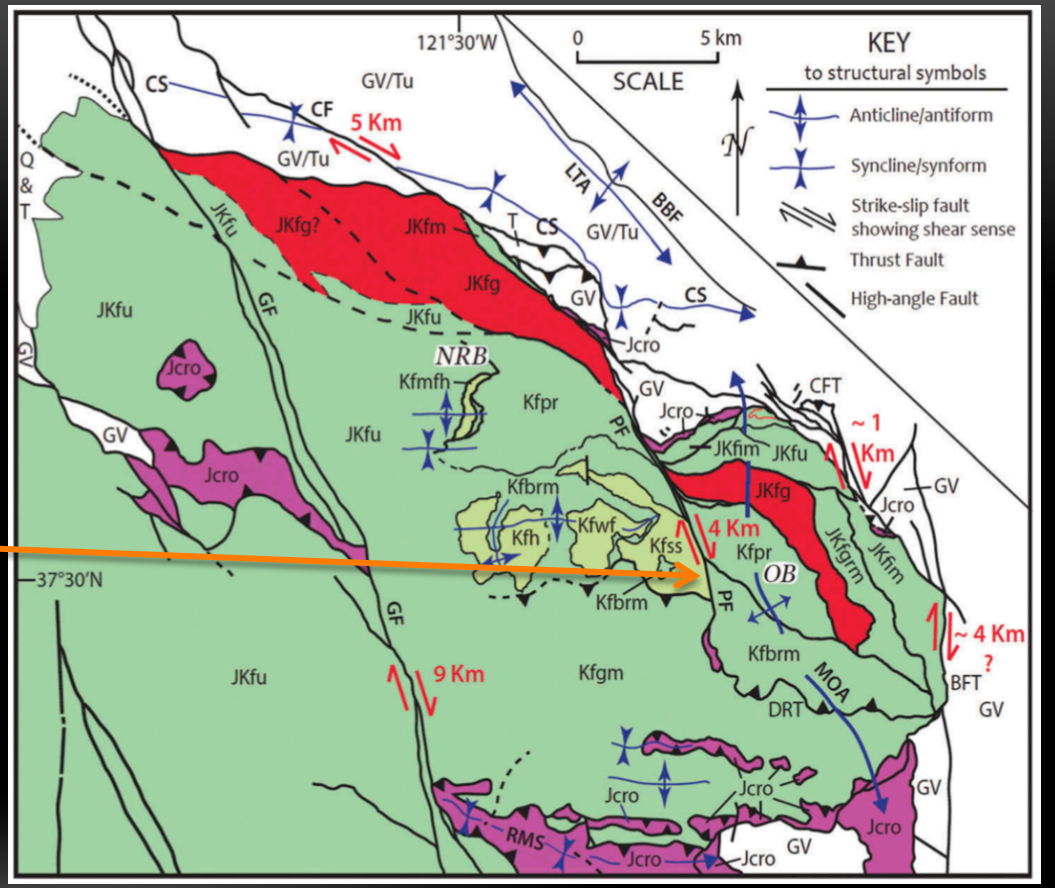
NORTHEASTERN DIABLO RANGE, CALIFORNIA





(Diagrams slightly modified from Raymond, 2107, What is Franciscan?: Revisited: IGR)

MAJOR POINTS - 1

- This is a preliminary and incomplete analysis — a progress report.
- Few pinpoints exist, so the analysis is largely pseudopalinspastic

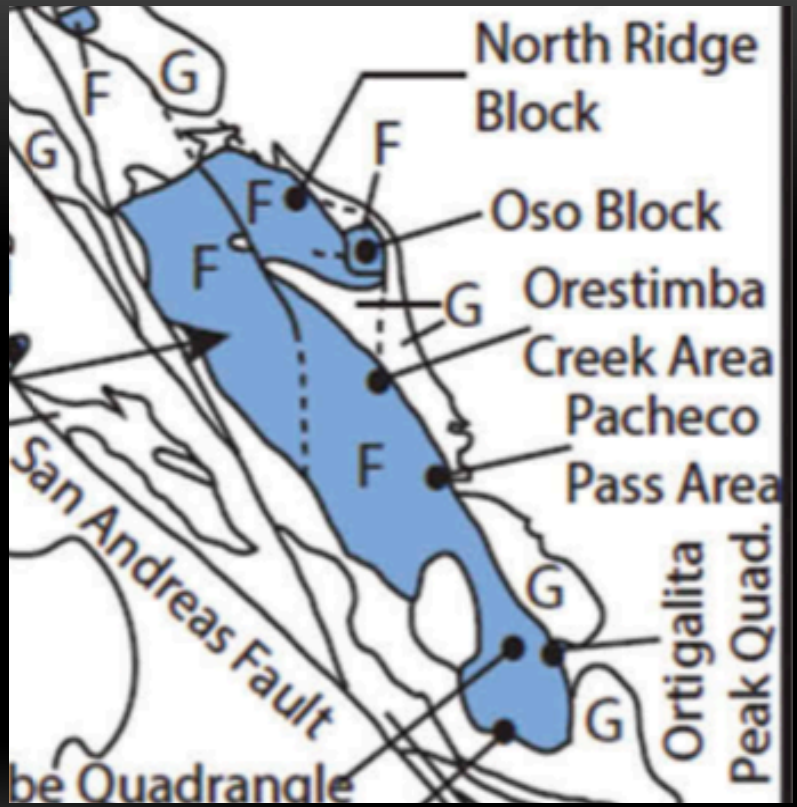
(and a bit free-wheeling)

- Post-accretion deformation of the Franciscan (Accretionary) Complex involved coeval uplift, folding, normal and reverse faulting, and extensive strike-slip faulting.

MAJOR POINTS - 2

- Progressively removing Cenozoic strike-slip separations disperses many Franciscan Accretionary Units southward in central California, allowing a more accurate assessment of the original structure of the accretionary Complex.
- Unfolding units folded during Late Cenozoic deformation more clearly reveals their aerial extent
- Unfolding assists in discriminating between subduction and later folds.

The underplated Franciscan Complex core of the Diablo Range consists predominantly of blueschist facies metasandstones and metashales with locally abundant metacherts and metabasalts comprising mélanges, dismembered formations, and broken formations. Core rocks were subducted, underplated, and metamorphosed at a depth of about 23-30 km.



(Diagram modified from Raymond, 2107, What is Franciscan?: Revisited: IGR)

DEFORMATION HISTORY (again) involves:

- SUBDUCTION UNDERTHRUSTING WITH FOLDING & UNDERPLATING
- POSSIBLE POST-SUBDUCTION DEFORMATION AT DEPTH DURING AND AFTER UNDERPLATING
- UPLIFT OF THE RANGE CORE
- STRIKE-SLIP FAULTING (Related to San Andreas Fault System deformation)
- FOLDING
- HIGH-ANGLE (normal and reverse) FAULTING

PROBLEMS IN RECONSTRUCTION

- Pinpoints are rare. Therefore, reconstructions are rarely truly palinspastic.
- Dates on multiple movement and folding events are rare.

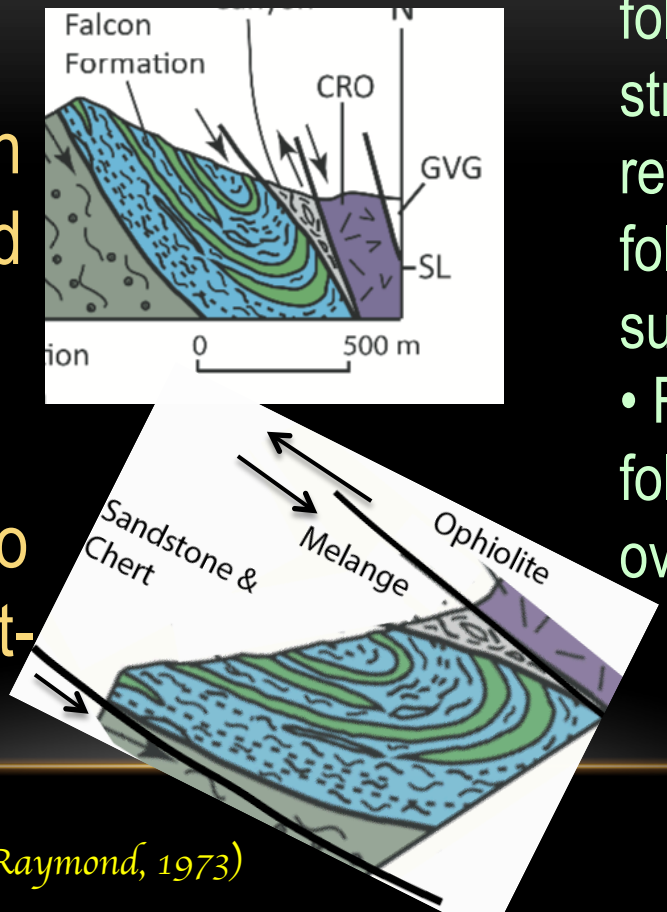
  (Histories of events on intersecting structures are difficult to determine).
- Determining fold dimensions, shear thinning amounts, and original thicknesses of broken formations and melanges is nearly impossible.

Fold Analyses

- Facilitate discrimination between subduction-related and post-subduction deformation
- and they contribute to better portrayal of post-accretion geometry of units

> For example, ... Examination of styles of folding and inferred stress distributions reveals that the isoclinal fold shown here is subduction related.

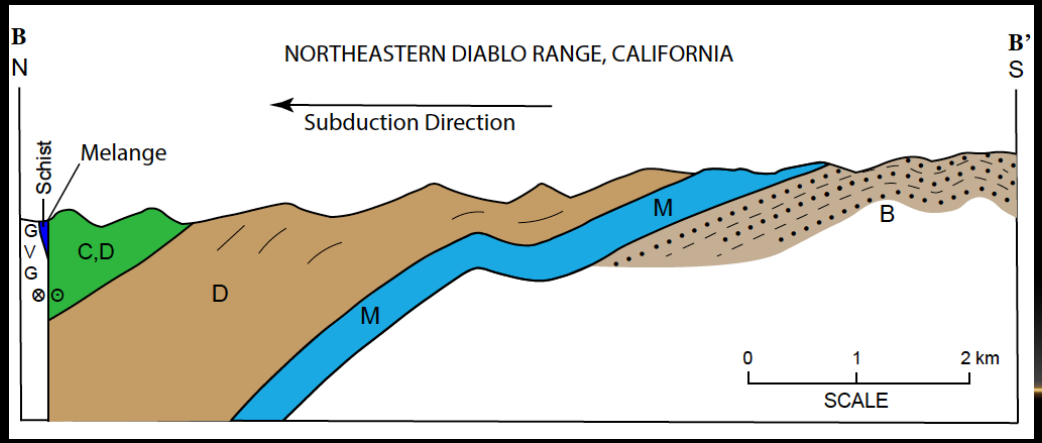
- Removing some of the fold-created dip of overlying forearc rocks makes the structure more like the original subduction geometry.



(Diagram modified from Raymond, 1973)

FOLD ANALYSES – UNFOLDING ALONG CROSS SECTION LINES reveals amounts of shortening of various blocks

For example, …



(From Raymond, 2019, Gondwana Research)

(Modified from Wagner et al., 1990)

THE FAULT ANALYSES

- are essential for palinspastic pre-Late Cenozoic reconstruction of the accretionary complex architecture

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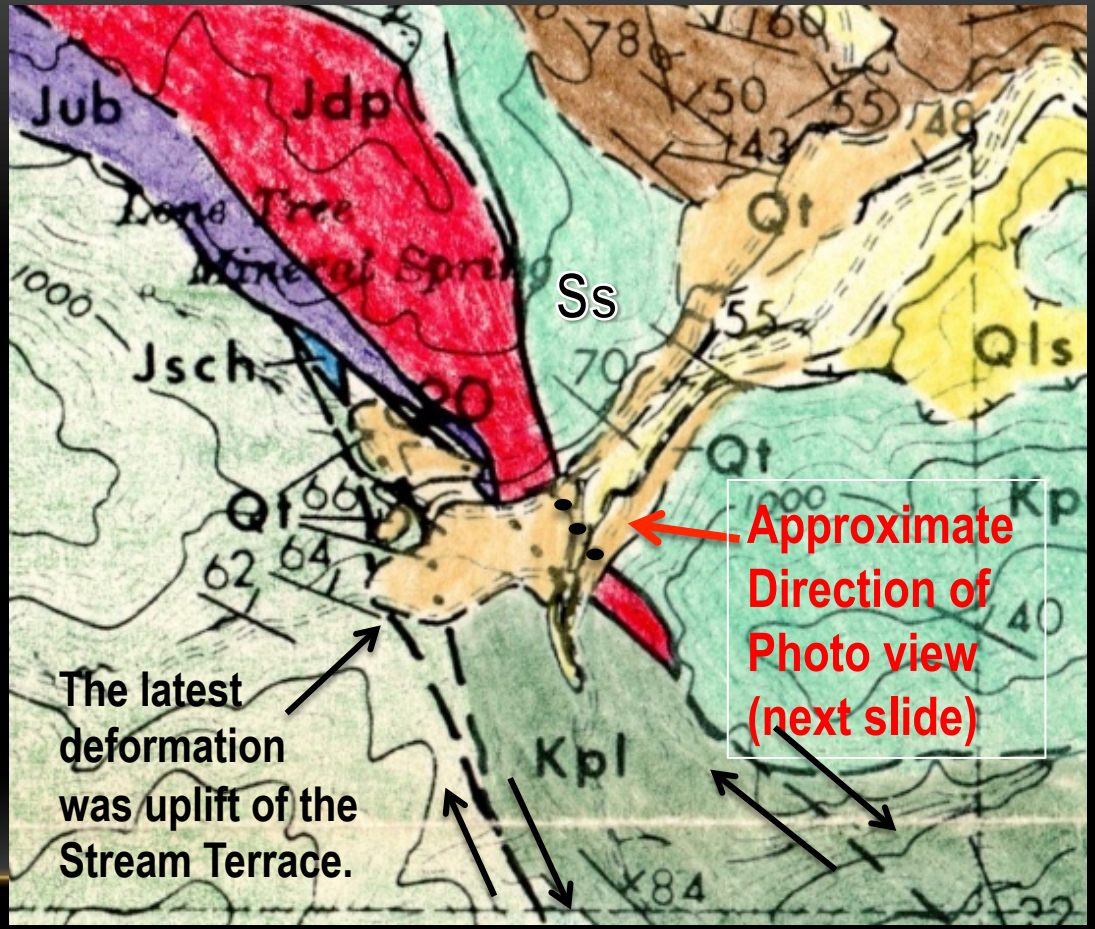
So, we can begin with an example of removing separations on two strike-slip faults.

Deformation was not sequential, but overlapping.

Notably, uplift events and strike-slip events affected the rocks alternately.

For example, ……

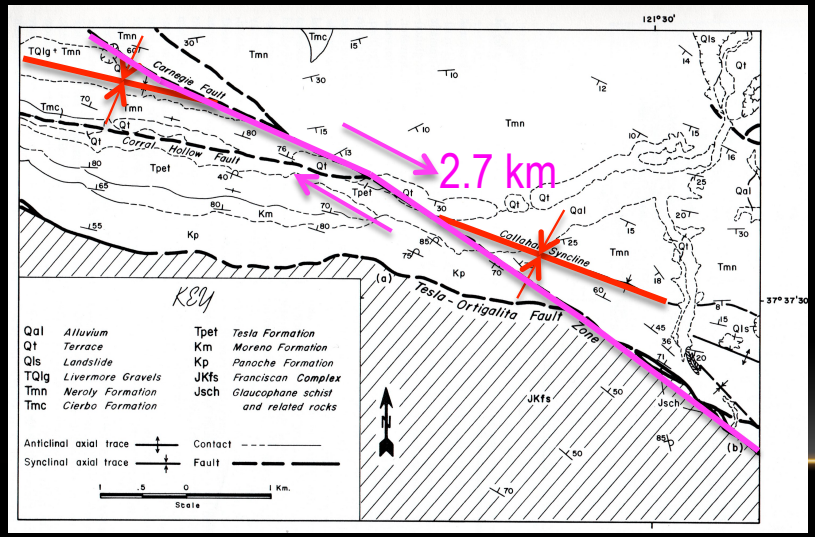


(Diagram modified from Raymond, 1969)


Stream Terrace
Gravel
Gouge zone
along Fault
Ss

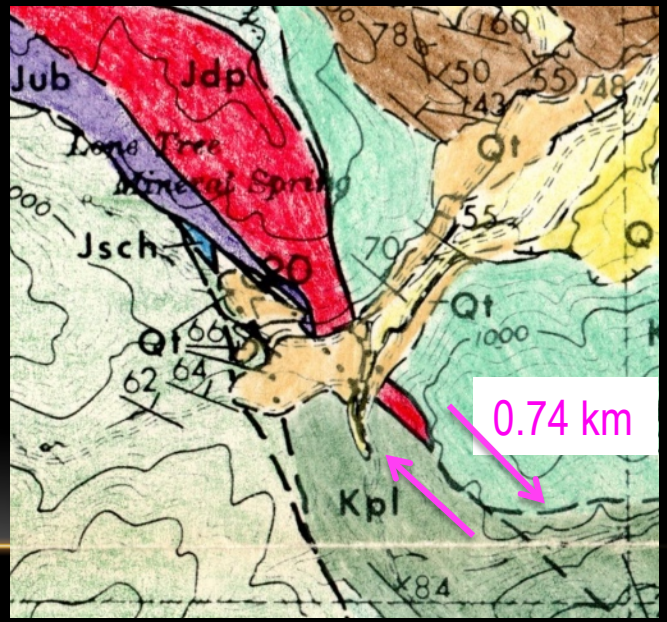
Since DEFORMATION was not sequential, but overlapping,

another consequence is that the maximum separation along a strike-slip fault is not represented at every locality.



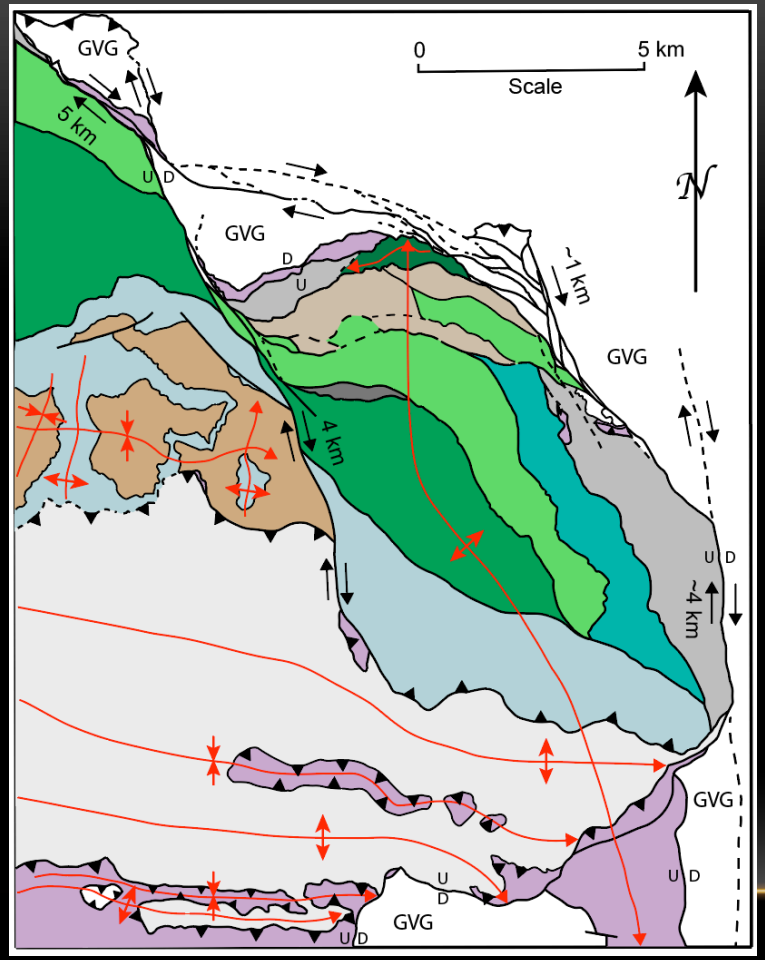
(Diagram modified from Raymond, 1969; 1973)

Maximum separation on this fault is 5 km. To the NW, the fault offsets a pinpoint by 2.7 km. On the same fault a few km SE, the later offset of a contact is only 0.74 km.

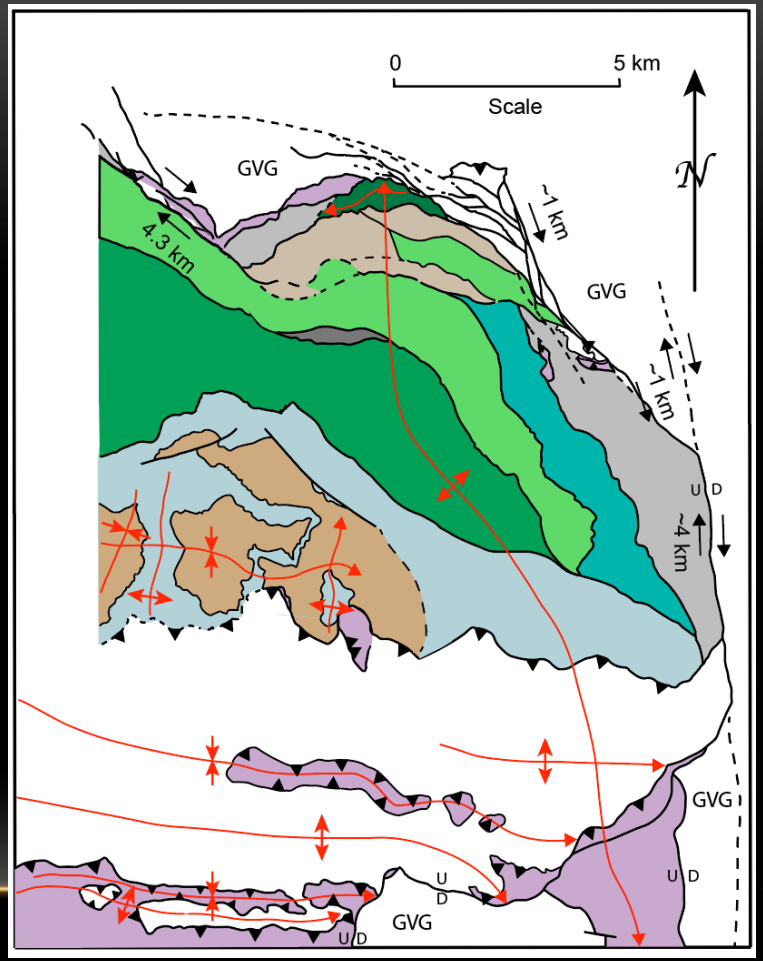


(Diagram modified from Raymond, 1969)

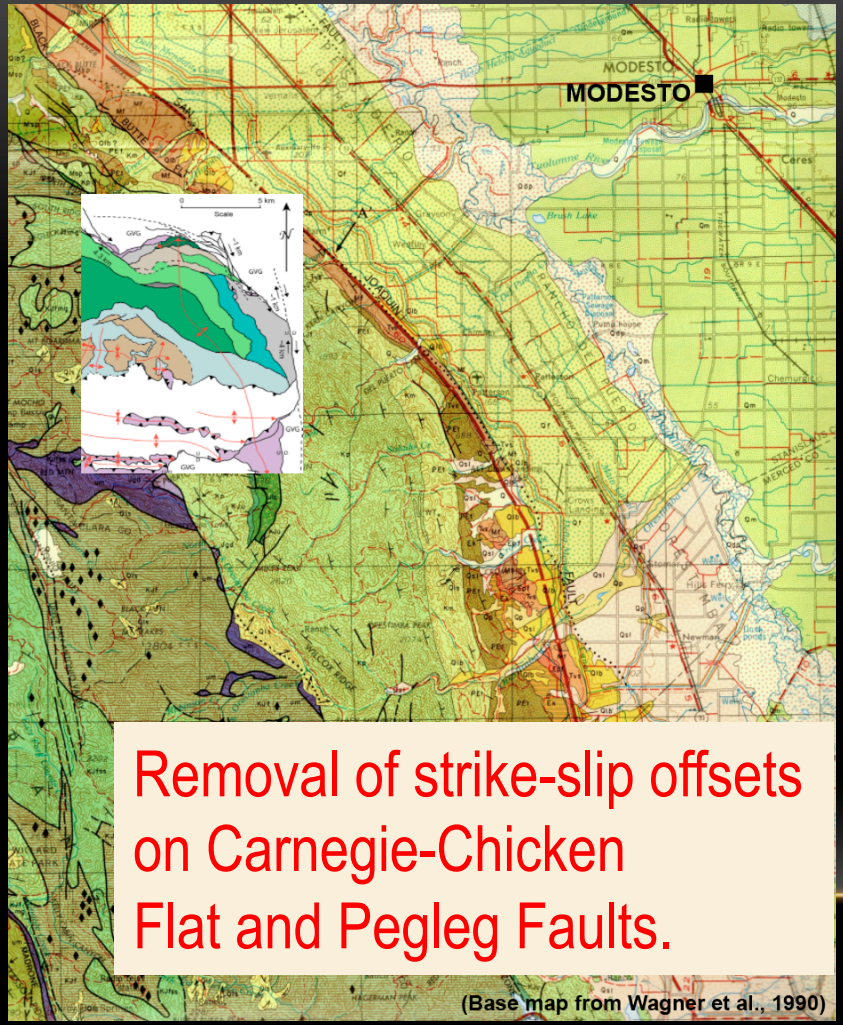
NE DIABLO RANGE



Present

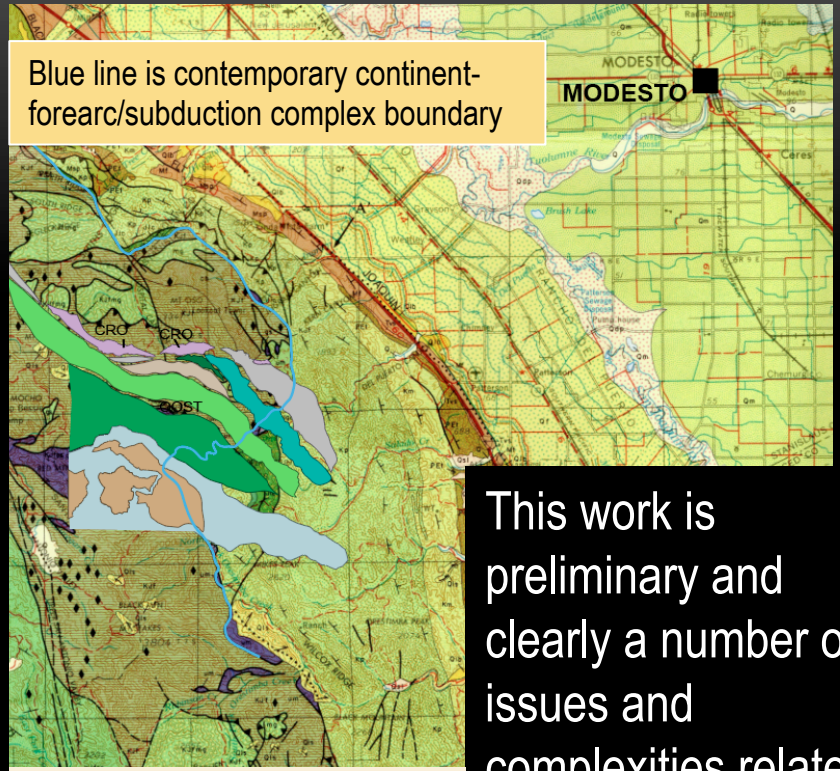


After removal of 4 km of Pegleg Fault movement



Removal of strike-slip offsets on Carnegie-Chicken Flat and Pegleg Faults.

(Base map from Wagner et al., 1990)



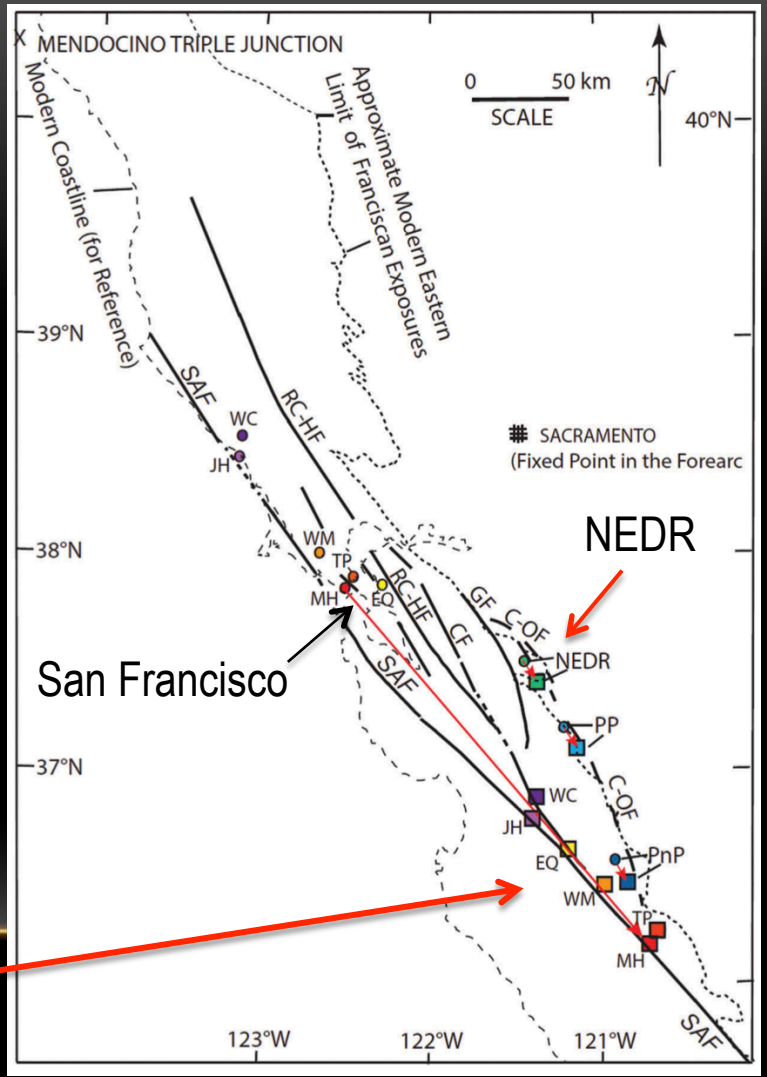
Removal of strike-slip offsets and most folding.

This work is preliminary and clearly a number of issues and complexities related to unfolding and rotation remain to be solved.

IN THE BIGGER PICTURE …

(Diagram modified From Raymond, 2017).

The movements discussed today are part of a larger, but still small 20+ km movement of eastern Diablo Range rocks to the south (Raymond, 2017), but that movement brings them closer to an inboard position relative to Franciscan Complex rocks, including some of the same age, in Sonoma County and the Bay Area, that reconstructions bring to a substantially more southerly position.




Thank you for your attention.