

## Acatlan Complex, Southern Mexico Paleozoic

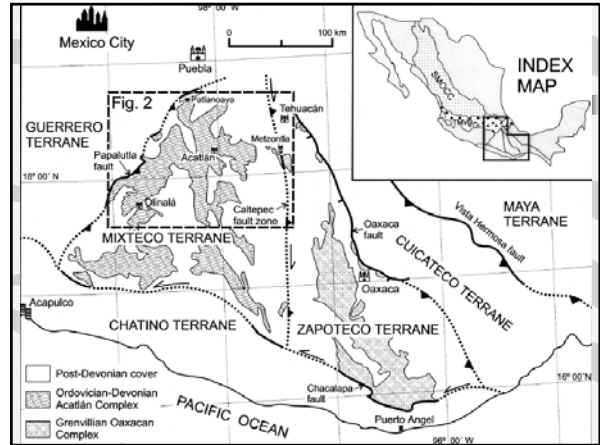
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## Outline

- Acatlan Complex
  - Subunits
  - Pluton
- Deformational/Tectonothermal Events
- Location (Oaxaca Terrane)
- North American Analog

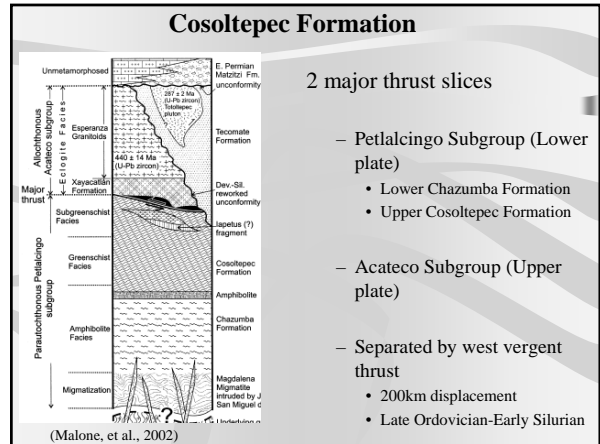
## Acatlan Complex

- Unconformable basement of Mixteco Terrane
- ~35,000 km<sup>2</sup>
- Nd crustal residence age = 1.5 Ga (Yanez, et al. 1991)
- Sequence <15 km thick
- Deformed mixture: metasedimentary rocks, granitoids, schists, eclogites
- Tectonically up against Oaxacan Complex
- Global location uncertain



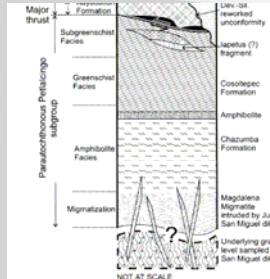
## Principal Metasedimentary Units

- Cosoltepec Formation
- Tecomate Formation



## Petalcingo Subgroup

- Lower plate
- Thick sequence of siliciclastic rocks
- Inferred ocean floor fragments
- Obducted accretionary prism
- Parautochthonous trench & forearc deposits of convergent continental margin
- Strongly metamorphosed (high T, moderate P) (Yanez, et al., 1991)

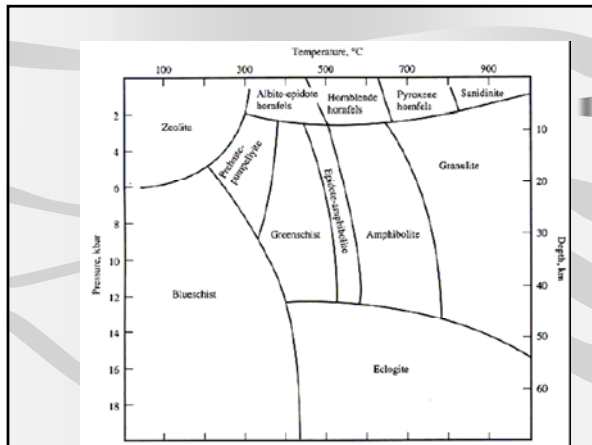
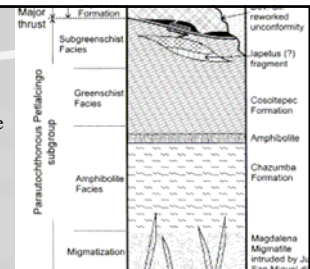


## Lower Chazumba Formation

- Qtz-rich biotite schist
  - Garnet, staurolite, sillimanite
- Amphibolite facies
- Psammitic & pelitic rocks

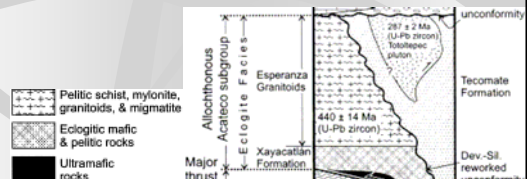
## Upper Cosotepec Formation

- Most exposed
- Greenschist facies
- Quartzose phyllite-chlorite-phengite schists dominate
  - Retrogressed biotite, abundant quartz veins
  - Lesser amounts: pillowed greenstones, metachert, massive quartzite, serpentinite, manganese rocks



## Acateco Subgroup

- Upper plate
- Xayacatlan Formation
- Esperanza Granitoids
- obducted ophiolitic sequence
- Eclogite Facies



## Xayacatlan Formation

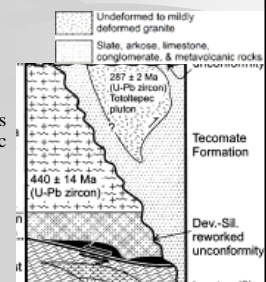
- High grade, mafic-ultramafic, interlayered pelitic & siliceous metasedimentary rocks
- Foliated garnetiferous schists, gneisses, porphyroblastic amphibolites, serpentinites, mylonitic ultramafics
- Eclogite

## Esperanza Granitoids

- Sheet-like mylonitic granitoids
- Megacrystic K-spar augen gneiss, migmatite, schist, minor amphibolite
- Interpreted as syntectonic w/ emplacement of thrust nappe 440 Ma (Malone, et al., 1991)
- Local metamorphism (Late Ordovician → Late Devonian)
- intrude Oaxaca terrane

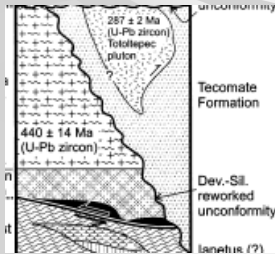
## Tecomate Formation

- Uppermost unit
- Mildly metamorphosed, strongly deformed
- Thinly bedded pelitic & psammitic sedimentary rocks
- Volcano-sedimentary
  - Some marbles, pebble conglomerates, volcaniclastic units of basaltic-andesite, & rarely felsic
- turbiditic volcanic arc sequence deposited in front of arc-continent collision
- Crinoids, bryozoan, mollusks found in limestone



## Totoltepec Pluton

- Tectonically overrides Tecamate Formation
- Grades upward: gabbro/diorite → trondhjemite/tonalite → mafic marginal phase
- Foliation, compositional banding, mild metamorphism
- Postdates main metamorphic & deformational events
- series of plutons extending length of Mexico
- 287±2Ma (U-Pb Zircon dating) (Malone, et al., 2002)

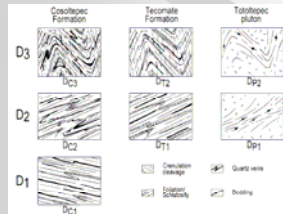


## Tectonothermal Events (Yanez, et al. 1991)

- Early-Mid Devonian (380-400Ma)
  - formation of schists & eclogite w/in terrane & intrusion & deformation of Esperanza granitoids
- Late Pennsylvanian-Permian:
  - Totoltepec pluton intrudes (287Ma)
  - result of NA-Gondwana collision
  - matches up w/ other tectonothermal activity in S. Mexico
- Early-Mid Jurassic (205-170 Ma)
  - Formation of later intrusion (San Miguel Intrusion) & Magdalena migmatite

## Deformational Events (Malone, et al. 2002)

- 3 events
  - Late Ordovician-Early Silurian Acatecan Event
    - Effects Cosoltepec Fm.
  - 2 in Early Permian
    - Occurred around same time as Ouachitan orogeny
      - D2: south vergent thrust, N-S dextral shear
      - D3: E-W shortening



## Where are we exactly?

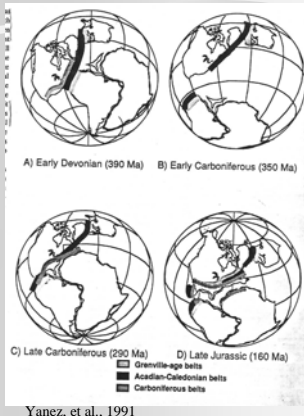


Malone, et al. 2002



Keppie et al. 2000

- Acatlan Complex deformed w/ Acadian belt during Gondwana-Laurentian collision.
- moved away from NA w/ Gondwana attached to present day Colombia
- 2<sup>nd</sup> NA-Gondwana collision cause deformation and plutonism in S. Mexico
- Break up of Pangea, Acatlan complex moves w/ NA plate to present position



Yanez, et al., 1991

## North American Analogs

- No metamorphism in NA Western Cordillera at this time
- Acatlan sediments are much older than sediments of Western Cordillera terranes during this time (ex. Wrangellia)
- Eastern Cordillera Acadian Orogeny

## References:

- Keppie, et al. A Grenvillian arc on the margin of Amazonia: evidence from the southern Oaxacan Complex, southern Mexico. *Precambrian Research*, v. 112, p.165-181. 2001.
- Malone, et al. Deformational history of part of the Acatlan Complex: Late Ordovician-Early Silurian and Early Permian orogenesis in southern Mexico. *Journal of South America*, v. 15, p. 511-524. 2002.
- Ortega-Gutierrez, et al. Oaxaquia, A Proterozoic microcontinent accreted to North America during Late Paleozoic. *Geology*, v. 23, p.1127-1120. 1995.
- Yanez, et al. Isotopic studies of the Acatlan Complex, southern Mexico: Implications for Paleozoic North American tectonics. *GSA Bulletin*. v. 103, p.817-828. June 1991.