The Coastal Batholith, Mesozoic Peru

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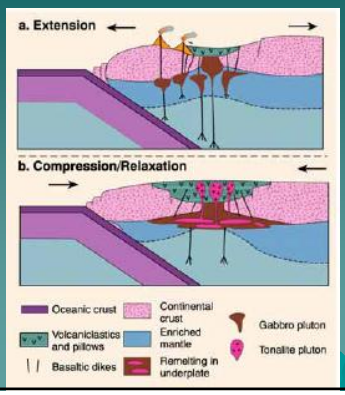
WHY COASTAL BATHOLITH?

- CB Major plutonic phase of Mesozoic magmatism in Peru.
- Typical of Western American batholiths.
- 100-37Ma
- Start of major plutonic activity that continued up until 3Ma with Cordillera Blanca Batholith

GEOLOGICAL SETTING

- Intruded into rifted continental margin parallel to today's trench.
- Albian volcanogenic marginal basin, along major crustal, extensional lineament. (1600km long.)
- Basinal systems related to continental margin extension which started in Jurassic.
- Uplifted in Upper Cretaceous and Lower Tertiary.

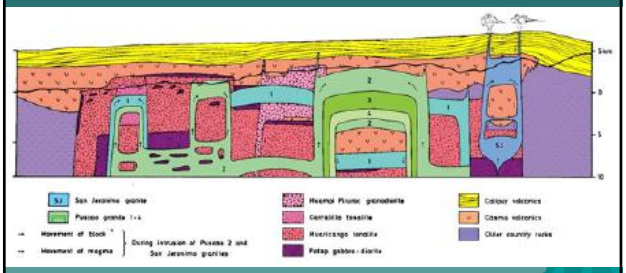
TECTONIC SETTING



CRUSTAL ROCK

- Marginal rifting in Albian marginal basin and crustal dilation.
- Basin filled in with basaltic lavas, sills, hyaloclasts, turbidites and gabbros: dense materials.
- Basin inverted and batholith intruded.
- Shallow melting of Albian basin basaltic fill produced CB magmas- derived from NEW basaltic material.

STRUCTURE



PETROLOGY

- Calk-alkaline suite, dominated by Tonalites. Also some diorites, grano-diorites, and granites.
- Grouped into Super Units e.g. Santa Rosa Tonalite: 2/3 of batholith.
- Super units show basic-acid sequence related to fractionation.
- Bimodal magmatism characteristic of many cordilleran batholiths.
- Zoned tonalite super units typically rich in plag, cpx and hornblende ± zircon.
- I type basalts and island arc andesites: wedge derived magmas.

CONTRIBUTION TO ANDES

- CB started the plutonic addition stage of the Andes 100mya that continued pass the CB through the Cordilleran Blanco Batholith to 3Ma.
- Consists of multiple plutons (estimates up to 1000), all of a thin, tabular structure that added a thin veneer to the crust.
- Growth by intrusion and under plating, caused great crustal thickening.

INTERPRETATION

- I type magmas that show an eastward change in composition and isotopic signature, related to increase in continental crust component.
- Increase K_20 and incompatible element abundances. Indicates increasingly enriched continental mantle rather than depth.
- Migration towards the interior of continent related to subduction direction.

RELATION TO SIERRA NEVADA

- SN U. Jurassic-Cretaceous.
- Similar aspect ratios as CB.
- Similar processes for 'room-making' in crust for intrusions.
- Extensional processes more dominant for CB.
- Similar zoning patterns seen in both batholiths.

QUESTIONS? & REFERENCES

- Atherton MP, 1990. The Coastal Batholith of Peru-The product of rapid recycling of new crust formed within rifted continental-margin. Geological Journal 25(3-4) 337-349.
- Atherton MP & Petford N, 1996. Plutonism and the growth of the Andean Crust at 9°S from 100Ma to 3Ma. Journal of South American Earth Sciences 9 (1/2) 1-9.
- Goeke, 2002. http://snebulos.mit.edu/home/egoeke/lectures/pet/chp18-2.pdf
- Haederle M & Atherton MP, 2002. Shape and intrusion style of the Coastal Batholith, Peru. Tectonophysics 345 17-28.
- Winter JD, 2001. An introduction to Igneous and Metamorphic Petrology. Prentice Hall.