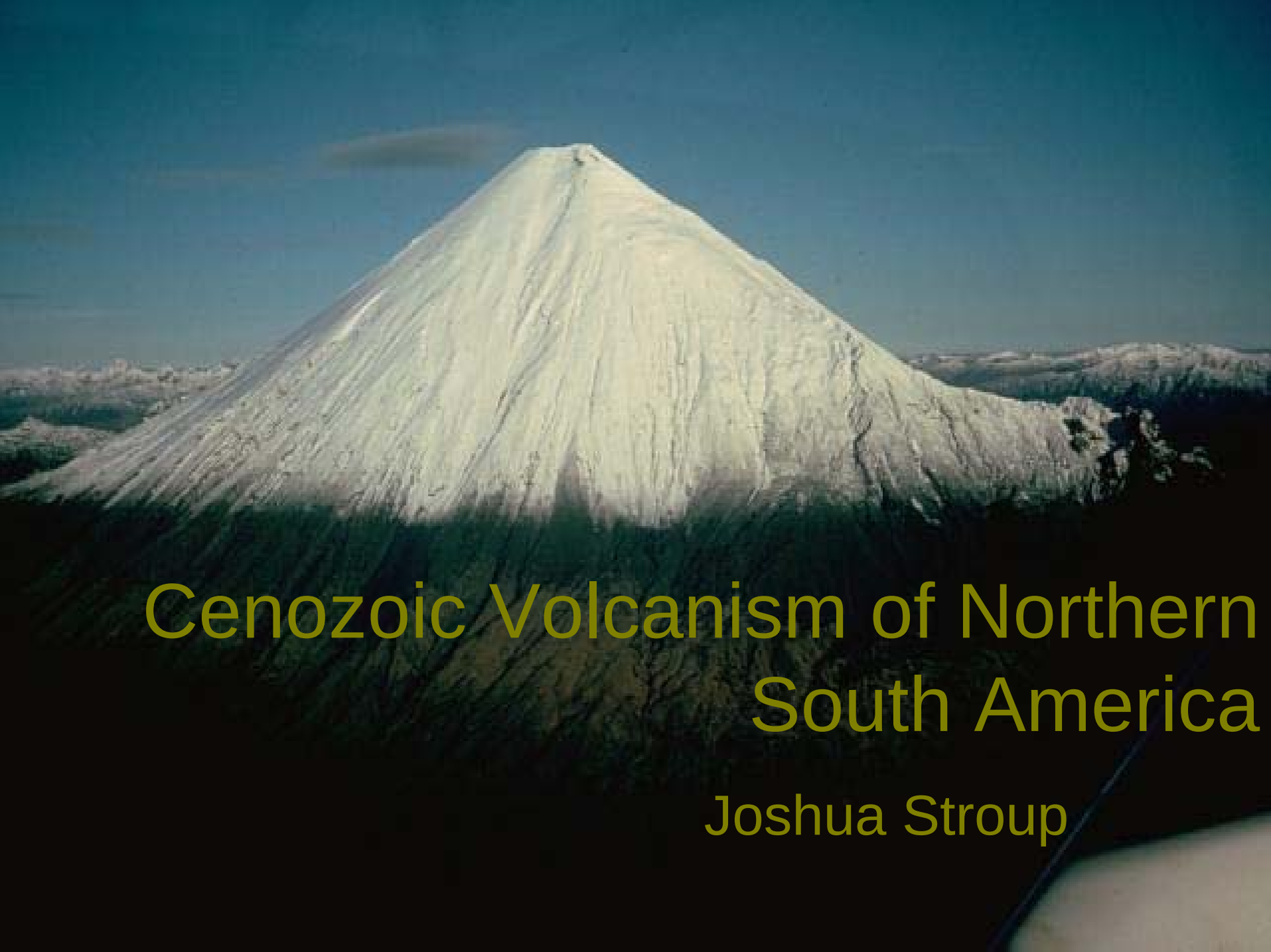
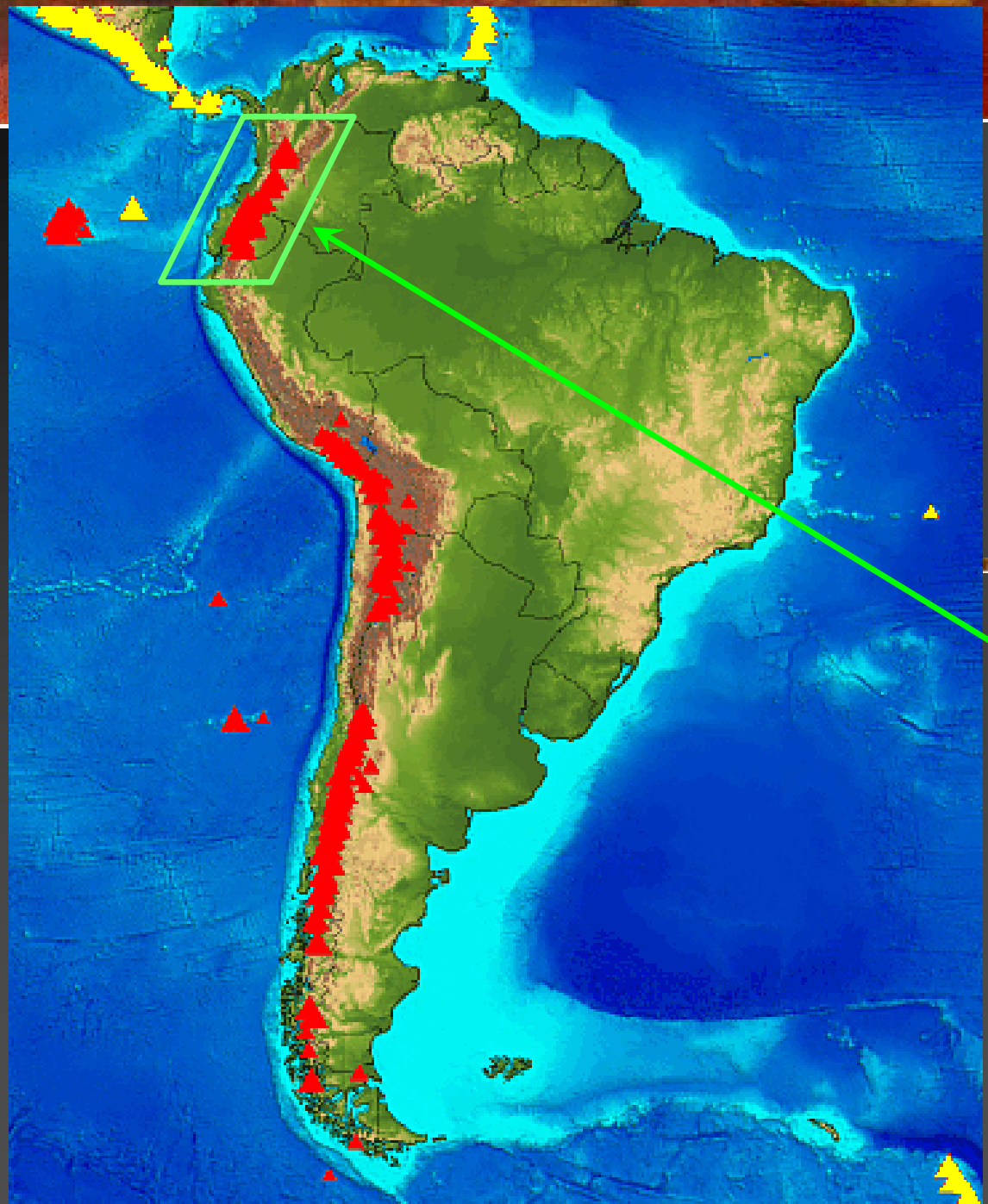


Cenozoic Volcanism of Northern South America

Joshua Stroup

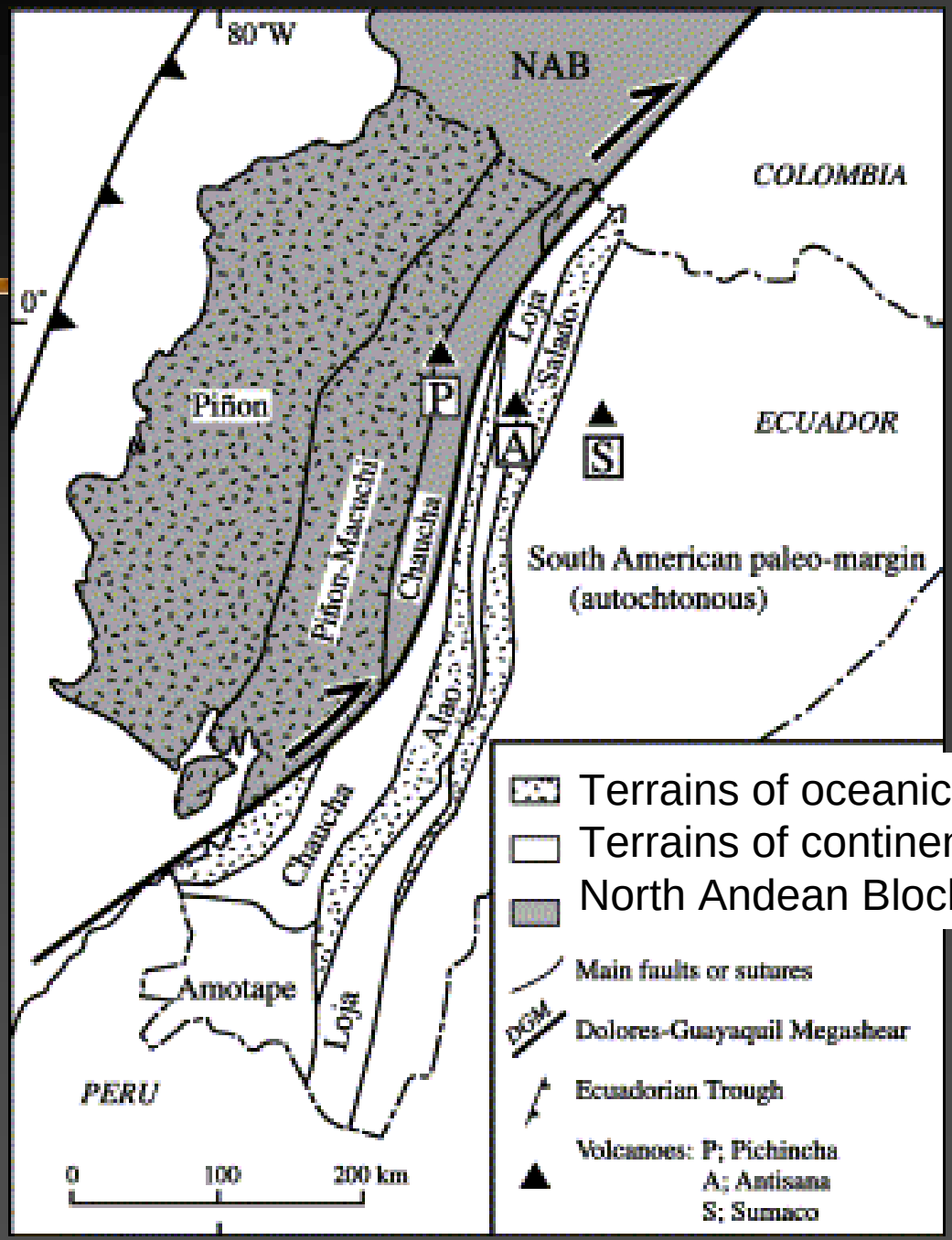


Current Volcanism

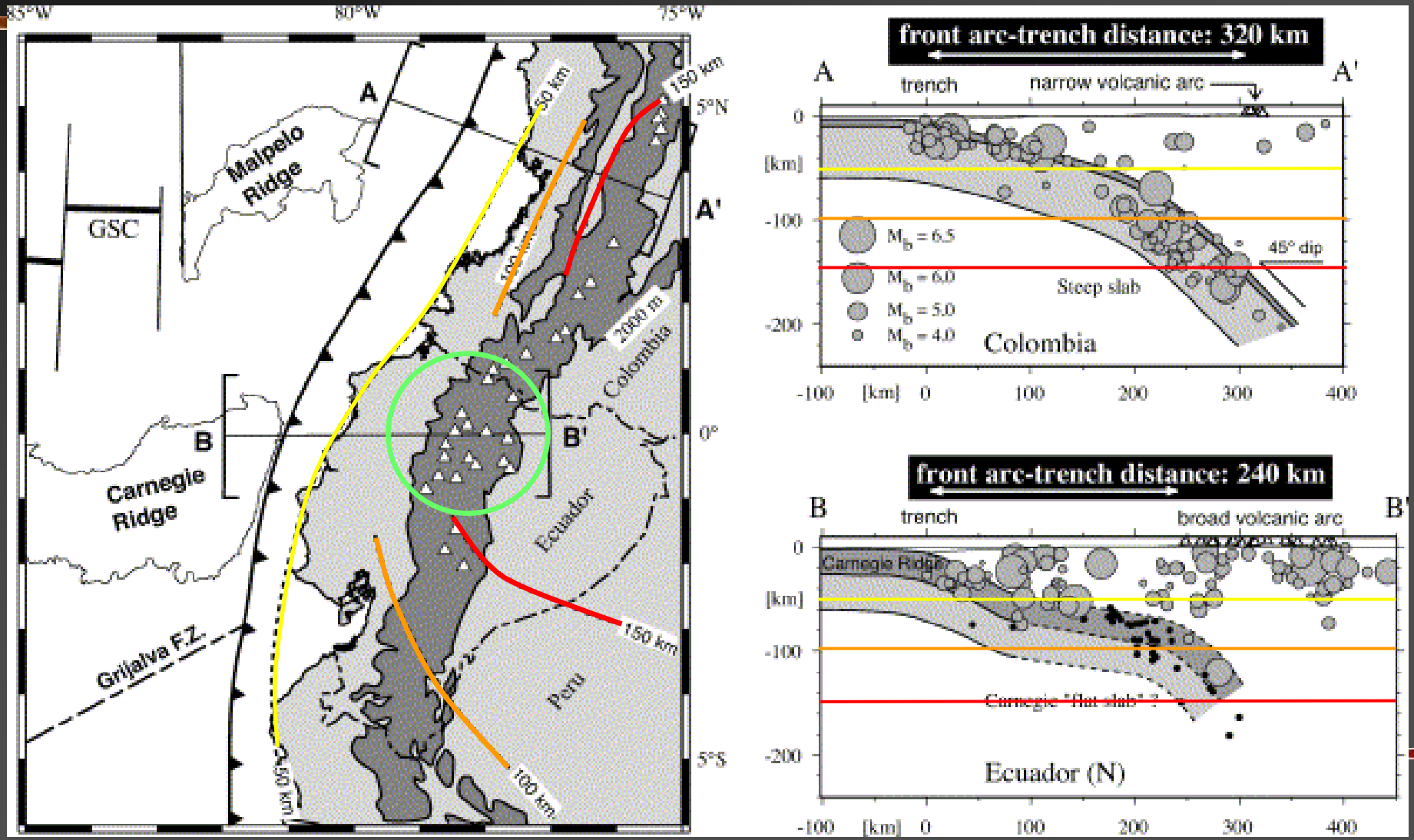
Focus Area Is the Northern Andean Volcanic Arc

Terrains of the Northern Andes

- There are a large number of accreted terrains



Subduction in the Northern Andes

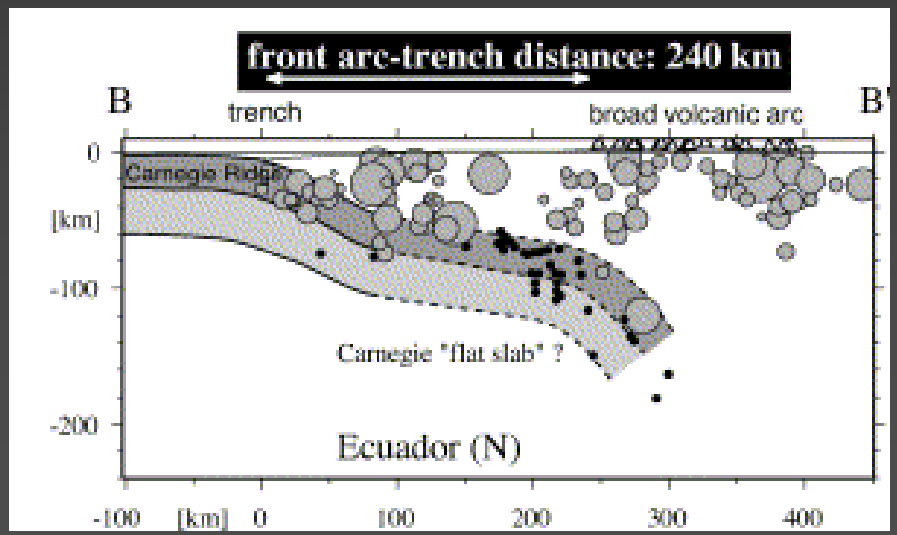


Geologic Setting

- In Ecuador the Andean magmatic arc is divided into two parallel chains
  - Cordillera occidental (west)
  - Cordillera real (east)
- A back arc also exists further east in the Amazon basin
- Cordillera occidental
  - Allochthonous terrain of mafic composition
  - 30 km thick
- Cordillera real
  - Metamorphosed granites and medasedimentary rocks of continental affinity
  - 60 km thick
- Back arc
  - Sedimentary rocks
  - 35 – 40 km thick

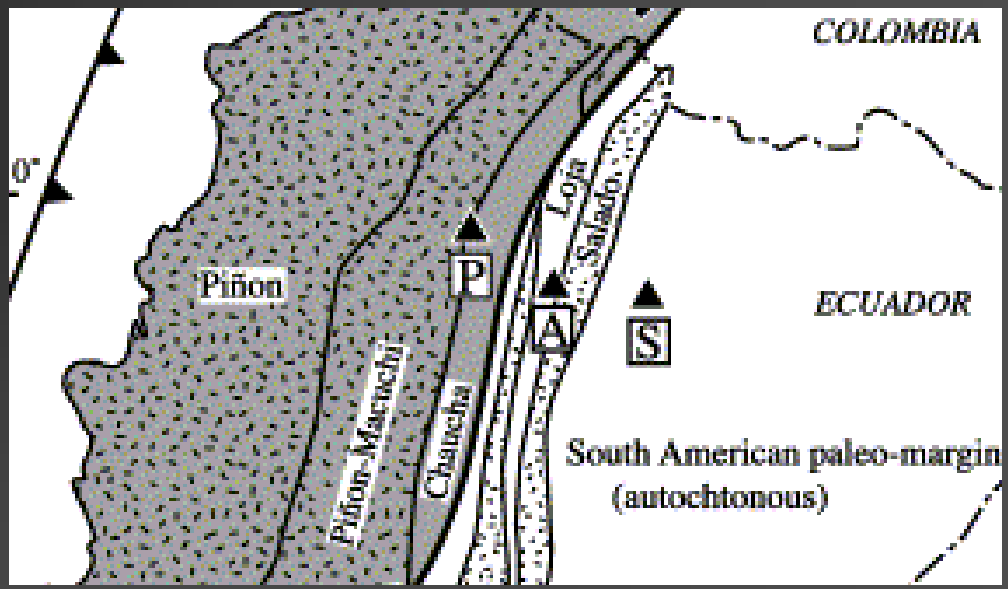
Ecuador

- Volcanism in Ecuador has developed as a broad magmatic arc
- This is the result of flat slab subduction of the Nazca plate



Volcanoes Across the Subduction Zone

- Pichincha volcano
  - Cordillera real
- Antisana volcano
  - Cordillera occidental
- Sumaco volcano
  - Back arc



Pichincha

- Stratovolcano
- Composed of at least two successive volcanoes
- Highly active
- Historic eruptions have produced lava domes, pyroclastic flows and ash falls

Pichincha con't.

- Guagua pichincha is built on the collapsed flank of the old rucu pichincha
- Magmas erupted here are adakites containing amphibole, plagioclase, pyroxene and Fe-Ti oxides
- Magma generated here results from the melting of oceanic crust

Antisana

- Massive stratovolcano
- Also composed of at least two successive volcanoes
- Built up over granitic and medasedimentary rocks
- Only one historic eruption, a lava flow

Antisana Con't.

- Magmas erupted here are calc-alkaline.
- This is due to the interaction with mature continental crust.
- Minerals include clinopyroxene, orthopyroxene and plagioclase and Fe-Ti oxides.

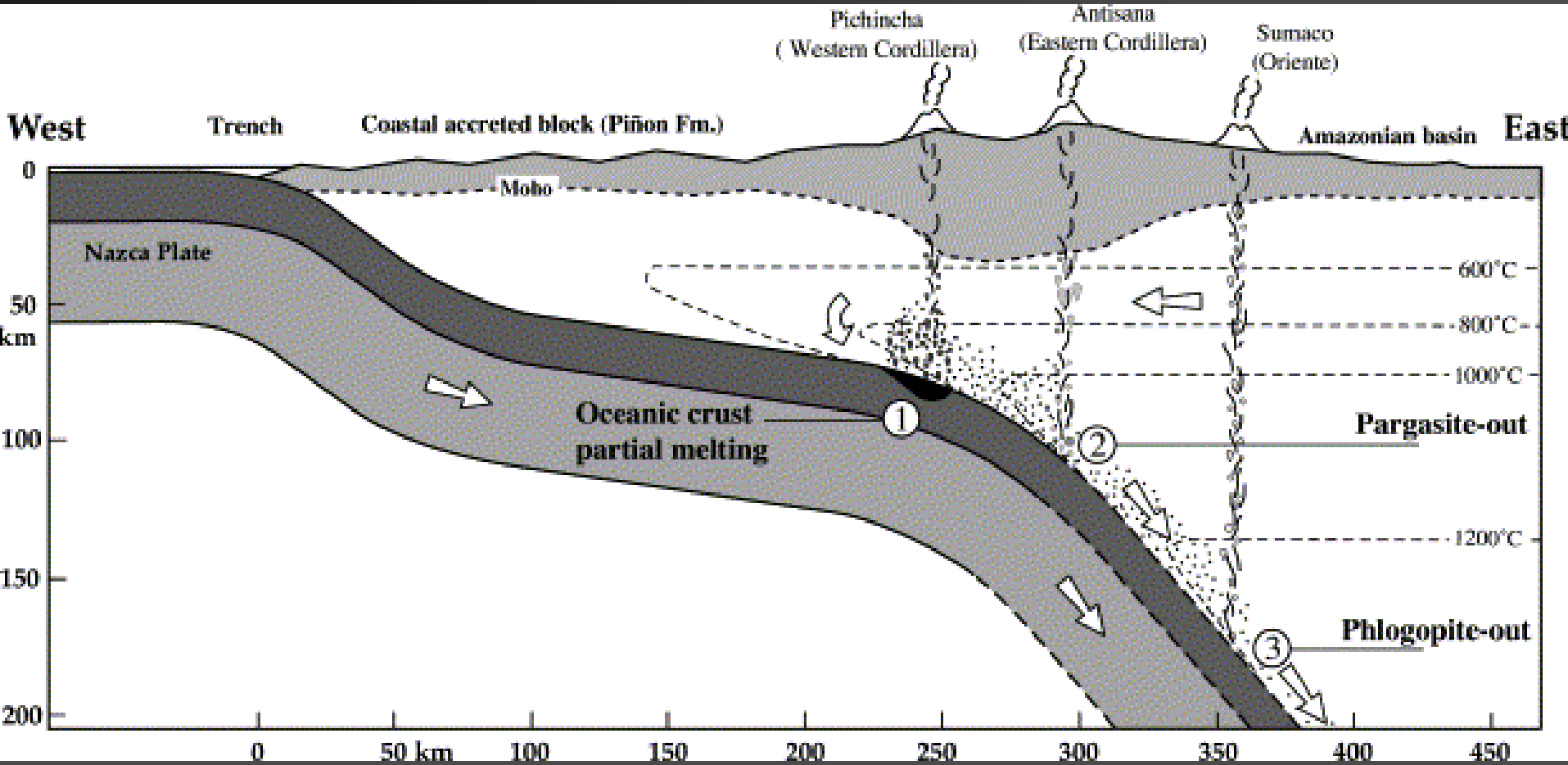
Sumaco

- Stratovolcano
- Situated far east of the main volcanic arc
- The volcano is built up over cretaceous sedimentary rocks
- From one to three historic eruptions

Sumaco Con't.

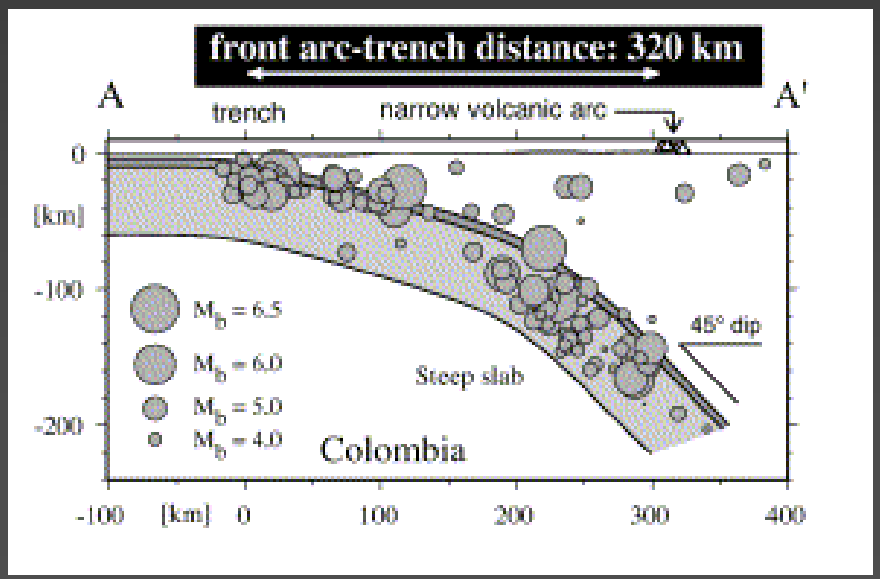
- Magmas erupted here are alkaline.
- Minerals include clinopyroxene, plagioclase, olivine Fe-Ti oxides and apatite.
- Strong enrichment of niobium.
- Highly evolved magmas despite low silica content.

Model of Subduction Below Ecuador



Columbia

- Volcanism in Columbia is a single magmatic arc
- This is the result of steep slab subduction of the Nazca plate



Galeras

- Stratovolcano with a breached caldera
- Two major caldera collapse eruptions in the Pleistocene
- Hydrothermal alteration has led to large scale edifice collapse
- Major explosive eruptions since mid Holocene
- Widespread tephra deposits and pyroclastic flows

Navado Del Ruiz

- Stratovolcano
- Also composed of at least two successive volcanoes
- It is composed of andesitic and dacitic lavas and andesitic pyroclastics
- cone consists of a broad cluster of lava domes built within the summit caldera
- Known for producing lahars

Correlations with North America

- Pinchincha
- Antisana
- Sumaco
- Galeras
- Navado Del Ruiz
- Mt. St. Helens
- No current correlation
- No current correlation
- Mt. Shasta
- Mt. Rainer

References

- Bourdon et al., 2003. Magmatic response to early aseismic ridge subduction: the Ecuadorian margin case
- Barragan et al., 1998. Subduction controls on the compositions of lavas from the Ecuadorian Andes
- Siebert, Simkin (2002-). Volcanoes of the World: an Illustrated Catalog of Holocene Volcanoes and their Eruptions. Smithsonian Institution, Global Volcanism Program Digital Information Series, GVP-3, (http://www.volcano.si.edu/world/).