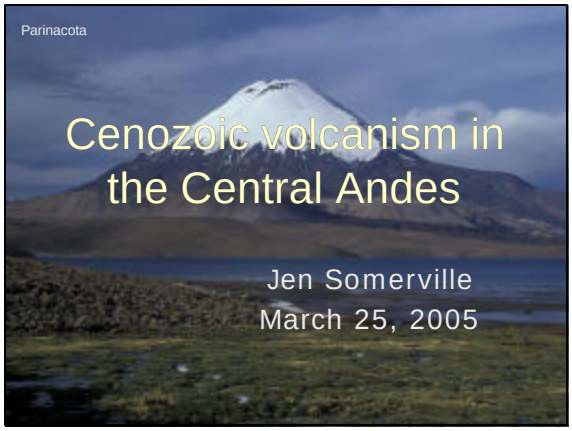
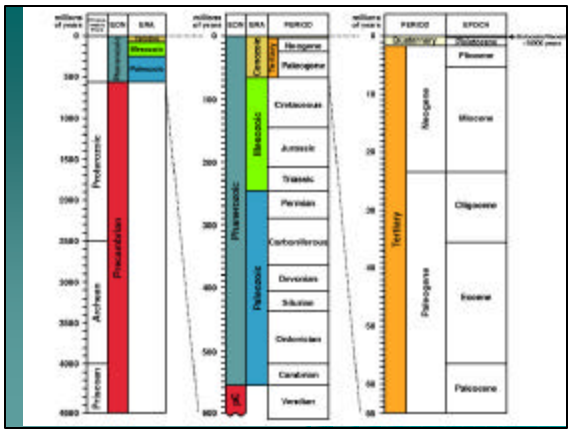
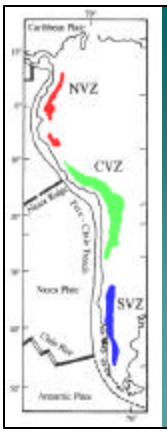



# Cenozoic volcanism in the Central Andes

Jen Somerville
March 25, 2005

## Tectonic setting





## Volcanic Zones

There are three volcanic zones in South America

1. NVZ (Northern volcanic zone): Ecuador and Colombia
2. CVZ (Central volcanic zone): Southern Peru, northern Chile, southwestern Bolivia and northwestern Argentina
3. SVZ (Southern volcanic zone): Southern Chile and southern Argentina

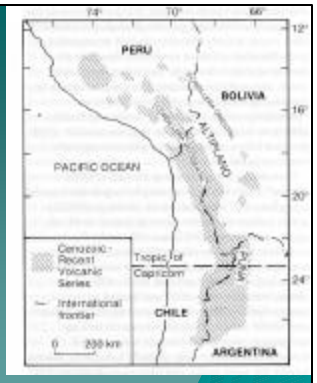
## CVZ

-The CVZ is not as studied, or as well known, as the NVZ and SVZ.

-The CVZ is located between 14° s and 28° s

- This zone is dominated by the Altiplano (Bolivia) and the Puna Plateau (Northern Chile and Argentina)

- The CVZ, unlike the NVZ and the SVZ , is underline by thick crust (70 km).

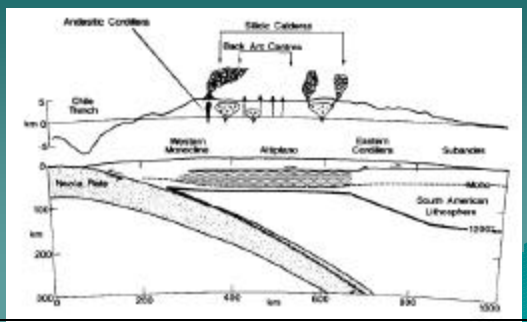


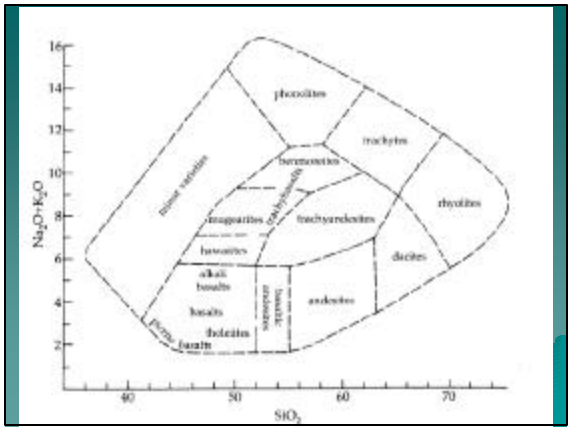

## Volcanism in the CVZ

There are three zones of volcanism in the CVZ

1. Well defined zone of calc-alkaline andesite volcanism
2. Scattered instances of calc-alkaline, high K and shoshonitic back-arc volcanoes
3. A zone of voluminous silicic volcanism, characterized by large ignimbrite erupting calderas.

## CVZ




## Andesitic Cordilleran Volcanism

- The Andean Cordillera in the CVZ is 7500 km in length and is defined by active volcanoes.
- Many of the volcanoes in this area are over 6000 m in altitude (which makes them some of the worlds highest volcanoes).
- These volcanoes are characteristically located about 250 km east of the trench and 100-125 km above the descending oceanic slab.
  - Magmas are generated by partial melting of the hydrated mantle wedge
- The volcanoes in this zone of the CVZ have lavas that are high potassium basaltic andesites, andesties and dacites.

## Ollague Volcano

Northern Chile

Ollague is a 5800 m high andesitic strato volcano with a dacite lava dome at its summit.

During the Pleistocene dome collapses deposited debris avalanches (evidence for glaciation so pre-11000 yrs ago).

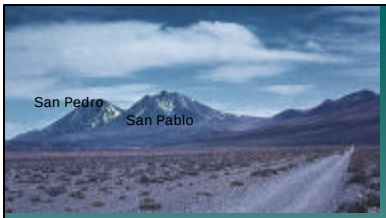
## Ojos del salado

Northern Chile

The world highest active Holocene volcano (6887 m)

Most recent eruption 700 AD

Andesitic to Rhyolitic lava domes, pyroclastic flows




## San Pedro

Northern Chile

San Pedro is a 6145 m high stratovolcano.

Dacite lava flows are present

Last known eruption: 1960

## Back-Arc Volcanism

-Large andesitic and dacite composite volcanoes which are found 100 km beyond the active (Andean) arc.

-These rocks have higher Nb and lowers Ba than those in the Andesite chain.

-Thus, the parent magmas for these volcanoes have different minor and trace element compositions and probably incorporate more of the plate.

-Volcanism occurred here over several million years and is related to some chemical and thermal evolution of the mantle below the area.

-Examples: Cerro Chorrillos and San Jeronimo in Argentina

## Large Silicic systems

-There are extensive ignimbrite sheets in the CVZ, generally located at elevations around 4000 m.

-The large calderas that produced the ignimbrites are located 200 km east of the arc

-They are mainly dacitic and are large (> 1000 $km^3$)

-They seemed to be active over many millions of years.

-An Ignimbrite is a large volume pyroclastic flow.

## Altiplano-Puna volcanic complex

-The largest silicic complex in the CVZ.

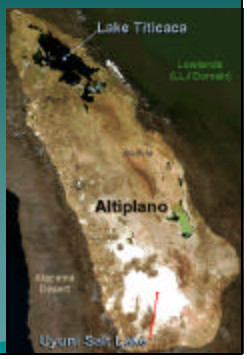
- Calderas include Pastos Grandes, La Pacana, Guacha and Purico

- Ignimbrites from this complex cover 17,000 $km^2$

Cerro Guacha caldera

Age :1-7 Ma

7000 $km^3$




## Cerro Panizos

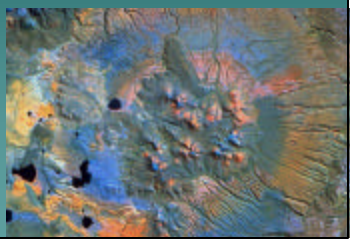
Late Miocene in age

40 km in diameter

3 ignimbrite units (volume is 500 $km^3$)

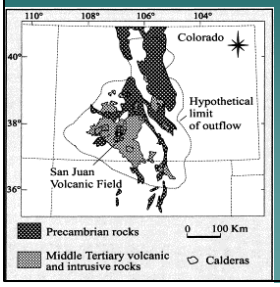
Dacites

SW Bolivia



## Western Cordillera comparison

The San Juan caldera complex in the western USA relates to the caldera complexes found in the Altiplano-Puna complex.




Oligocene in age

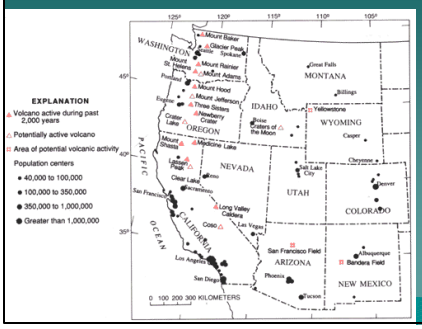
Rhyodacite to rhyolites in composition.

Result from a low angle subduction

Volumes: 40,000 $km^3$

## Cascades

Cascades are like the Andean arc.



# Activity

**Activity closest to the coast was about 300 km from the trench. (in the CVZ, the active arc was 250 km from the trench)**

**The style of volcanism changed as you got farther from the trench, just like in south america.**

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