

BUILDING CAPACITIES FOR EARTHQUAKE AND VOLCANIC STUDIES AND MONITORING

INSTITUTO GEOFISICO
ECUADOR
MAY 2015



Geodynamic context

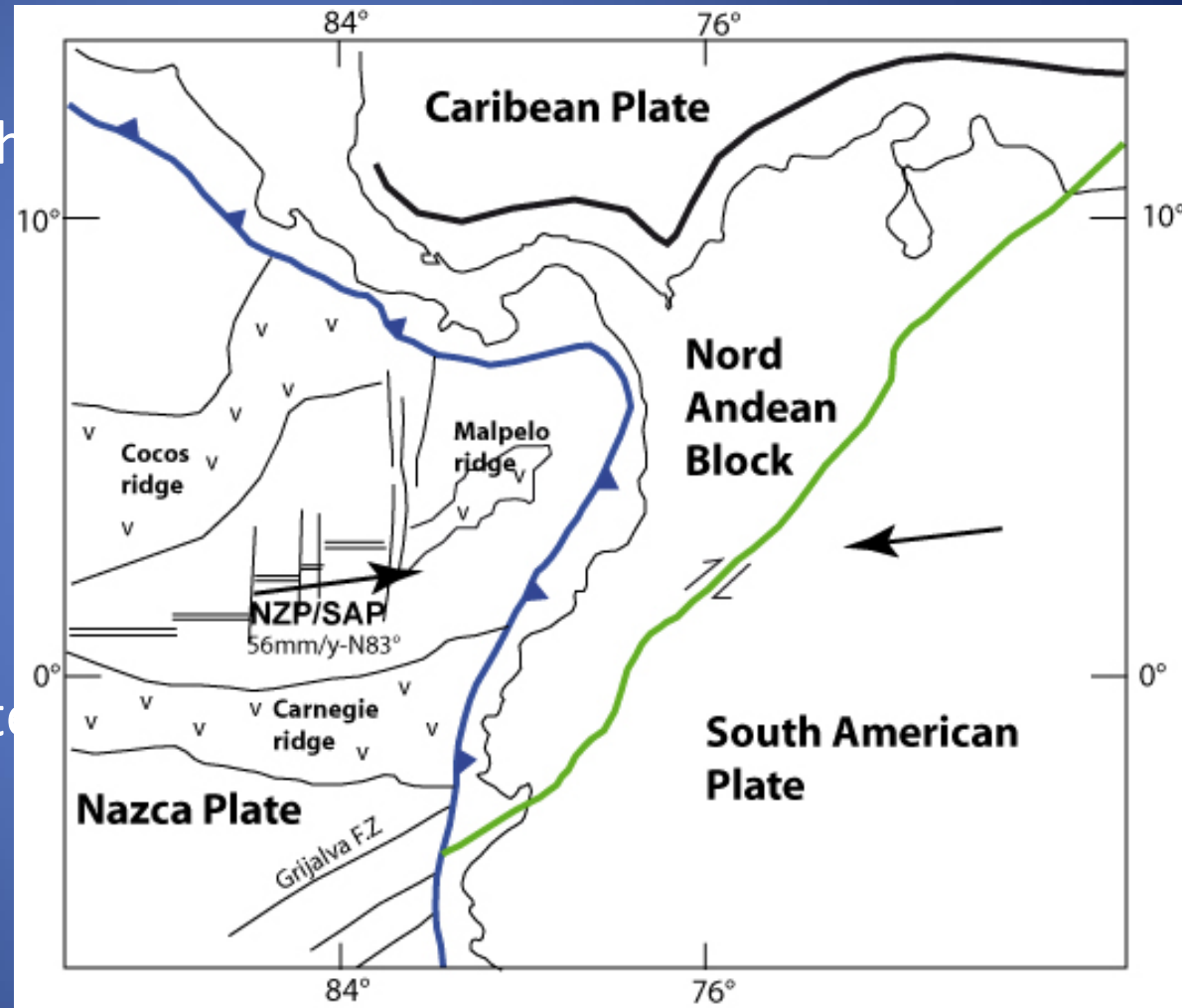
• Nor-andean Block – South America Plate:

10 +/- 2 mm/year

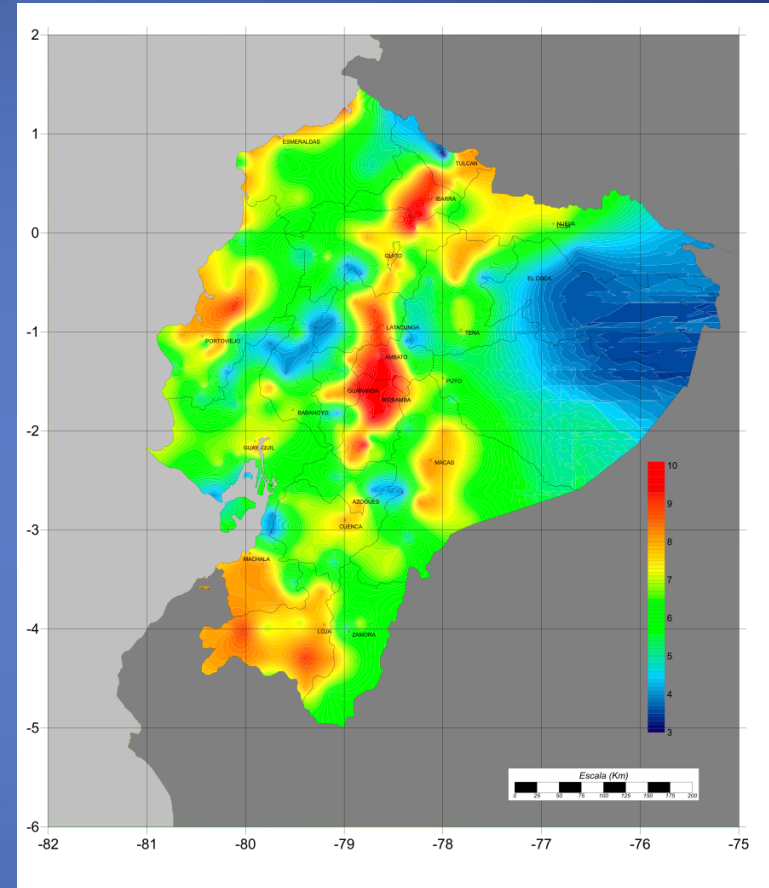
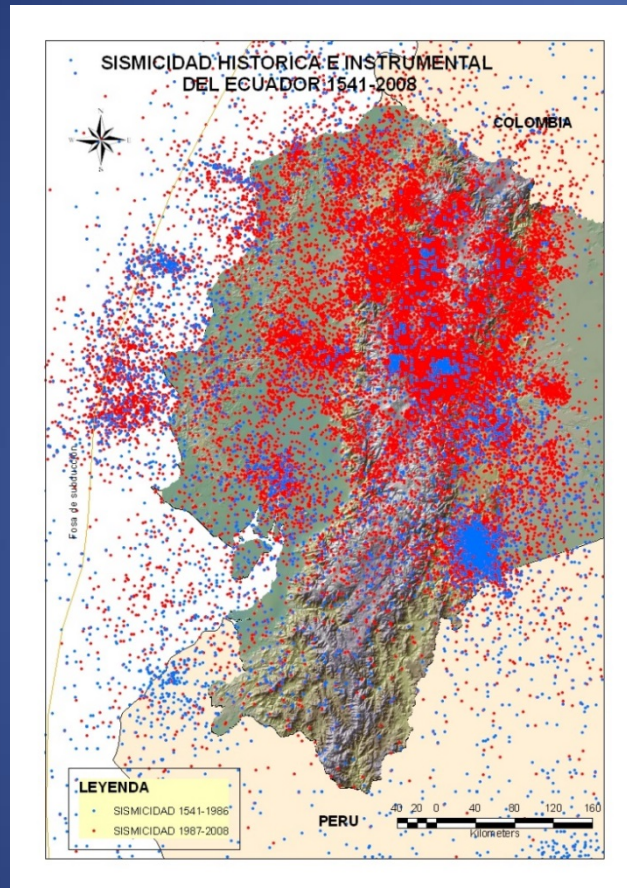
• Carnegie ridge

• Nazca – Sud America Plate convergence:

56 mm/yr. N83°E



Seismic activity in Ecuador



Mapa con la sismicidad histórica (1541-1986) e instrumental (1987-2008)

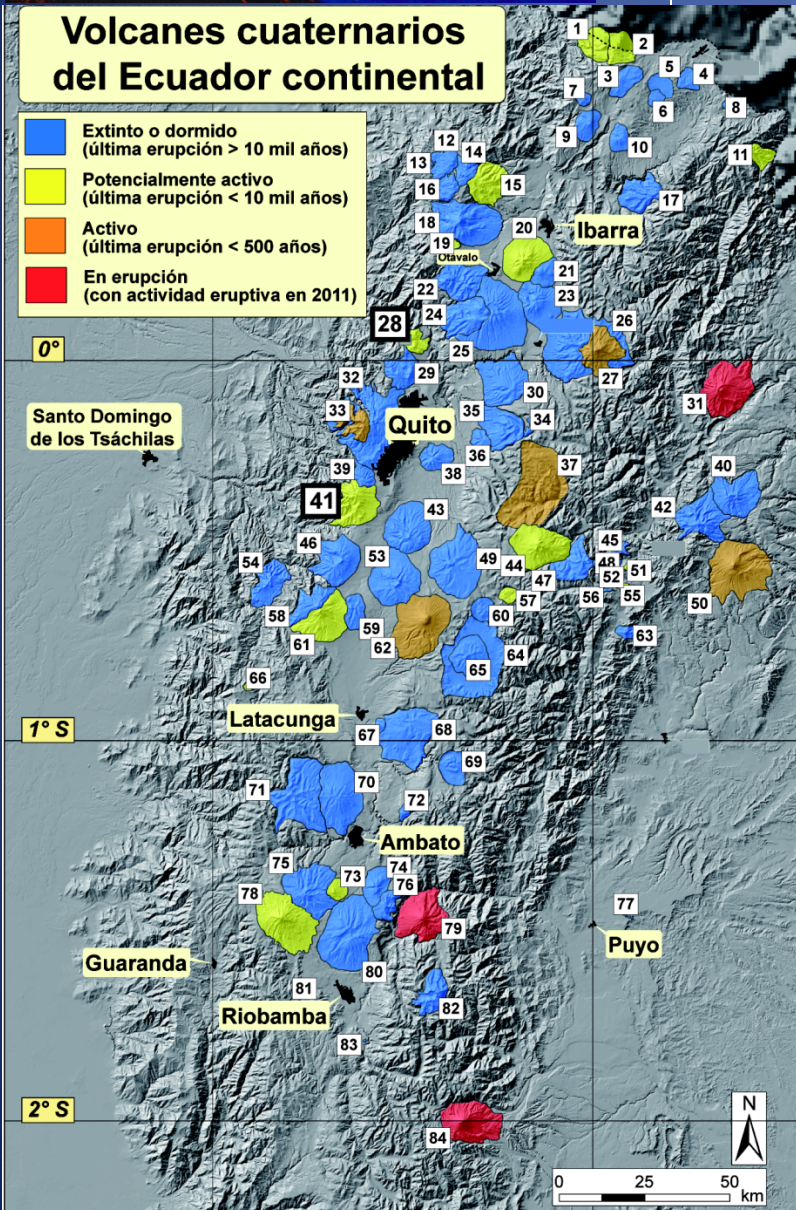
Distribución de intensidades sísmicas en el Ecuador

Seismic crises monitored by IGEPN

- 1987 Reventador earthquake. 1500 fatalities, oil pipeline destroyed.
- 1987 Chalupas-Pisayambo
- 1990 Pomasqui
- 1995 Cordillera de Cutucú
- 1996 Santa Rosa de Cusubamba
- 1998 Bahia de Caraquez. Sustancial damage in Bahia and Canoa
- 2010 Deep event at the Subandean Andean
- 2015 Event magnitude 5.2 with epicenter north of Quito



Geodynamic context: volcanism



The Continental Arc

- **84 volcanic complexes** have been identified.
- **13 potentially active** (with at least one eruption during the last 10 Ka).
- **8 active volcanoes** (with eruptions since 1532)
- **3 volcanoes** are currently in eruption.

Main historical destructive earthquakes

Pichincha: 1587 (IX); 1755 (VIII); 1859 (VIII); 1914 (VIII); 1923 (VIII); 1929 (VIII); 1938 (VIII)

Chimborazo: 1645 (IX); 1674 (IX); 1786 (VIII); 1797 (XI); 1911 (VIII); 1961 (VIII)

Tungurahua: 1687 (VIII); 1698 (X); 1868 (VIII); 1949 (XI)

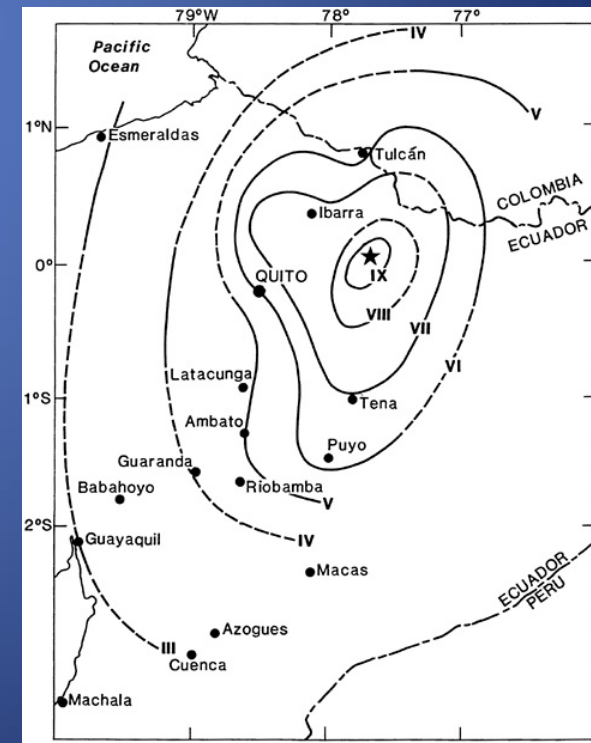
Cotopaxi: 1736 (VIII); 1757 (IX); 1962 (VIII); 1976 (VIII)

Imbabura: 1859 (VII); 1868 (X); 1955 (VIII)

Carchi: 1868 (VIII); 1922 (VIII)

Loja: 1749 (VIII); 1970 (VIII)

Napo-Sucumbíos: 1987 (IX)



Milestones

- 1988-1989 First Seismic Network. UNDRO-USAID Project
- 1989-1990 Second Phase Seismic Network. OAS project
- 1991-1993 Tungurahua Monitoring System. DHA-Undro Project
- 1992-2000 Tungurahua and Cotopaxi Monitoring. INECEL-EPN agreement
- 1993-present ORSTOM – IRD Cooperation
- 2004-2009 JICA Project Enhancing Volcano monitoring system at Cotopaxi and Tungurahua
- 2006-2011 Early Warning System at Tungurahua and Cotopaxi. BID
- 2008-2013 Senascyt project for Enhancement of the IG and SENASV
- 2013-present Generation of Early Warning Alerts project
- 2014-present IRD and EPN agrees to consider Instituto Geofísico as a Mutual International Laboratory
- 2014-2015 Second phase of Enhancement of the IG (Spain's funding)
- 2014-2017 JICA Project Early Warning Alerts for Tsunamis

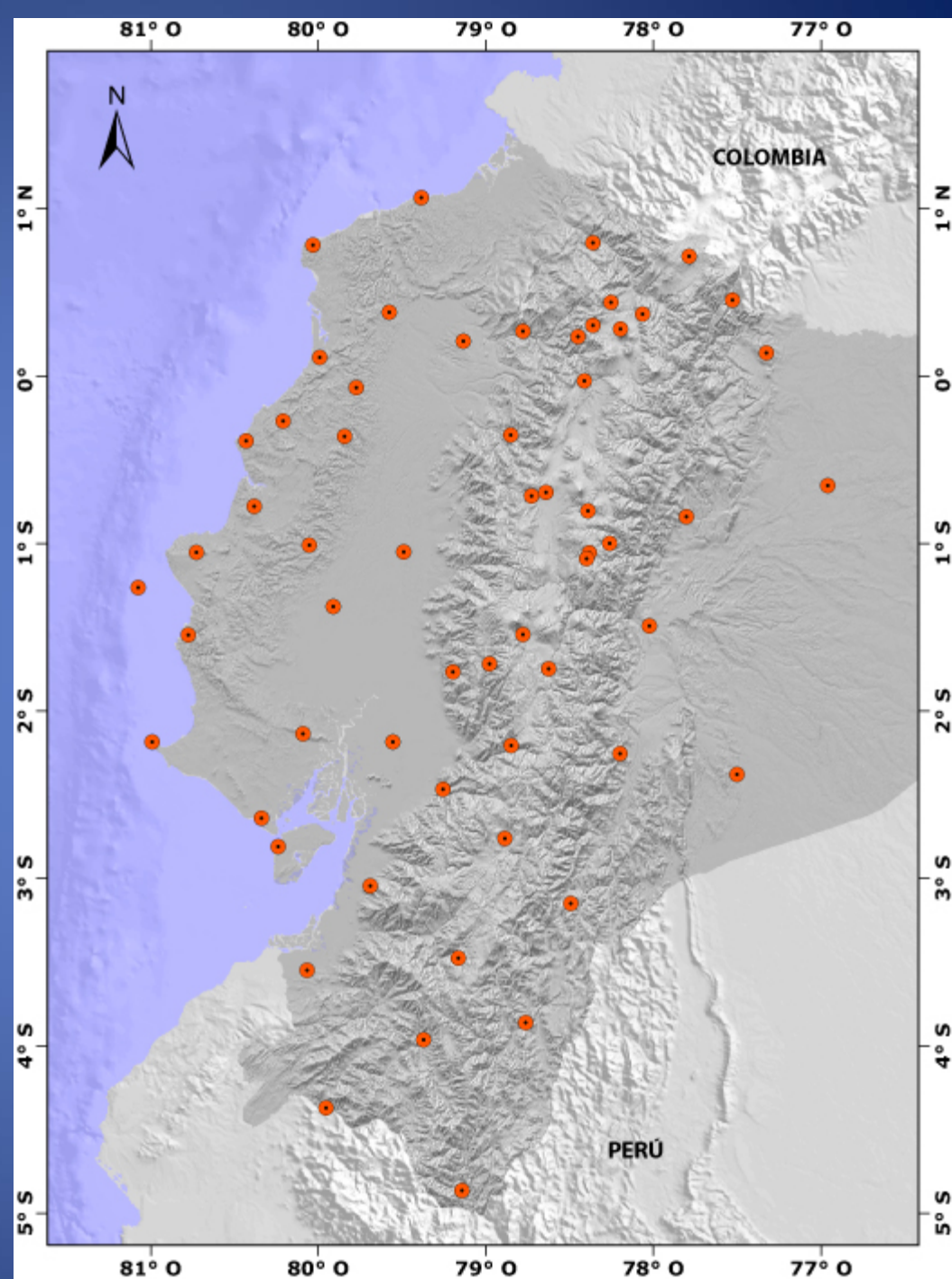




NATIONAL SEISMIC NETWORK

140 seismic stations
Short period and broad-band

- Seismic Catalog
- Seismogenic sources characterizations



RENSIG

- 105 Broad band seismic stations

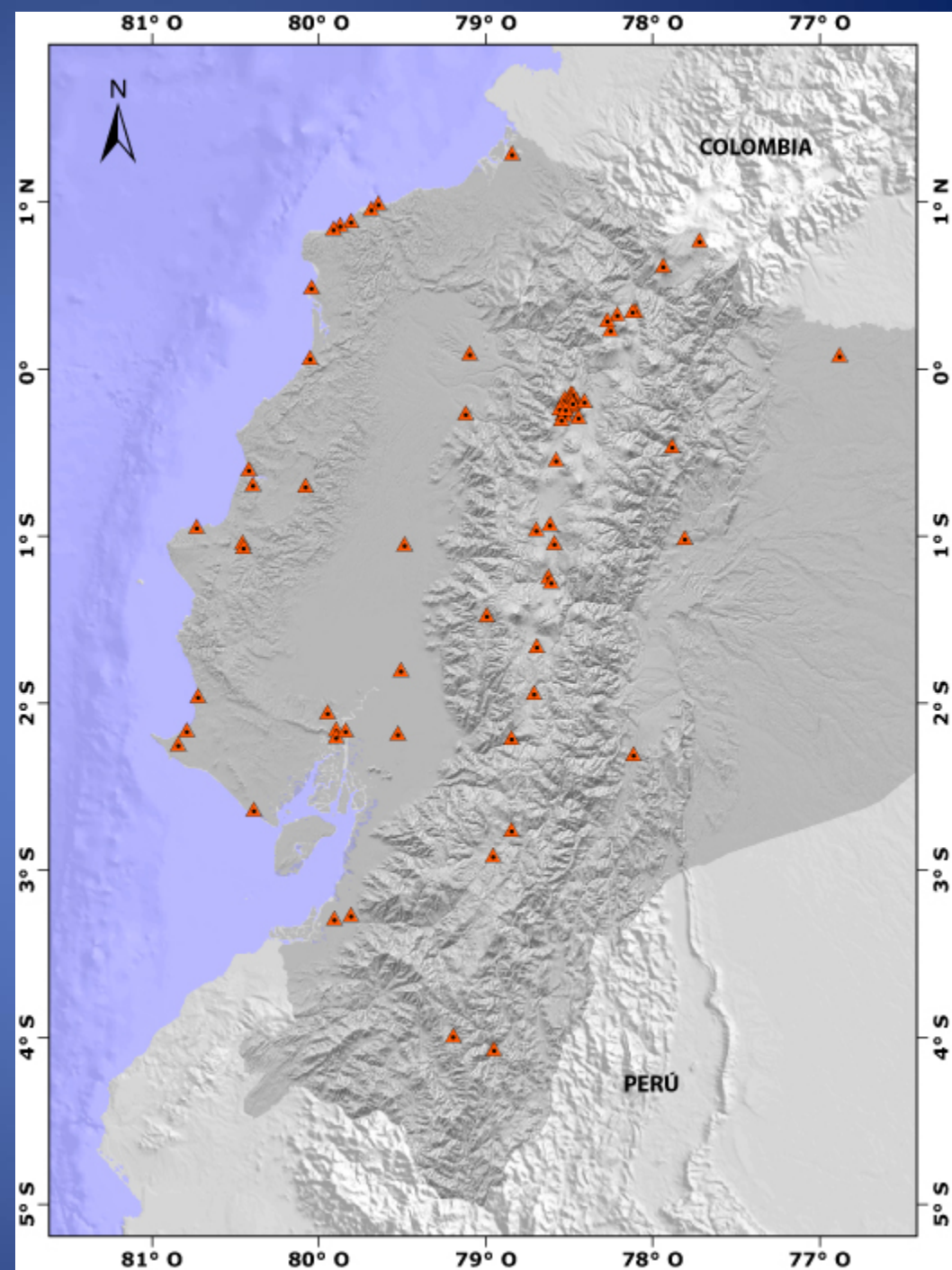




NATIONAL STRONG MOTION NETWORK

76 stations

- Ground accelerations: multi parametric stations
- Seismic Intensities in urban centers



RENAC

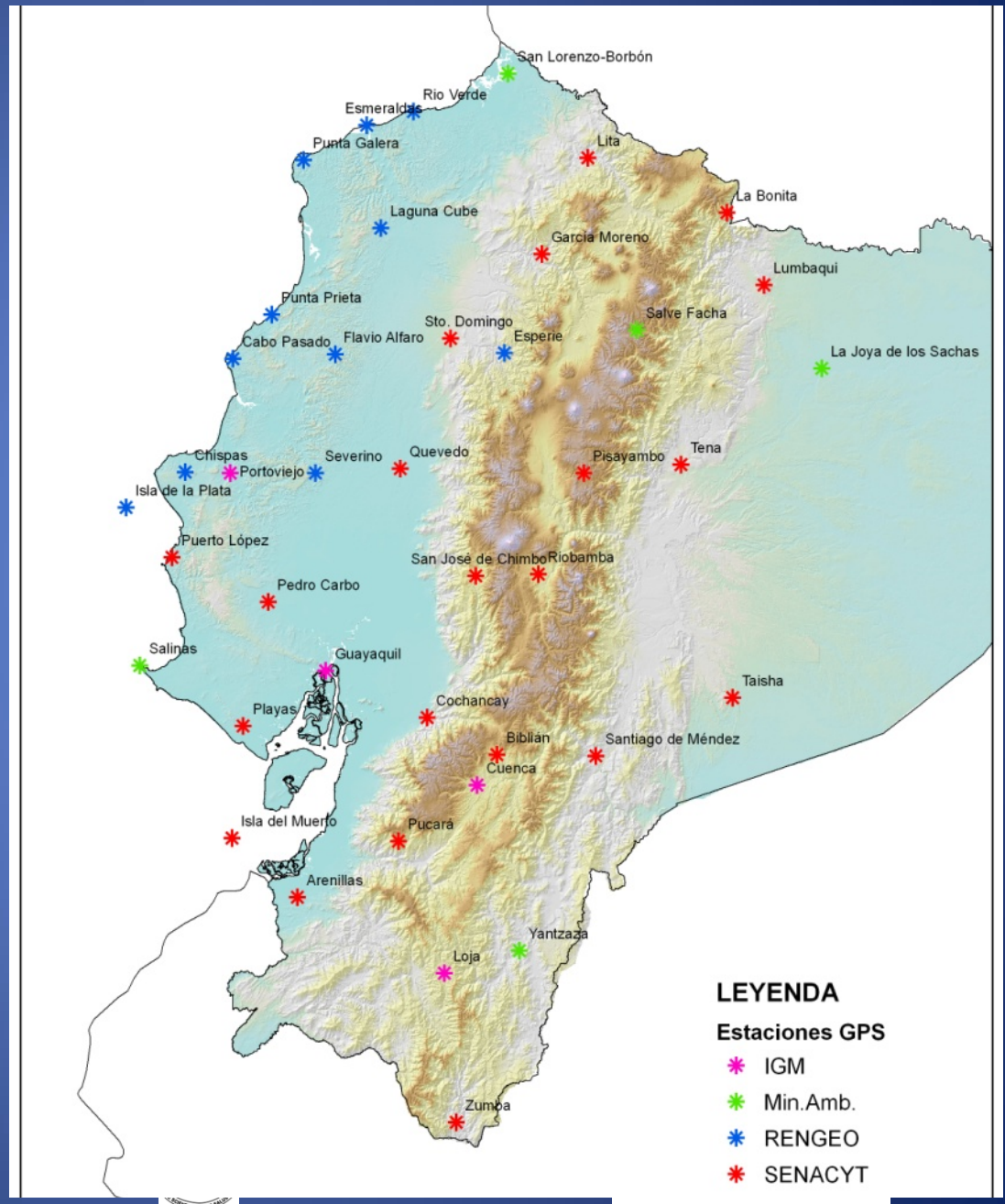
- 76 digital strong motion recorders
- Multichannel accelerometers (12 sensors)
- Rapid respond set (5 instruments)



NATIONAL GEODETIC NETWORK

75 IGEPN double
frequency GPS
receivers

- Crustal deformation
- Volcano inflation
- Locked zones
- Slow slip events
(2005, 2010, 2013)



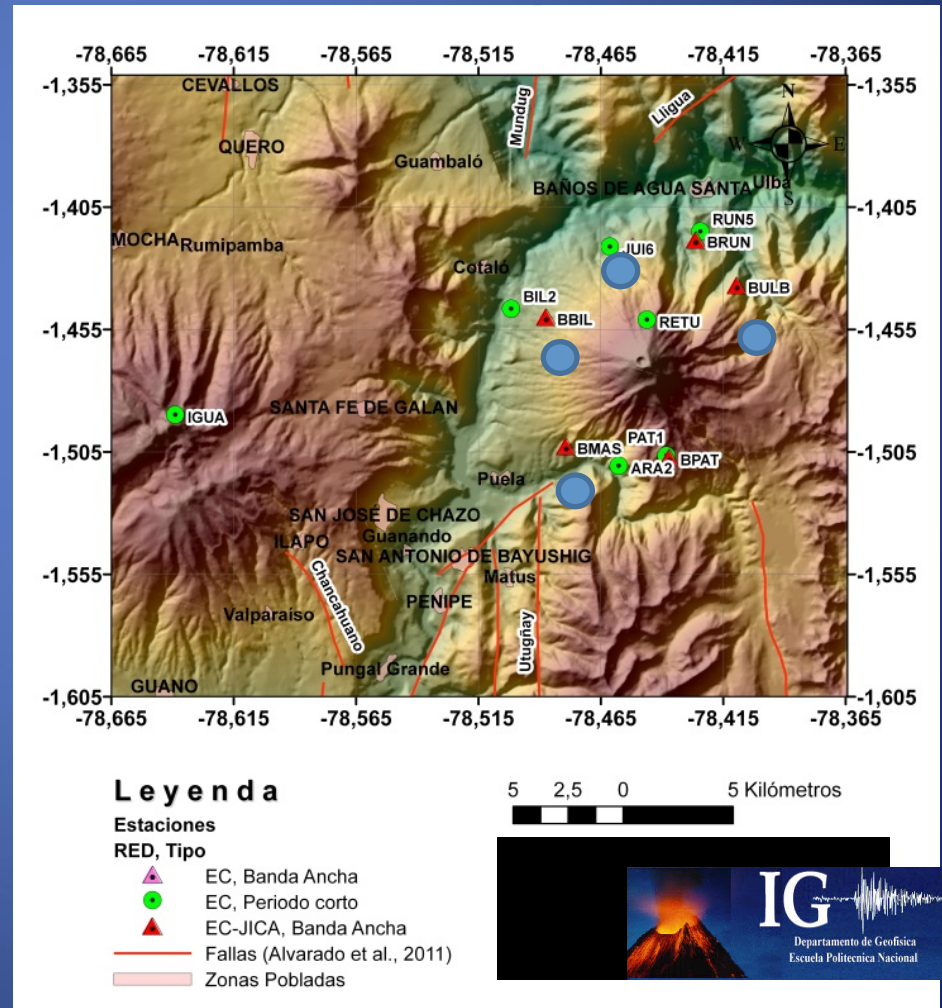
RENGEO

- 75 continuous GPS stations



ROVIG

- Observatories at active and potentially active volcanic centers



REPET

- Data transmission network: VSAT links, microwave back bone, optic fiber link (Transelectric), digital radio, internet



NATIONAL DATA CENTER AND Centro de Procesamiento, Información y Alerta Volcánica y Sísmica

- Secure archive of data
- Permanent monitoring of seismic and volcanic activity (24/7)
- Rapid dissemination using different ways: email, SMS, website, twitter, facebook
- Radio link with SGR and INOCAR (Near field Tsunami Warning System)
- Free data for research and academic institutions



GRACIAS

