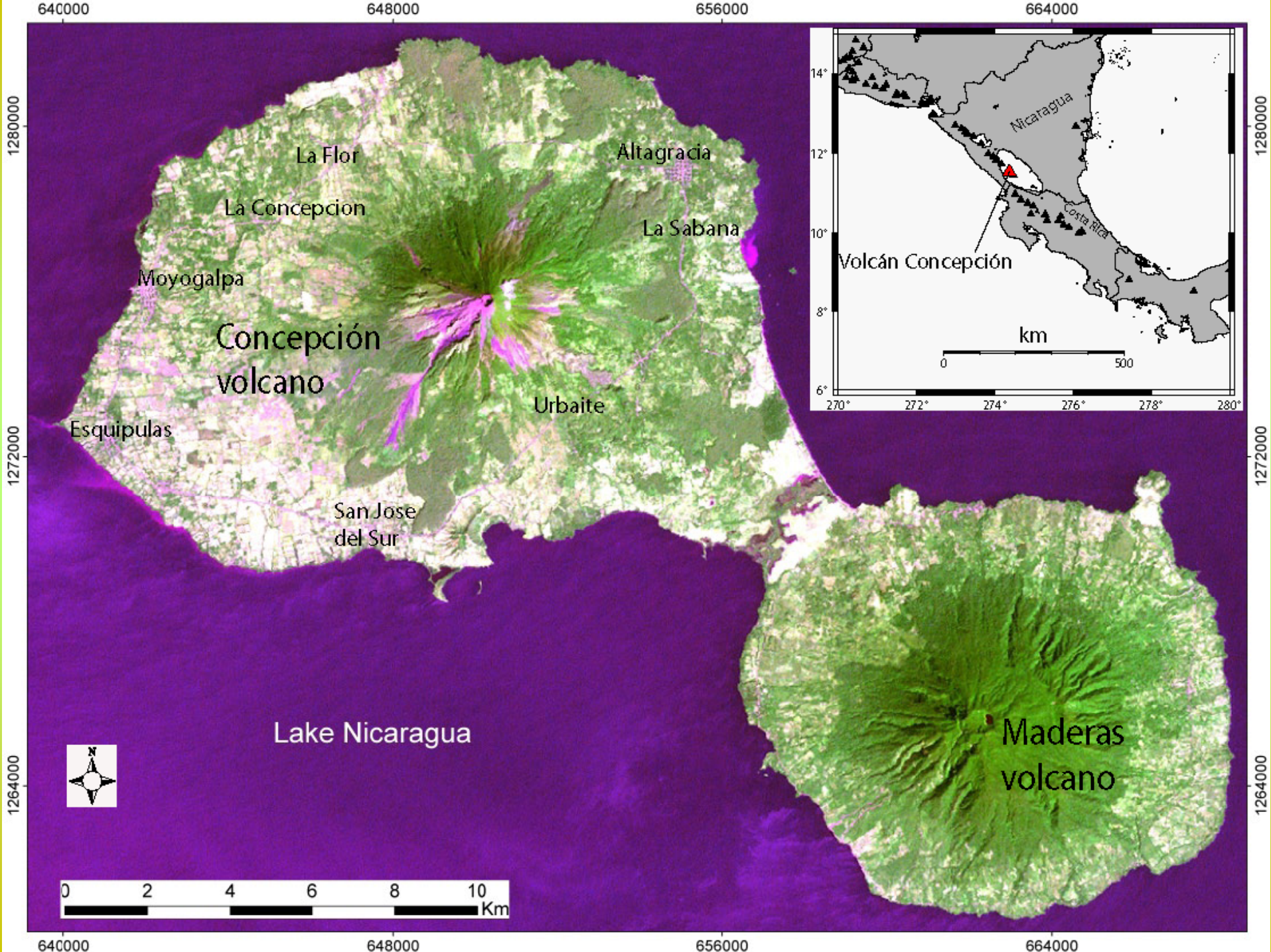


Preliminary Geodetic GPS studies at Concepción volcano, Ometepe Island Nicaragua

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Motivation of this research

Is Concepción volcano spreading by the action of gravity?

E-W radial spreading should be the fastest according to Borgia and van Wyk de Vries, 2003.

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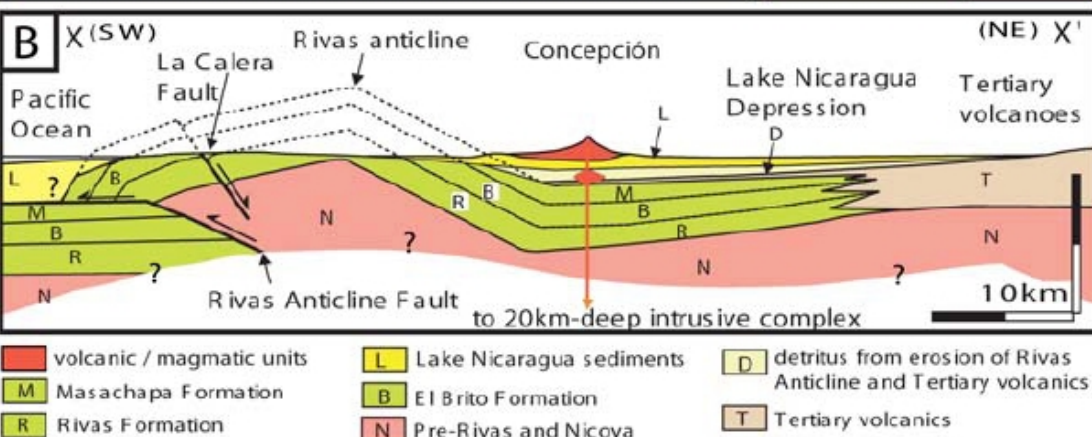
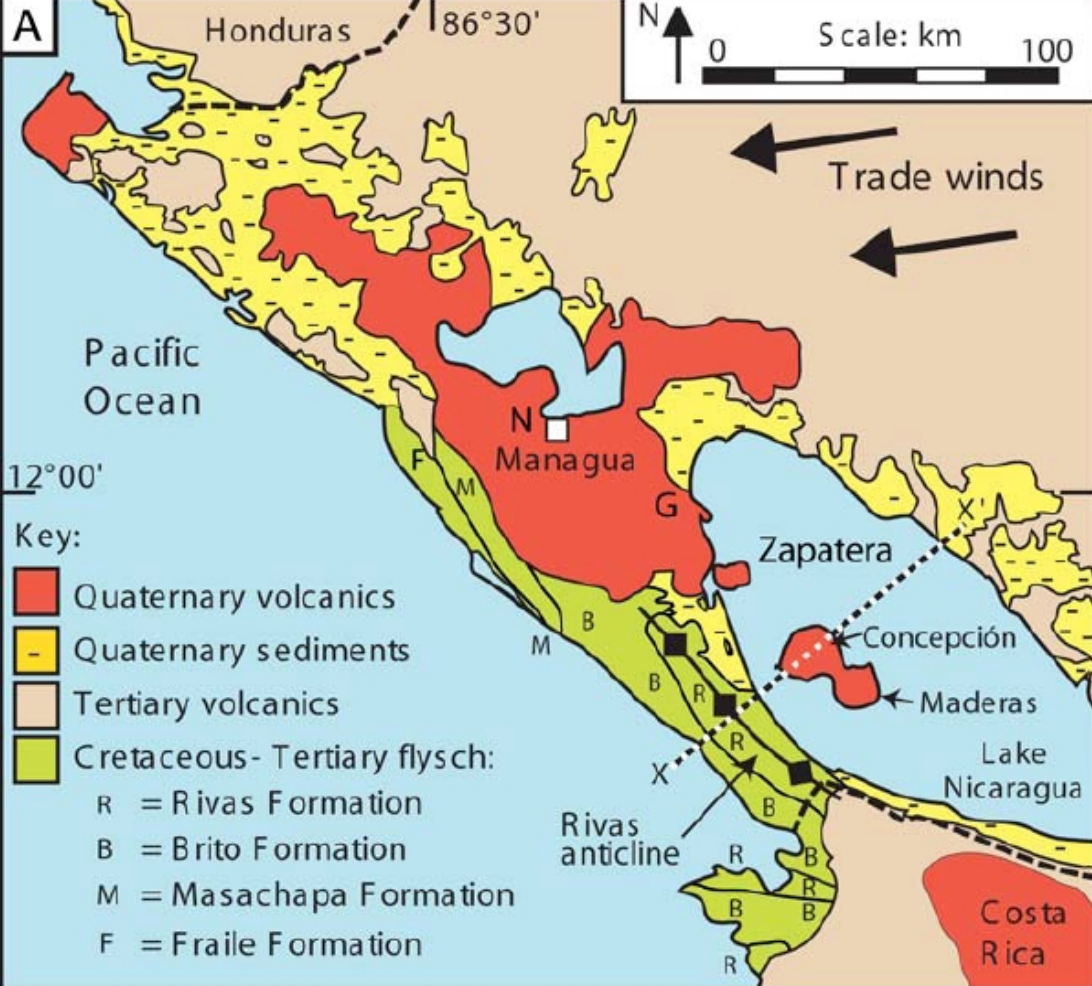
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The short-term hazards heavily rely on these facts and current volcanic activity

Geological setting



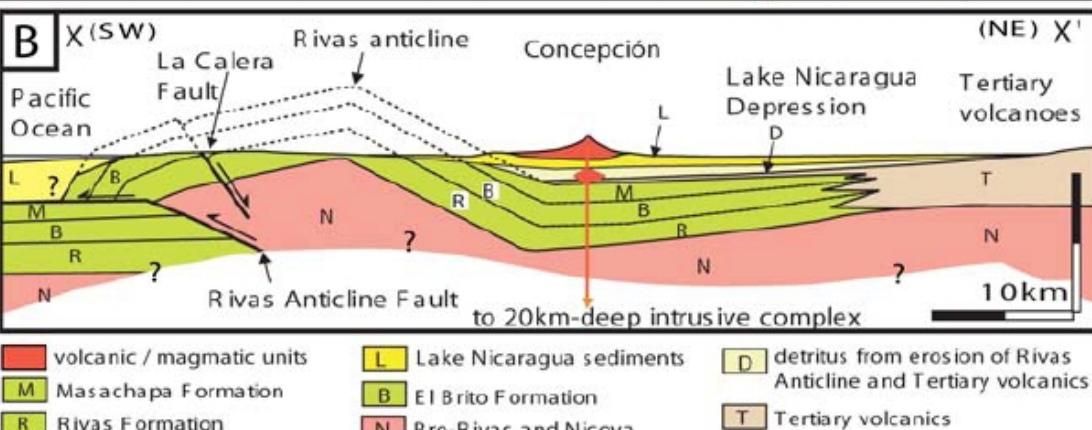
From: Borgia, A. and van Wyk de Vries, B., 2003. The volcano-tectonic evolution of Concepción, Nicaragua. *Bull Volcanol*, 65:248-266

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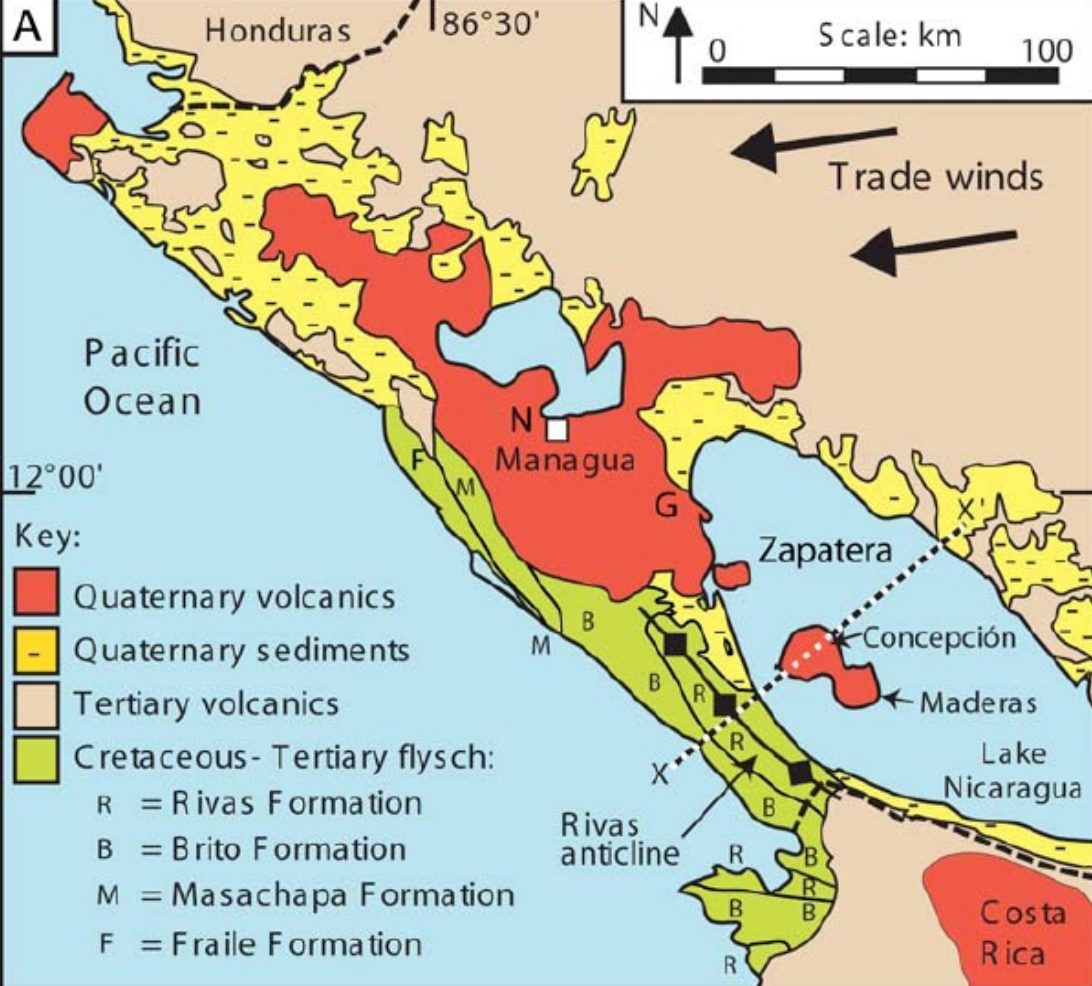
§ Ometepe Island rests on top of a 1 Km-thick Quaternary lake sediments (silt & clay)

§ The eastern limb of the Pliocene Rivas Anticline lies on the W edge of the Ometepe Island



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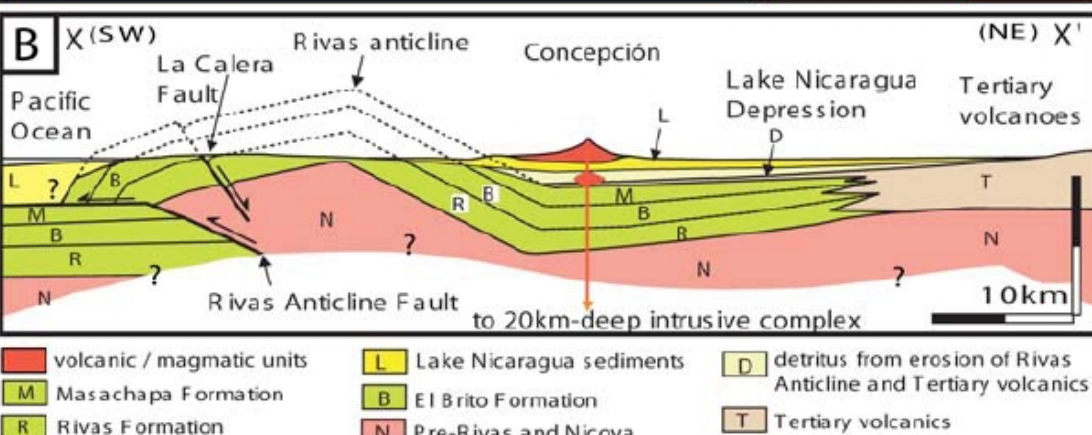
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§ Ometepe Island rests on top of a 1 Km-thick Quaternary lake sediments (silt & clay)

§ The eastern limb of the Pliocene Rivas Anticline lies on the W edge of the Ometepe Island

§ The Rivas Anticline does not exert any dynamical influence on Concepción volcano



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Recent Relevant Activity at Concepción

- Second most active volcano in Nicaragua during the last 150 yrs.

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- A minor effusive activity in 1986
- Ash eruptions from small to moderate size are characteristics since reports exist.



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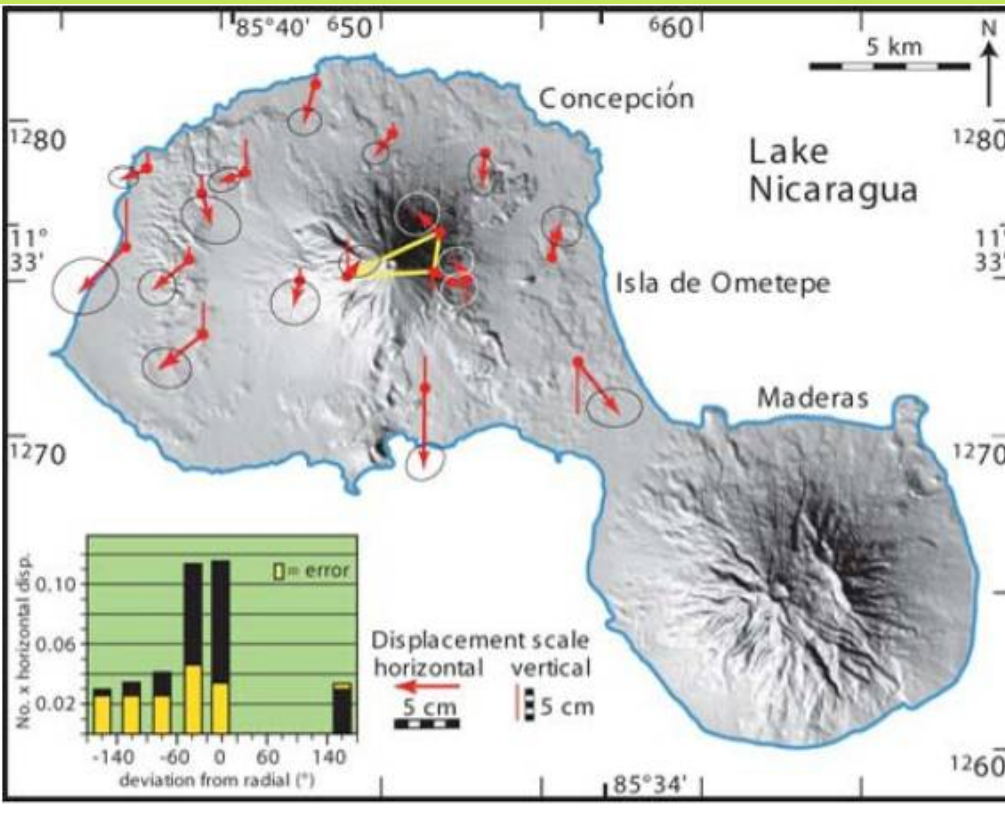
If Concepción is spreading how fast it is happening?

$$T = \frac{3\mu L^2}{\rho g H_v H_d^2}$$

Borgia et al., 2000; Borgia and van Wyk de Vries, 2003

$\mu =$	1.00E+16	Pa s	viscosity of ductile layer		
$L_v =$	4500	m	volcano radius		
$\rho =$	1764.00	Kg m-3	volcano density	T =	2.20E+10 s
$g =$	9.8	m s-2			696 years
$H_v =$	1600	m	volcano height		0.696 Ka
$H_d =$	1000	m	thickness of ductile layer		

Previous Geodetic GPS measurements at Concepción by Borgia and van Wyk de Vries, 2003



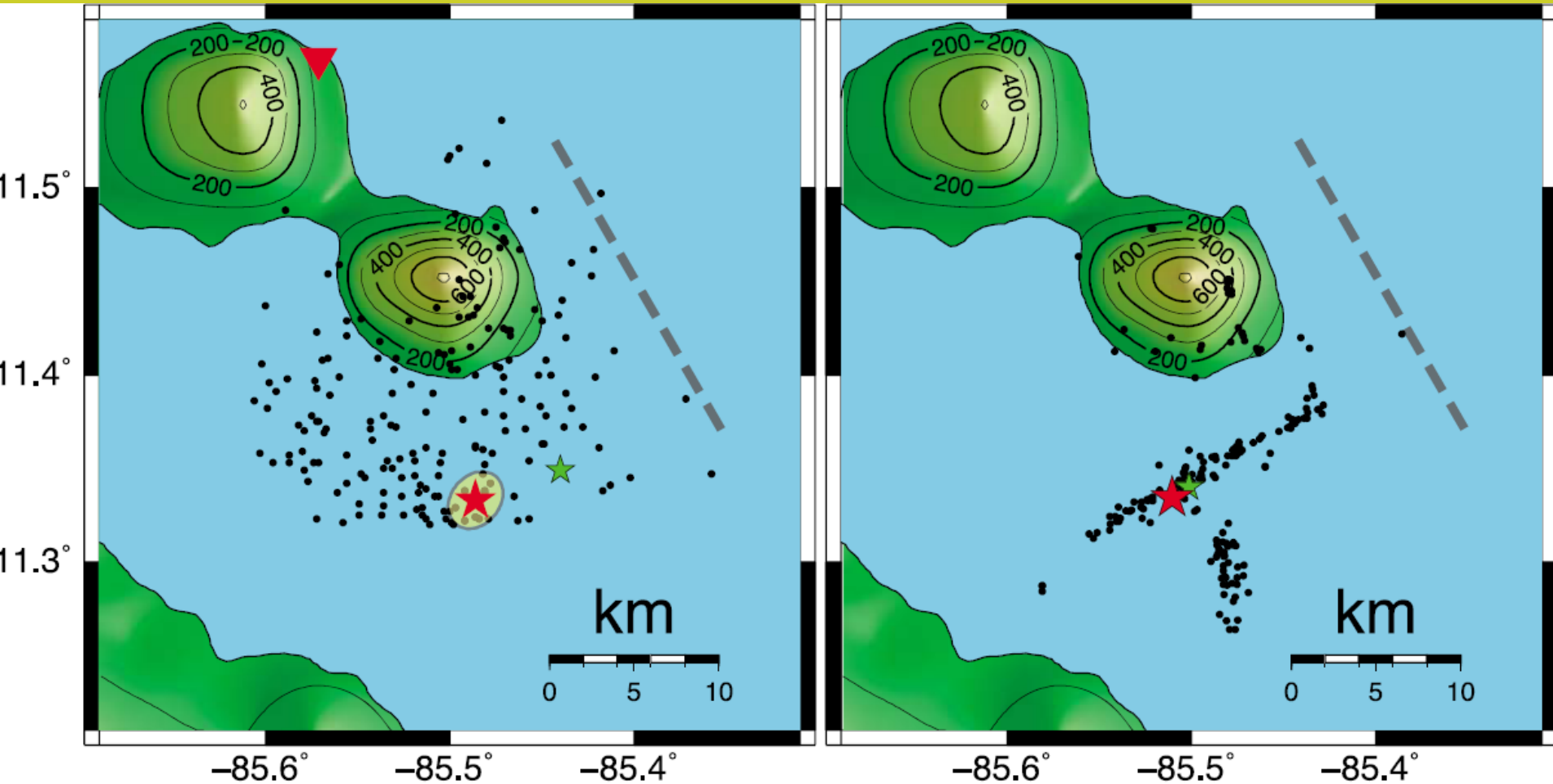
Total of 20 stations surveyed with 299-Leica dual-freq. equipments. Stations < 10 km apart were sampled using rapid-static technique.

Data were processed with SKI software.

Two campaigns spanning a 2.5-year period, between 1994 and 1997.

Maximum horizontal displacements: 2.2 cm/yr, and most are 0.8 cm/yr.

2005 Earthquakes



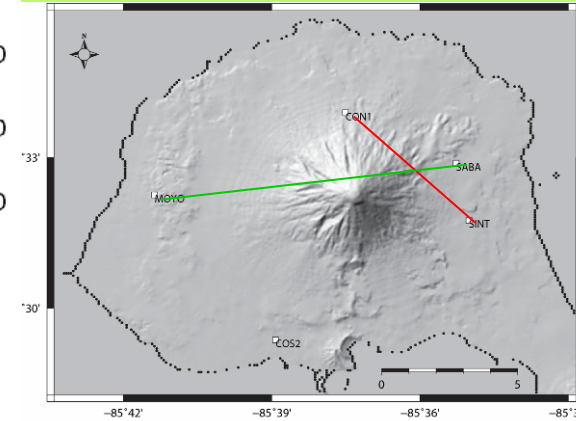
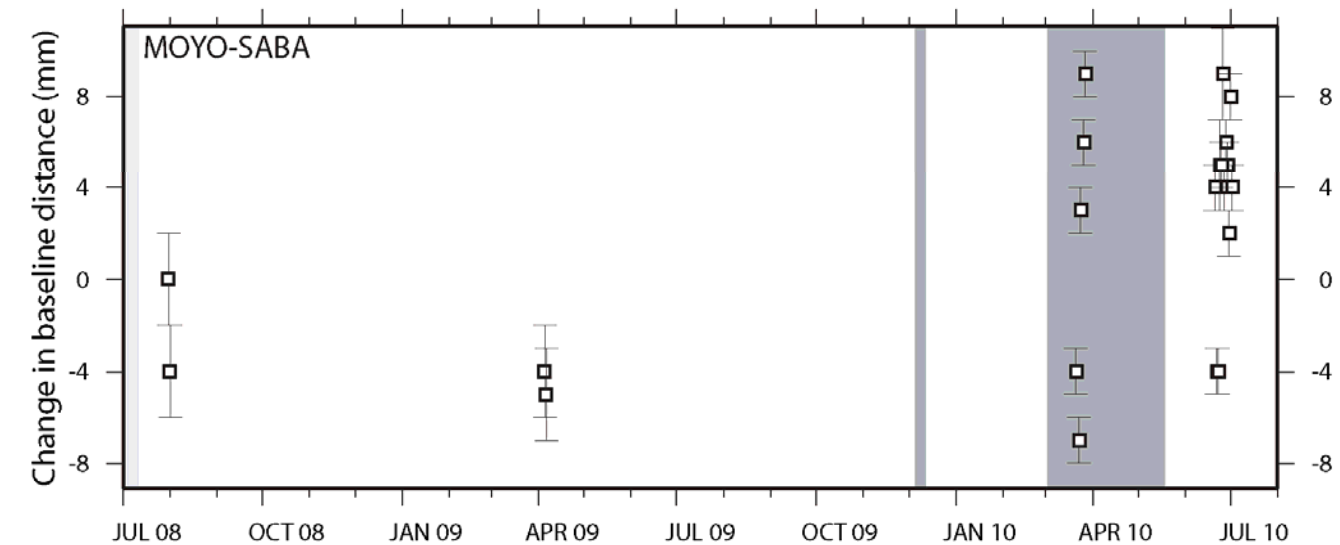
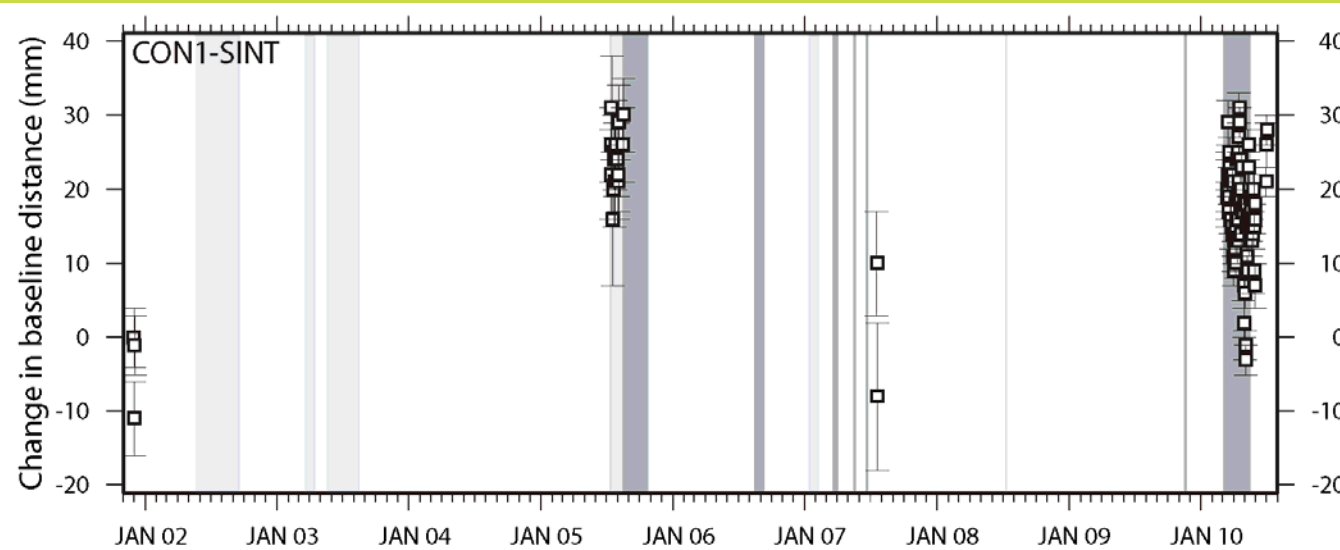
August 3rd 2005 seismic activity. 5.3 and 6.3 Mw fore and main shock, respectively.
Taken from French et al., 2010 (G³)

Geodetic GPS Data Campaigns at Concepción

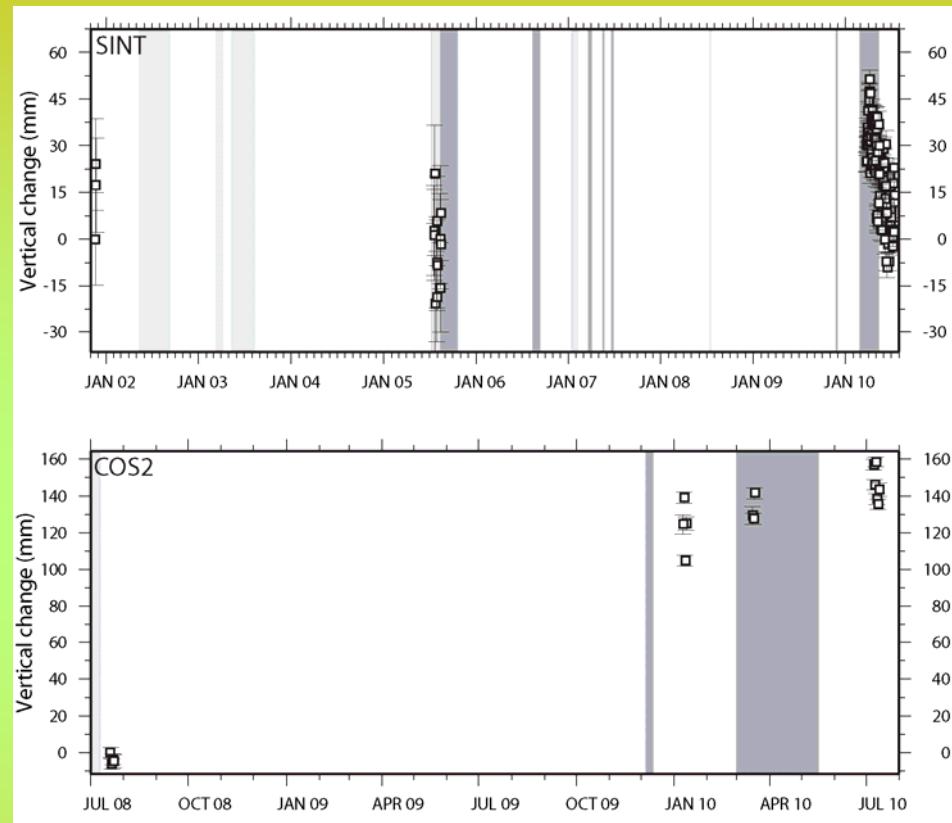
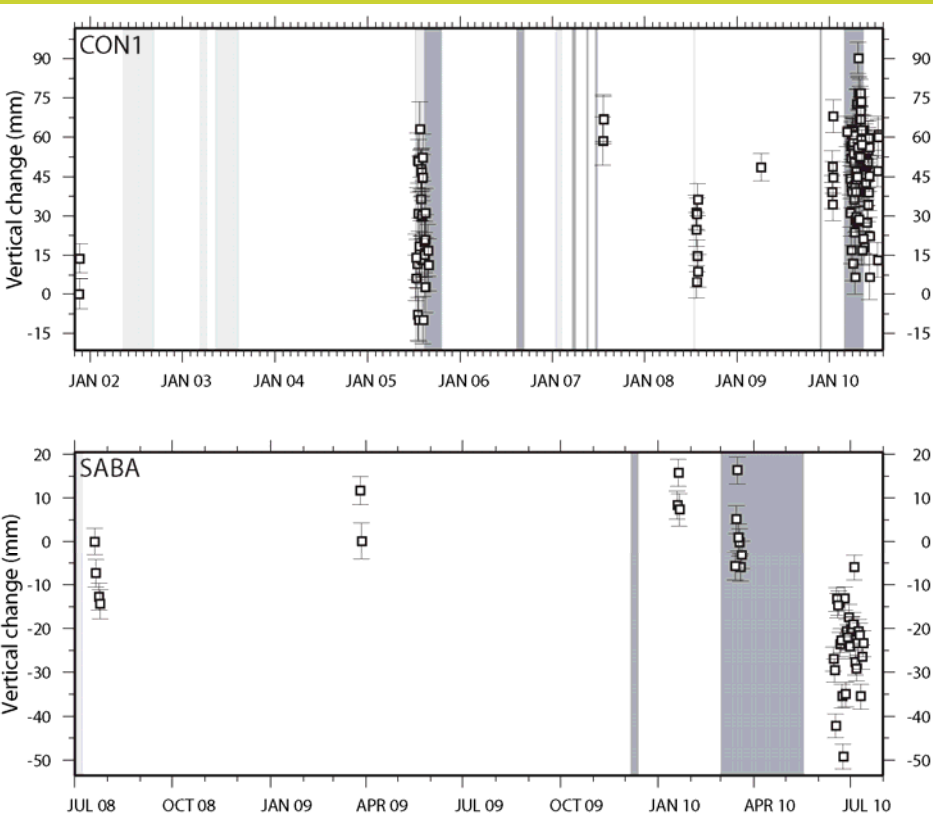
The Geodetic data were collected in episodic campaigns with dual-frequency GPS instruments, and processed with the GIPSY-OASIS II software developed by the JPL using a standard precise point positioning analysis strategy (Zumberge et al. 1997). The daily fiducial-free position of each site was transformed to the International Terrestrial Reference Frame of 2005 (Altamimi et al., 2007).



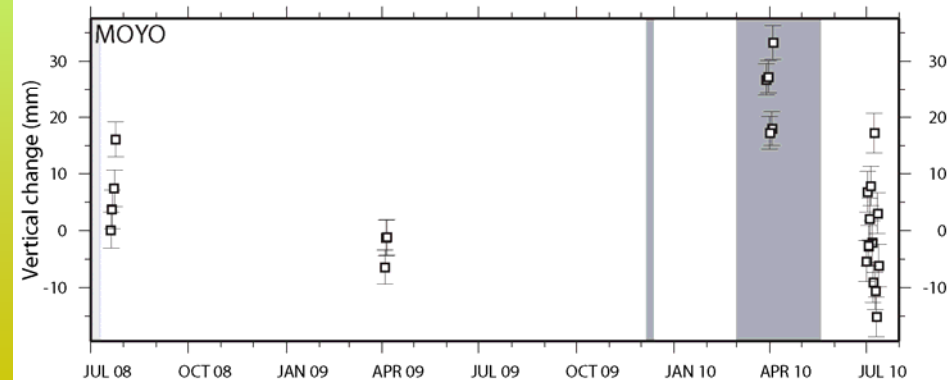
Baseline Changes Through Time



Changes in Vertical Components



COS2 site shows a noticeable increase in the vertical component of 13–16 cm in 1.932 yrs. A linear weighted least-square regression fit yields a change rate of $80 \pm 1 \text{ mm yr}^{-1}$



!Gracias!



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