

Holocene marine deposits at Huinay: evidence of paleoseismic activity on the Liquiñe – Ofqui Fault Zone?

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Abstract. Fossiliferous marine deposits dated ca. 9500 yrs BP crop out at the locality of Huinay, Region de los Lagos, southern Chile. Several sedimentary horizons containing fossil bivalves in living position, as well as plant fragments, crop out in cliffs at the northern part of the mouth of rio Loncochahua, up to several meters above present sea level. They reveal a period of episodic subsidence, preceding their uplift to their present position. This instability is interpreted as being related to seismogenic deformation along the main trace of the Liquiñe Ofqui Fault zone.

Keywords: Marine fossils, Holocene, Liquiñe-Ofqui Fault Zone

1 Introduction

The Liquiñe Ofqui Fault zone is an intraarc dextral strike slip structure which extends at the western foothills of the Andes between ca. 39° to 45° S (Hervé et al., 2009) whose present day activity was suddenly revealed by the Aysén seismic swarm of 2007, which culminated in a 6.9 Ms earthquake. Evidence of further Holocene activity is not widespread in the region, which was heavily glaciated until ca 15.000 yr BP (Heusser, 1990), generating a rock surface which constitutes most of the present landscape.

During regional geological studies of the basement complexes in the Comau Fjord, a fossiliferous sedimentary succession was identified along the northern shore of Loncochahua river (Latitude: 42° 22' 19.3" S; Longitude: 72° 25' 16.3" W), near its mouth into the Comau Fjord, just north of the Huinay research station. This locality has become a GEOSITE of Sociedad Geológica de Chile (see www.sociedadgeologica.cl).

In this paper, some details about the geological aspects of the site and the results of the ¹⁴C dating will be given, together with an interpretation of the deposit.

2 Local Geology

In the northern shore of the Loncochahua river, near its

mouth into Fiordo Comau, a fossiliferous sedimentary succession crops out in a cliff developed by river erosion and probably also by sea wave action in its western end.

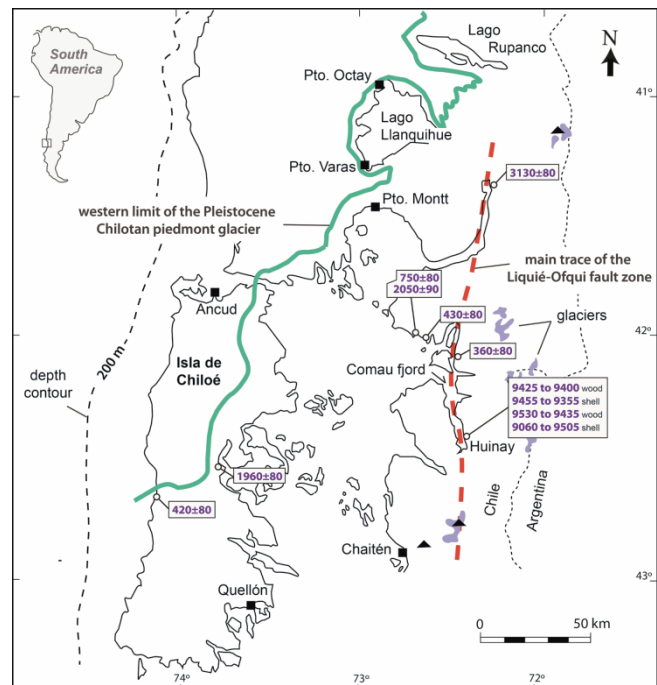


Figure 1. THIS FIG. NEEDS AN EXPLANATION !!!!!

The sediments, barely consolidated, are unconformably deposited over rocks of the Comau Metamorphic Complex, of probable late Paleozoic age. Modified from Hervé and Ota (1993)

Three main outcrop areas are observed along 200 m section upriver. The horizontal strata make up a 12 m thick succession, in which four shell bearing horizons are observed. The lower (older) one was sampled near the sea at the westernmost outcrop. It is composed of silt with numerous shell remains composed of clams (*Protothaca* sp.?), in life position with both valves articulated, minor amounts of gastropods, and mussels shells predominantly in fragmental aggregates, as well as plant and wood remains. Two shell bearing horizons without sharp bedding planes are distinguished (Fig. 2), and both were sampled for similar bivalves and plant material. The most complete section of the sediments is observed near the eastern end of

the exposures, and consists there of 12 m of silty sands in 10 cm thick strata, with intervening thin (1-2 cm) dark beds with abundant plant material. The terrace formed by these deposits extends up river through an undetermined extension.



Figure 2. Dated shell horizons

3 Results

Four ^{14}C ages were obtained by Beta Analytics on two pairs of samples, composed of shell material and wood. The results are given in Table 1.

Table 1. Radiocarbon ages for the analyzed samples. Present is 1950 AD. Libby ^{14}C half-life is 5568 years.

Sample data	Measured Radiocarbon age (years BP ± 1 sigma)	D 13 C (0/00)	Conventional Radiocarbon age (years BP ± 1 sigma)	2 sigma calibration age (years BP ± 1 sigma)
FO14157 1A shell	8520 \pm 30	- 1.3	8910 \pm 30	9600 to 9505
FO14157 1B wood	8540 \pm 40	- 27.5	8500 \pm 40	9530 to 9435
FO14157 3A shell	8320 \pm 30	- 0.4	8720 \pm 30	9455 to 9355
FO14157 3B wood	8510 \pm 30	- 28.1	8460 \pm 30	9400 to 9425

4 Discussion

The presence of marine shells in the sedimentary deposits indicates that by the 9500 \pm 100 years BP in which they were living, the ice had receded completely from this area and the sea had invaded the Comau Fjord. There is no evidence of ice floe action in the sedimentary record. At present, clams are known to live buried in silty sand some

cm below the sediment surface in the intertidal region, where in low tide, the water jets they throw are visible.

The obtained ages vary from 9400 to 9600 years BP, with the stratigraphically lower samples FO141571A being older than the samples FO14157B by no more than 200 years. Samples are separated by 30 cm in the vertical direction. The repetition of beds with clams in living position, suggests that subsidence was taking place in the area when sediment deposition forced the clams to move up through the sediment to attain a shallow depth beneath the surface.

This might have been caused by coseismic subsidence as sediment compaction can be ruled out as the cause of subsidence in such a thin deposit. The clams disappear up section, which is interpreted as caused by the installment in the area of an estuarine environment, with high sedimentation rates, which allowed the alternation of silt and plant rich deposition, not allowing the clams to establish themselves as a well developed bank. Broken clam shells are sparse in this deposit. The timing of the final emergence of the clams to their present altitude of 2 to 3 m above sea level is not known.

The shells dated here are much older than the ones dated in Hervé and Ota (1993), which span between 360 \pm 80 to 3130 \pm 80 years BP. These authors determined an uplift rate of ca 10 m/kyr for sites located near the LOFZ for the last three thousand years. In contrast, the older clams dated here lie only 2 or 3 m above sea level, which implies an average uplift rate of ca. 0.3 m/kyr. This may be interpreted as indicating initial subsidence or slow uplift before 3 kyr, or widely variable uplift rates along the LOFZ at a given time.

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