Aconcagua river estuary
Tidal hydrodinamic

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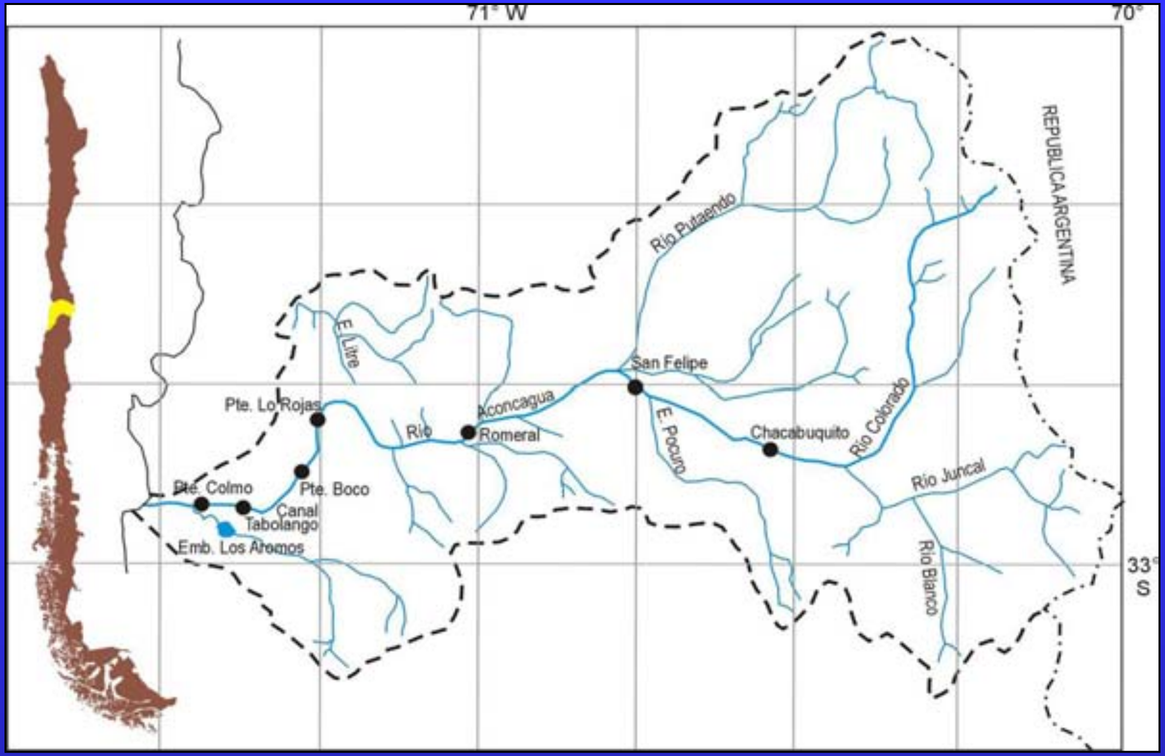
Tides

- Tidal wave in shallow water estuaries is afected by non lineal mechanisms generating sub-harmonic and composed waves (Speer *et al.*, 1991; Lessa, 1996).

- Amplitude and phase distortions of the tide wave are quantified through relationships between M_4 and M_2 constituents (Pugh, 1987).

- Variations at the river flow produce modifications of the tidal wave (Godin 1981; Parker, 1991).



Introduction

Hydrology

- Aconcagua basin is located at the semi-arid mixed regime river area (Niemeyer & Cereceda, 1984), with irregular hydrological and pluviometric patterns (Allesch & Constanzo, 1997).

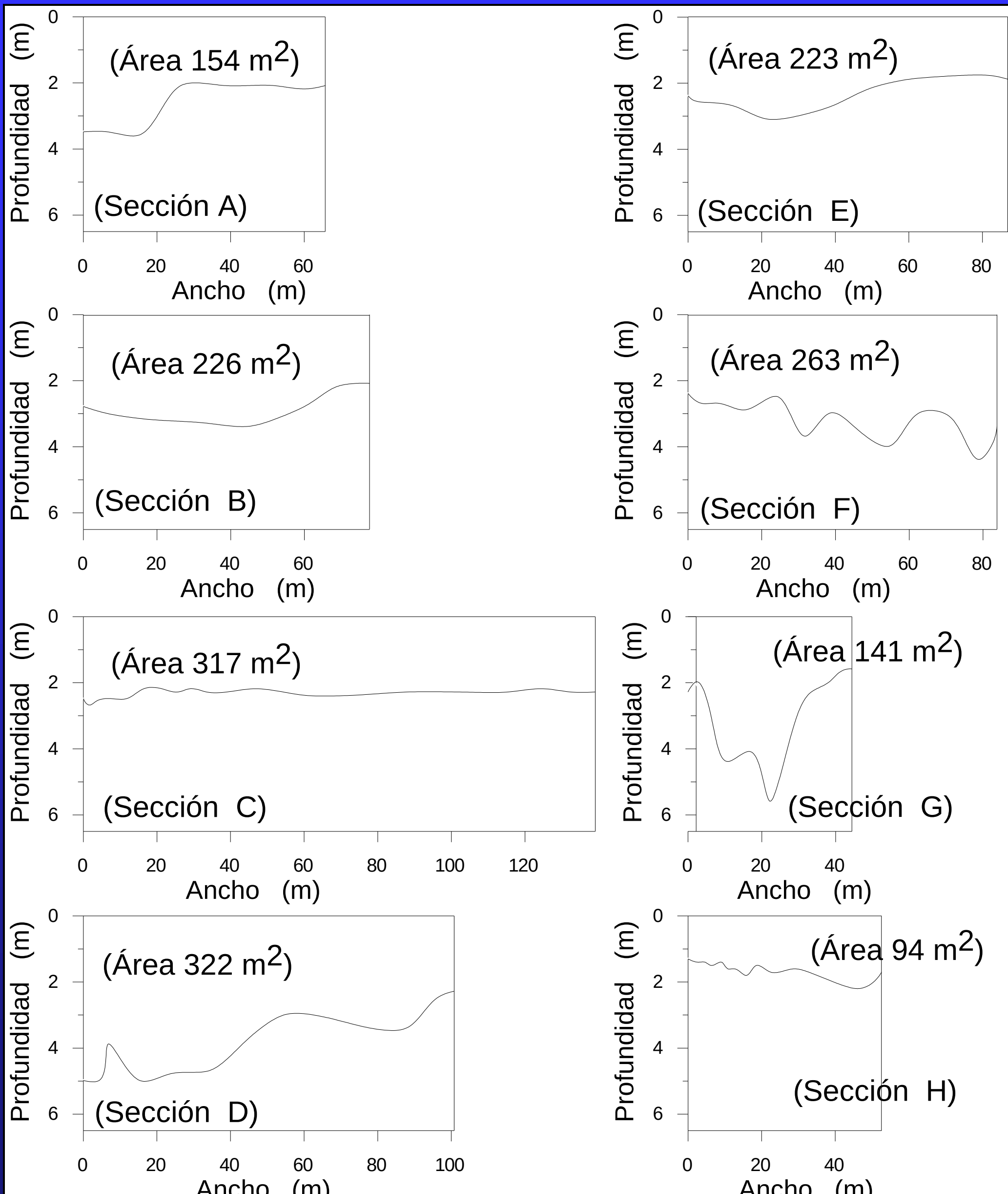
- Tributaries originates at the inner Andes. River discharge is permanent and most intense in winter and summer (Niemeyer & Cereceda, 1984).

Objetive

- To describe monthly variability at the tidal wave during its propagation in the Aconcagua estuary.

Area of study

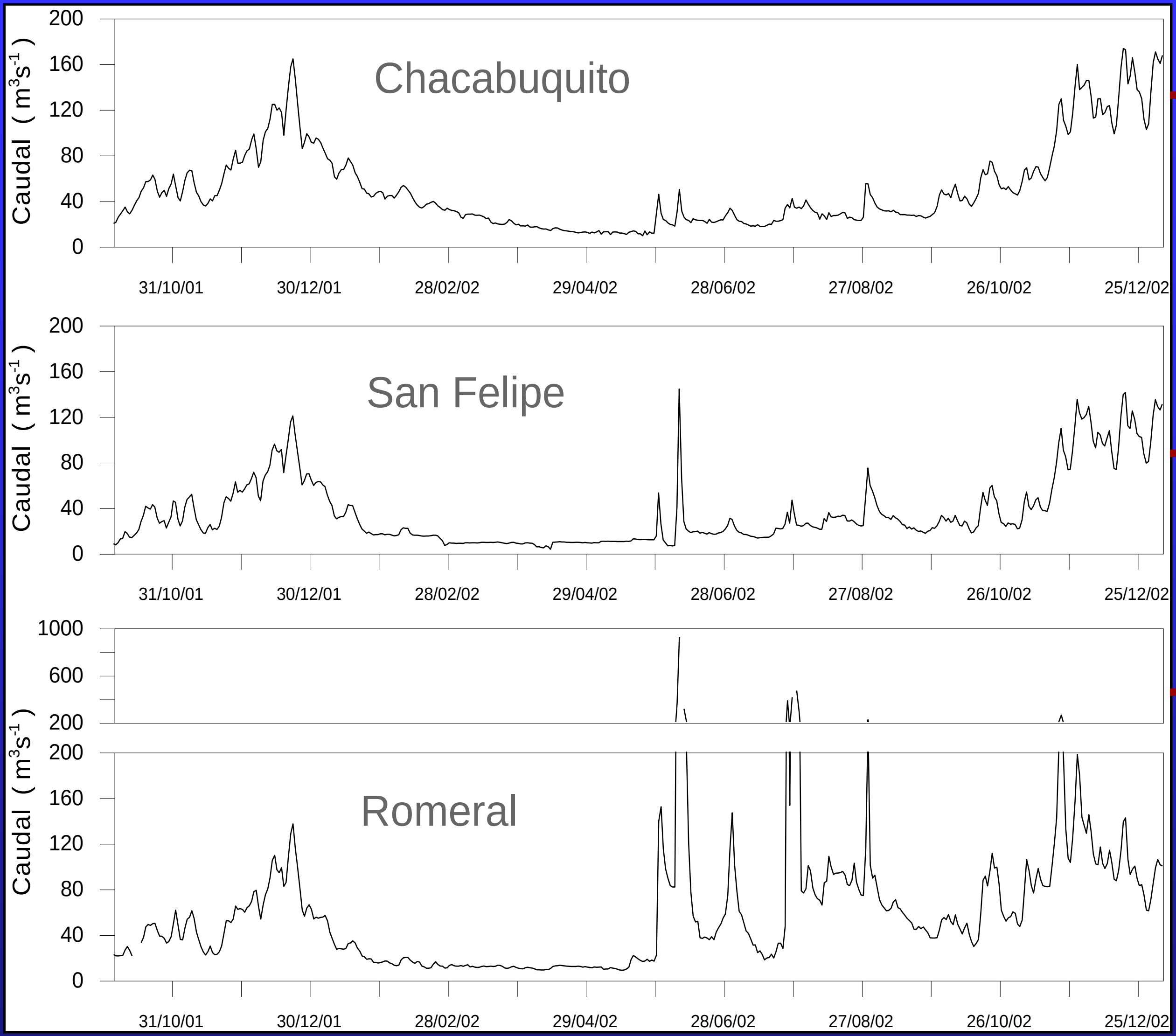
Aconcagua river cross sections

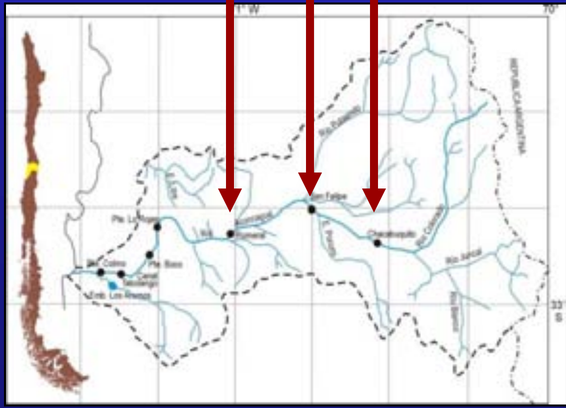


Data analisis

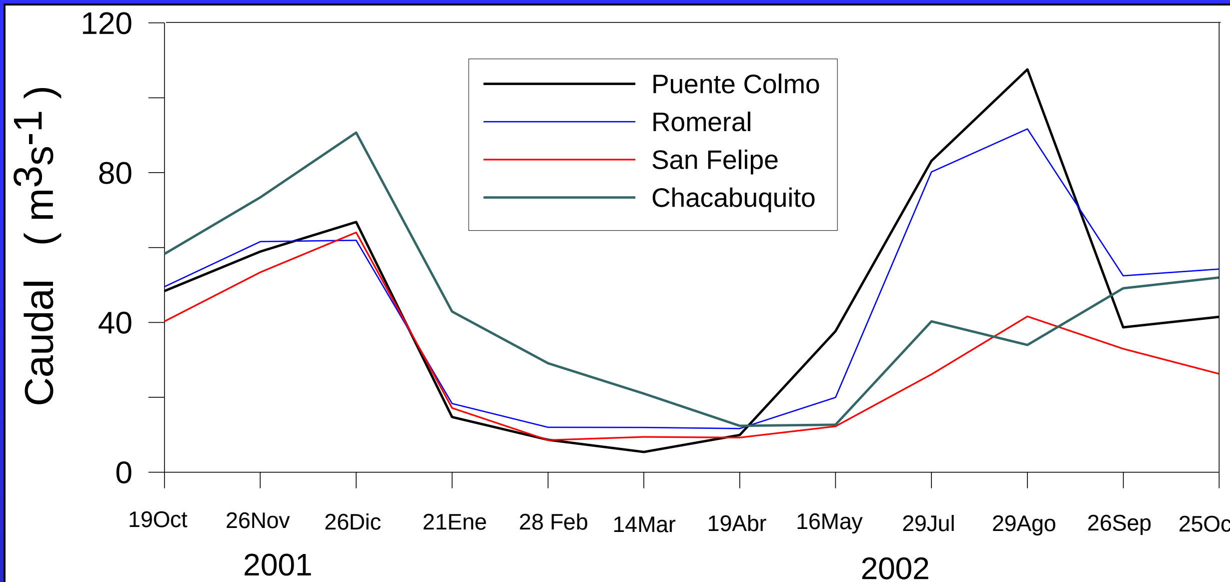
Analisys	Description
Post-Proccessing	**Sea level** Inverted barometer correction. Mean and trend substraction. Filtering by Lanczos Cosine 121 weight, 40 hours. High frequency series. Harmonic analysis on monthly series at each place (Foreman, 1993). Spectral analysis on monthly series at each place . Tidal wave distortion quantification. River flow influence description.

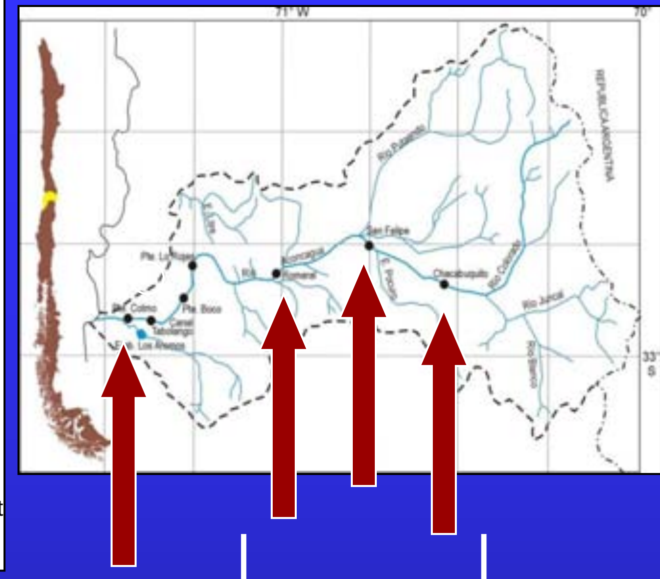
Daily mean river flow





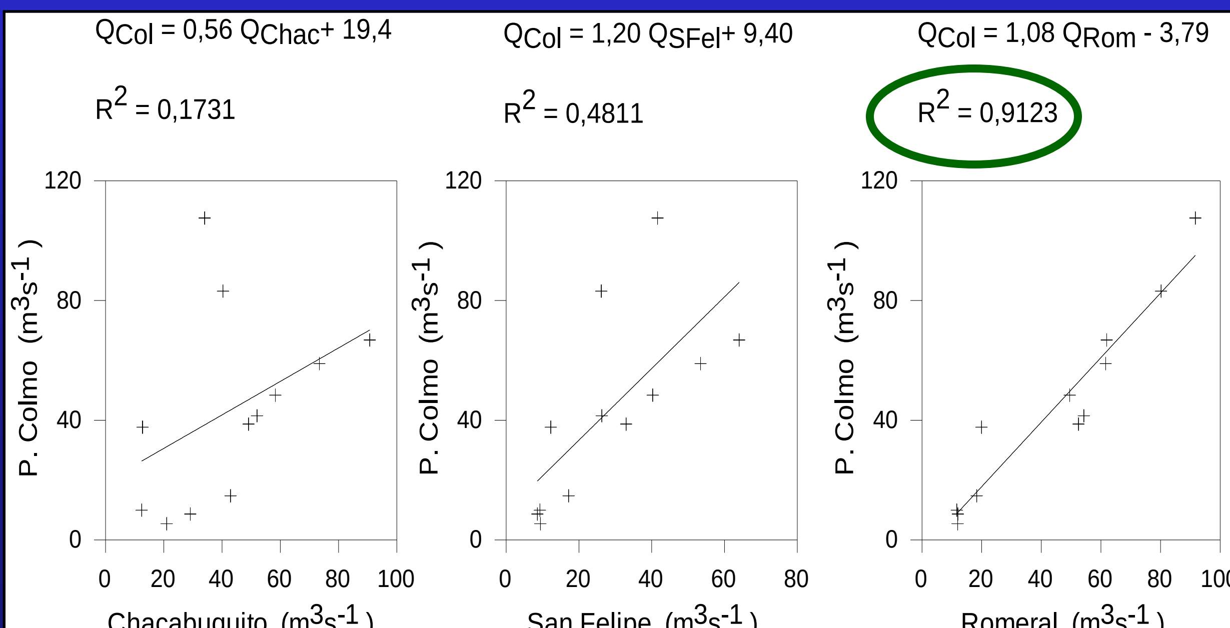
Daily mean river flow in Aconcagua estuary





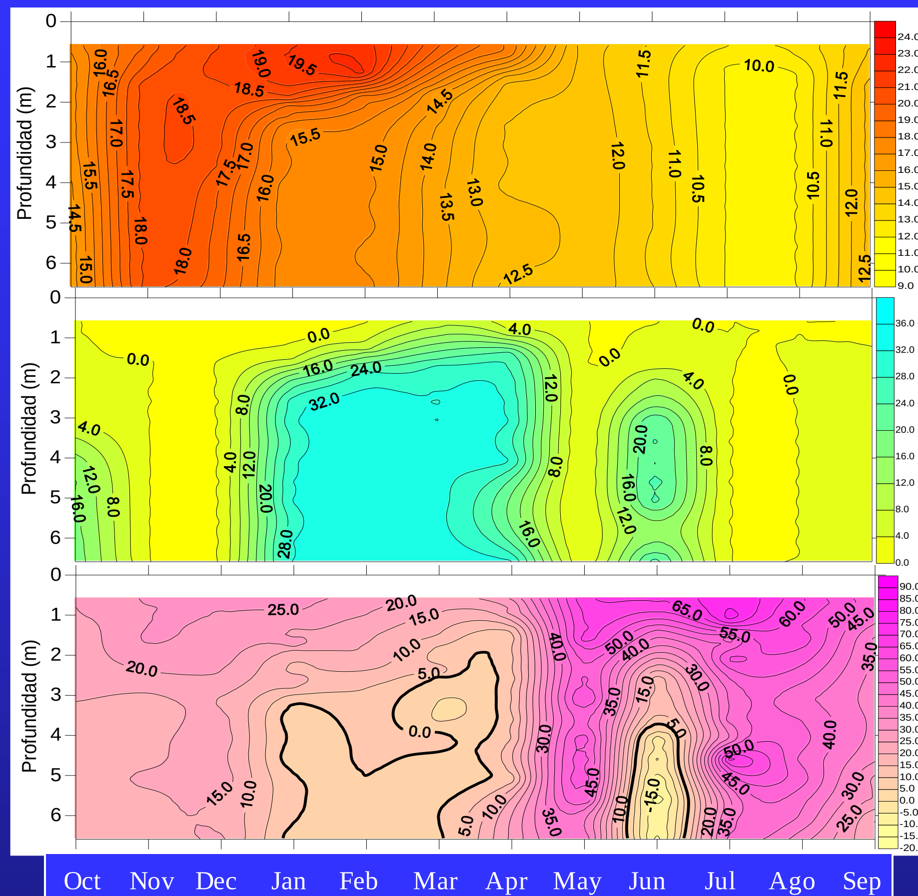
Colmo Bridge

Fluviometric stations



Vertical pattern temperature, salinity and current velocity in Concón bridge at anual cycle

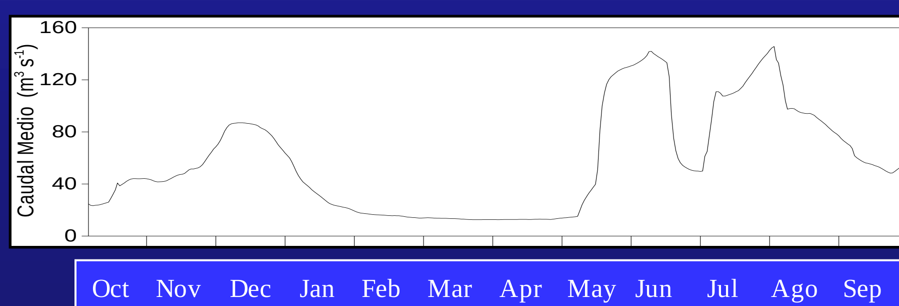
High water



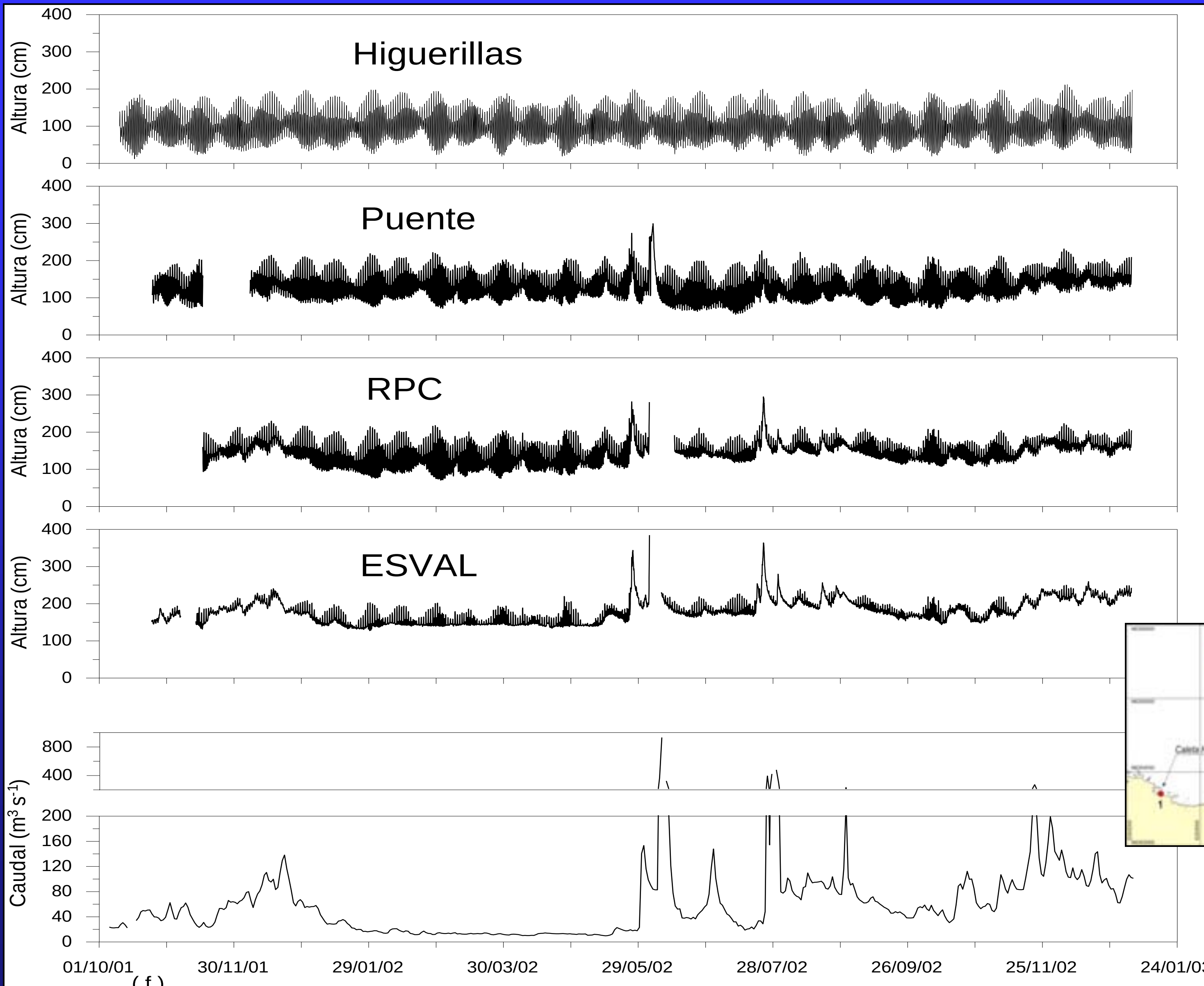
24,0
20,0
15,0
10,0

32,0
20,0
12,0
0,0

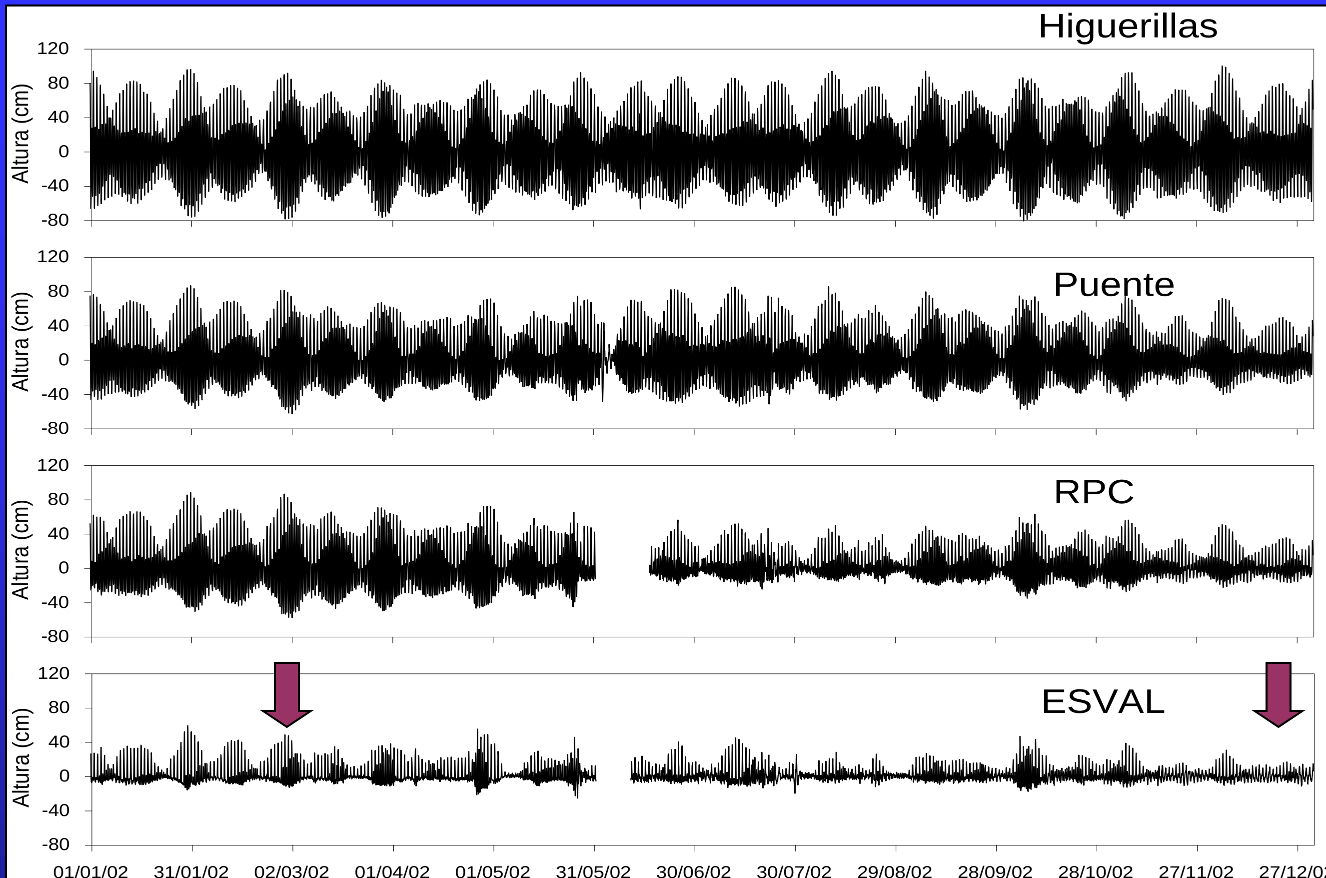
50,0
20,0
-10,0



Sea Level Observation

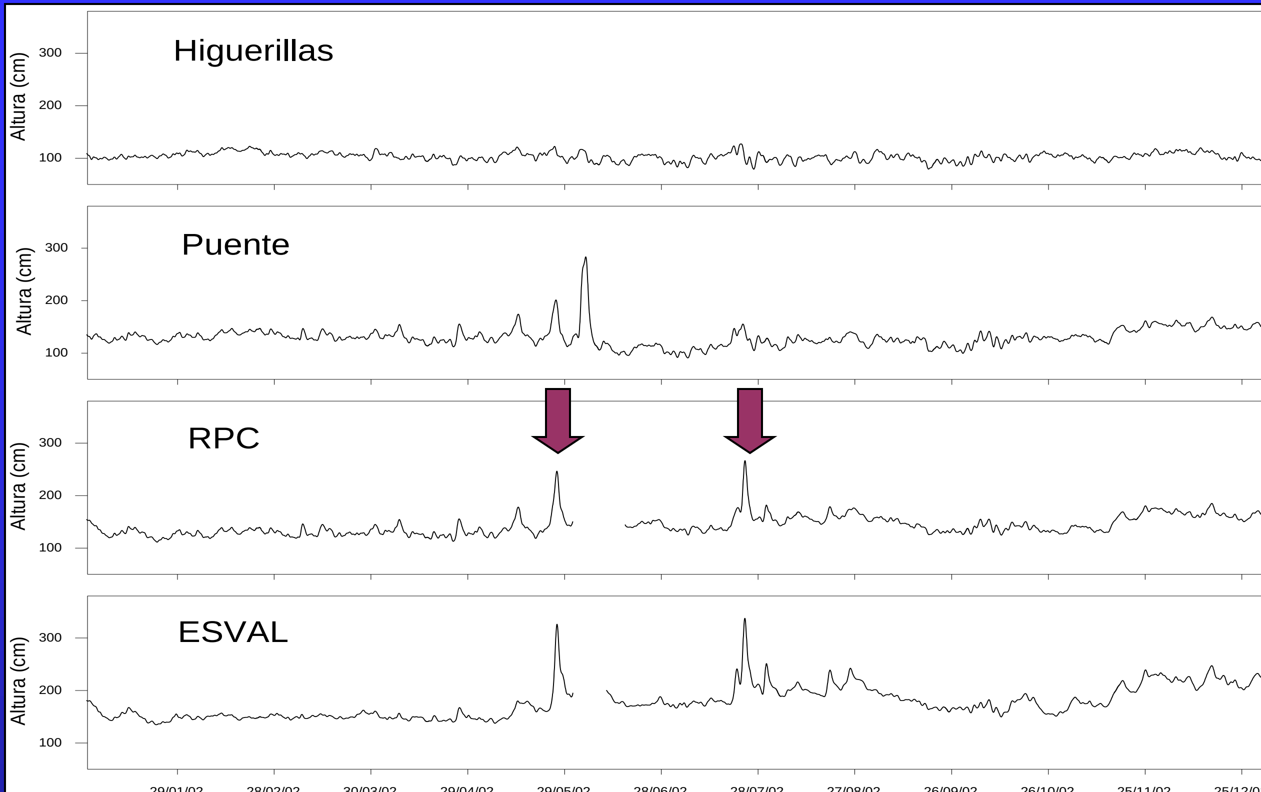


Sea level high frequency signal



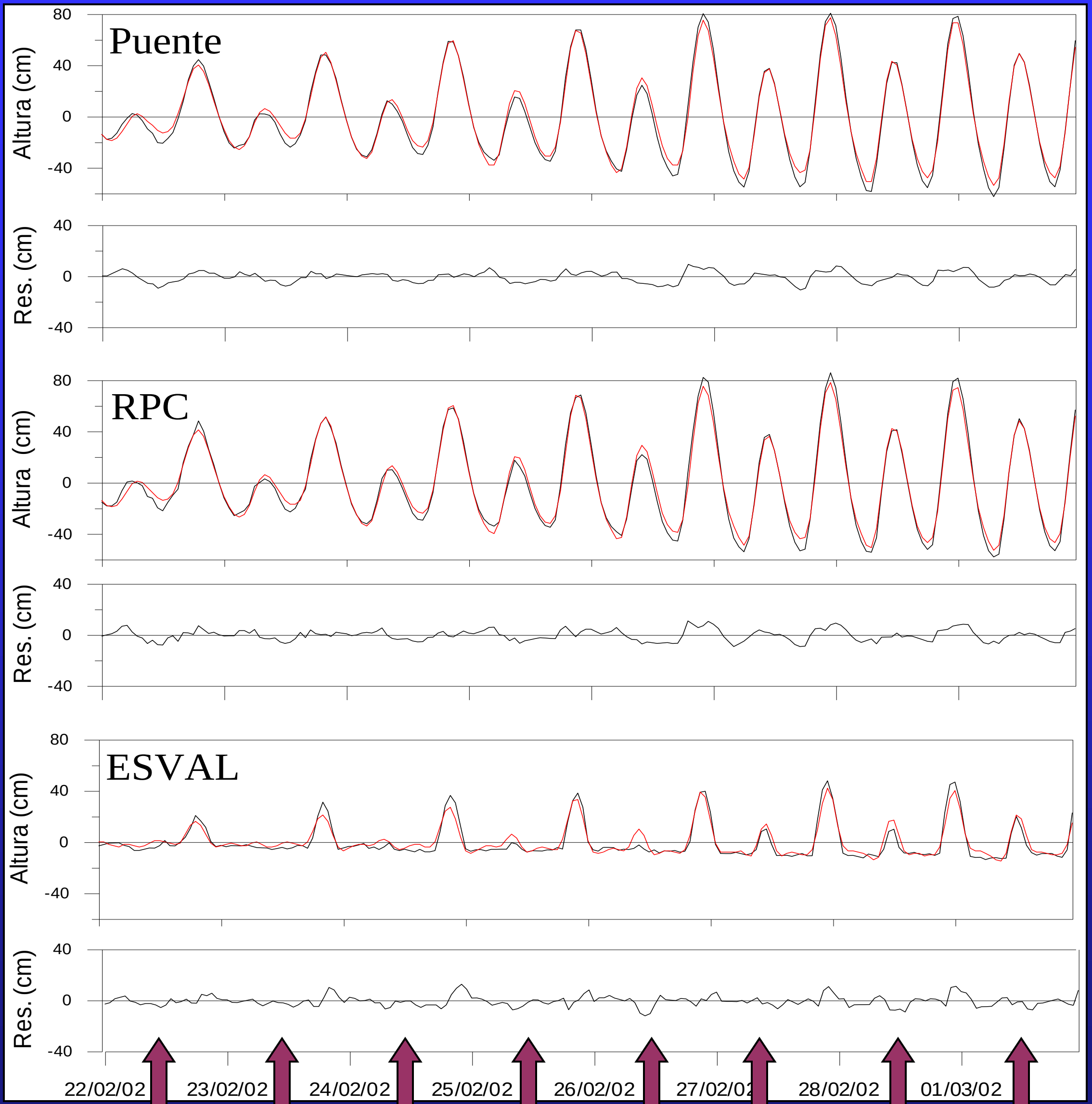
Date	Flow	Tidal max range (m)			
	(m^3s^{-1})	Higuerillas	Concón bridge	RPC	ESVAL
Feb. 28th	8,7	1,57	1,34	1,33	0,57 (36,3%)
Dic. 19th	106,2	1,24	0,57	0,34	0,12 (9,7%)

Sea level low frequency signal



Date	Flow	River max height(m)			
	(m^3s^{-1})	Higuerillas	Pte. Concón	RPC	ESVAL
May. 26th	147,4	1,21	2,00	2,45	3,25
Jul. 23th	433,0	1,26	1,54	2,65	3,36
Dry season		1,21	1,54	1,54	1,66
Ice melts season		1,18	1,67	1,84	2,46

Sea level. River flow influence at summer season.



Max. residual

9,1 cm

10,7 cm

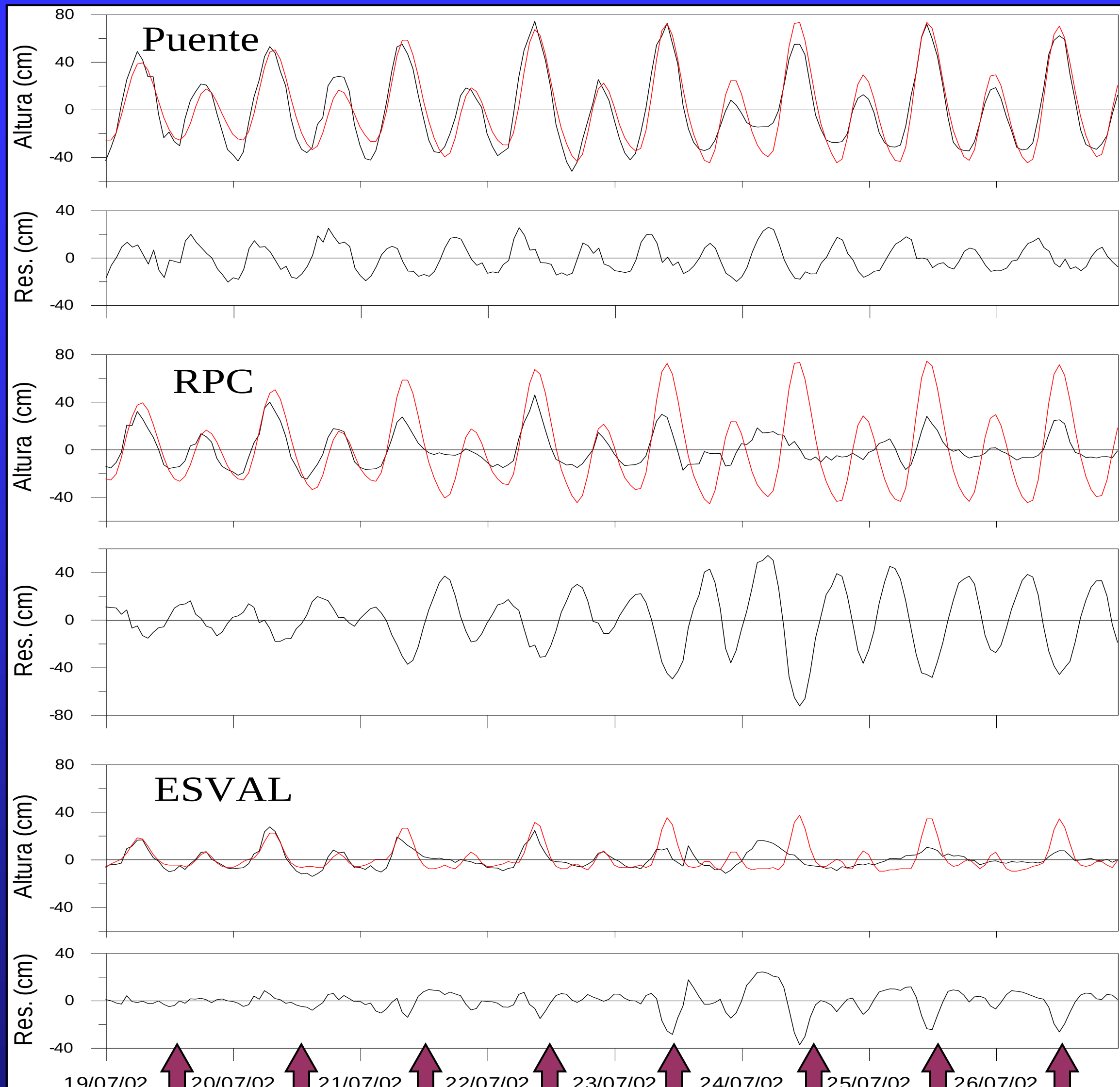
12,4 cm

Flow (m^3s^{-1})	12	12	15	15	14	14	14	15

Observed

Prediction

Sea Level. River flow influence in winter



<u>Max. Residual</u>

25,4 cm

53,9 cm

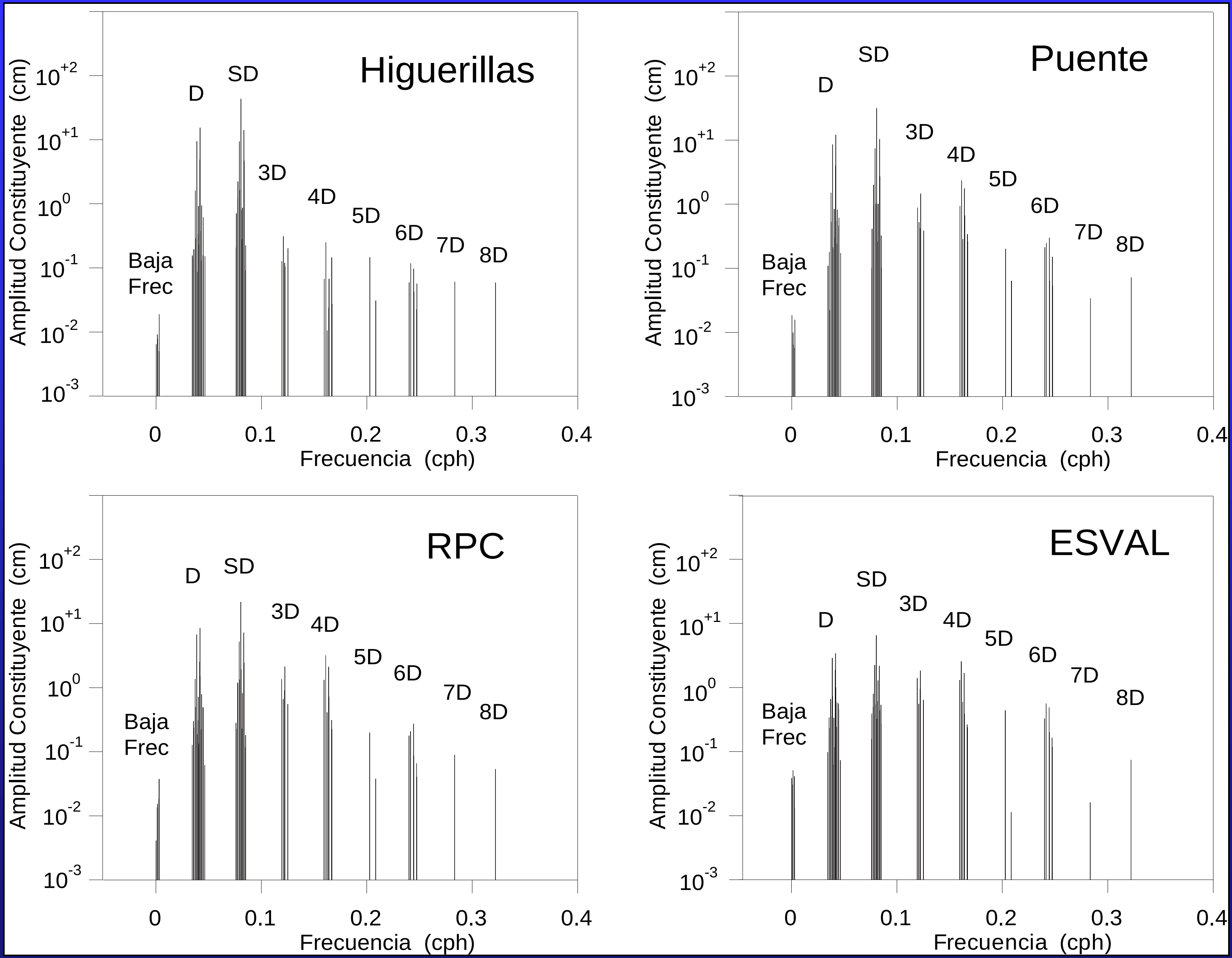
23,8 cm

River flow (m^3s^{-1})	30	51	402	162	433	460	491	305

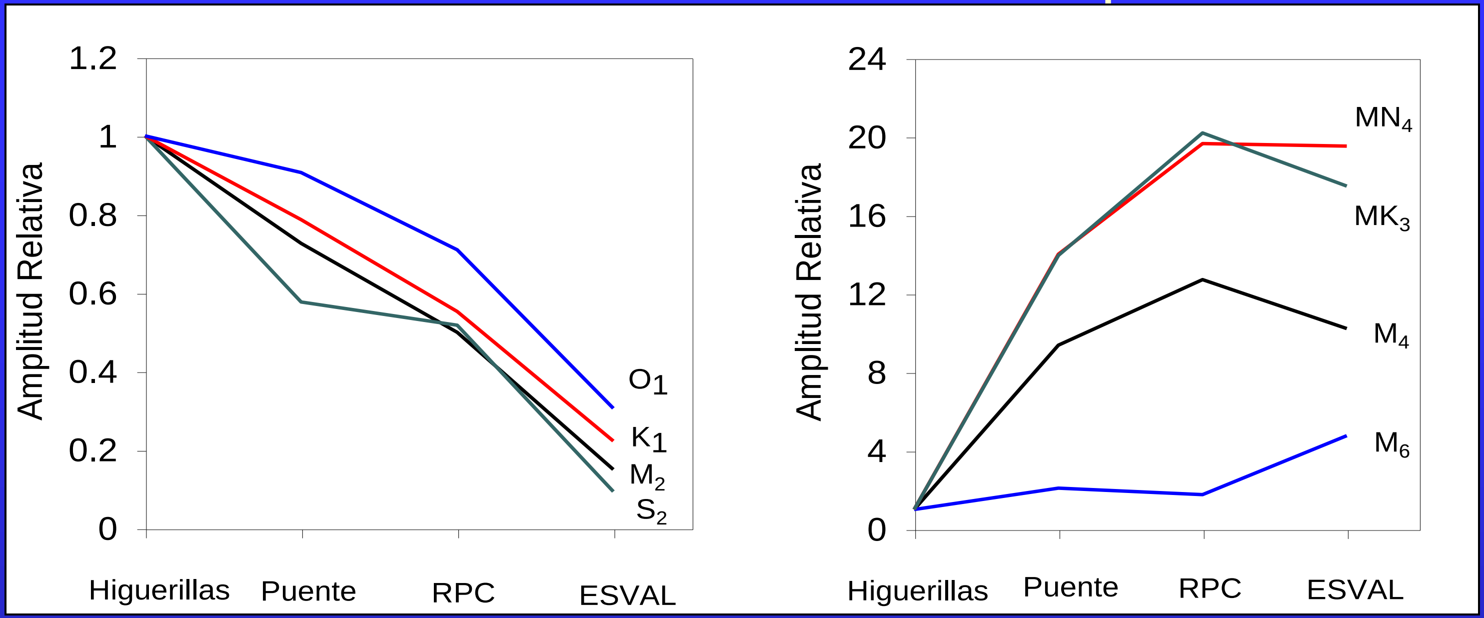
Observed

Prediction

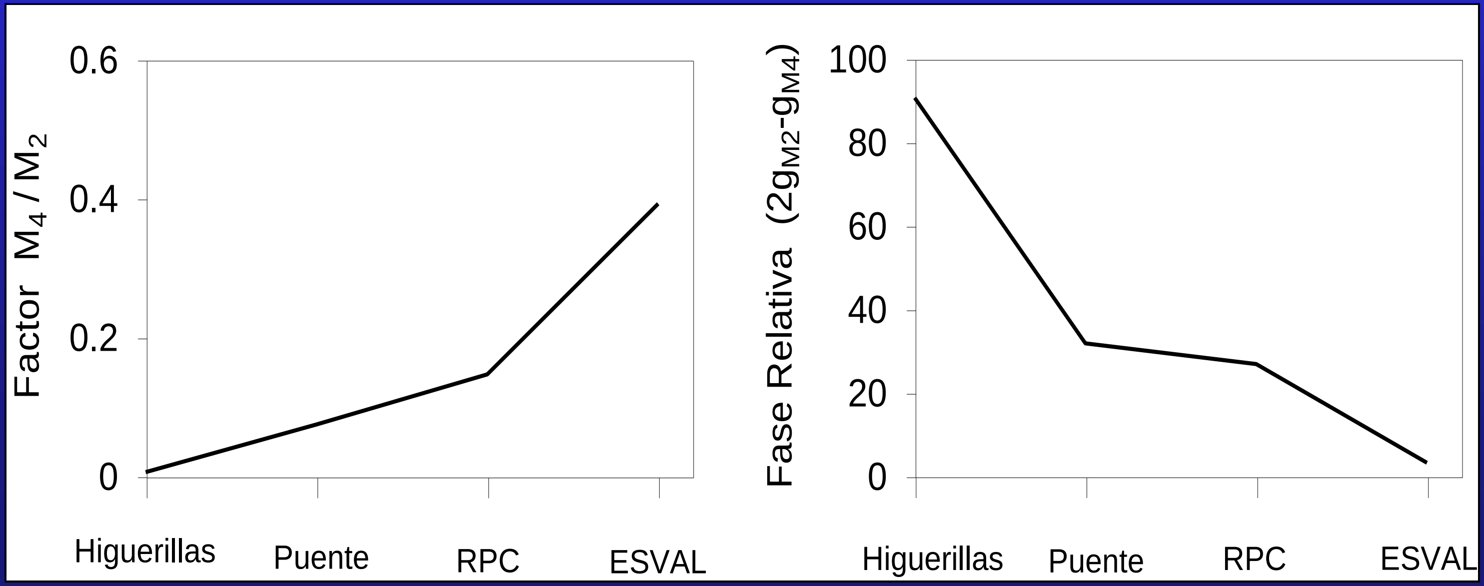
Tidal amplitude constituents periodograms



Harmonic waves relative amplitude



Tidal wave distortion



Conclusiones

- The mixed semidiurnal tidal wave is progressively distortioned through the estuary, experiencing a strong distortion at the ESVAL sector.

- The principal harmonic constituents transfer its energy to shallow water constituents along the estuary. Sub-harmonic and composed constituents strongly amplify their energy at the upper estuary.

- Freshwater inflow determines seasonal river level and tidal range through the estuary. Extraordinary winter floods strongly modify tidal wave propagation pattern through the estuarine zone of the Aconcagua river.

END