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Fjords and channels dynamics studied with HF Radars in Chile

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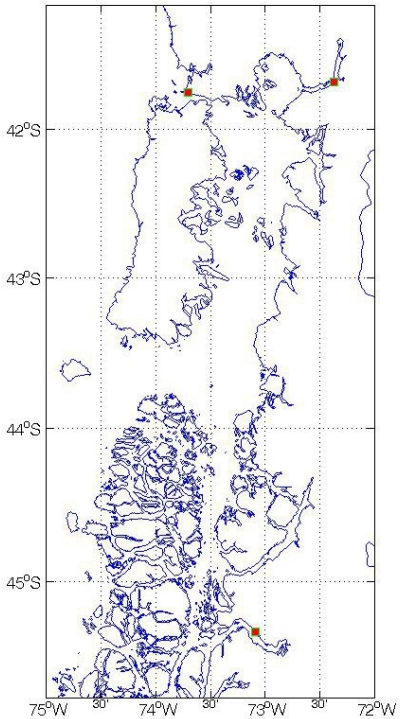
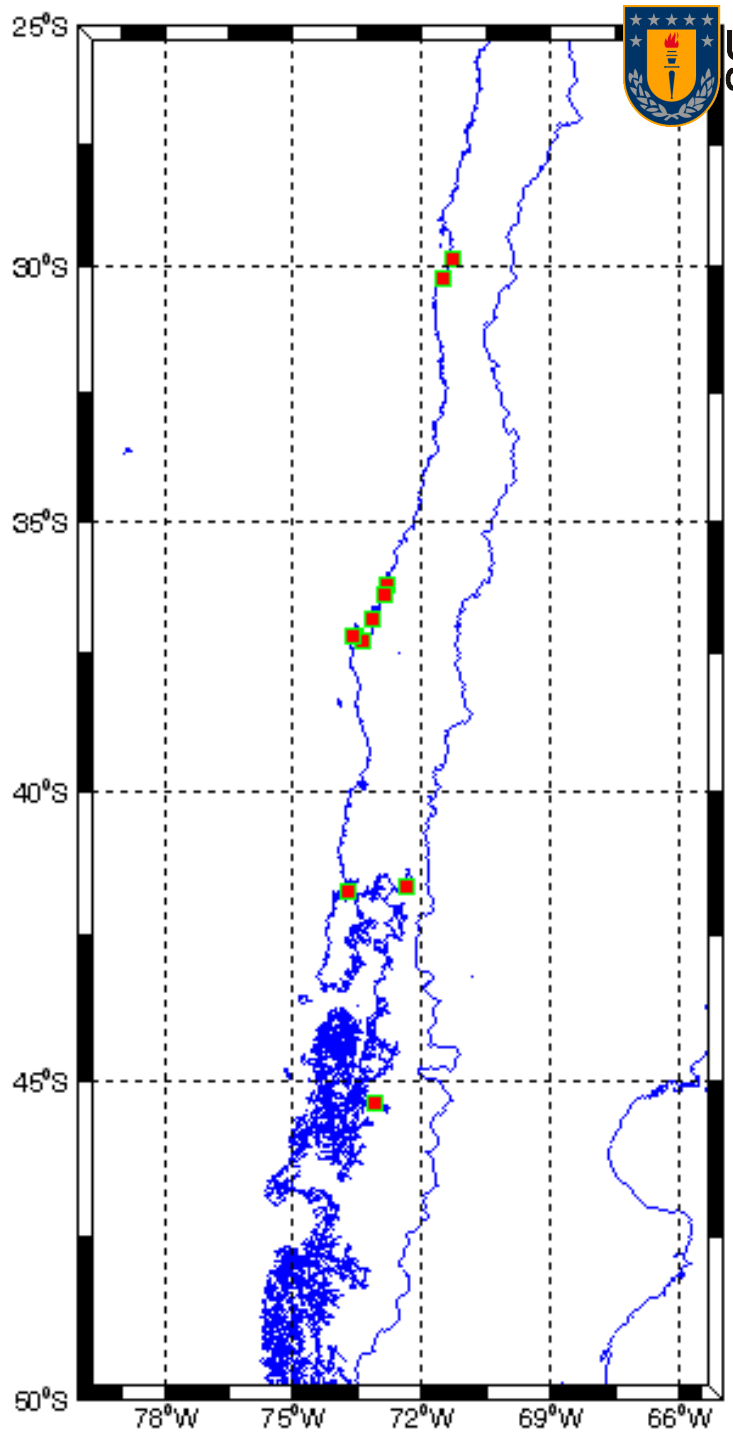
Chacao channel



Reloncaví fjord

Aysén fjord



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Main characteristics of the WERA HF marine radars used in Chile

- Antennas	8 Rx linear
- Frequency	22.447 MHz
- Spatial resolution (500kHz)	250-300m
- Currents accuracy	3-5 cm/s
- Precision Hs	$<12\%$
- Azimuthal resolution	$\sim 12^{o}$
- Range currents	~ 60 km
- Waves range	~ 30 km
- Transmitted power	28 W

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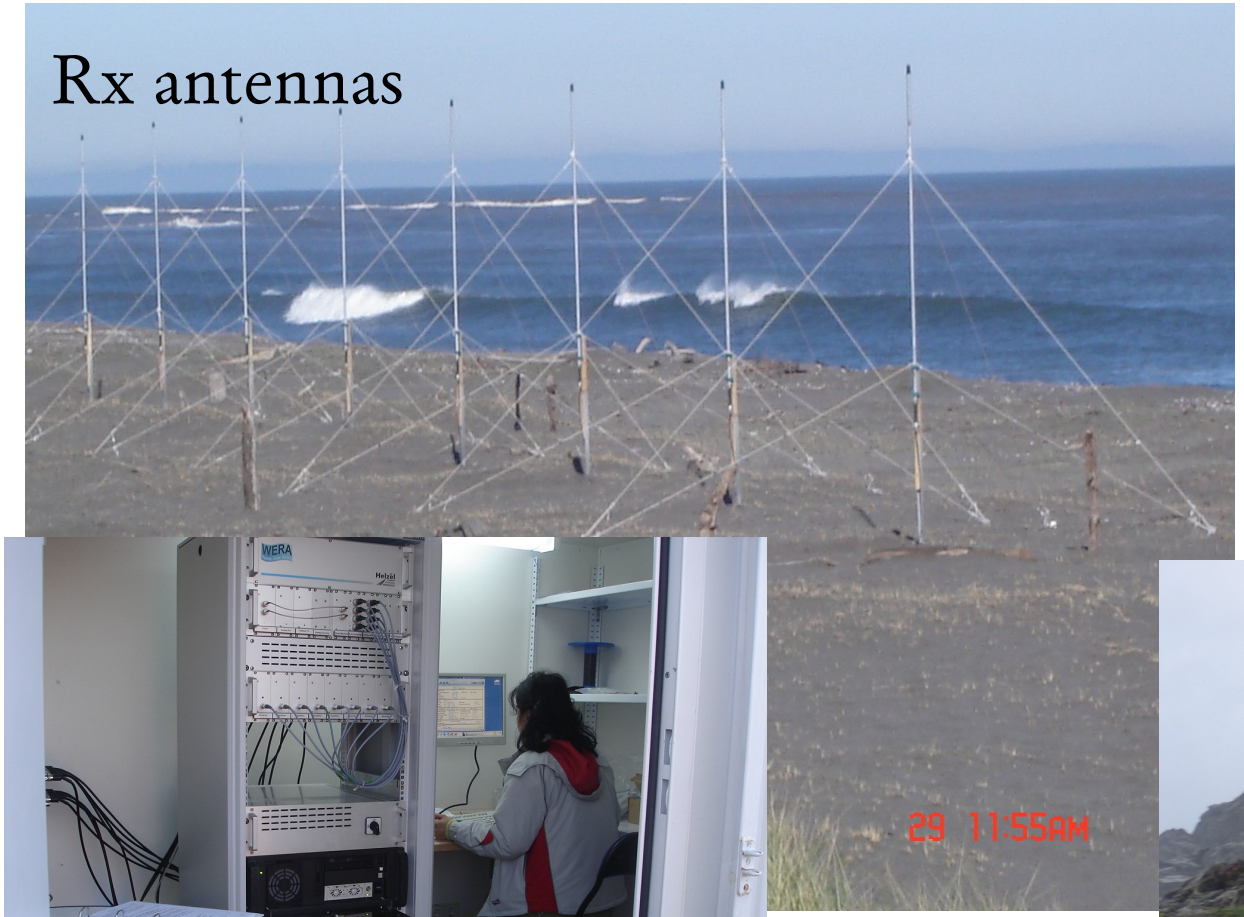
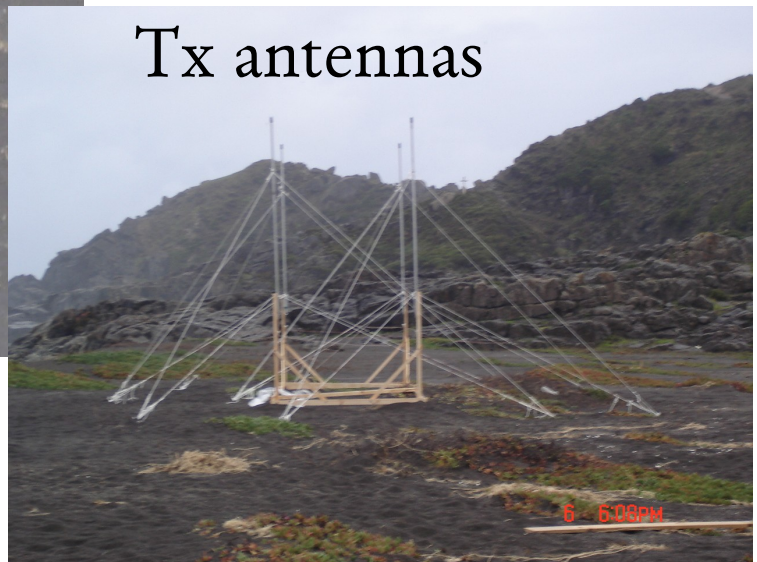
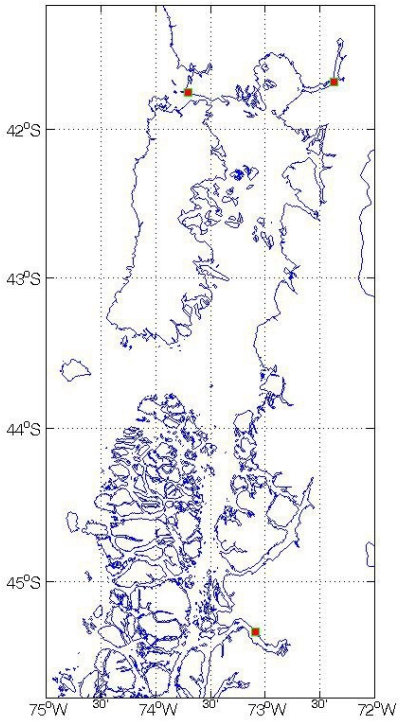
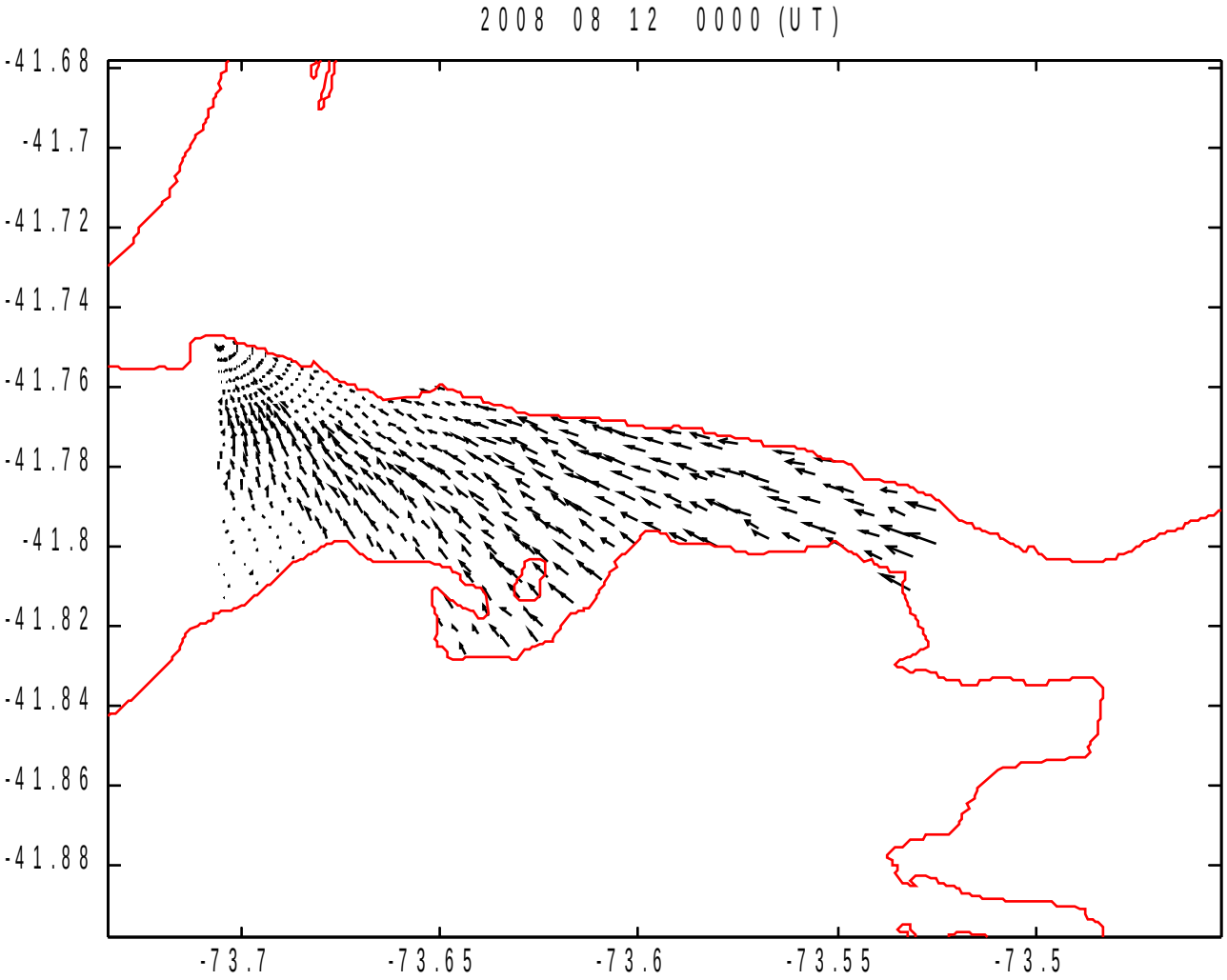




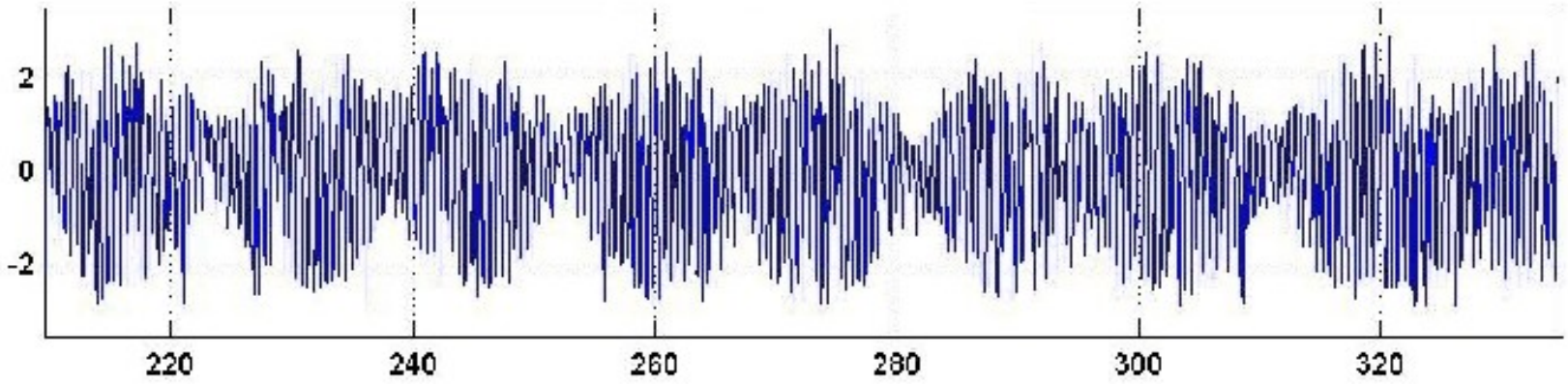
Currents in Chacao Channel

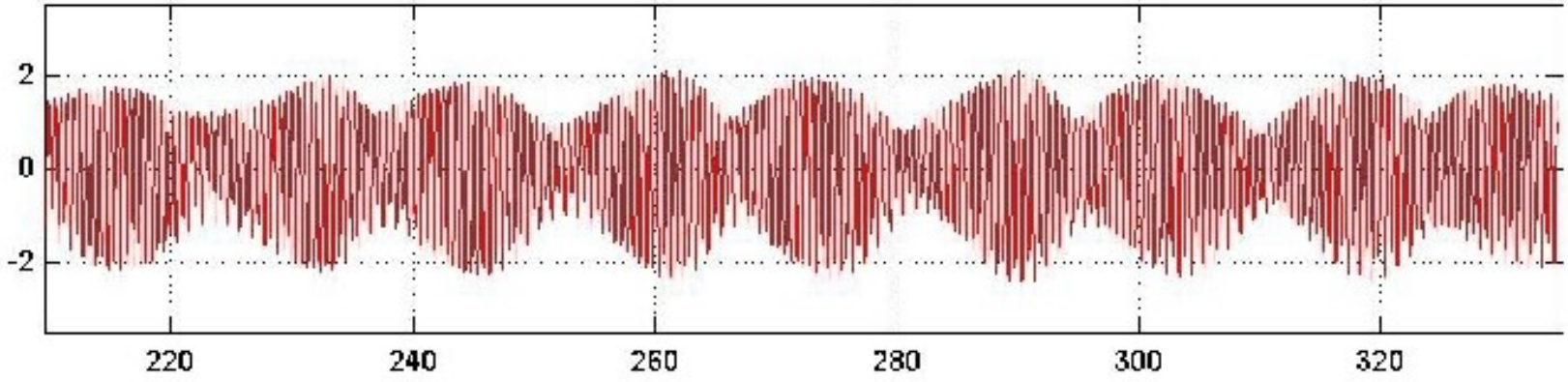




Currents in Chacao channel

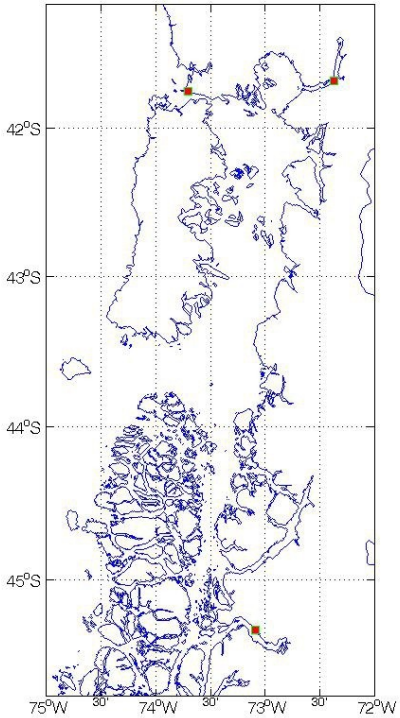
Radar velocity

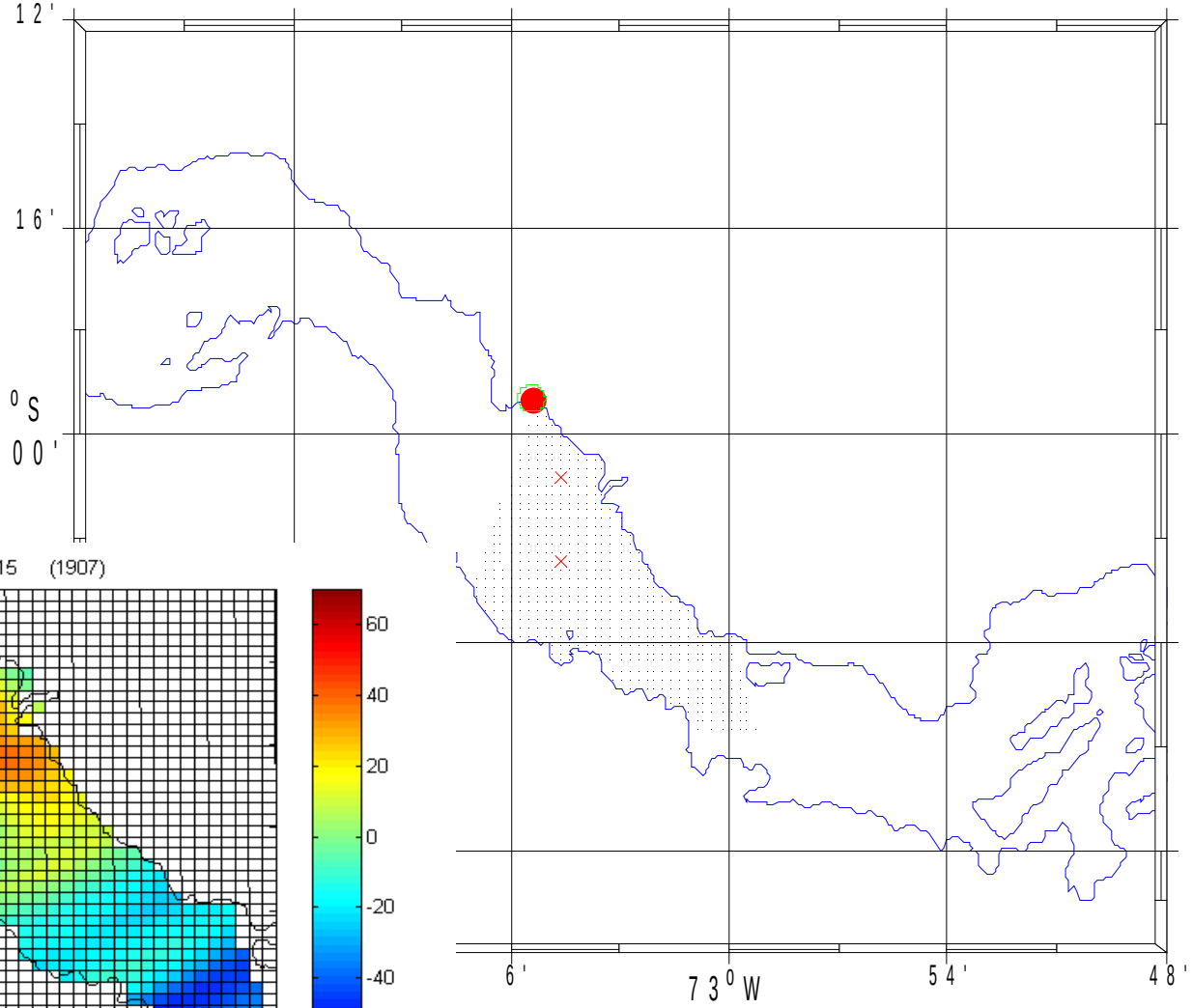


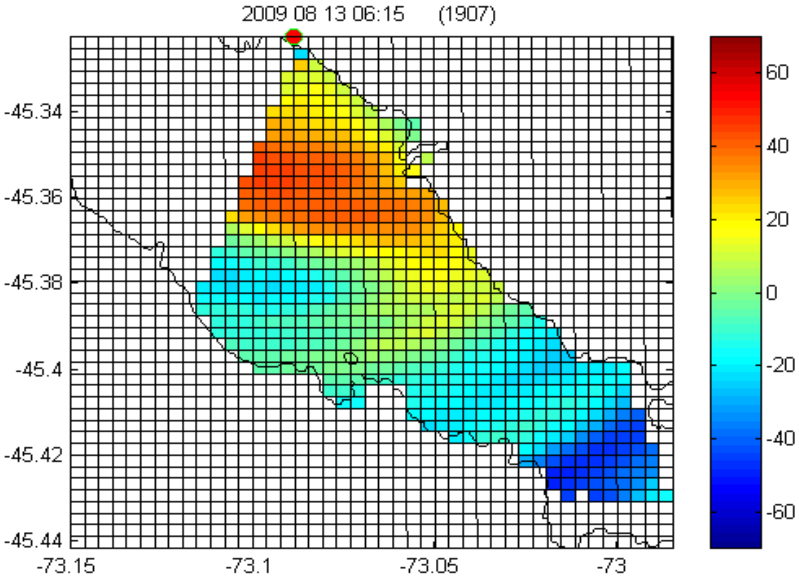


Predicted tidal height

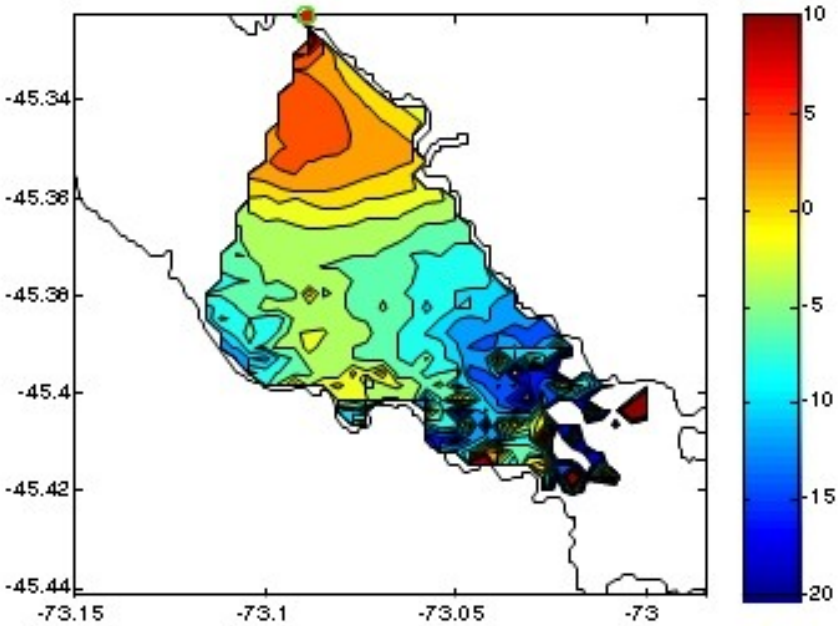
HF radar on the Aysén fjord





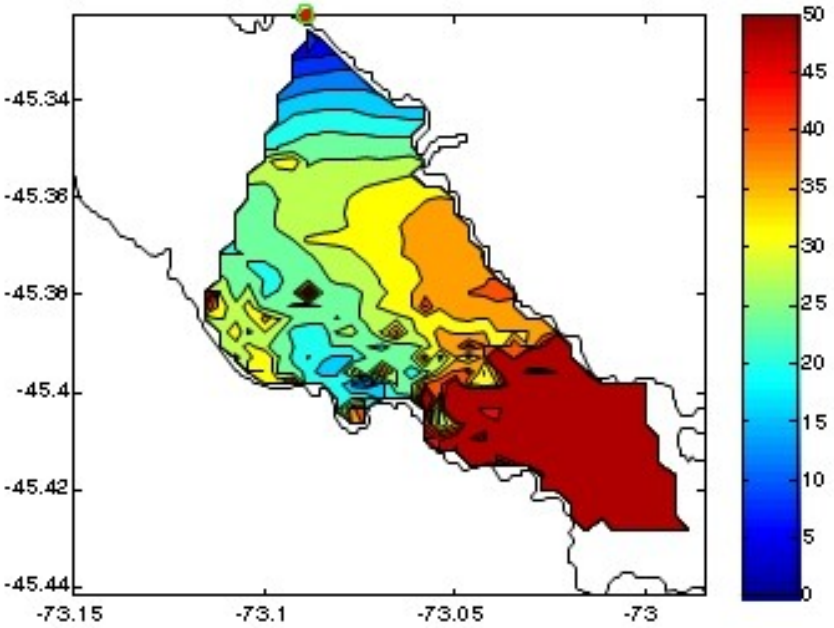


Aysén fjord

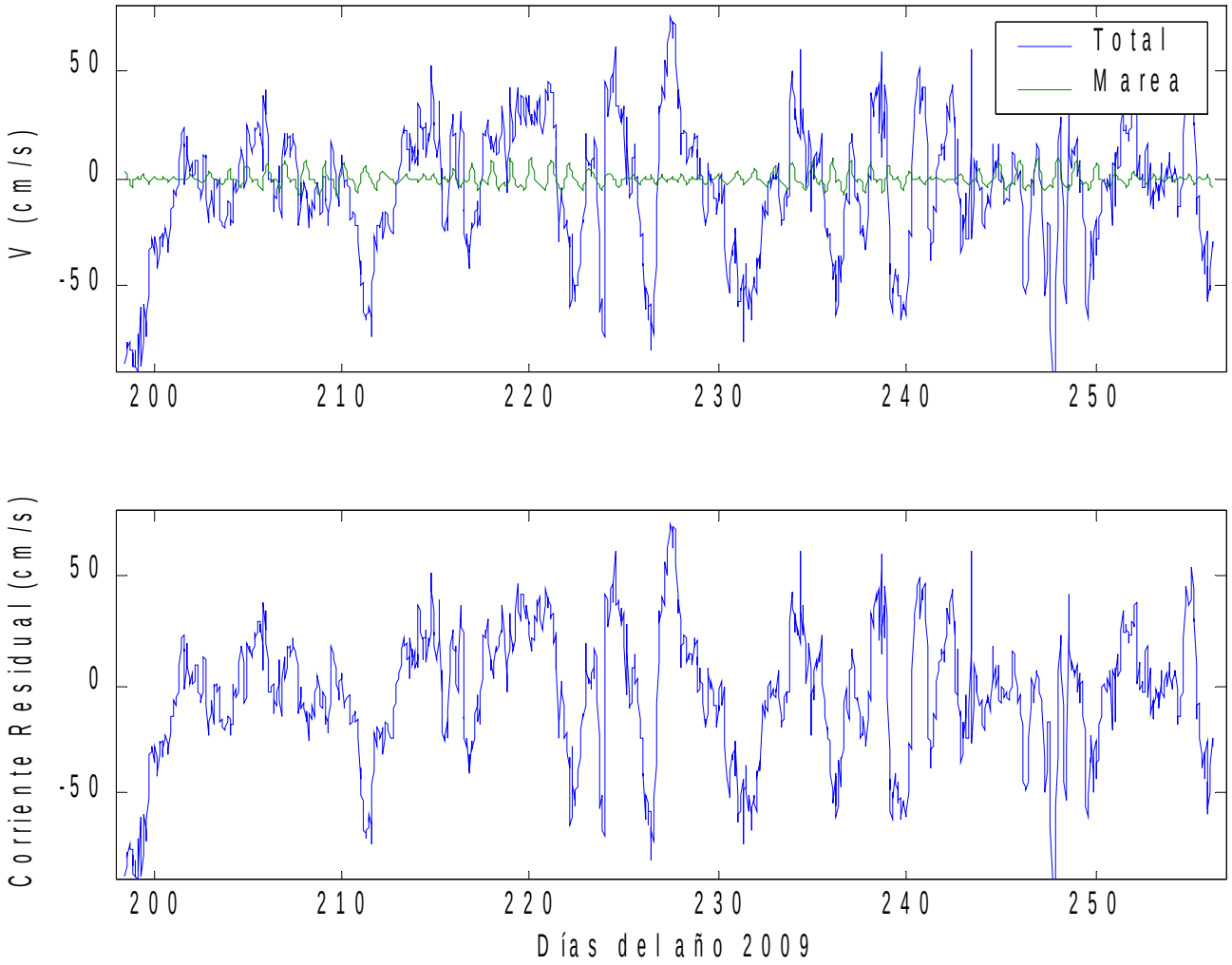


Radar mean velocity

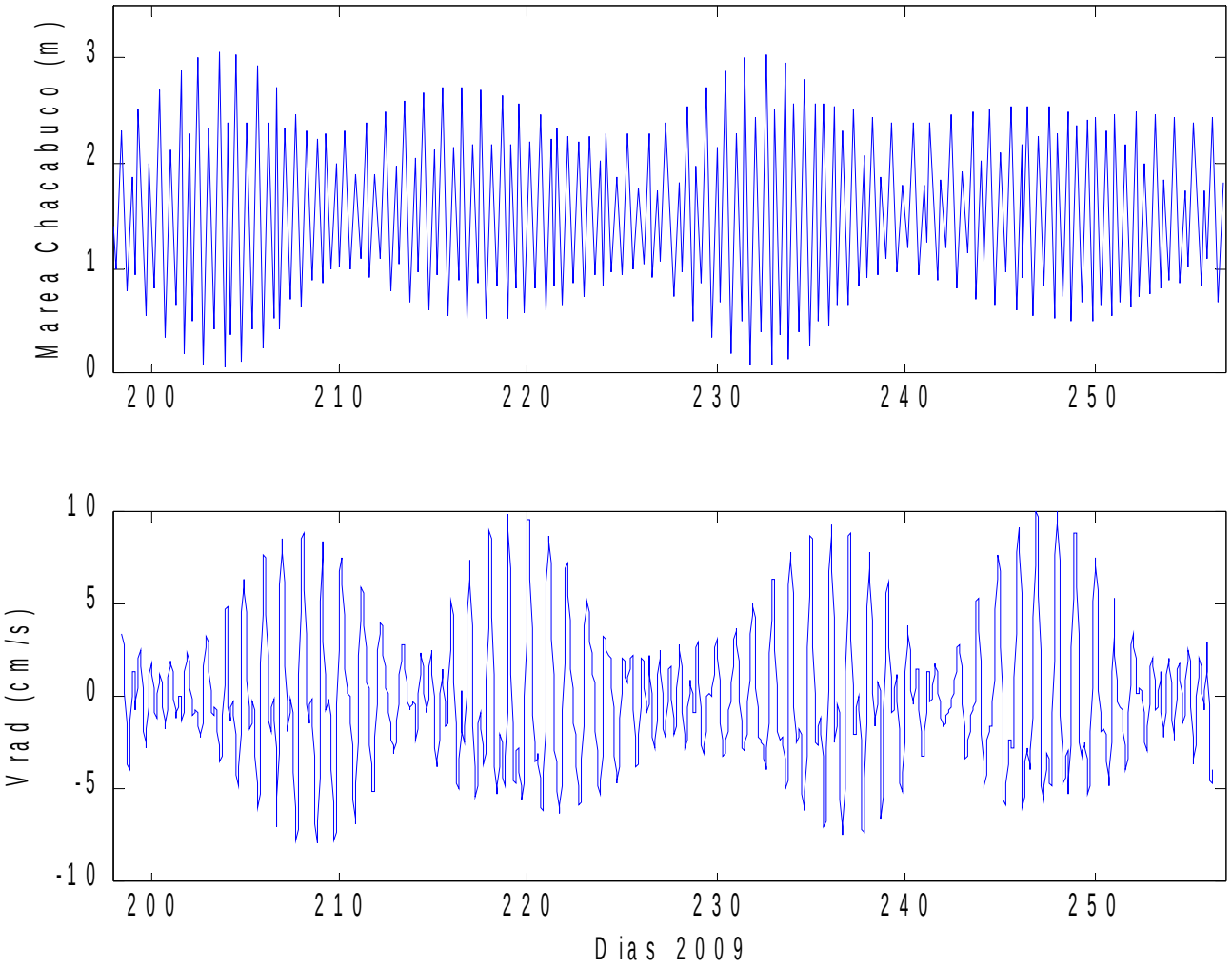
Radar velocity standard dev.



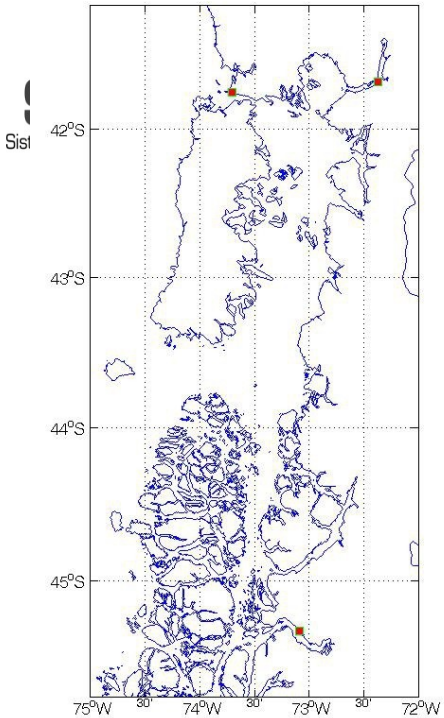
Aysén fjord

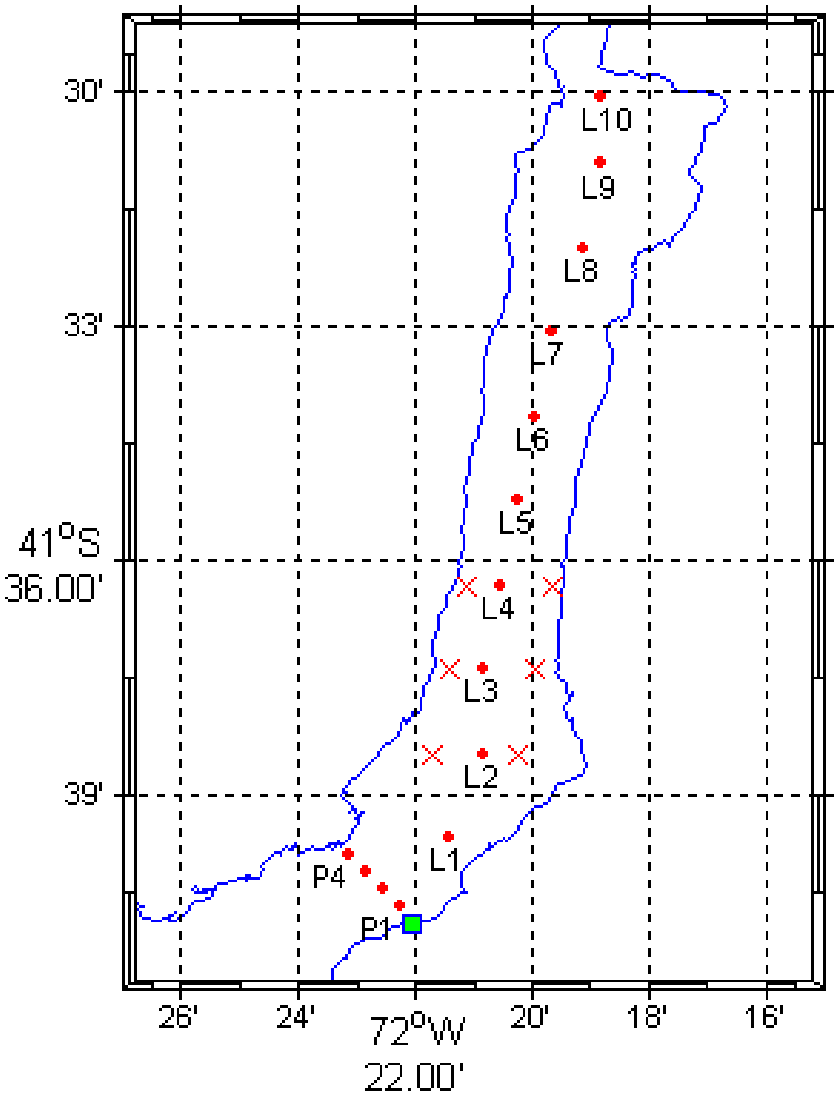

Total
Marea
V (cm/s)
50
0
-50
200
210
220
230
240
250
Corriente Residual (cm/s)
50
0
-50
200
210
220
230
240
250
Días del año 2009

Tidal currents in Aysén fjord

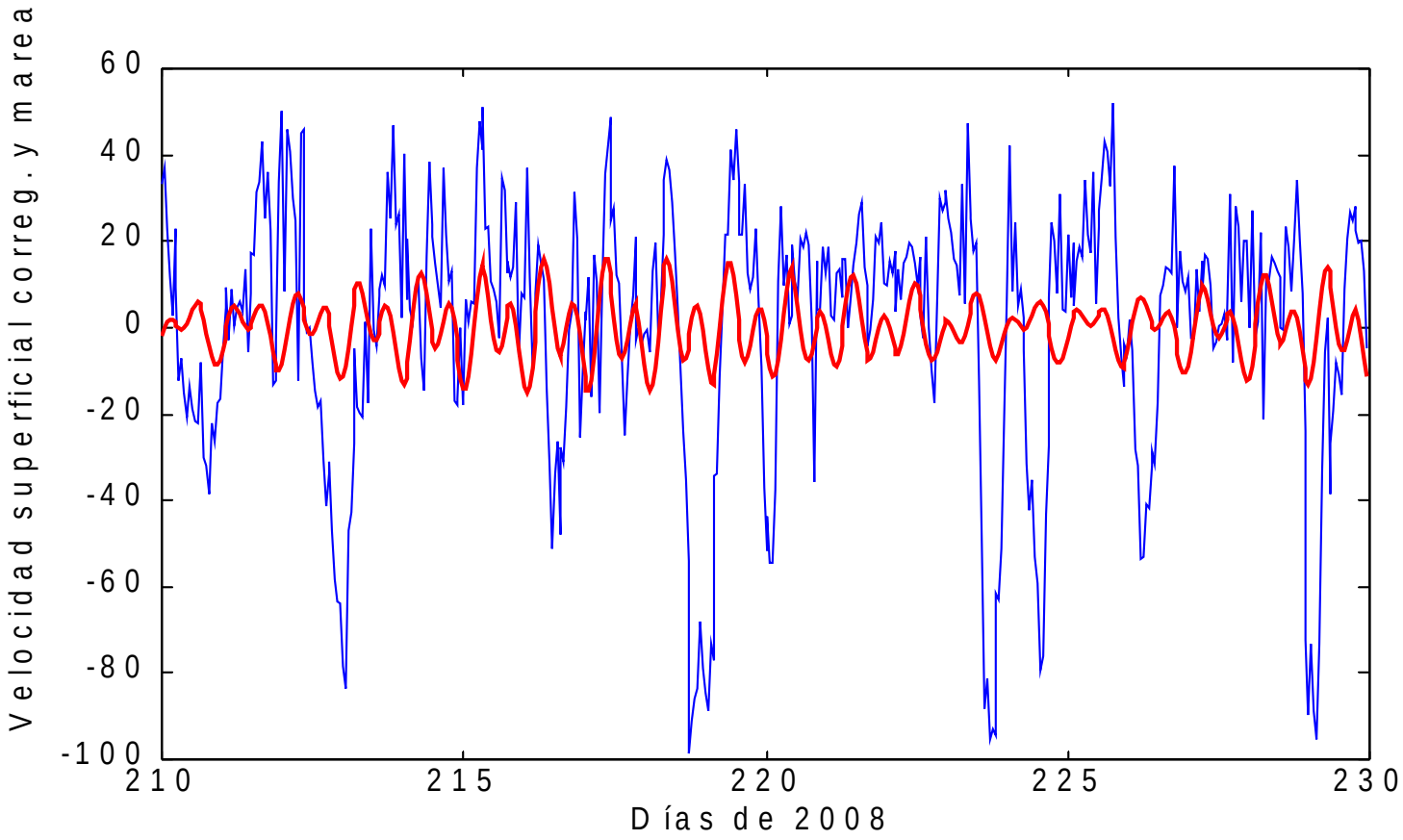


HF radar in Reloncaví fjord

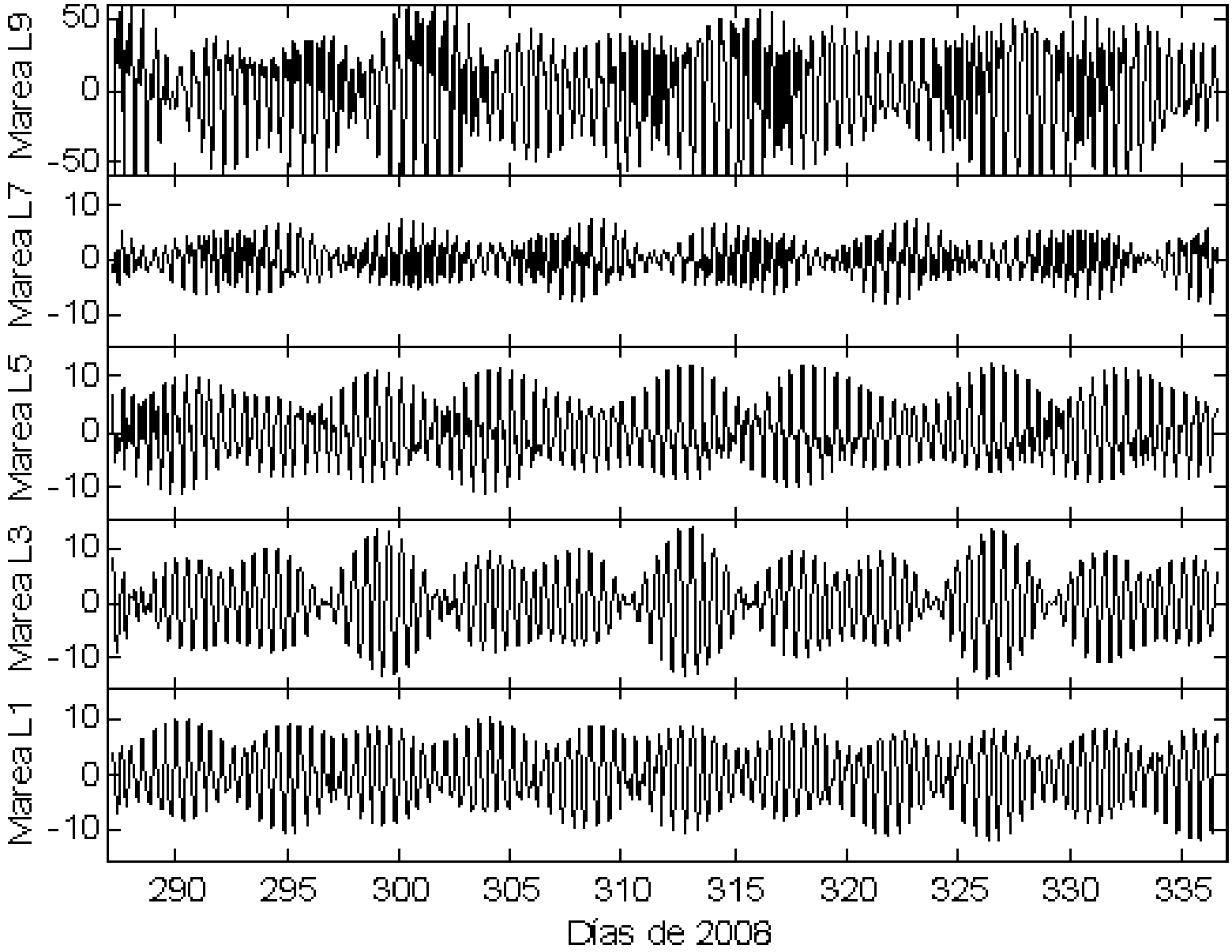




Tidal and total surface currents in fjord Reloncaví



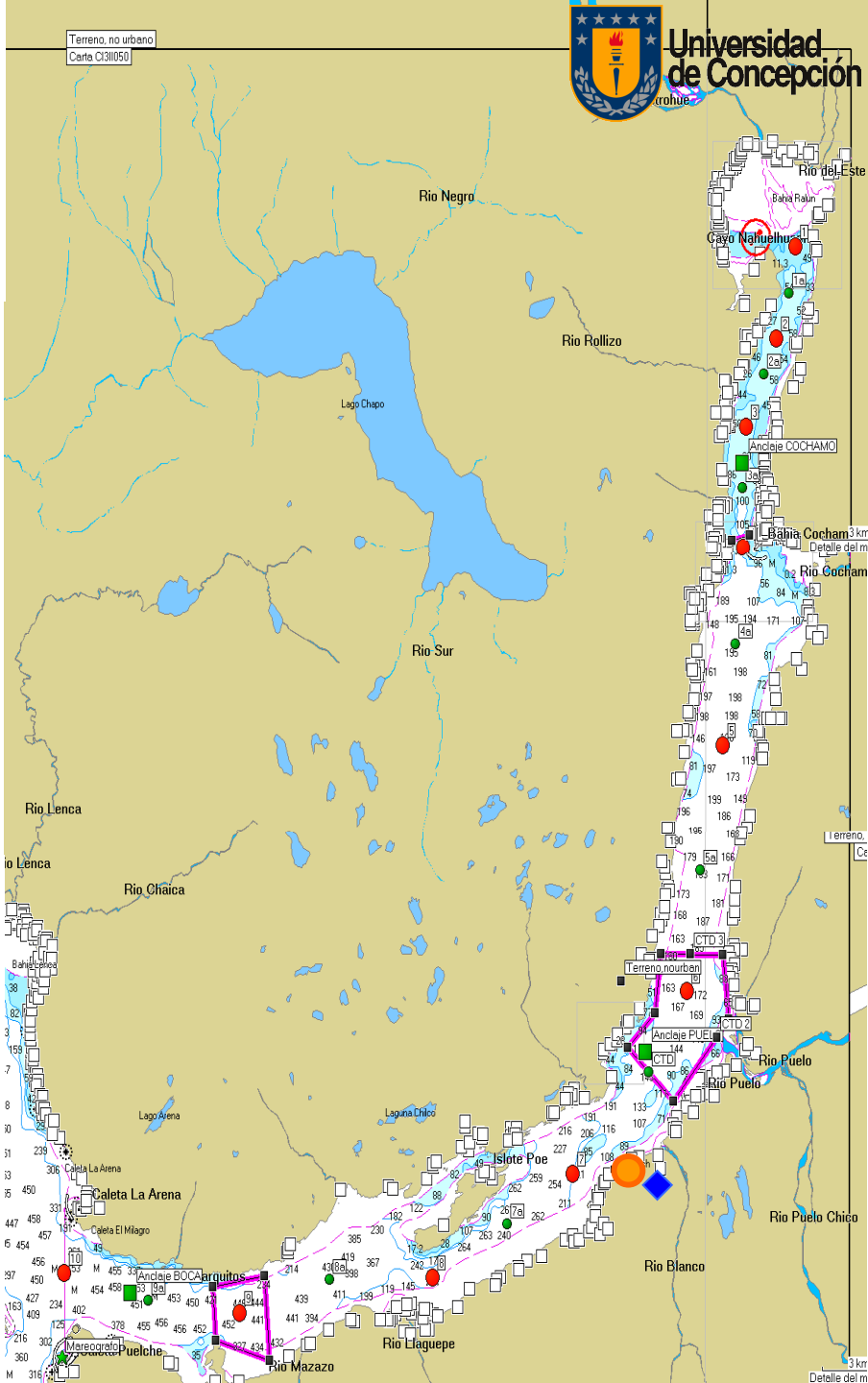
Tides in Reloncaví fjord



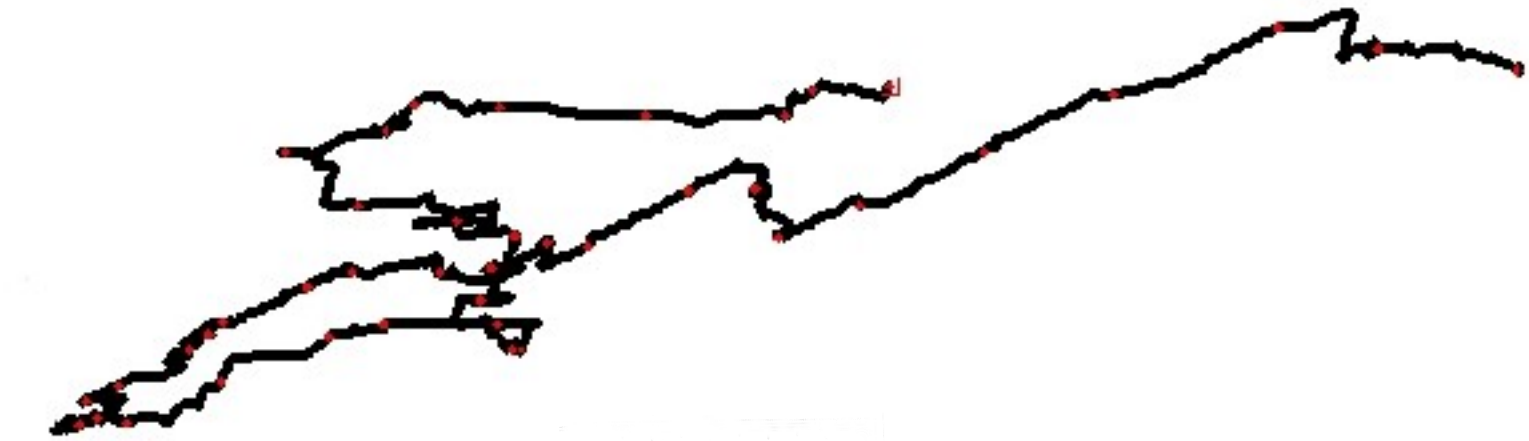
Measurements in Reloncaví fjord

- WERA HF radar
- ADCP mooring
- CTD (shallow st)
- CTD (deep station)
- Towed ADCP
- Sea level
- Meteorological station

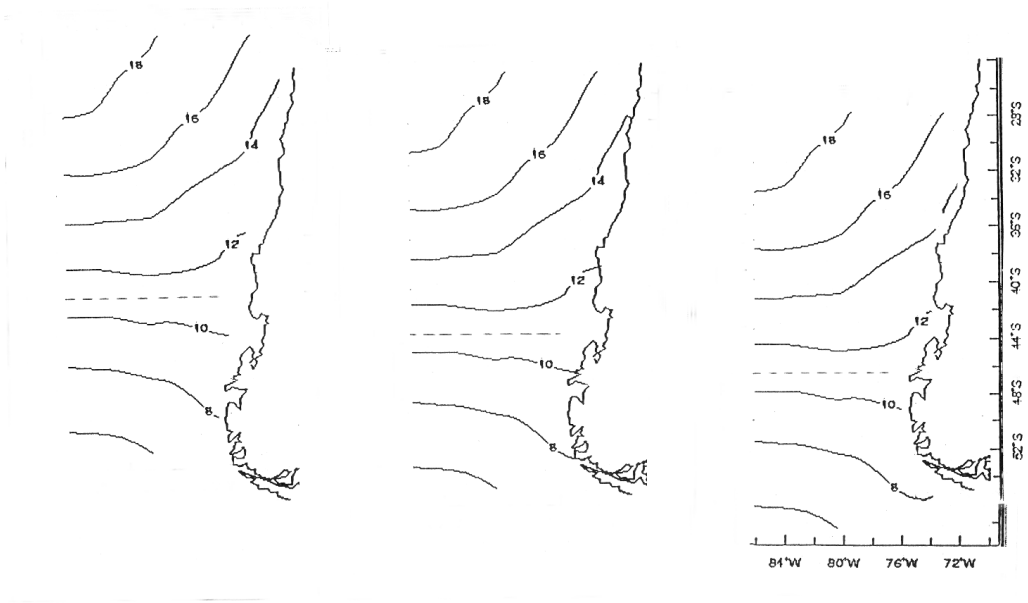
+ 6 thermistors chains



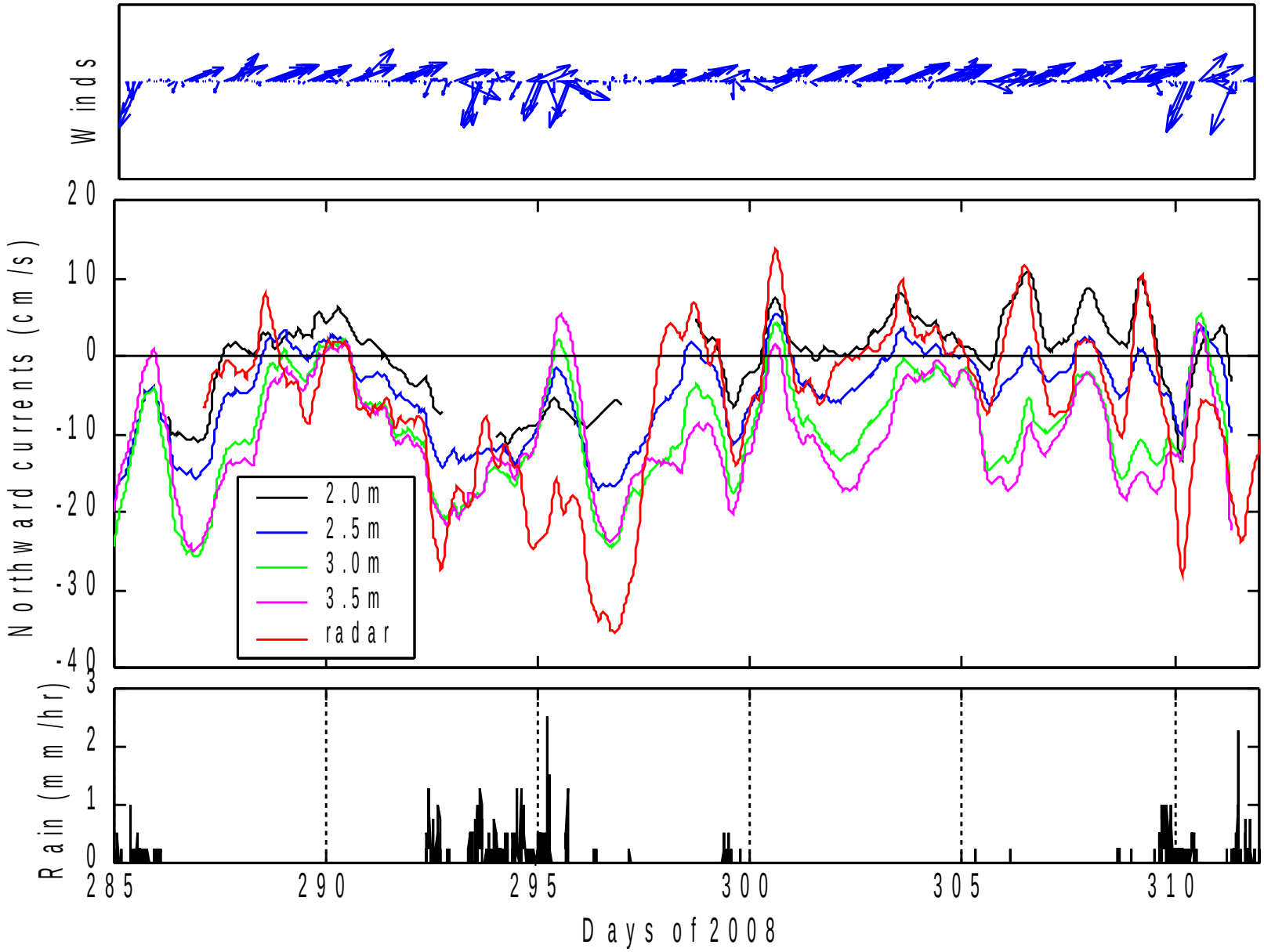
Winds on Reloncaví fjord



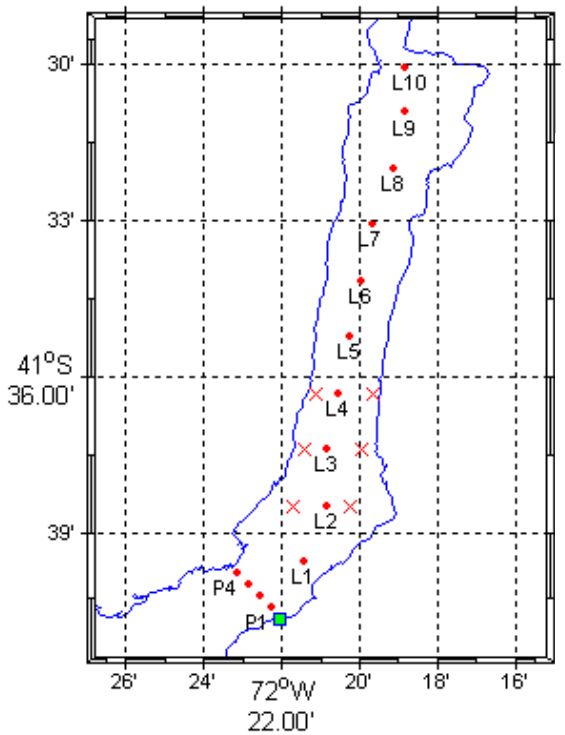
10/Sep/2008

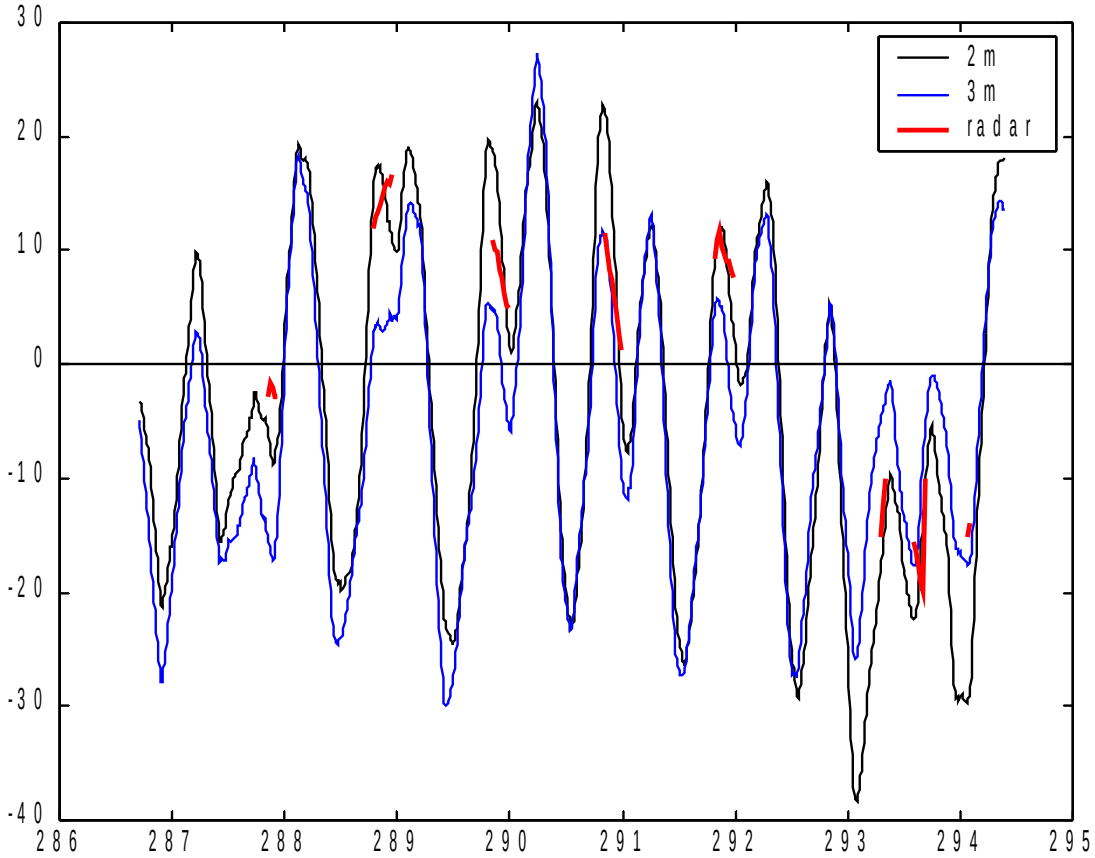


A comparison between radar and ADCP



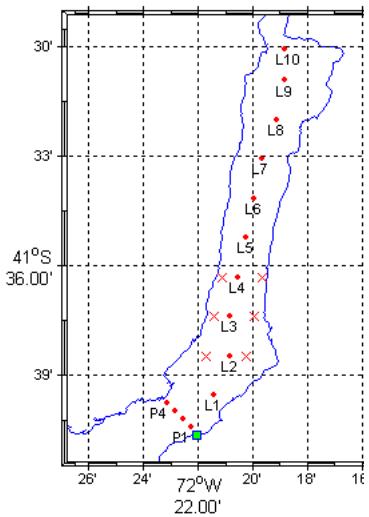
Far from the radar

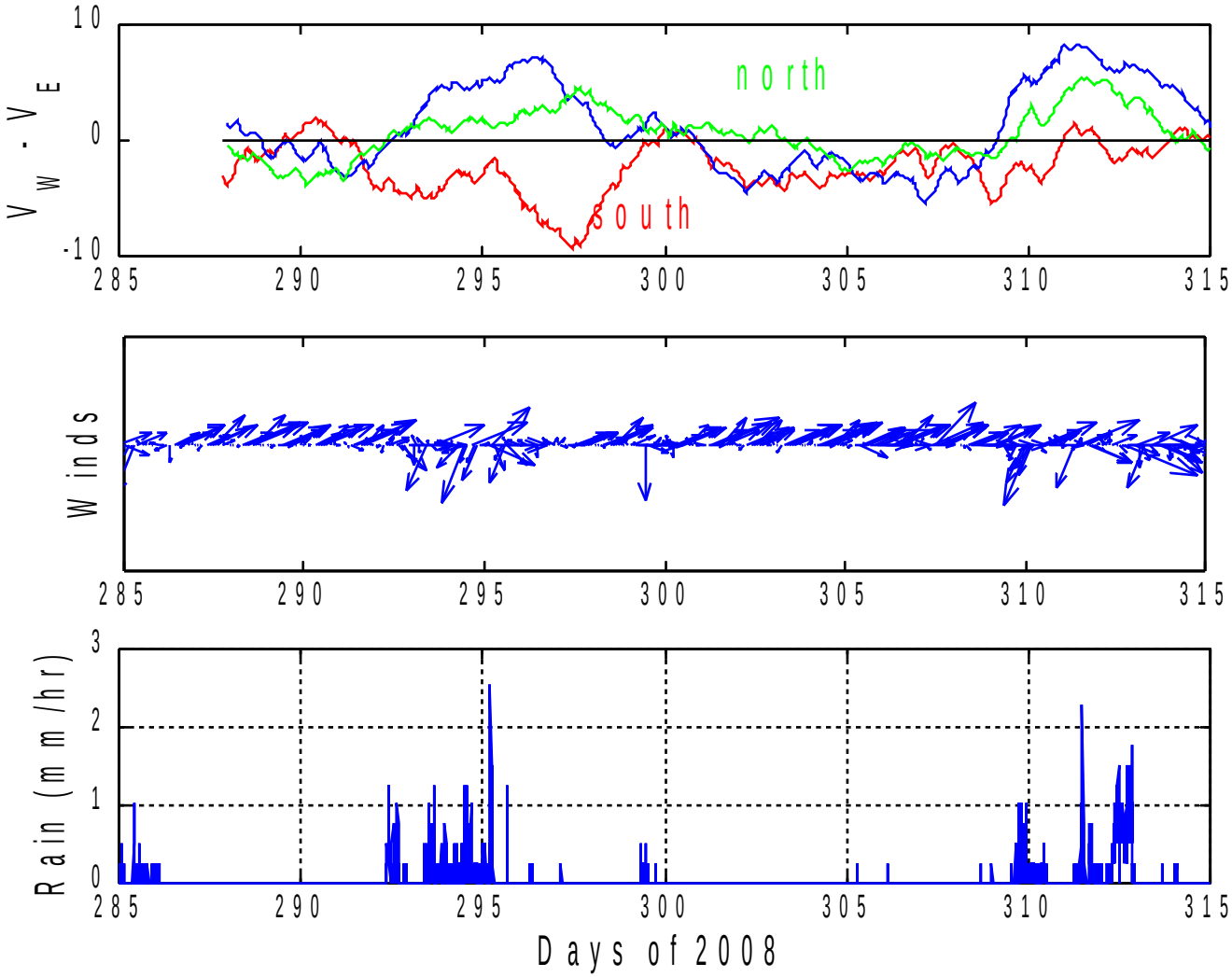




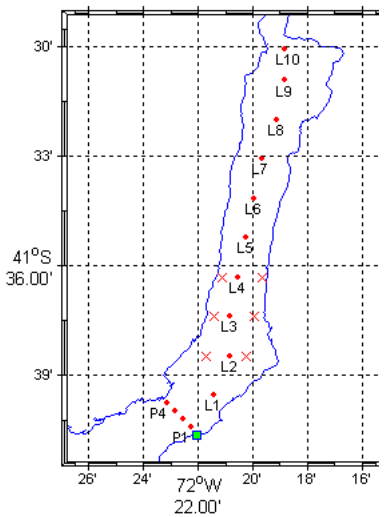
Comparison between borders

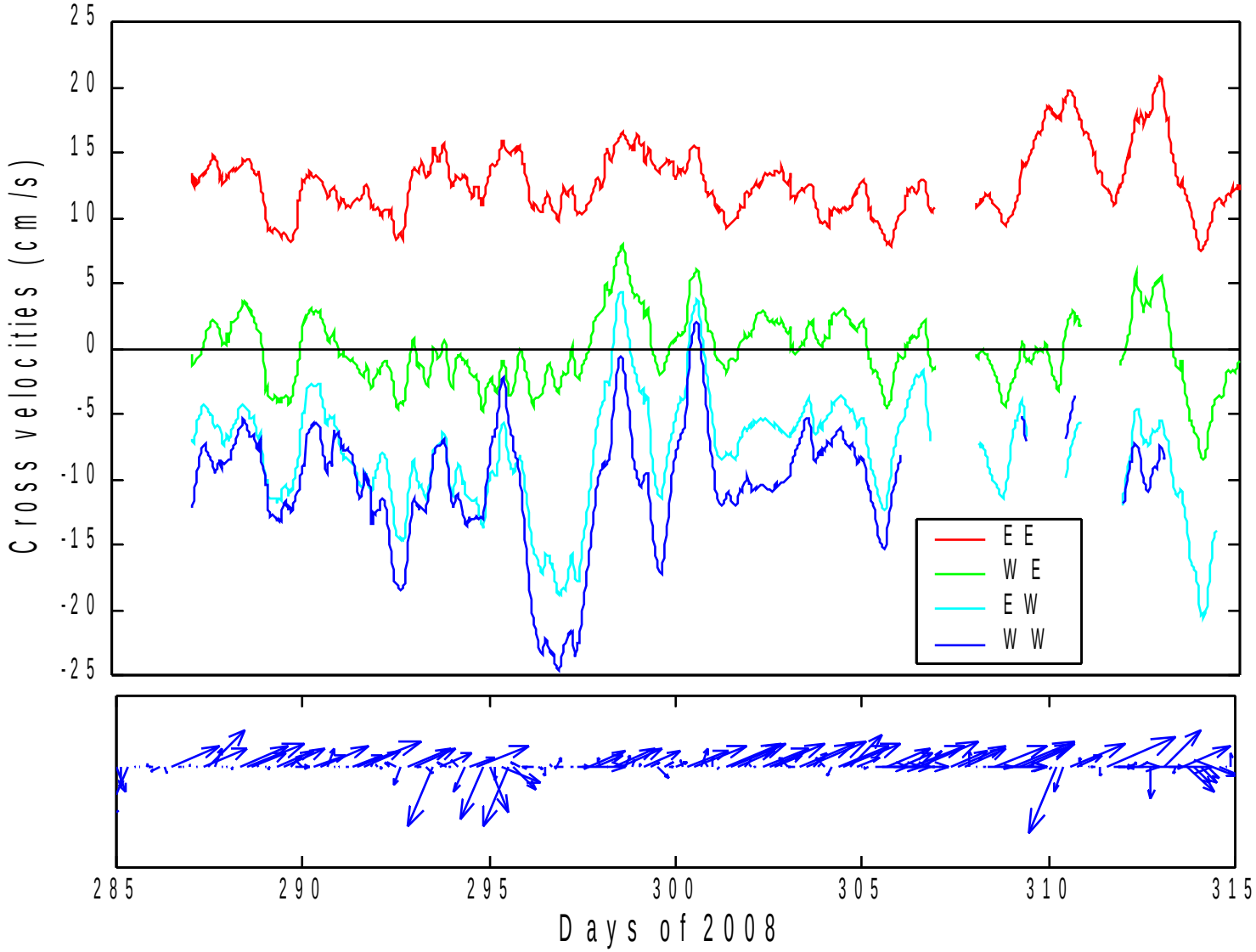
$(V_{\text{Western side}} - V_{\text{Eastern side}})$





Cross-currents in fjords





Results

- HF beam forming radars can provide very reliable radial surface velocities even in narrow and enclosed topographies, even in case of 8-antenna systems

- Apparently the range is reduced to ~15-20km

- Surface velocities (~1m) respond mainly to the winds, and not necessarily to an estuarine circulation

- Cross currents are of the same order of longitudinal ones. It can take a water parcel just a couple of hours for reaching the other side of the fjord-