Sea level changes: analysing PSMSL and SONEL data

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r first purpose: to use the available data and to critici
m: it means to use our enemies arguments to demas
m

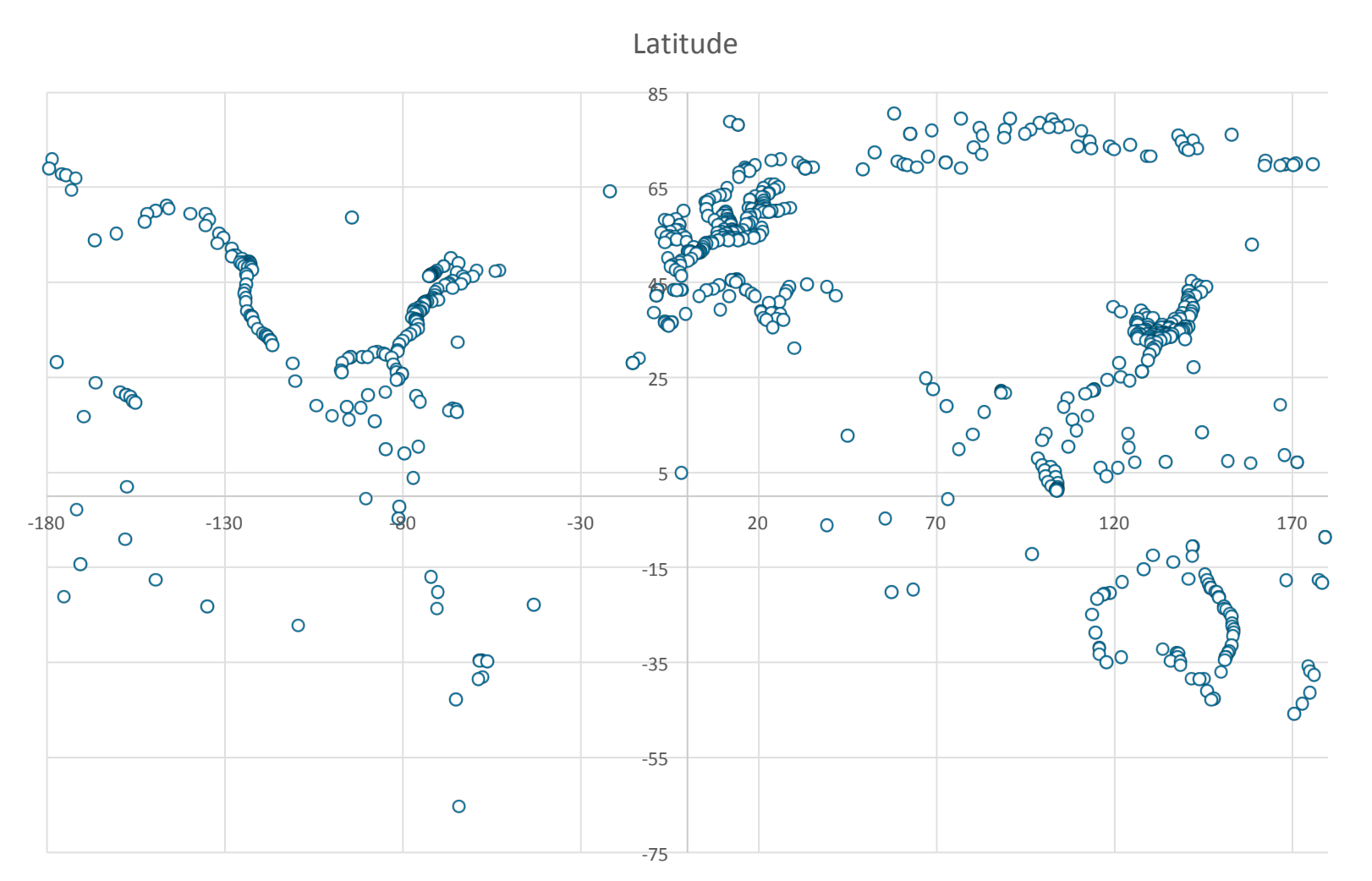
ause, most of the times
have:

We are going to analyse:

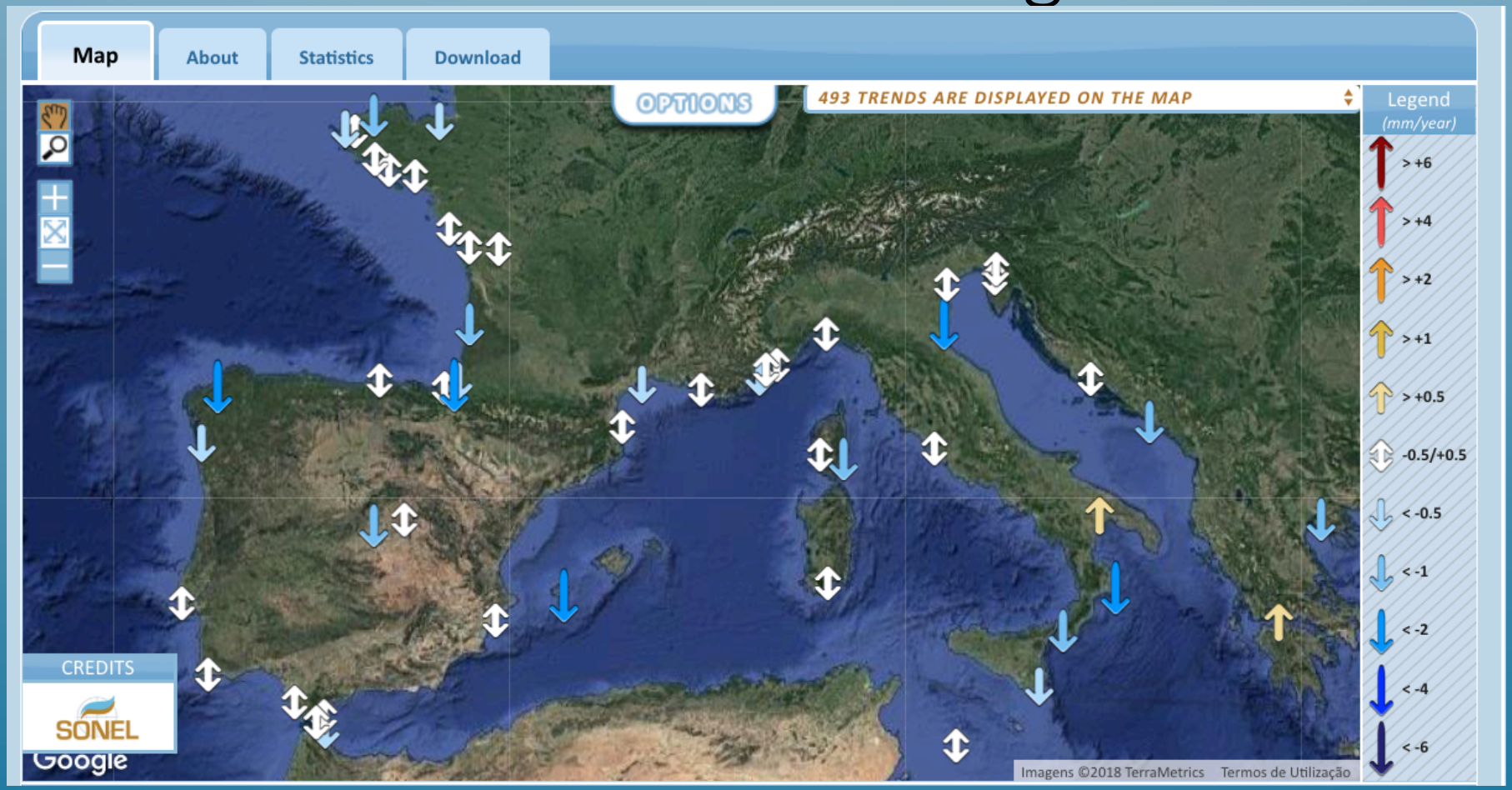
PSMSL
Permanent Service for
Mean Sea Level

SONEL
Système d'Observation
du Niveau des Eaux
Littorales

PSMSL stations: its latitude and longitude
A very unequal coverture

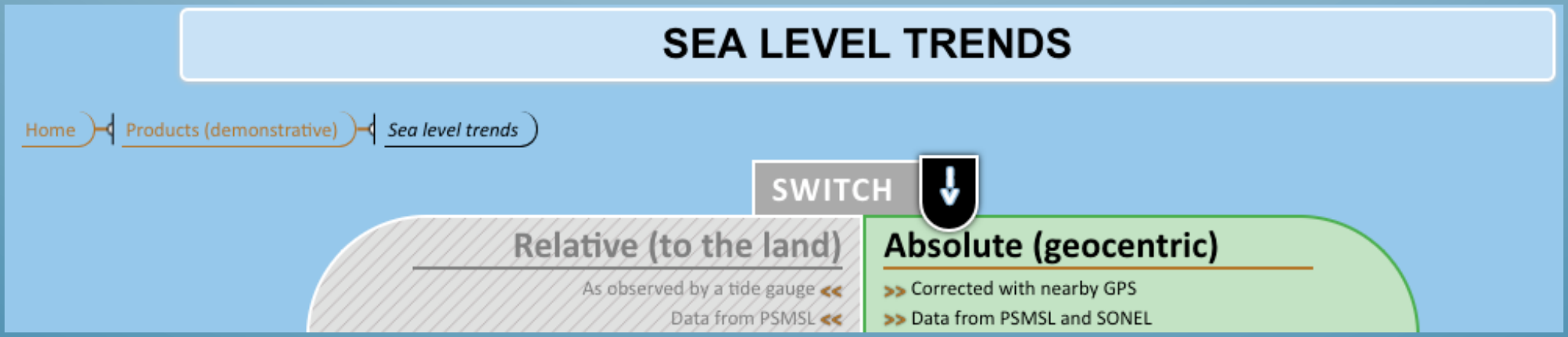


cently we got the ability to understand the influence
earth movements: GPS stations generally show a low
ubsiding trend in the littoral: it can accelerate sea leve
rise but we can’t do nothing about it!

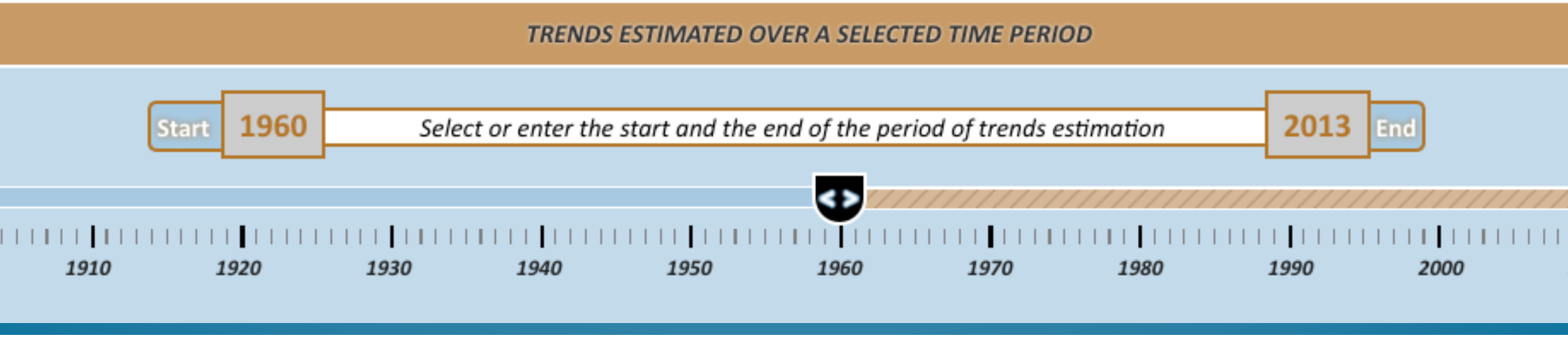


ONEL: http://www.sonel.org/-Sea-level-trends-.html?lang=e

low it works: from relative to absolute sea level trend



Time can be adjusted, too



Map views: “absolute” sea level changes

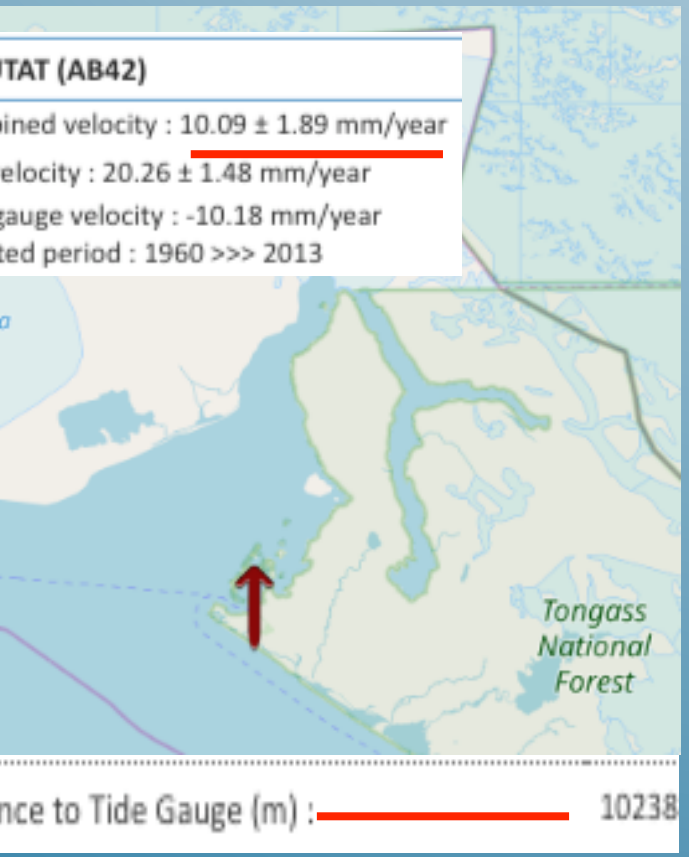
Map views: “absolute” sea level changes

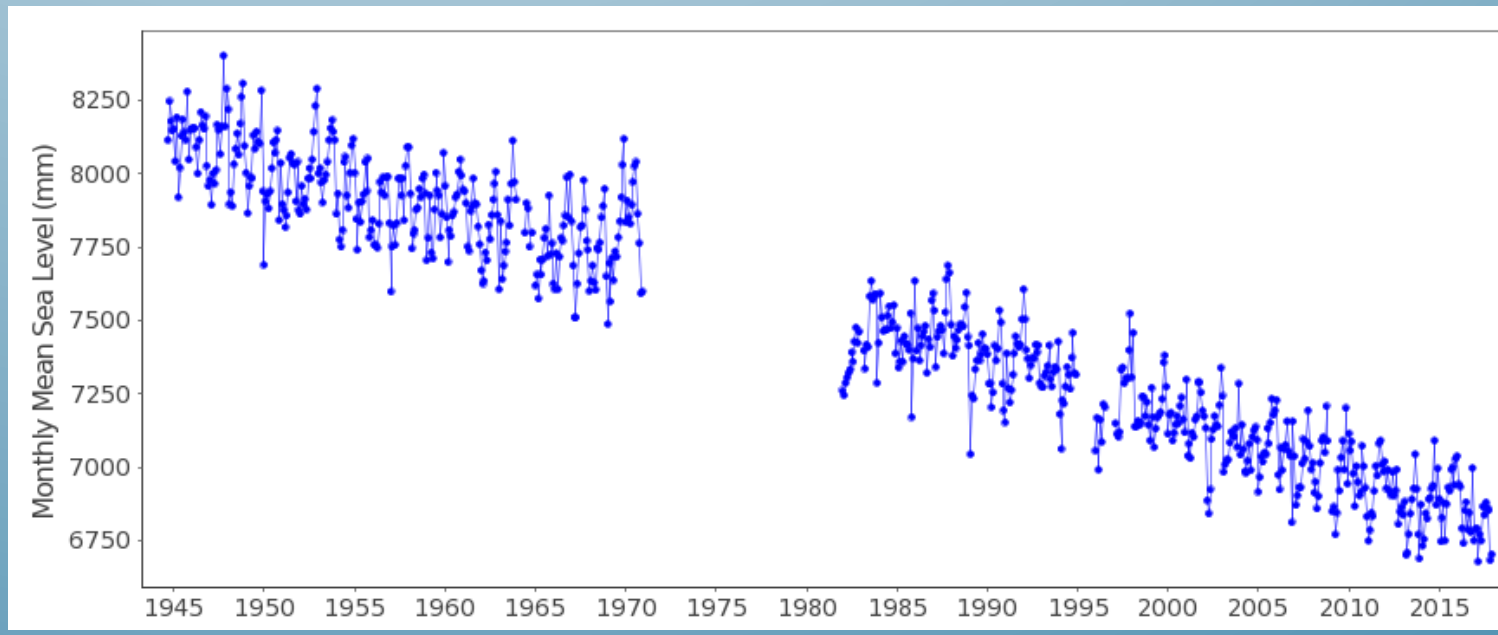
Counting on land movements, only 7 stations above 4mm/year

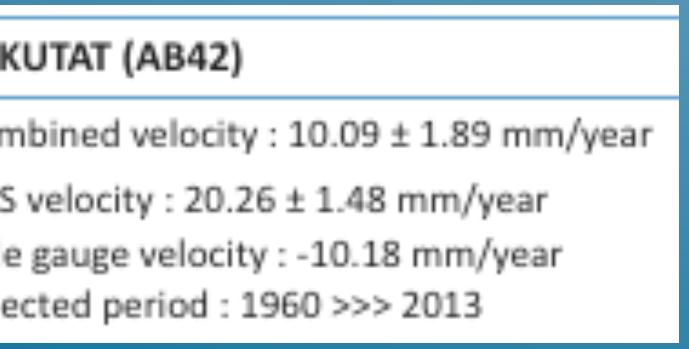
he red > 4 mm trend and
rown > 6 mm trend yr. stations

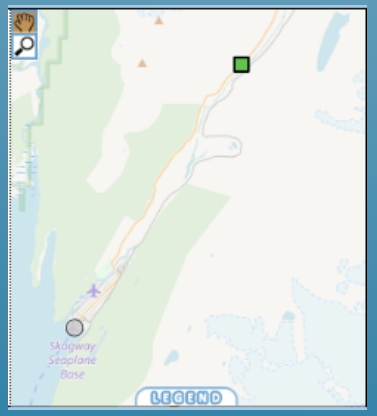
AKUTAT (ALASKA)
NTOFAGASTA (CHILE)
ALERMO (ARGENTINA)
ARADAY (ARGENTINA ISLANDS)
ADIZ III (SPAIN)
LAIPEDA (LITUÂNIA)
VAKKANAI (JAPAN)

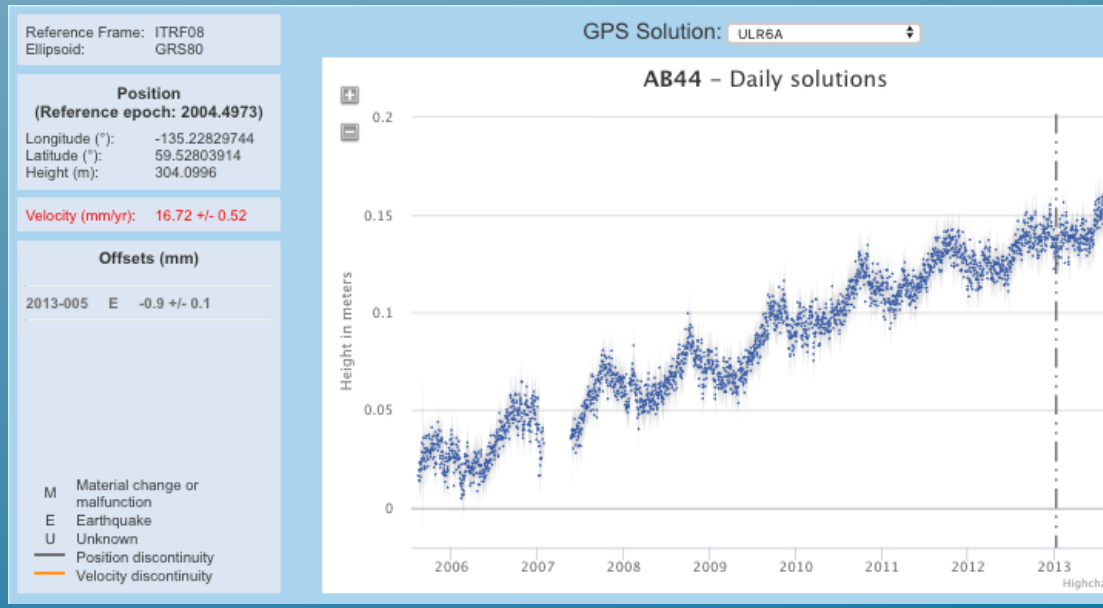
AKUTAT (Alaska): combined velocity: 10 mm, 10 km from tide gaug





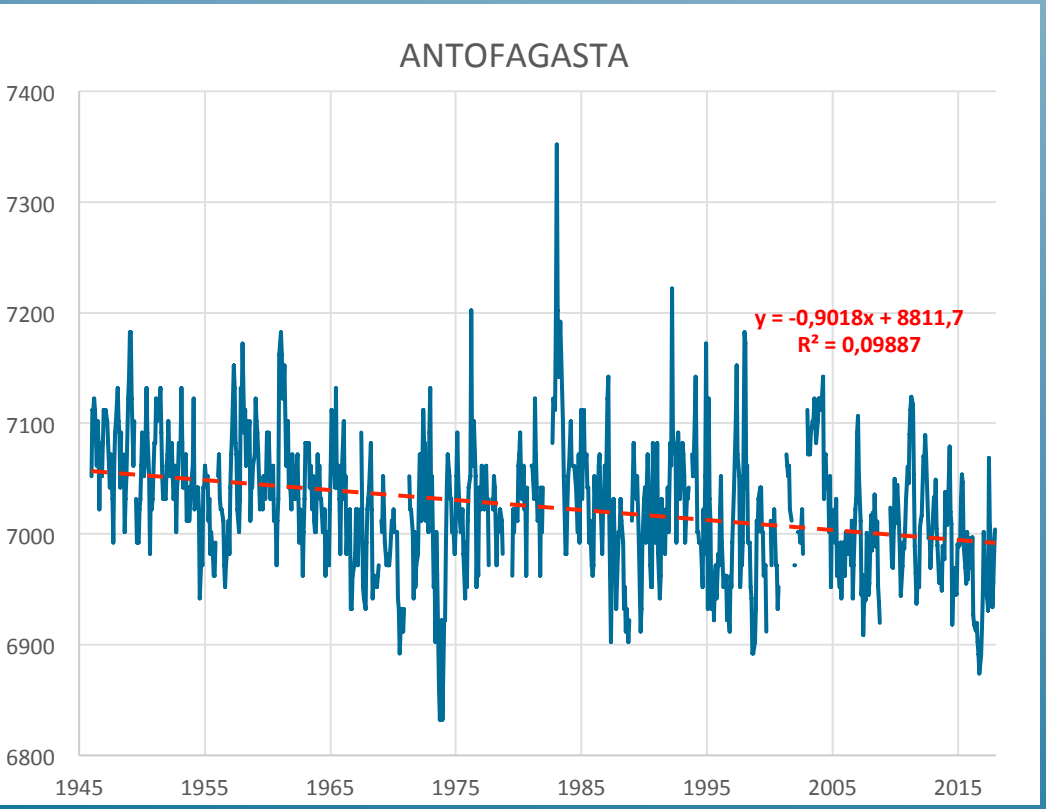


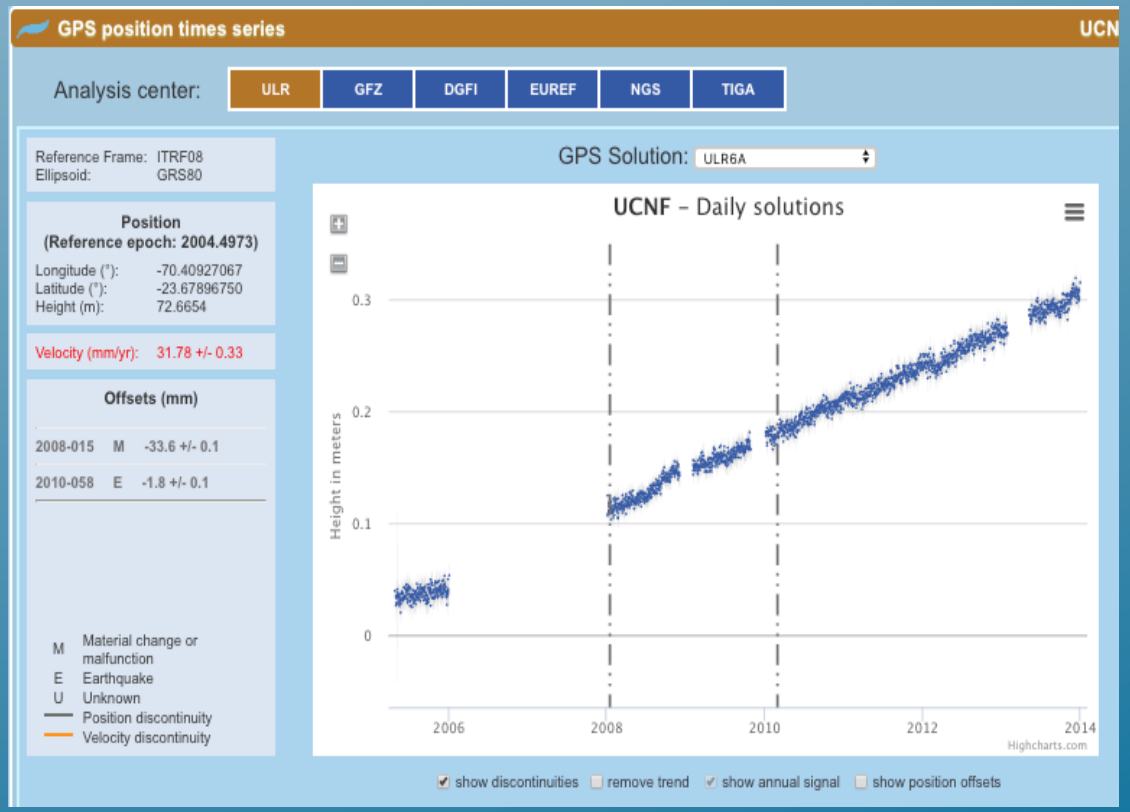




ANTOFAGASTA: relative sea level is going down (-0,9mm/yr.), a big uplift (31mm/yr.)

Combined velocity : 31.45 ± 0.51 mm/year
GPS velocity : 31.78 ± 0.33 mm/year
Tide gauge velocity : -0.33 mm/year
Selected period : 1960 >>> 2013





LERMO, ARGENTINA: the mbined velocity 69 +/- 0,55; 7 km from tide uge (why in red?)

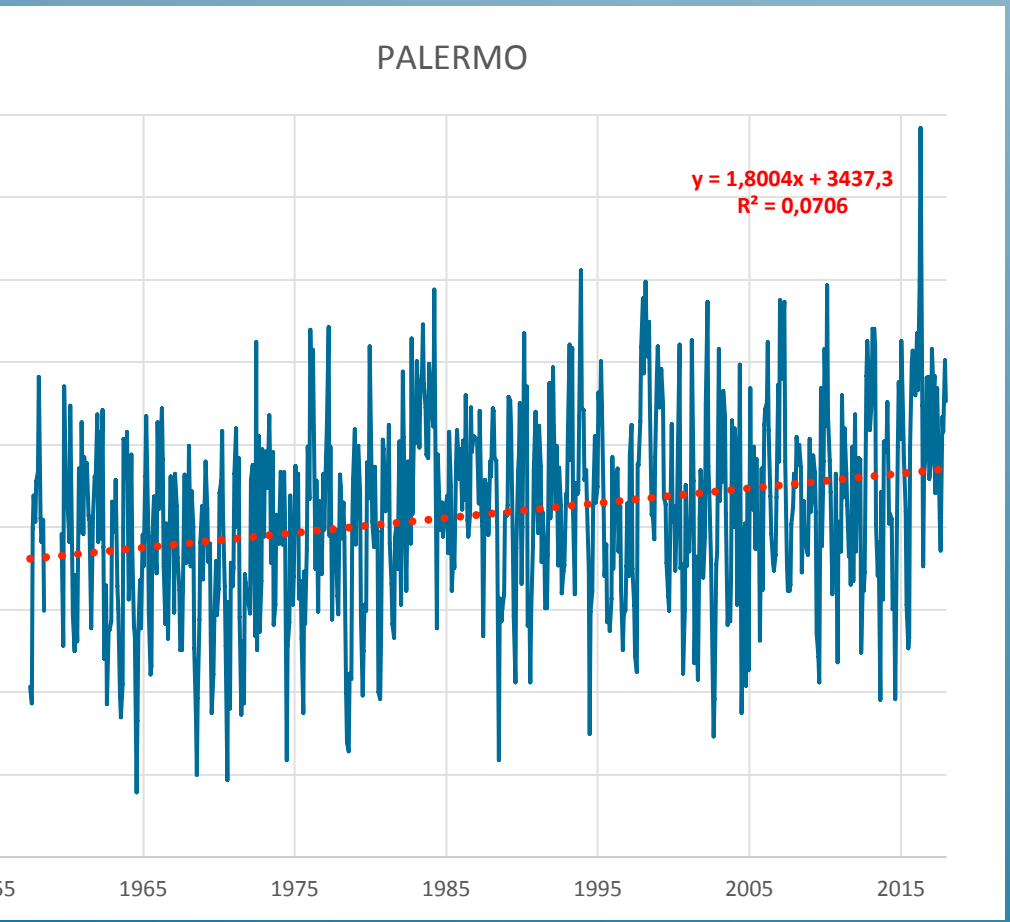
PALERMO (IGM1)

Combined velocity : 2.69 ± 0.55 mm/year

GPS velocity : 1.03 ± 0.24 mm/year

Tide gauge velocity : 1.66 mm/year

Selected period : 1960 >>> 2013



Reference Frame: ITRF08
Ellipsoid: GRS80

Position (Reference epoch: 2004.4973)

Longitude (°): -58.43931930
Latitude (°): -34.57224385
Height (m): 50.6835

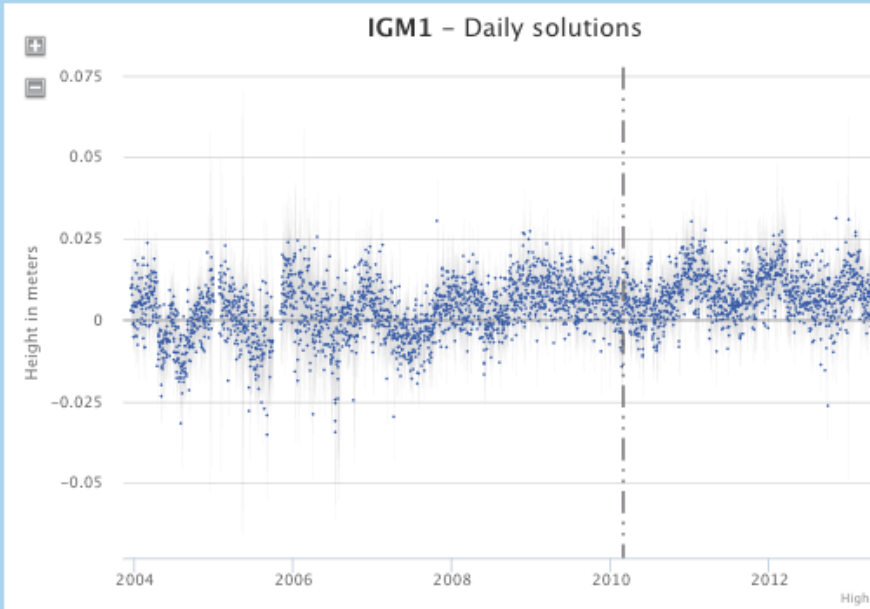
Velocity (mm/yr): 1.03 +/- 0.24

Offsets (mm)

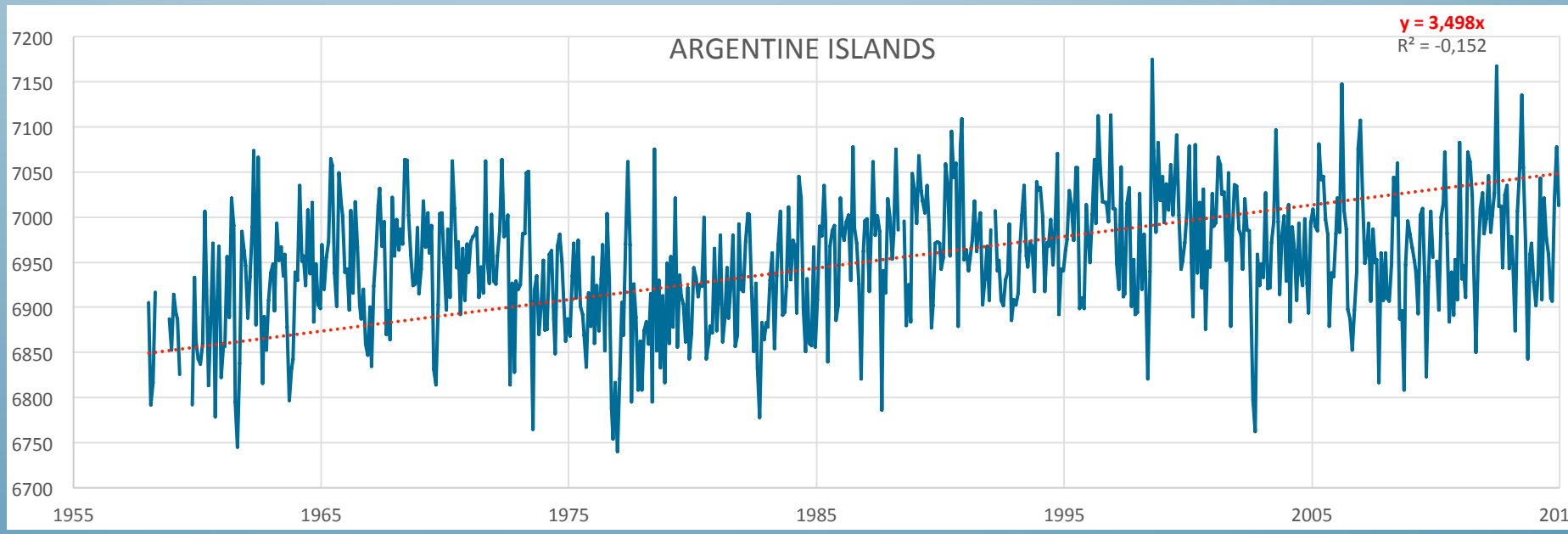
2010-058 E -4.8 +/- 9.7

M Material change or malfunction
E Earthquake
U Unknown
Position discontinuity
Velocity discontinuity

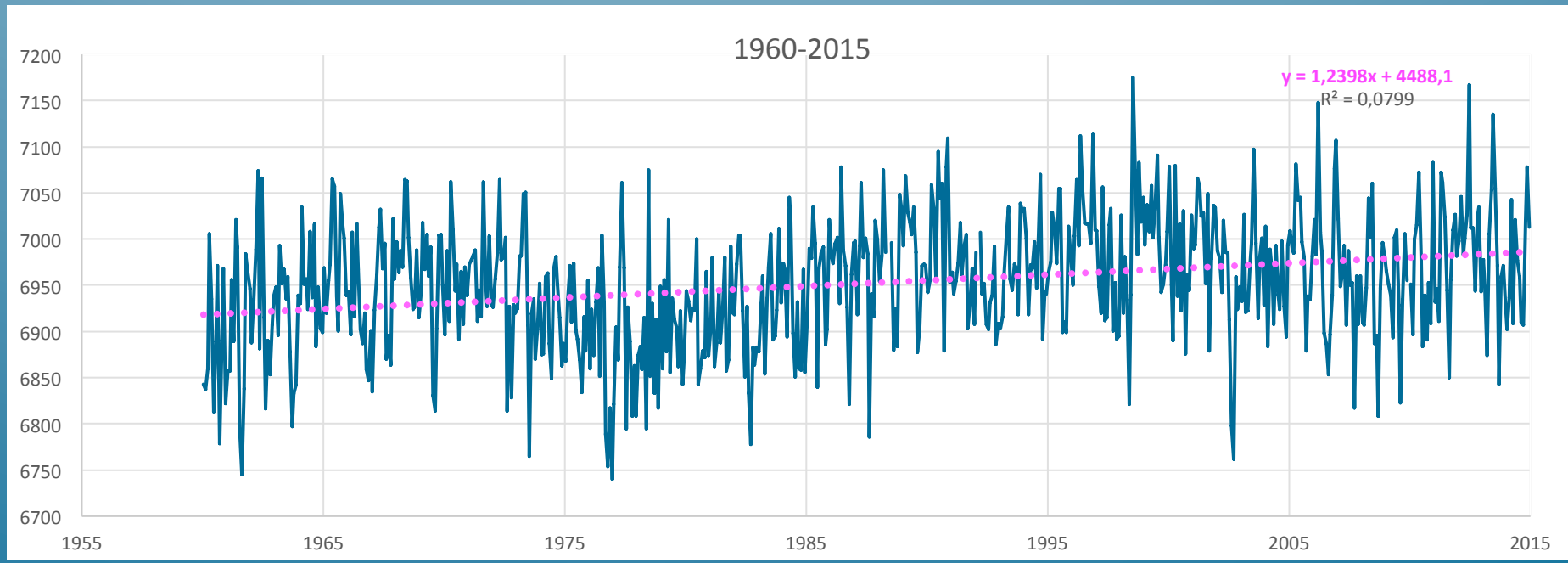
GPS Solution: ULR6A



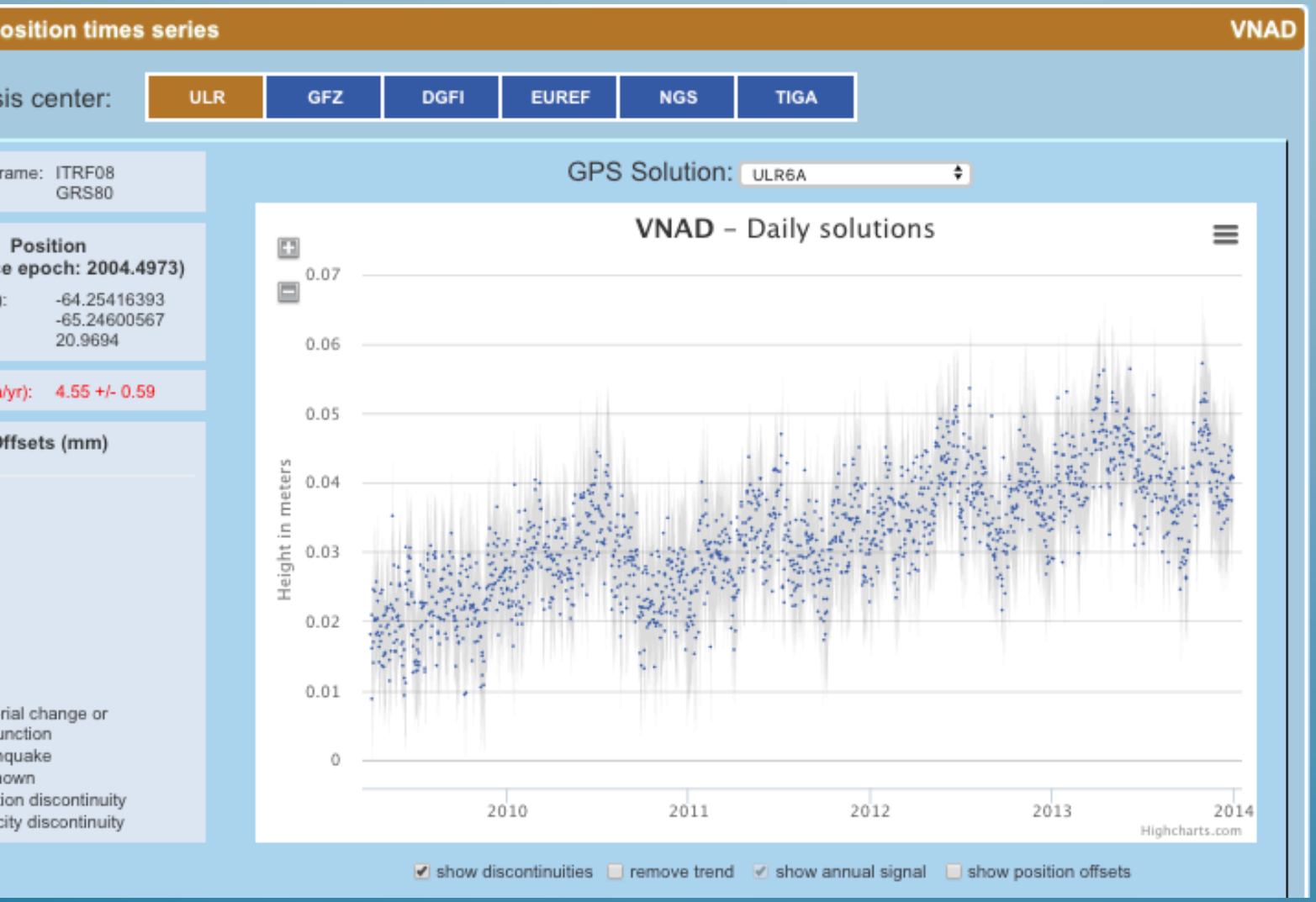
rgentine Islands ntarctica)



Trends anges with e. The first ears seem to have orrect data



rgentine Islands: very irregular GPS data: is it reliable



Faraday, A... (VNAD)

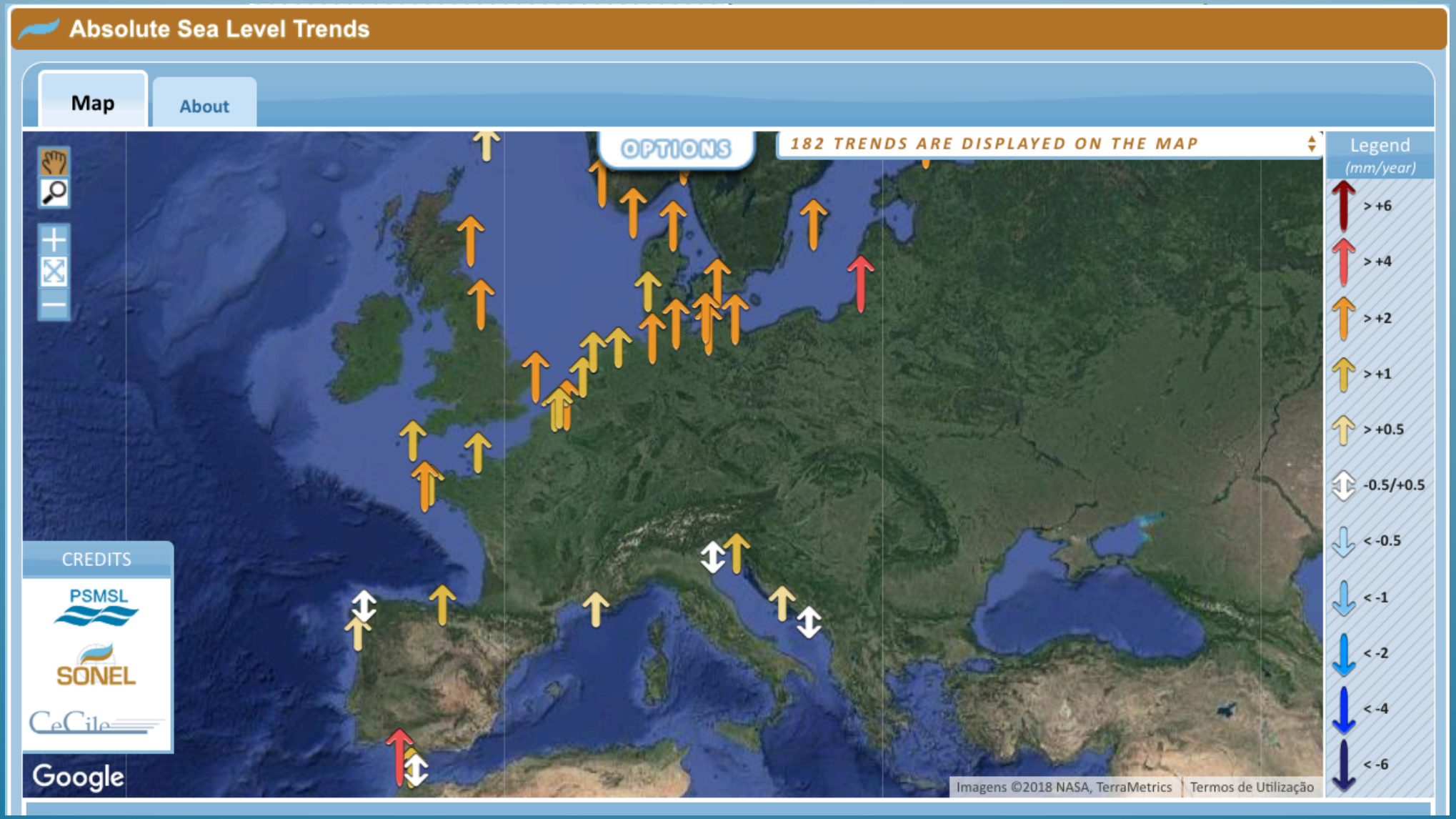
Combined velocity : 5.90 ± 0.76 mm/

GPS velocity : 4.55 ± 0.59 mm/year

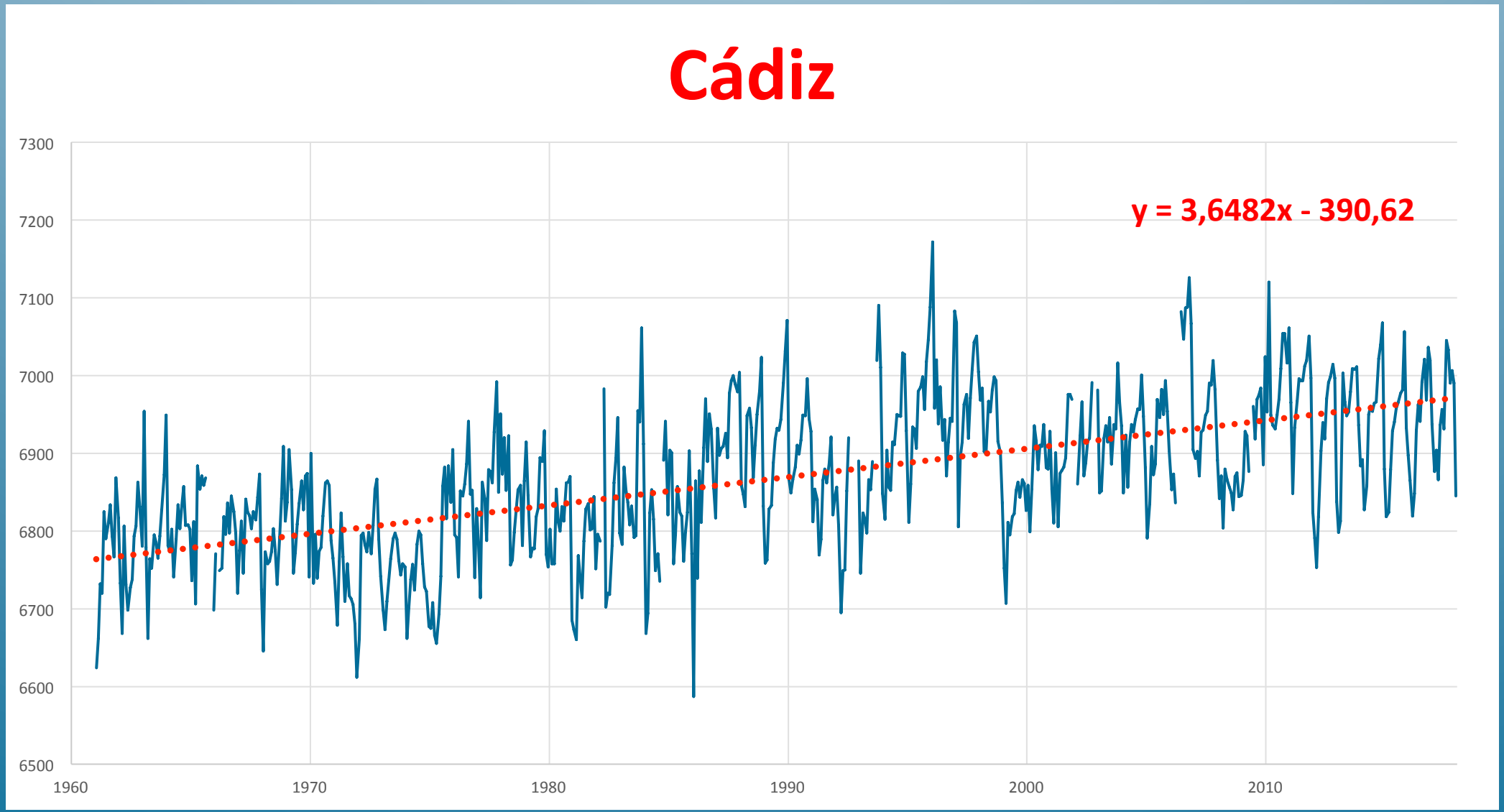
Tide gauge velocity : 1.35 mm/year

Selected period : 1960 >>> 2013

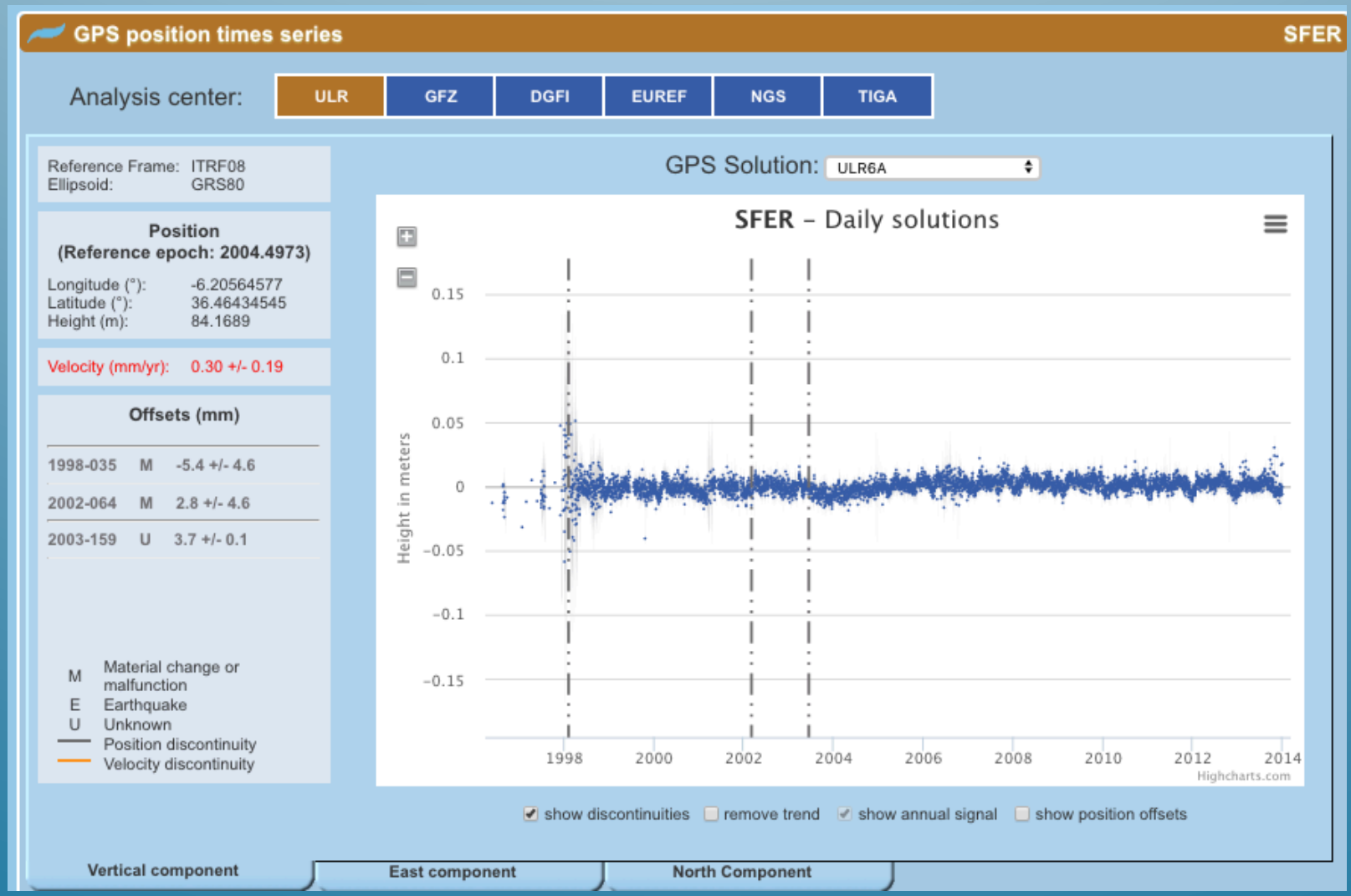
“Absolute” sea level trends in Europe: 2 red arrows Cádiz and Klaipeda



Cádiz: trend = 3,6 mm/yr.



GPS data: it shows stability



But the GPS is more than 10 km away from the used tide gauge!

Station summary

ype acronym :	SFER
ude :	36.46434504
tude :	-6.20564614
led date :	1995-12-18
mmissioned date :	
try :	SPAIN
	CADIZ
n status :	active (green)
nce to Tide Gauge (m) :	10311
es Nr.:	13402M004
n operator:	Unknown Manage this station
ke station form :	sfer_20180626.log (current) View

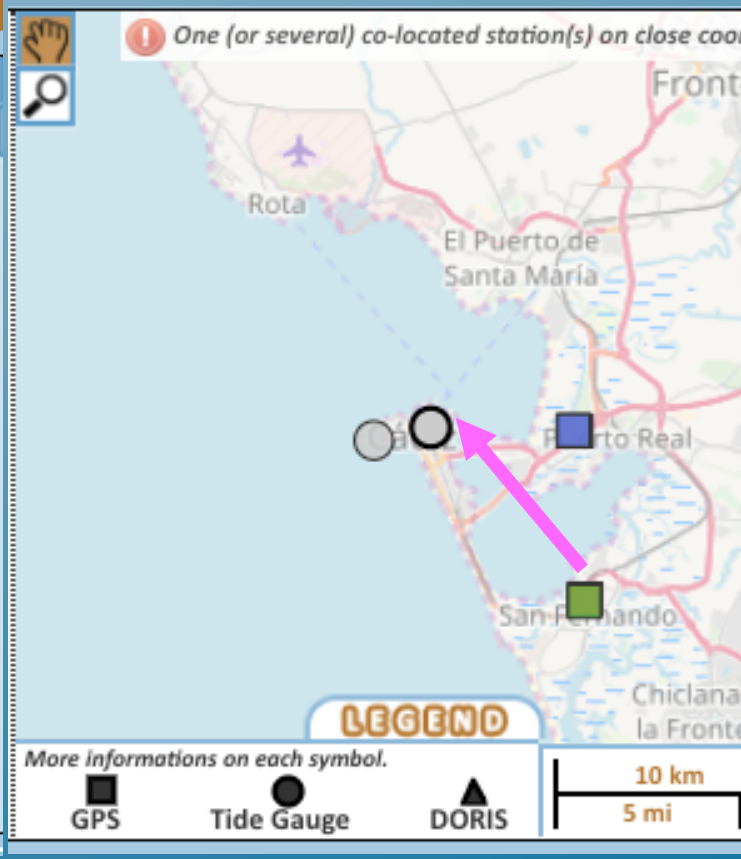
CADIZ III (SFER)

Combined velocity : 4.12 ± 0.54 mm/year

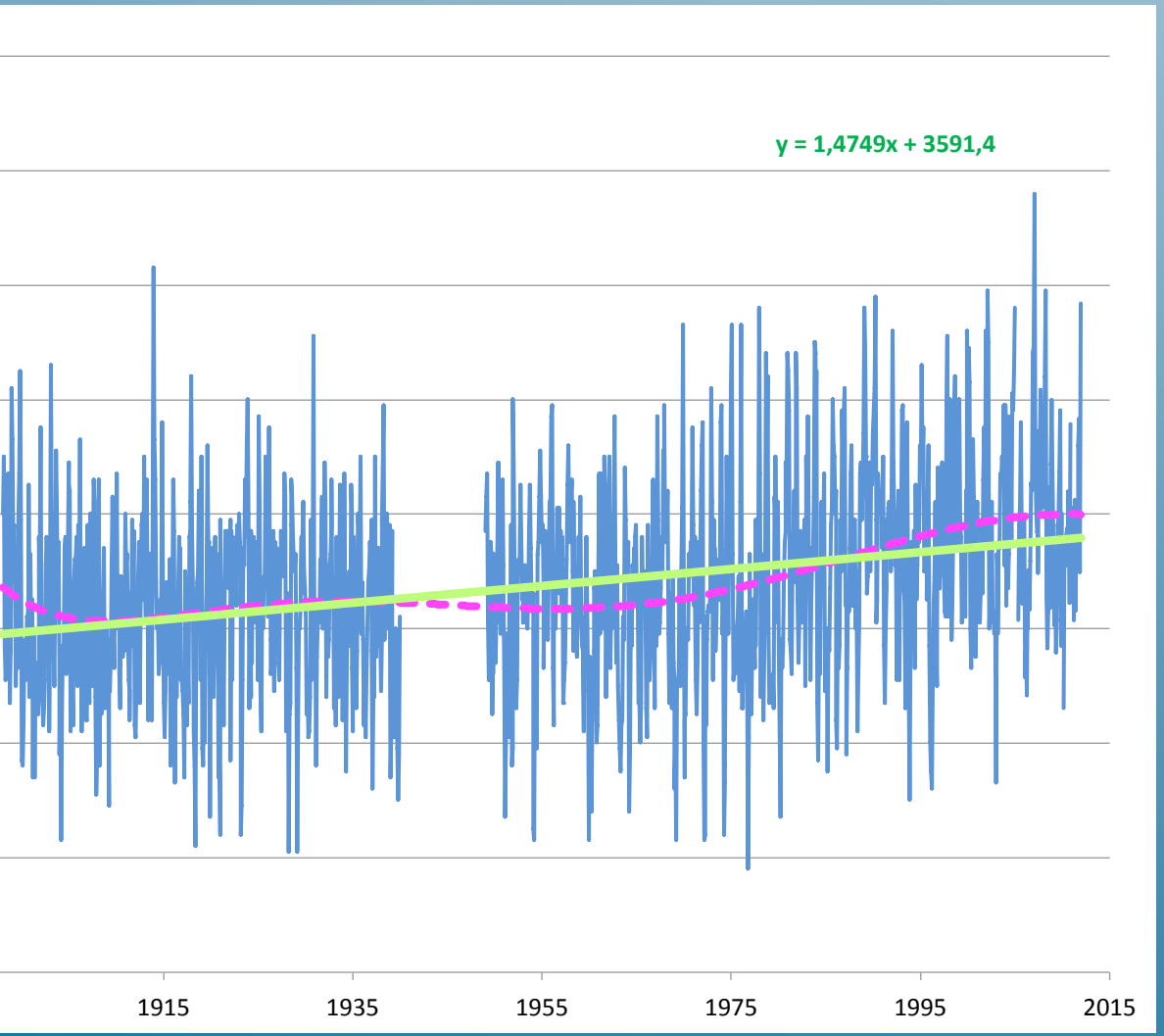
GPS velocity : 0.30 ± 0.19 mm/year

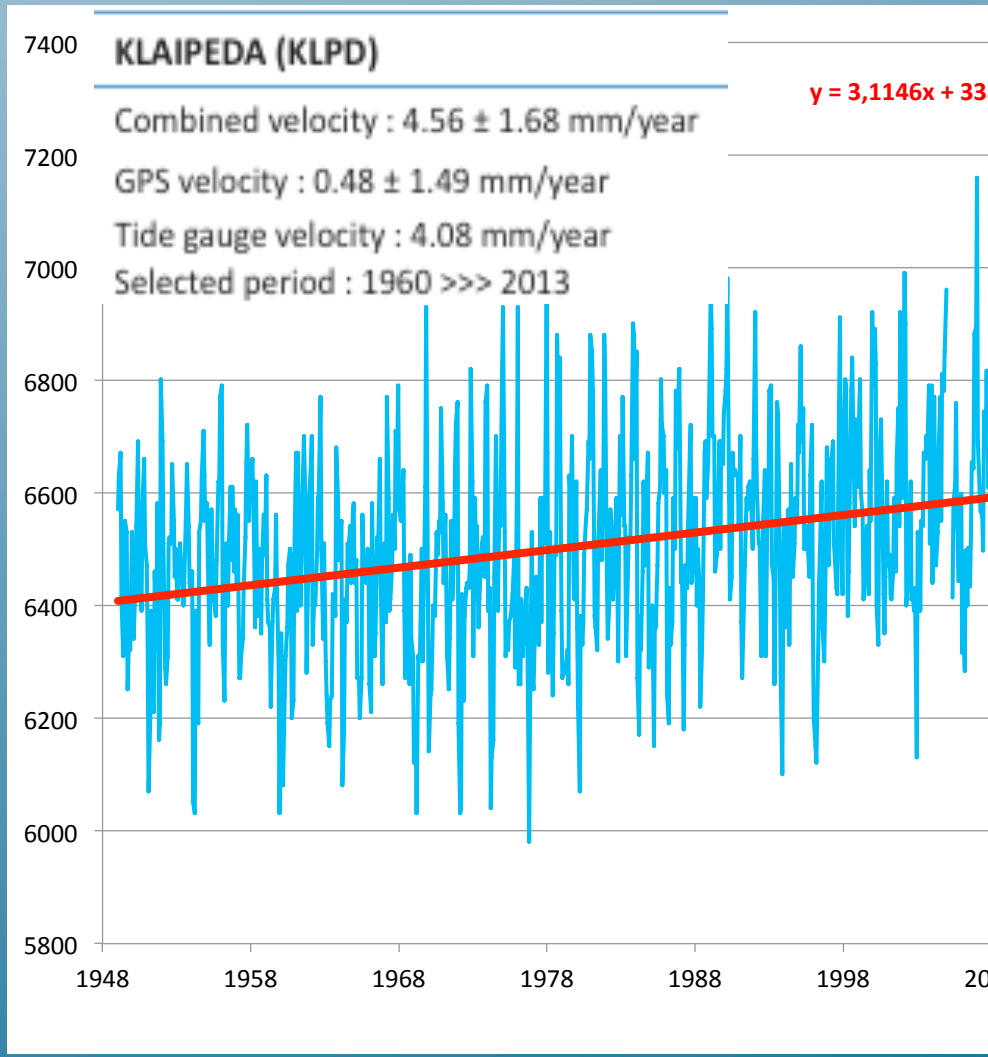
Tide gauge velocity : 3.82 mm/year

Selected period : 1960 >>> 2013



LAIPEDA (Lithuania): a longer series gives a muc lower trend





KLAIPEDA (Lithuania): Not reliable GPS data

PS position times series KLPD

alysis center: ULR GFZ DGFI EUREF NGS TIGA

nce Frame: ITRF08
d: GRS80

Position
erence epoch: 2004.4973)
de (°): 21.11888454
e (°): 55.71535521
(m): 42.7464

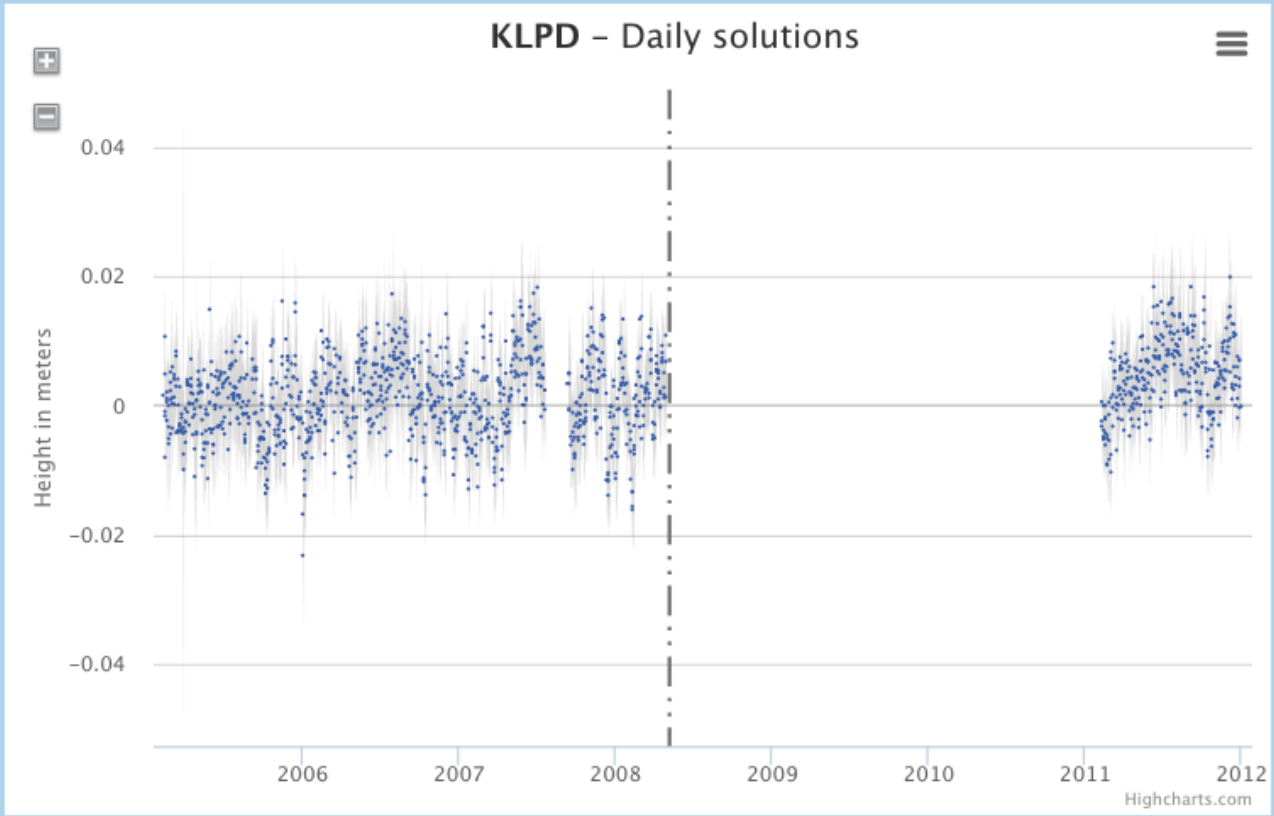
y (mm/yr): 0.48 +/- 1.49

Offsets (mm)

25 M 2.8 +/- 0.1

Material change or malfunction
Earthquake
Unknown
Position discontinuity
Velocity discontinuity

GPS Solution: ULR6A



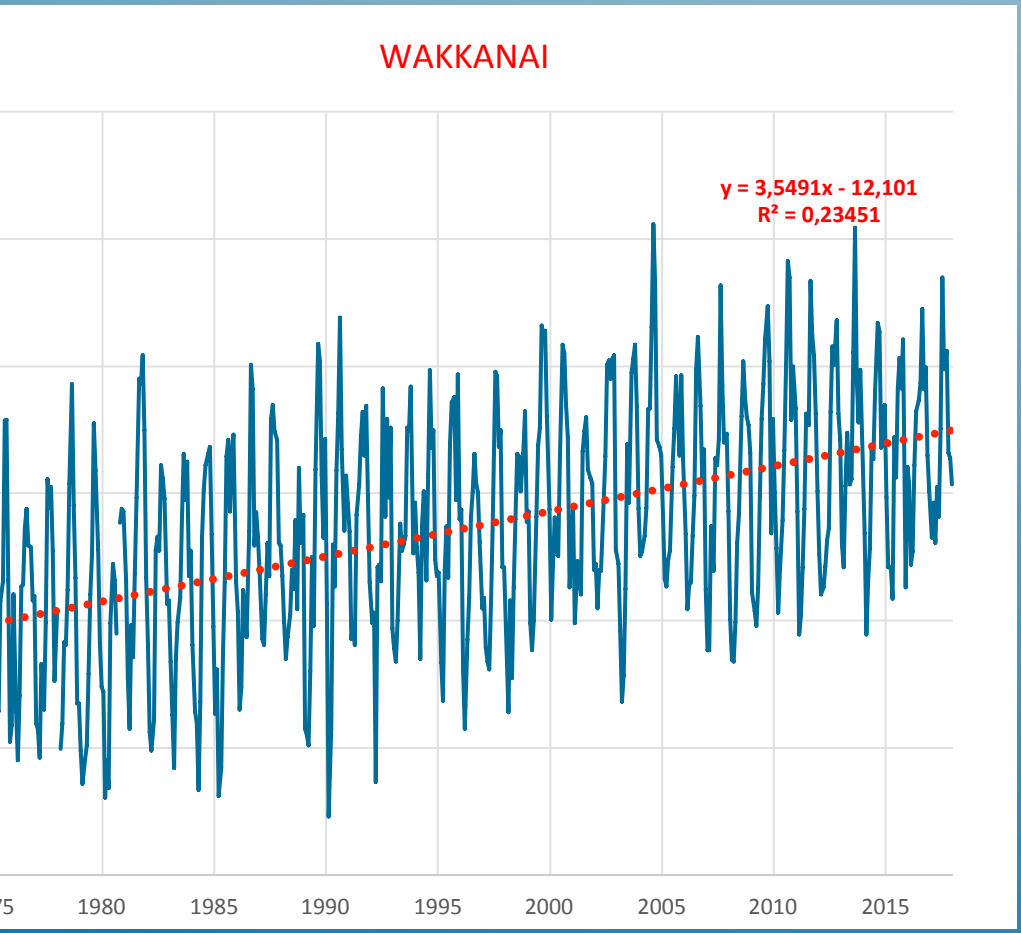
show discontinuities remove trend show annual signal show position offsets

ertical component East component North Component

KLAIPEDA (KLPD)

Combined velocity : 4.56 ± 1.68 r
GPS velocity : 0.48 ± 1.49 mm/ye
Tide gauge velocity : 4.08 mm/ye
Selected period : 1960 >>> 2013

WAKKANAI: Here we have a sea level rise and also apparently uplifting... It is the only puzzling situation with *ca.* 5mm/yr. "absolute" trend



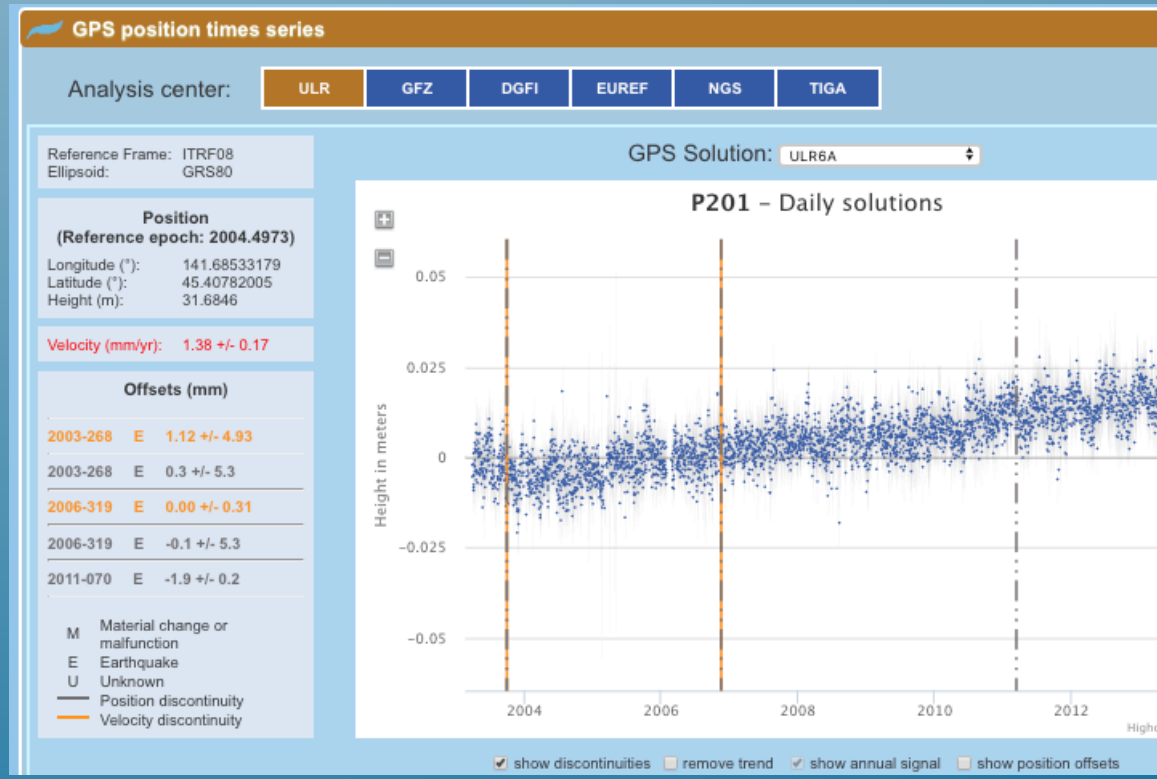
WAKKANAI (P201)

Combined velocity : 5.07 ± 0.30 mm/year

GPS velocity : 1.38 ± 0.17 mm/year

Tide gauge velocity : 3.69 mm/year

Selected period : 1960 >>> 2013



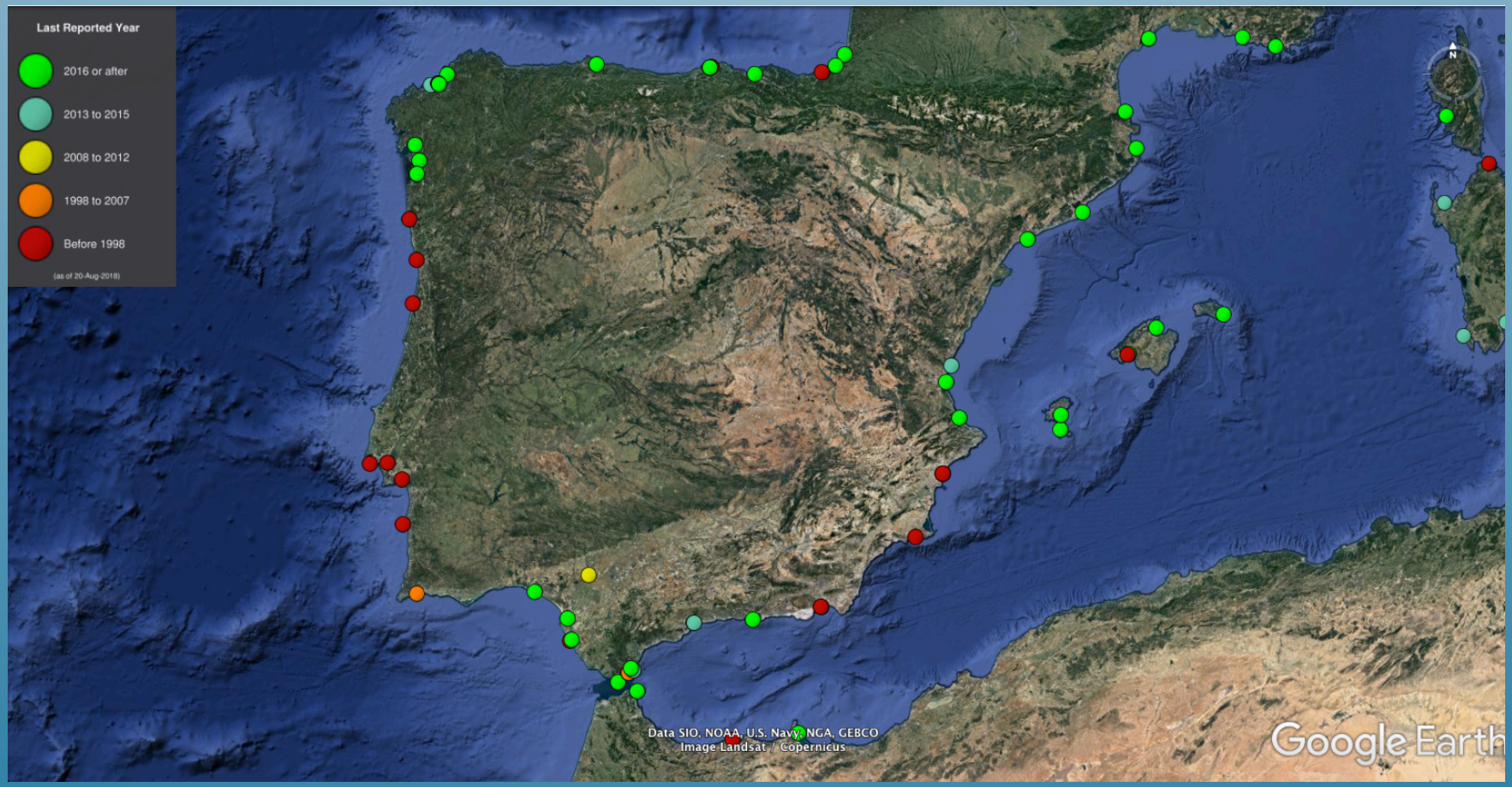
ounting on land movements, only 7 ations above 4mm/year

he red > 4 mm and
rown > 6 mm year stations
ombined Velocity (cv):

AKUTAT (ALASKA): cv=10,09 mm, 10 km from tide gauge
NTOFAGASTA (CHILE): sea level is going down, a big uplift (31mm/yr.)
ALERMO (ARGENTINA): cv = 2,69 +/- 0,55; 7 km from tide gauge (why in red?)
ARADAY (ARGENTINA ISLANDS): sea level trend: 1,23; very irregular GPS data
ADIZ III (SPAIN): 10 km GPS from tide gauge: the GPS stability is erroneous
LAIPEDA (LITUÂNIA): GPS data not reliable
/AKKANAI (JAPAN): a possible 5mm/yr. trend. The only ONE IN THE WORLD

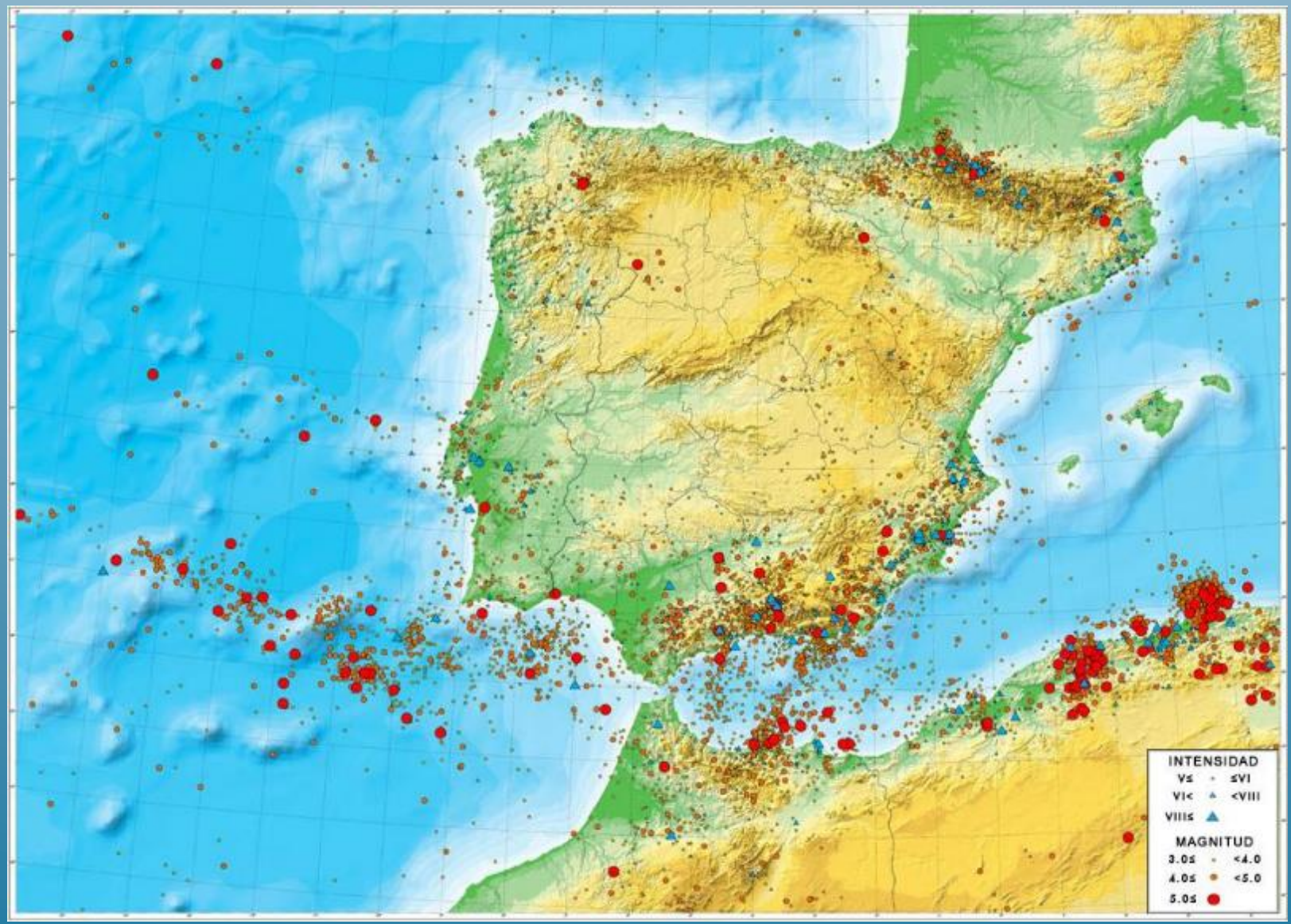
What about Iberia?

Many PSMSL stations are not updated

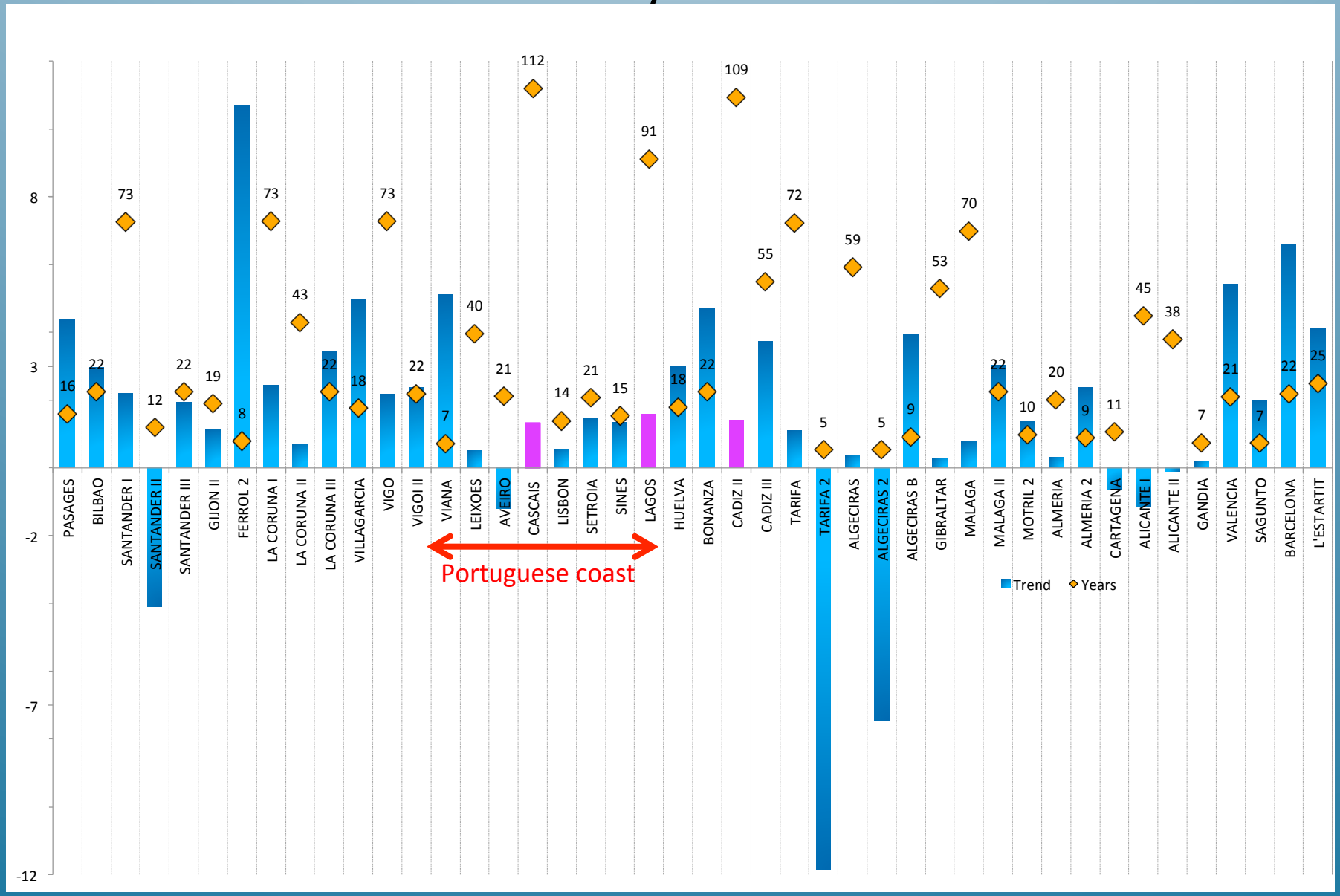


Neogene compression

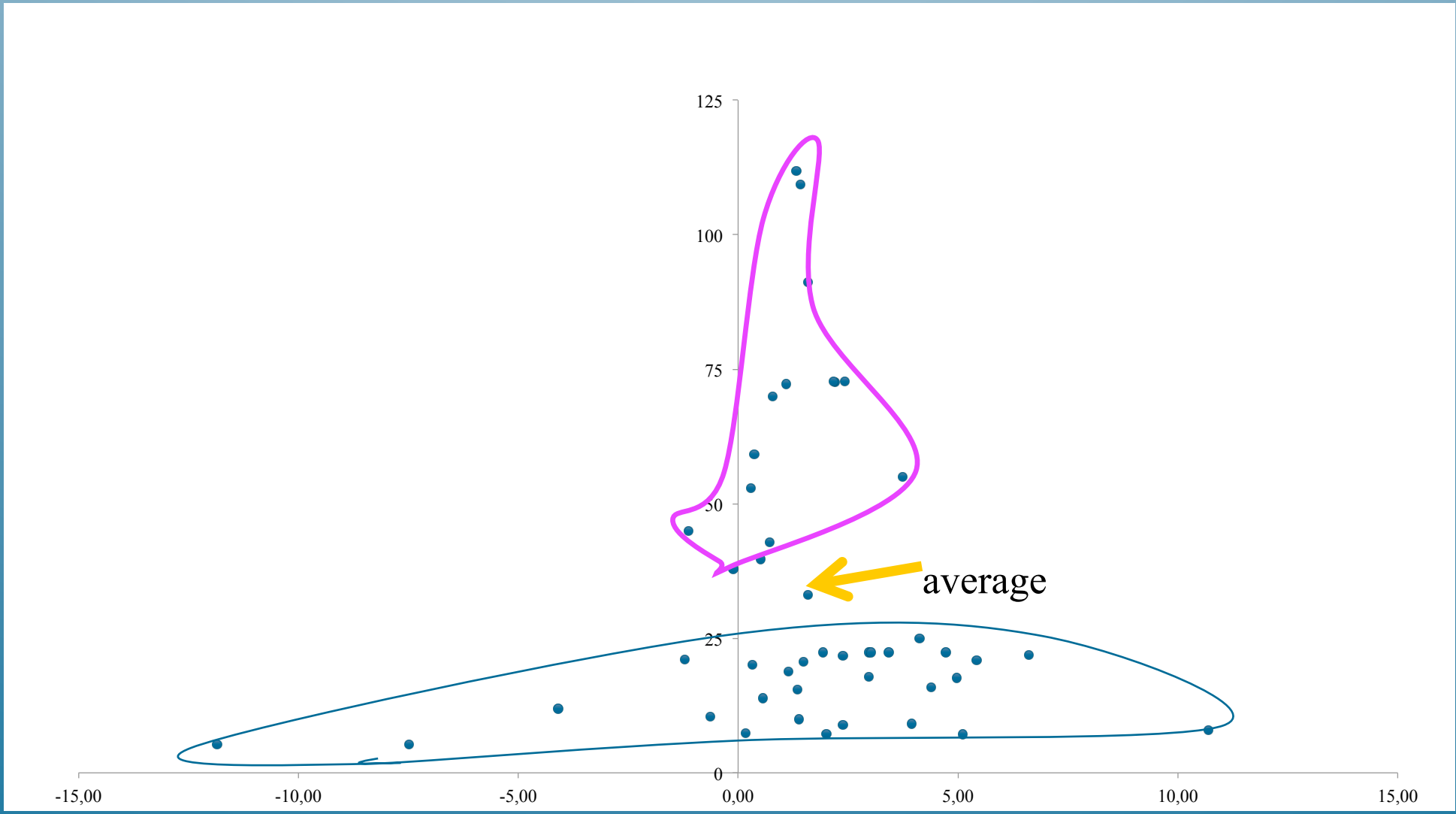
Earthquakes in Iberia: active recent tectonics



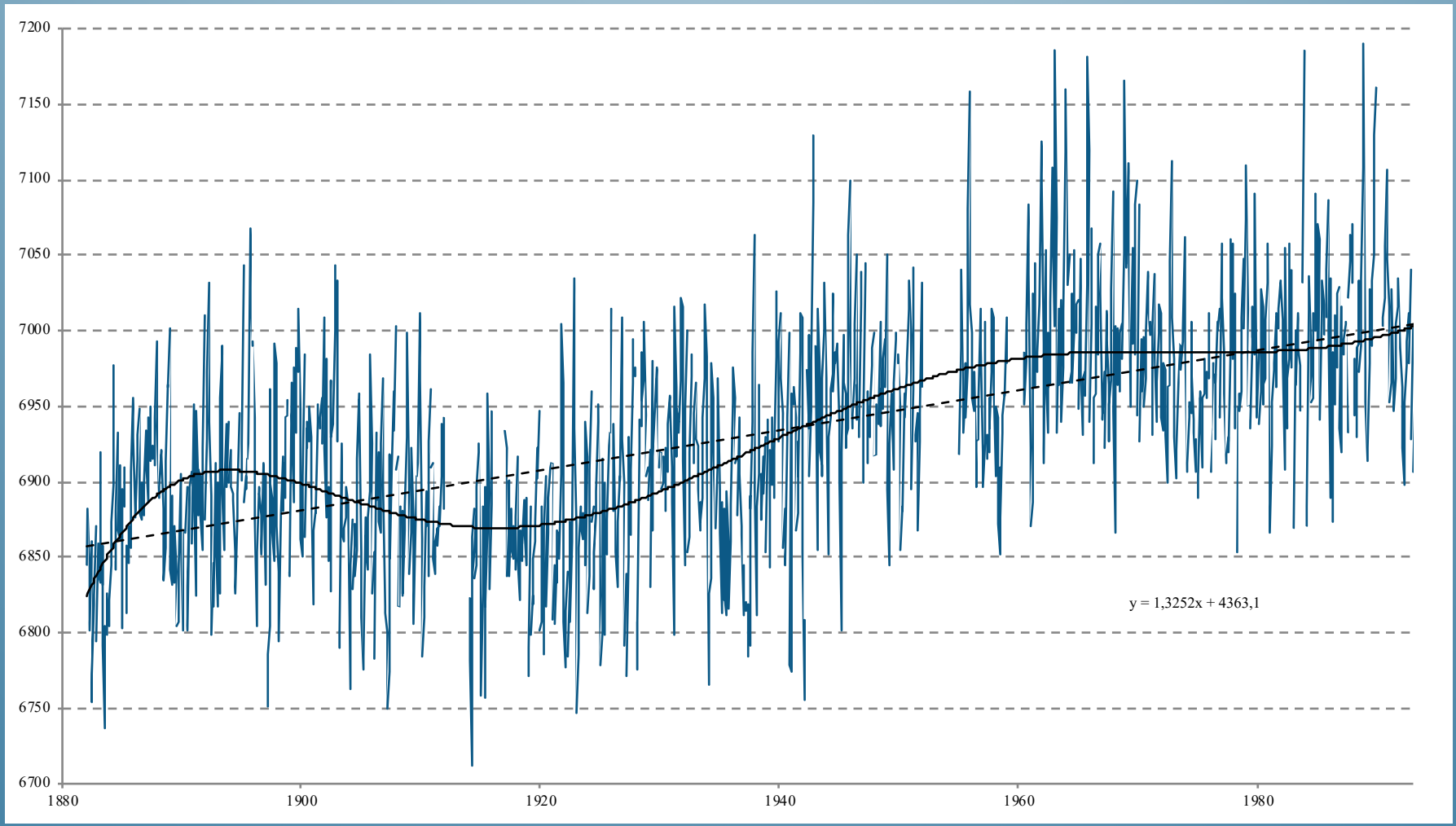
peria: trends *vs.* length of series: very irregular at rece tectonic areas: Pyrenees and Baetics



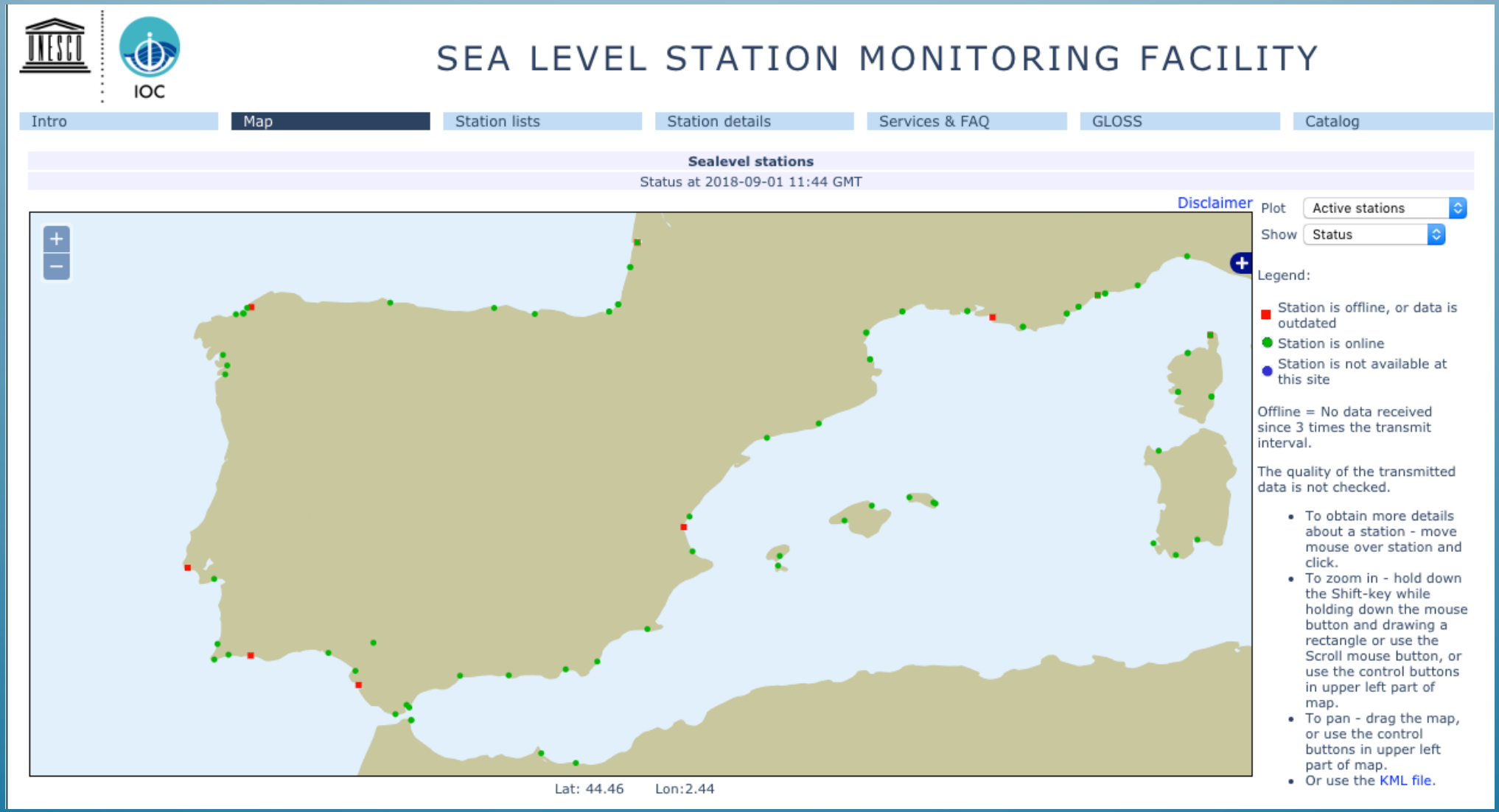
peria, in short series: great irregularities in the trends



Cascais: PSMSL data



Sea level station monitoring facility



Secular variation of sea level at Cascais