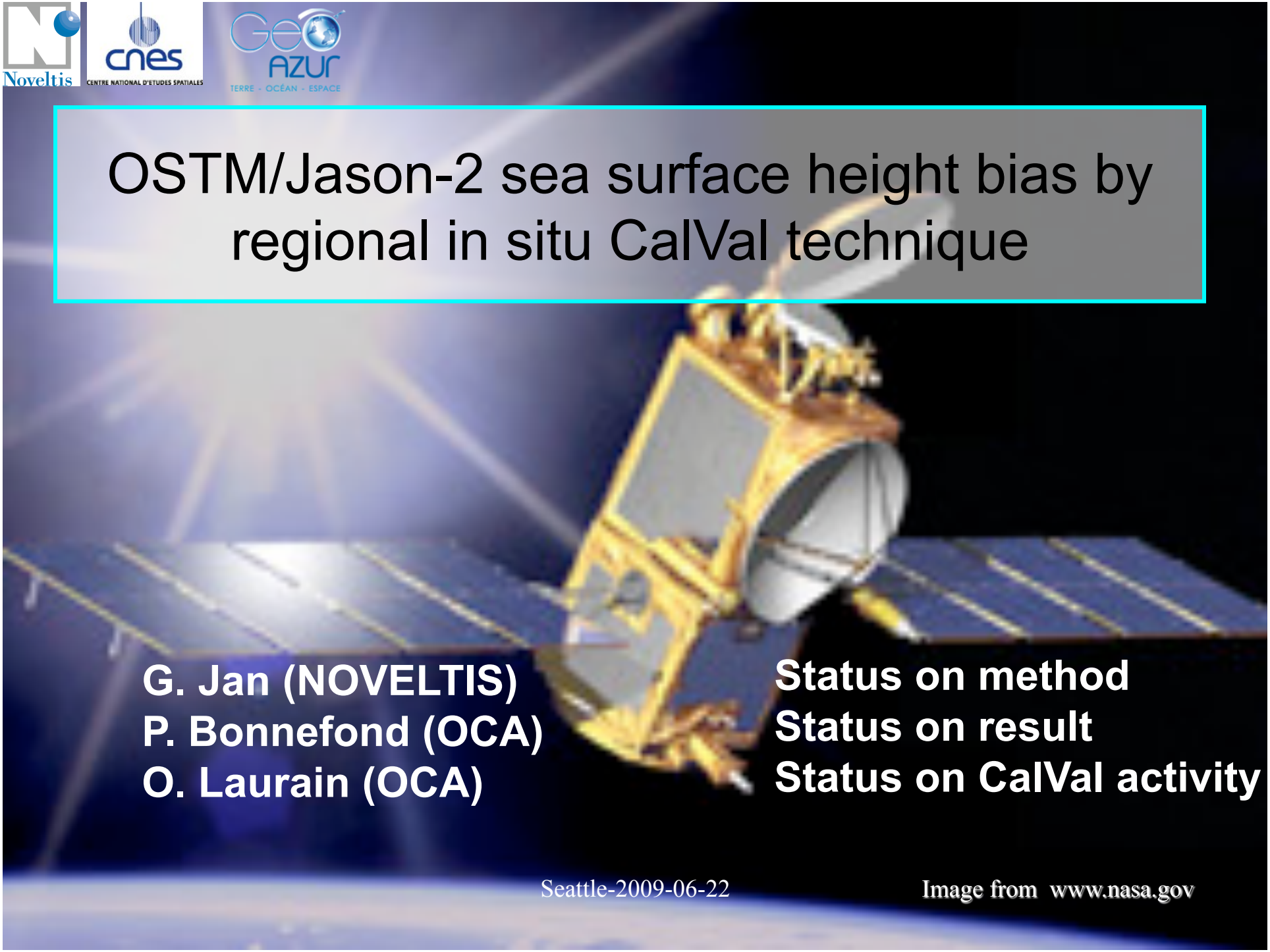
OSTM/Jason-2 sea surface height bias by regional in situ CalVal technique



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O. Laurain (OCA)

Status on method
Status on result
Status on CalVal activity

Seattle-2009-06-22

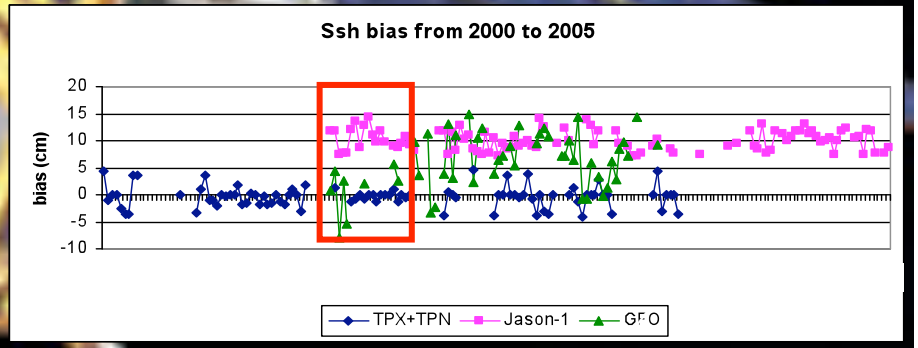
Image from www.nasa.gov

One word on Sea surface height biais context

- In situ calibration:
  - Regular long term control of SSH measure : independent way from altimetry
  - Interest to increase the number of usable altimeter data
- Using a set of satellites to propose an inter calibration of altimeter missions.
- Extend the principle of the in situ calibration by using satellite passes located far from the CalVal site.

Direct application => multi missions, multi passes computation of absolute SSH bias => continuity between altimetry missions (Oststt-2006, Venice)

ante	2002	2003	2004	2005	2006/ …	
-0.4 cm (rms=1.9cm)						Topex-Poseidon
7.2 cm (rms=4.6cm)						GFO
45.4 cm (rms=4cm)						ENVISAT
9.5 cm (rms=1.5cm)						Jason-1



+

Envisat B= 45.4cm , rms=4cm (merge method)
B= 43.3cm, rms=7.3cm Ajaccio
cycles 12 to 31

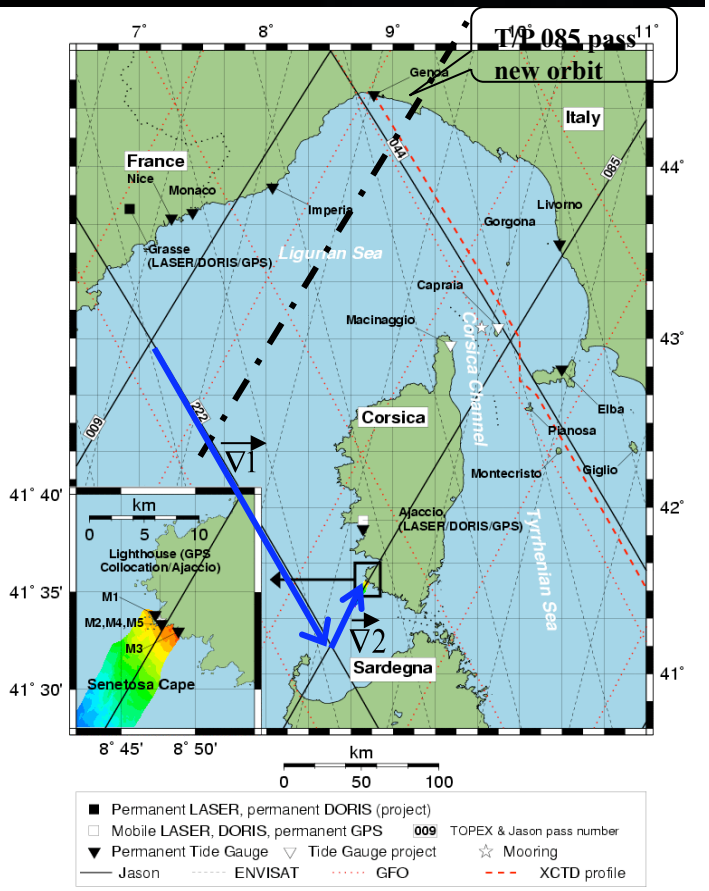
In situ Method : « Zenithal » pass and offshore passes

- **Increasing the distance** between dedicated site and pass sets the problem of the measures co-localisation.
  - Increase the measures density
  - Two main effects : the geoid slope and the ocean dynamics.

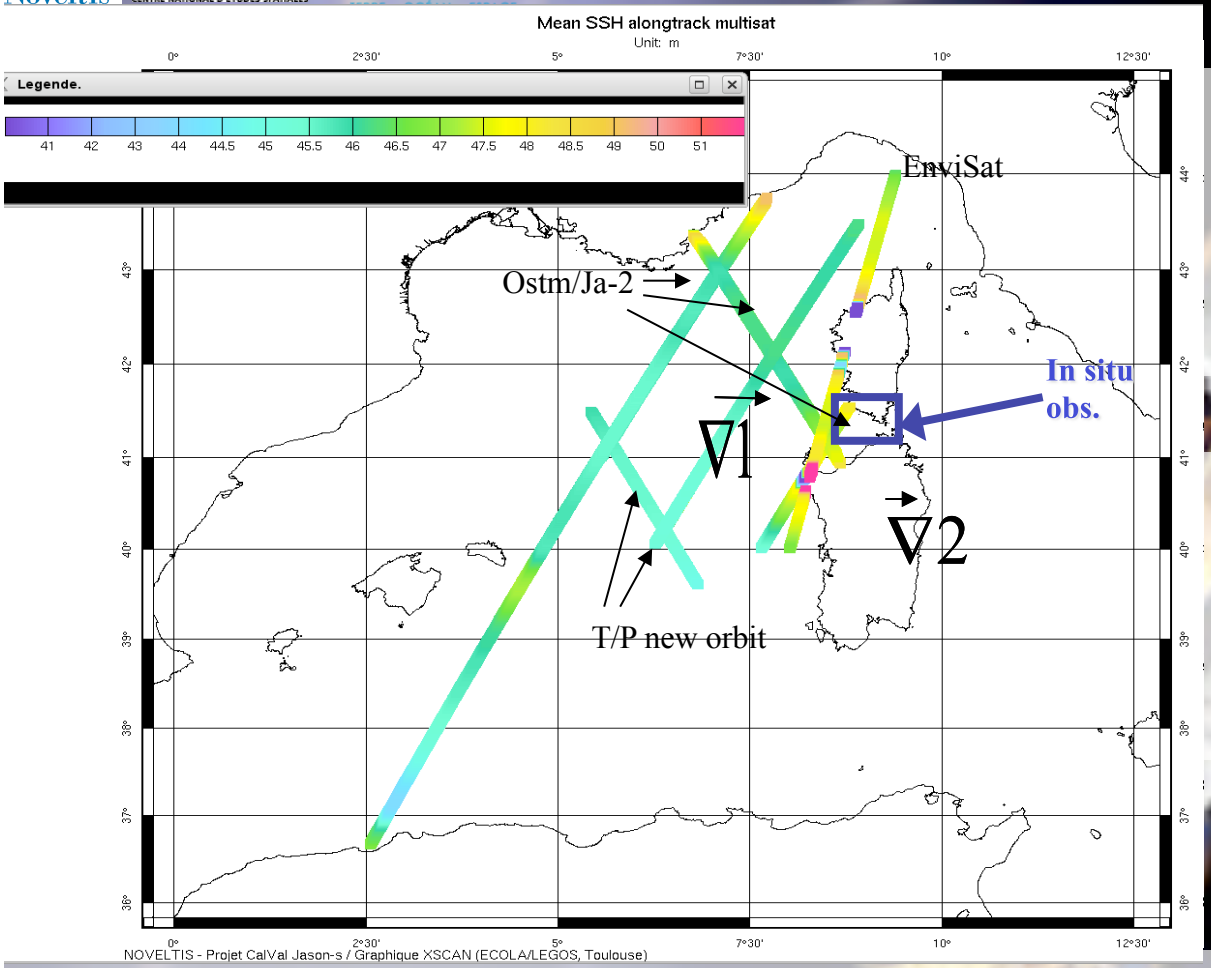
- **The method** brings back to the CalVal site, a distant altimetric ssh by following a path defined by the succession of known mean passes, taking into account of the spatial gradient due to the marine geoid ($\vec{\nabla}_z$ on map)

- **Ocean dynamics differential effect** : Sea level difference, due to ocean dynamics, between cross-over points and tide gauge point

- **Method is applicable to any altimeter satellite, assuming that there is an accurate mean profile available over the CalVal site to connect offshore altimeter data with in situ data.**



In situ method : « Zenithal » pass and offshore passes



❖ How the merged method (regional + coastal) can improve the sea surface height bias estimation and reinforce it statistically?

❖ 1 CalVal site = possible calibrations of N1 satellites (Jason1,2, Topex - Poseidon, GFO, ENVISAT) and N2 passes for 1 satellite calibration

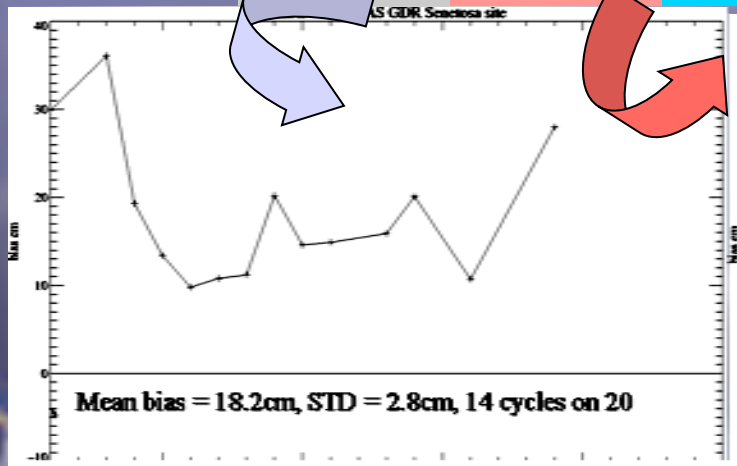
➢ The method makes possible ssh bias computation for several altimeters :

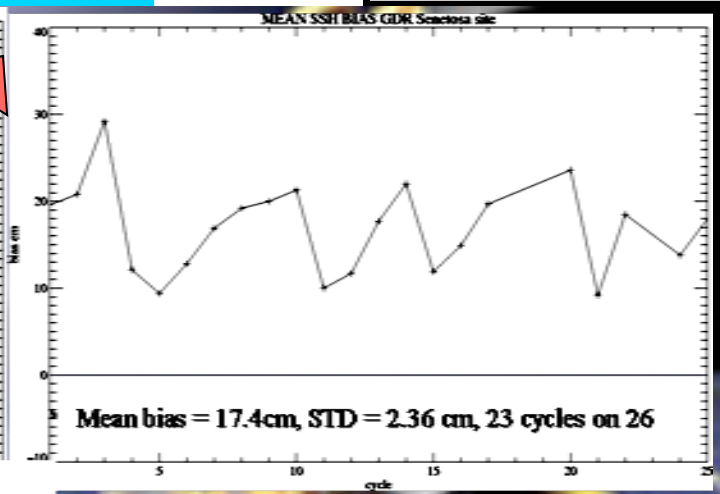
➢ OSTM/Jason-2, Jason-1 new orbit,T/P & GFO, ENVISAT, future altimeter missions (ssh bias referred to ellipsoid)

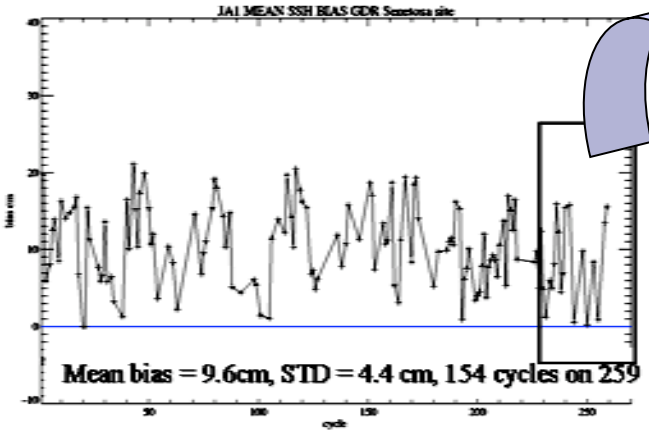
➢ Follow on : Multiply the calibration opportunities: SSH bias at ocean regional scale and error budget using this method

Results on Ssh bias

unit=cm	OSTM/JA-2				JA-1 GDR-c	
Pass n°	**85**	**222**	**9**	**MERGE**	**85**	**85**
ssh bias	18,2	17,4	16,5	17,4	10,3	9,6
std	2,8	2,4	2,6	2,3	4,3	4,4
cycles	14	23	19	23	15	154
% cy used	**70.0%**	88.5%	73.1%	**88.5%**	78.9%	59.4%
					cycles 239-259	cycle 1 to 259

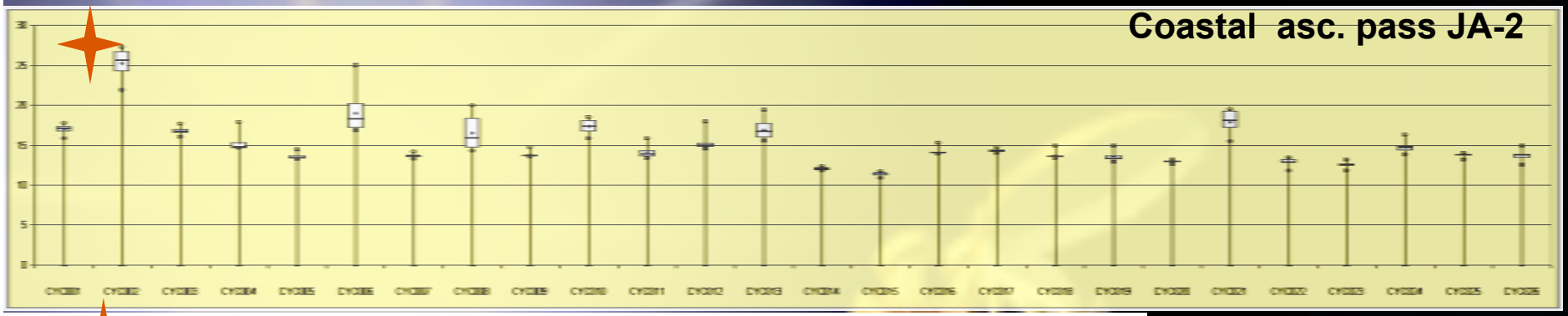


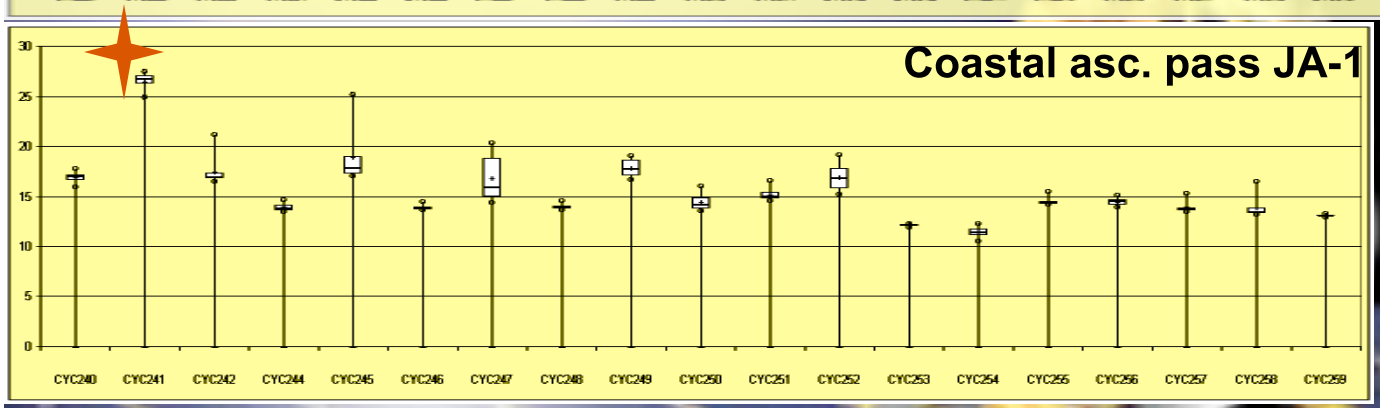


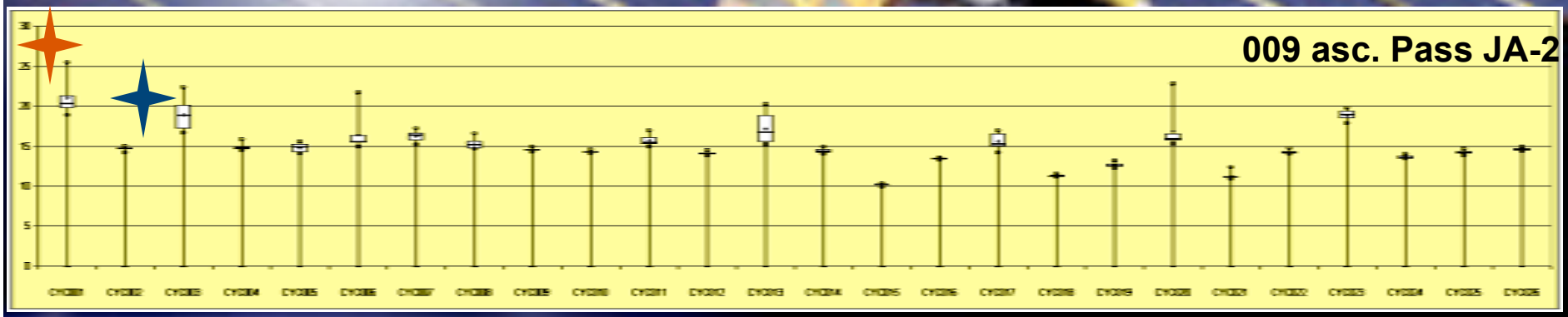


JA-1 bias= 10.3cm, std=4.3cm, 15 cycles on 20 (Ja1, ostm/Ja2 common period)

Sig0_ku (dB) Jason-1, Ostm/Jason-2 (JA-2)

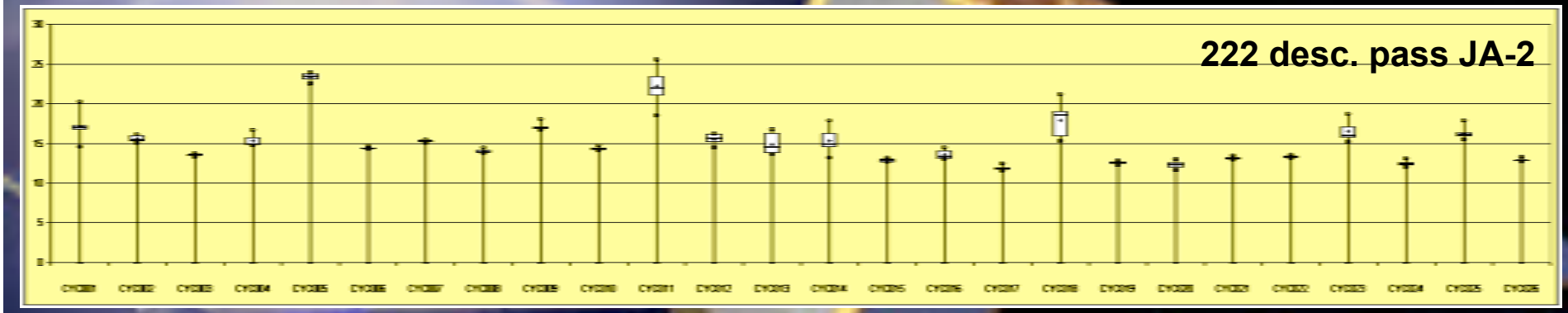




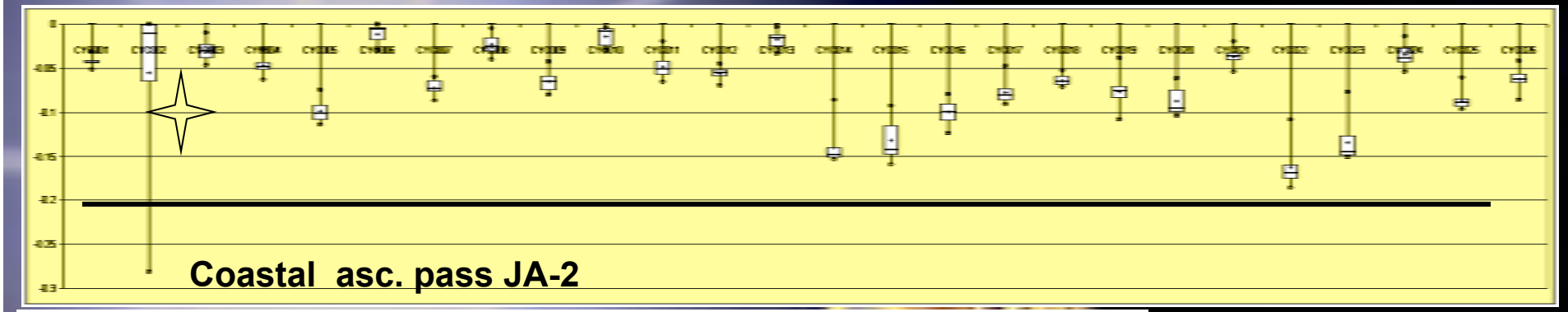


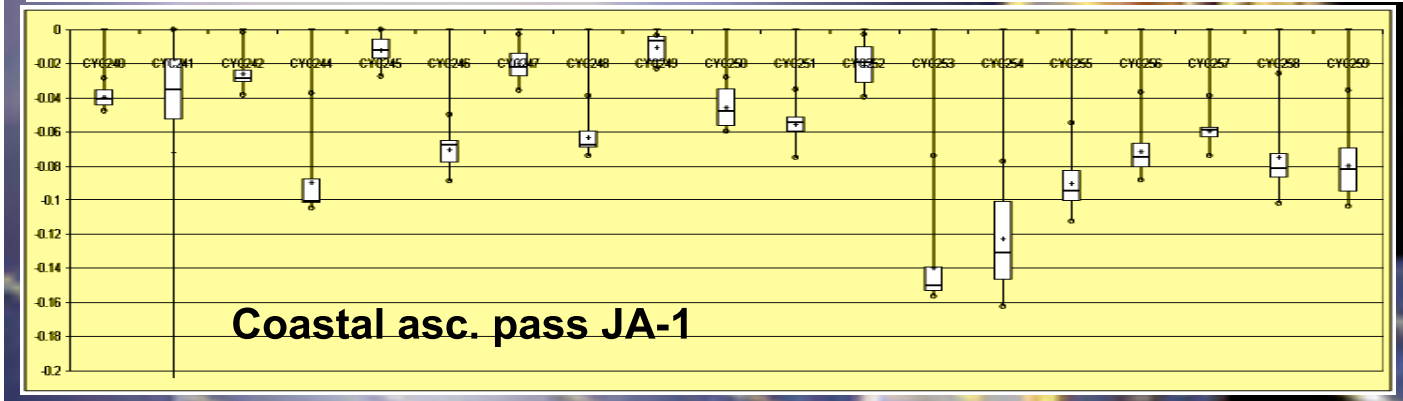
Sig0_ku (dB) OSTM/ Jason-2.

. Donc la diff sur ssb vient de swh ou vent. Nbre de cycles + complet

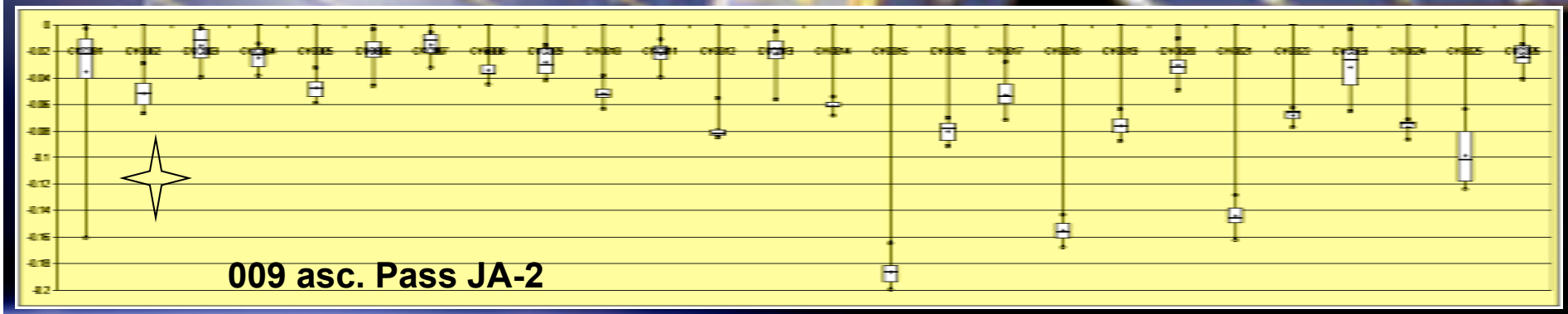


Ssb_corr (m) JA-1, Ostm/Jason-2 (JA-2)





Less dispersion on JA-2 mean value

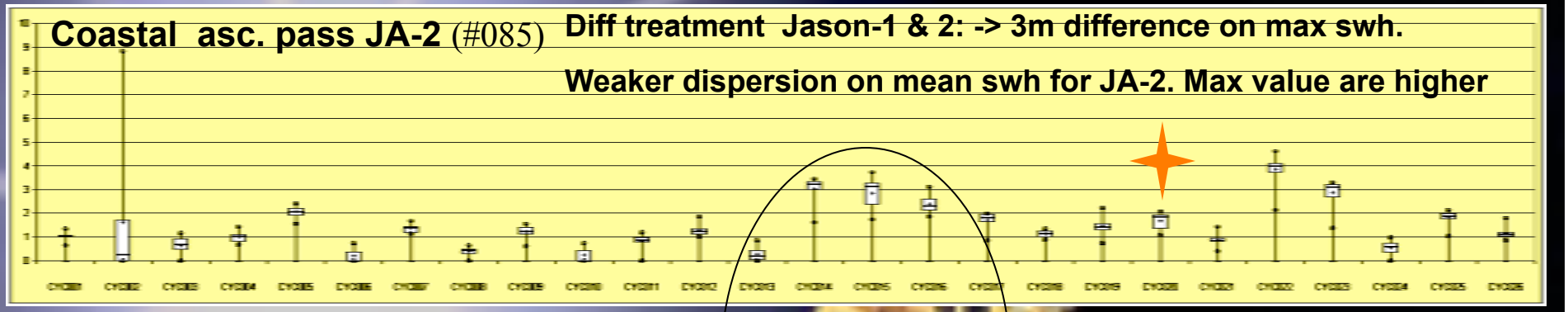


SWH (m) Jason-1, Ostm/Jason-2 (JA-2)

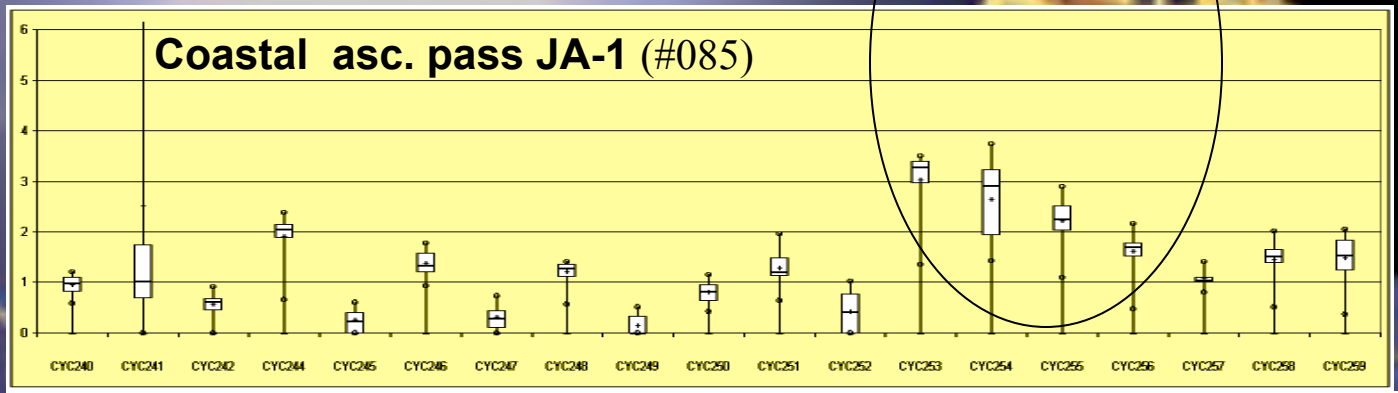
Coastal asc. pass JA-2 (#085)

Diff treatment Jason-1 & 2: -> 3m difference on max swh.

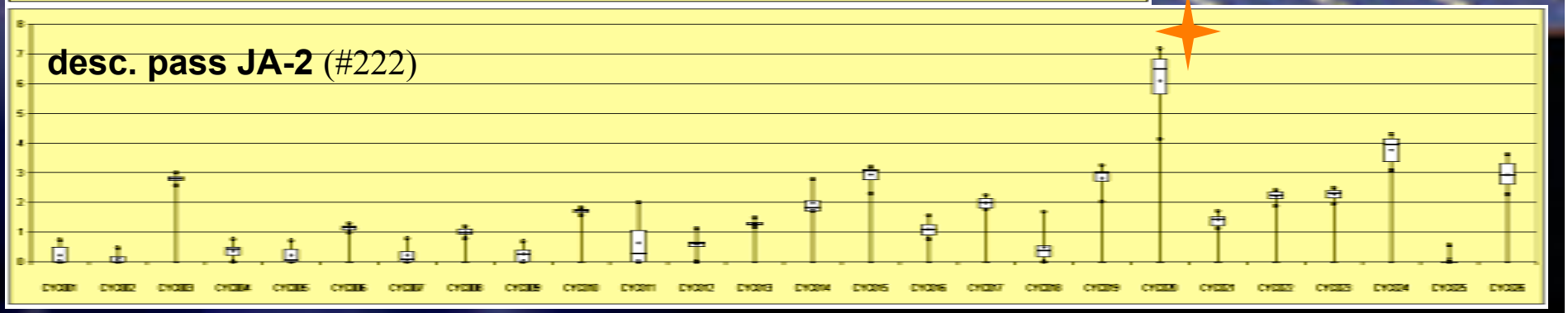
Weaker dispersion on mean swh for JA-2. Max value are higher



Coastal asc. pass JA-1 (#085)

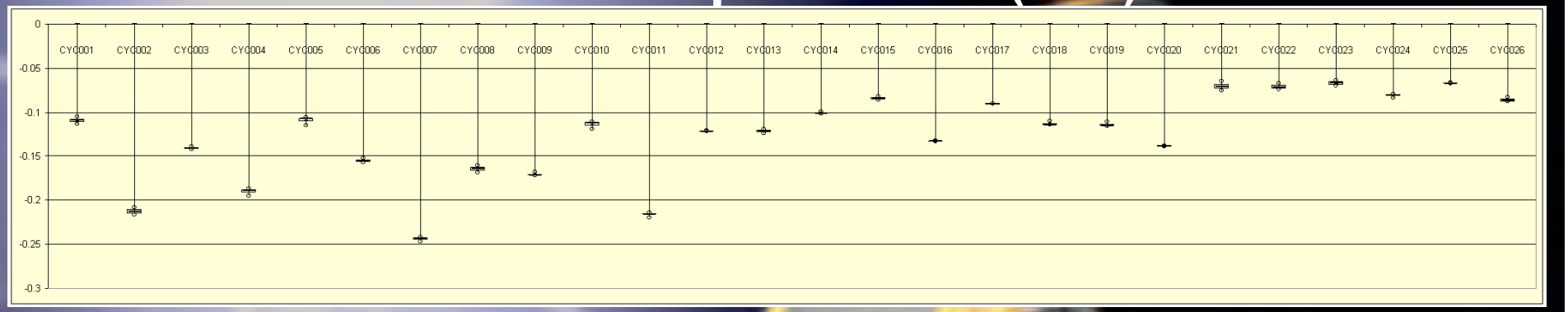


desc. pass JA-2 (#222)

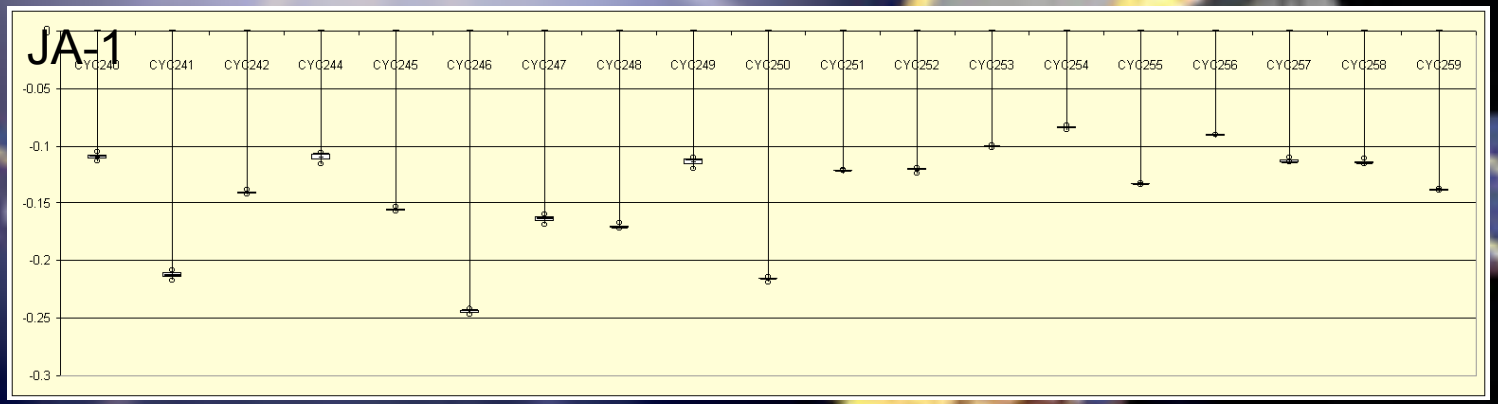


JA-2

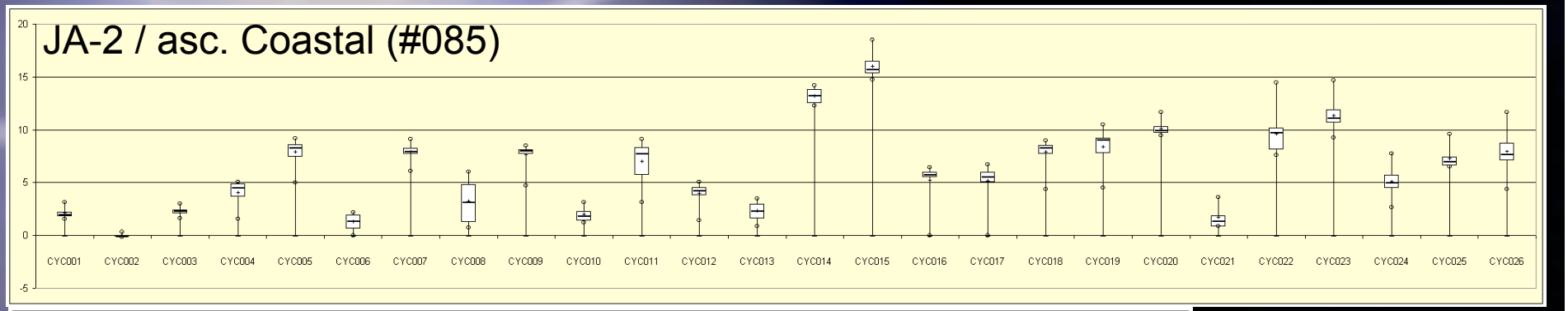
WetTropoCorr (m)

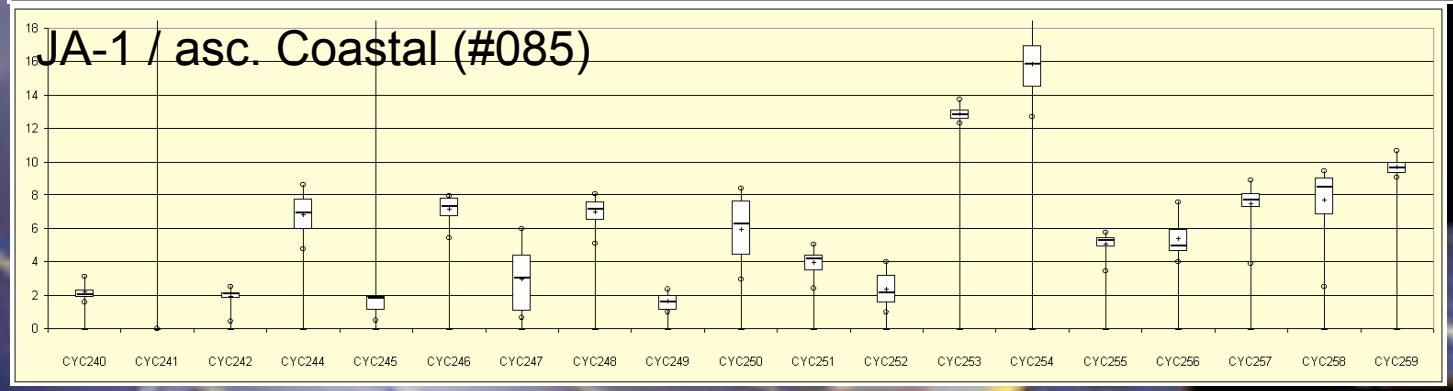


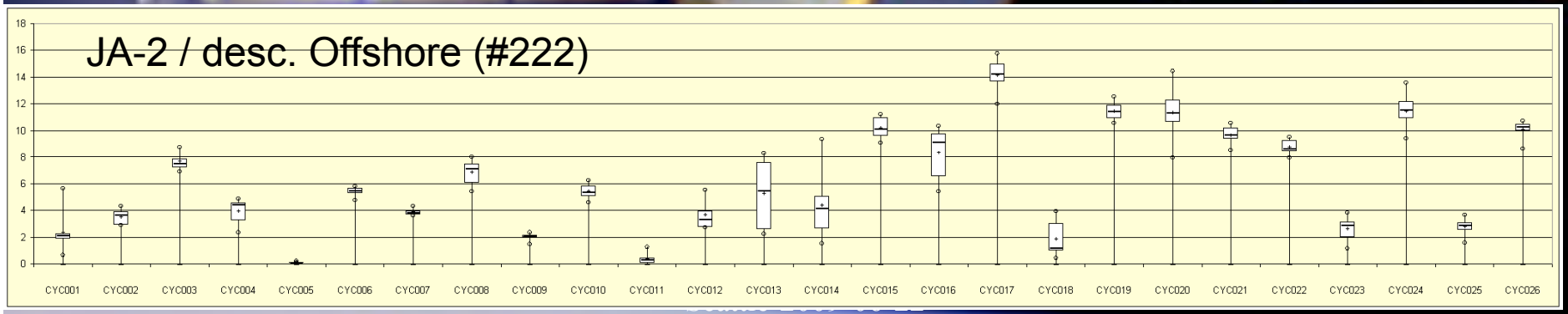
JA-1



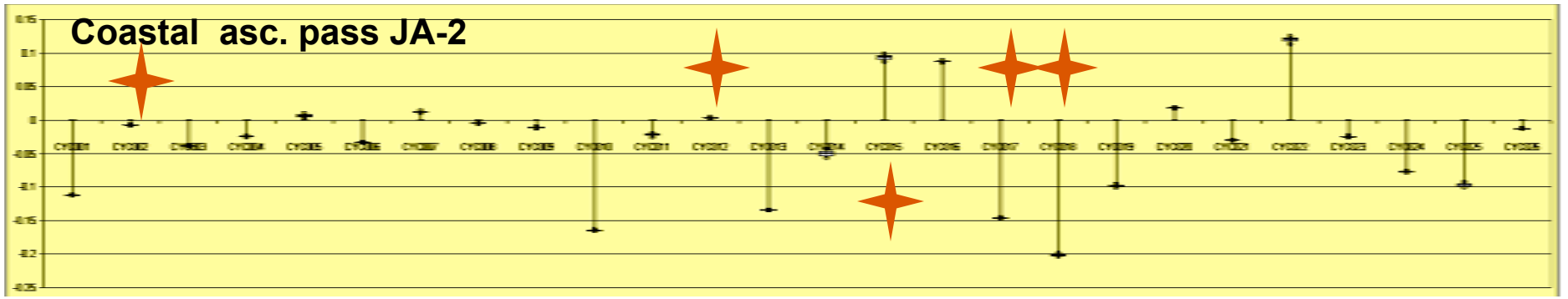
WindSpeedAlt (m/s)

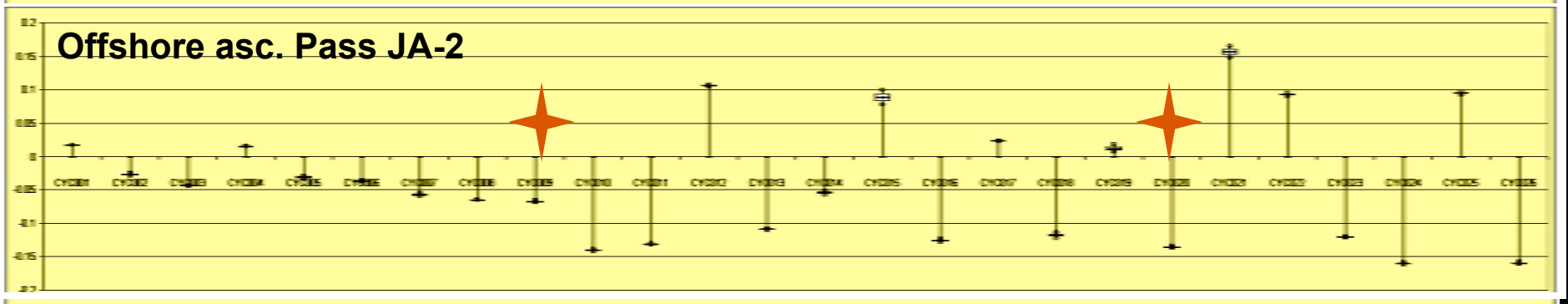


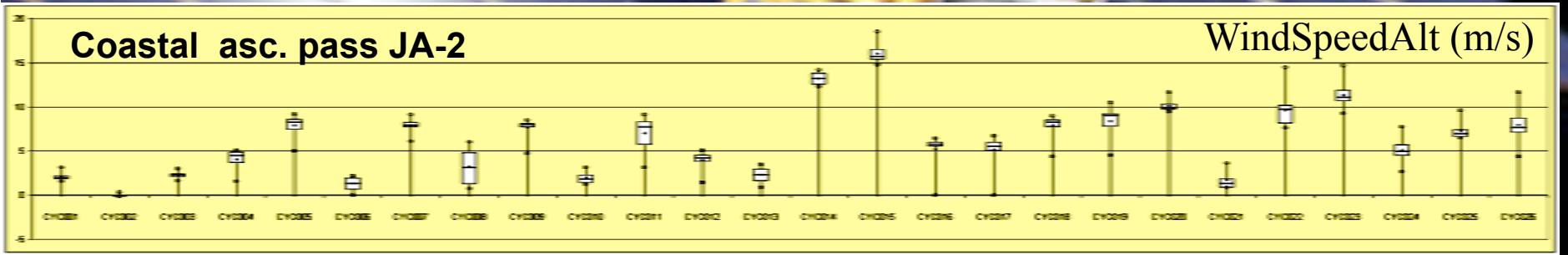


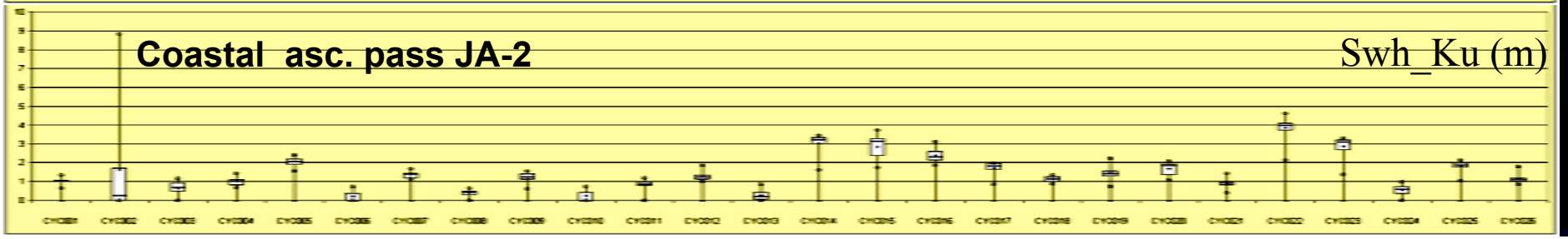


IBCorr (m)

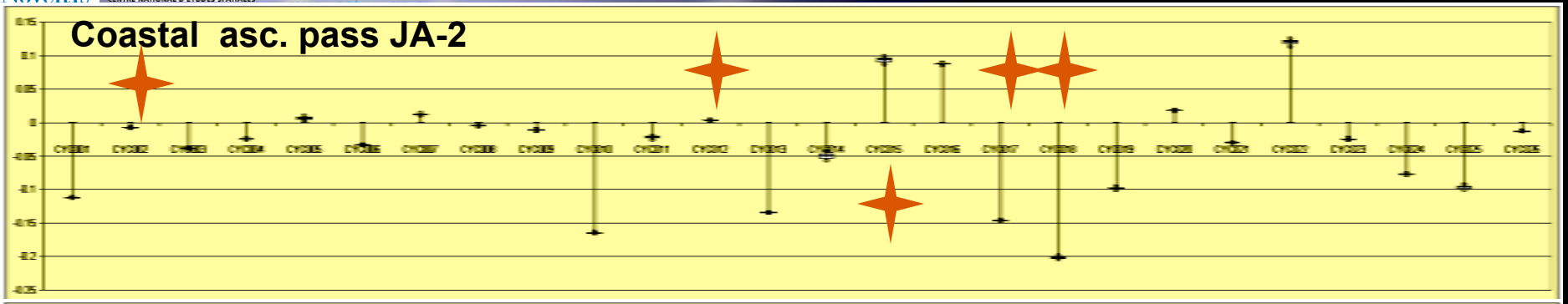

Coastal asc. pass JA-2

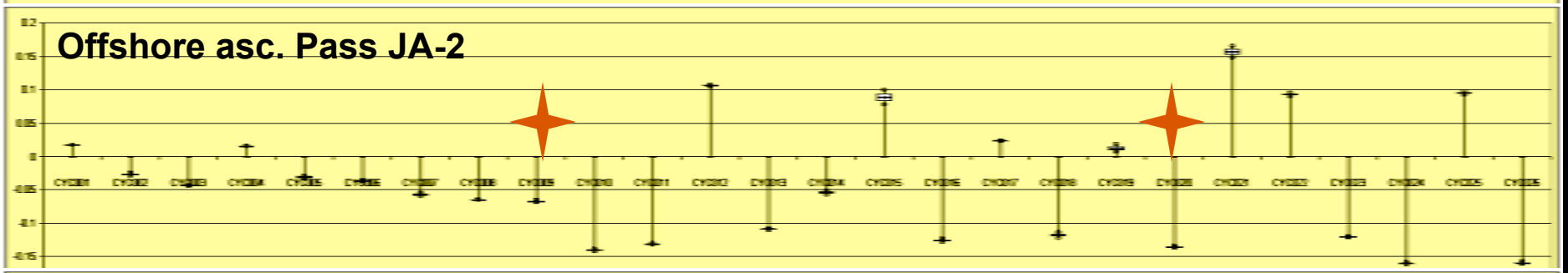

Offshore asc. Pass JA-2


Coastal asc. pass JA-2
WindSpeedAlt (m/s)

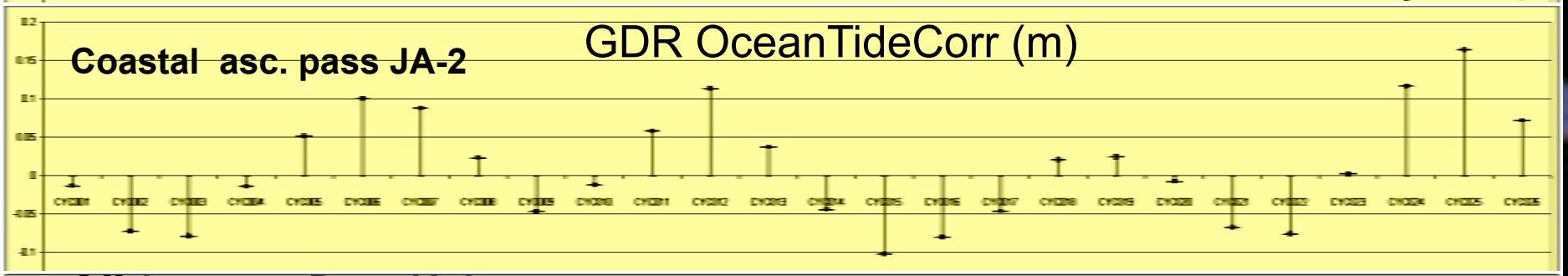

Coastal asc. pass JA-2
Swh_Ku (m)

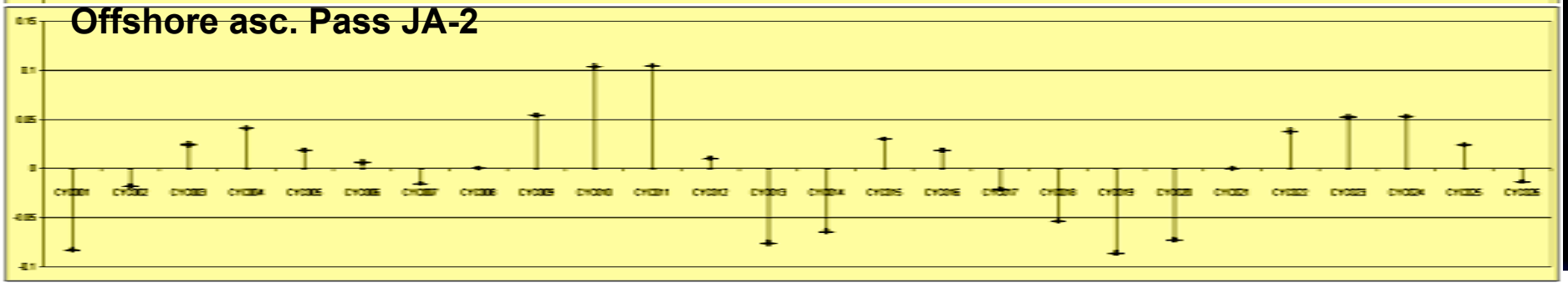
IBCorr (m), Ocean Tide Corr (m)



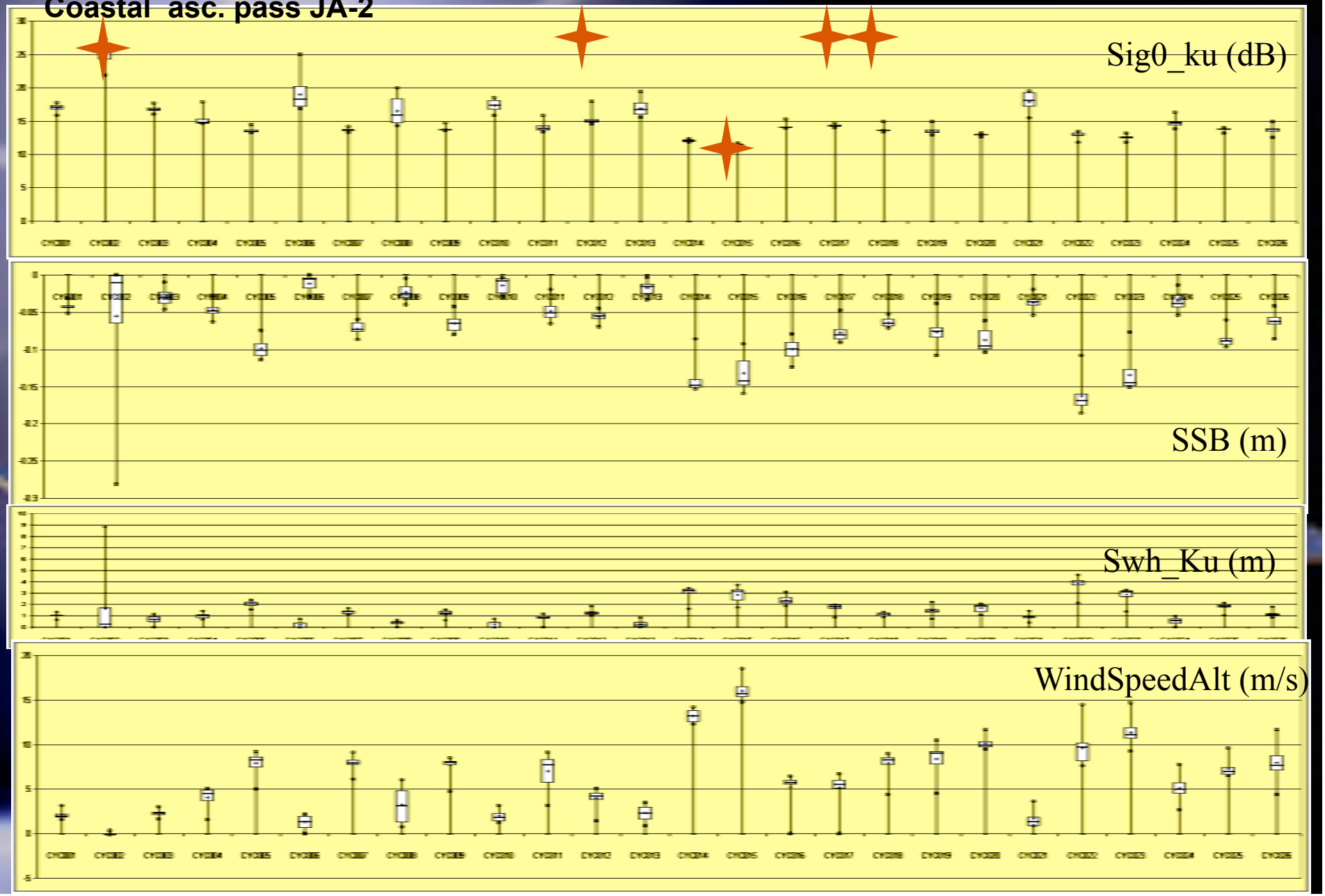


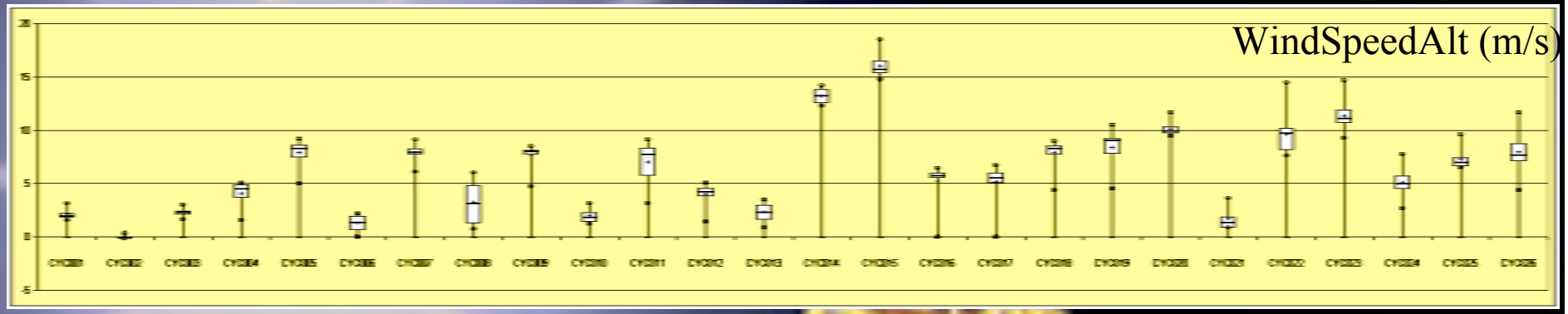
GDR OceanTideCorr (m)

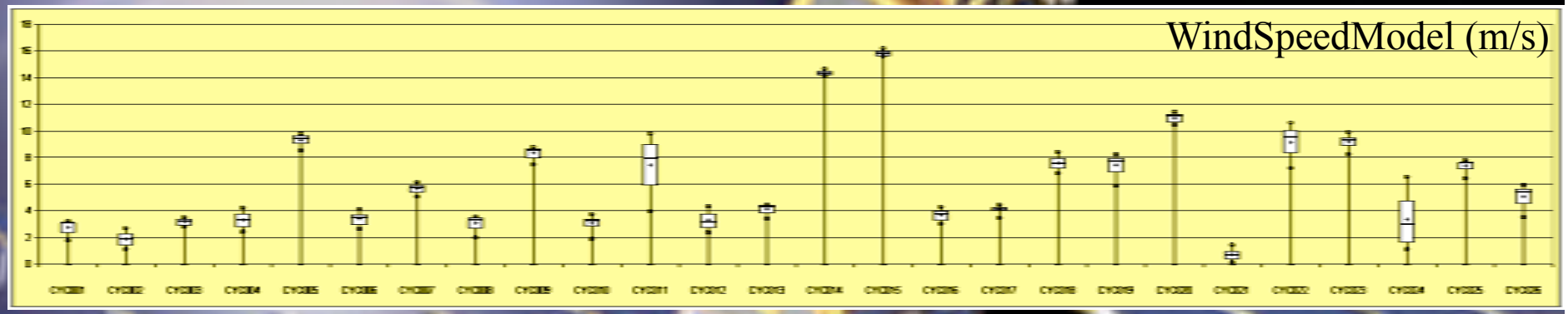




Coastal asc. pass JA-2

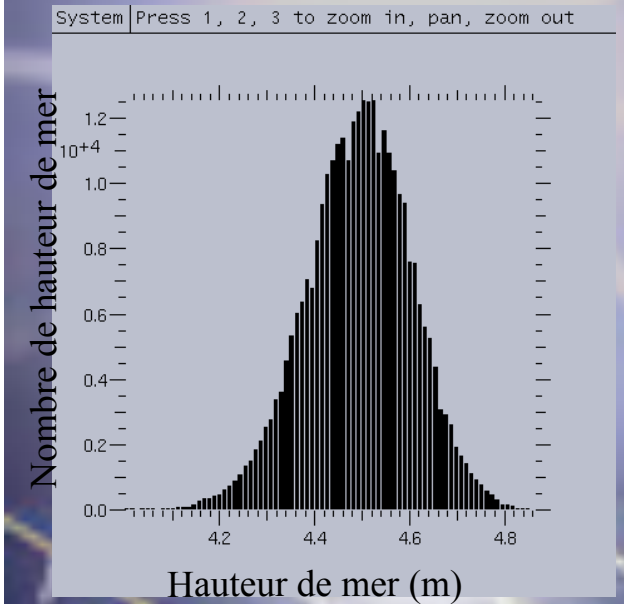



WindSpeedAlt (m/s)

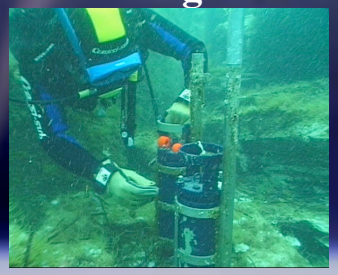

WindSpeedModel (m/s)

Sea state from local data

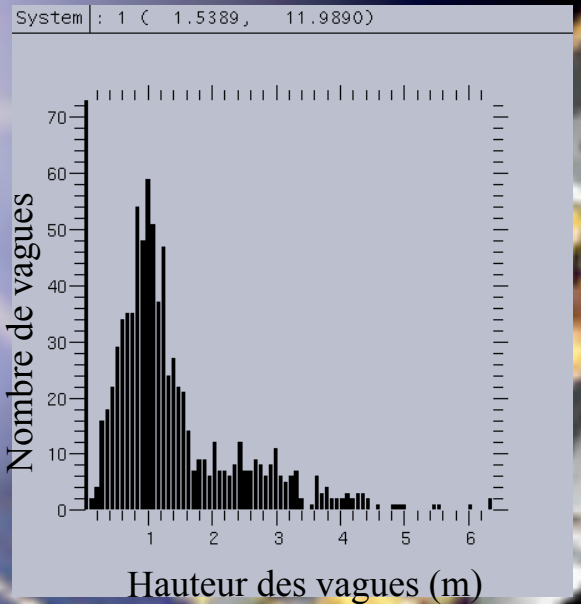
Marégraphe



histogramme des hauteurs de mer enregistrées en M4

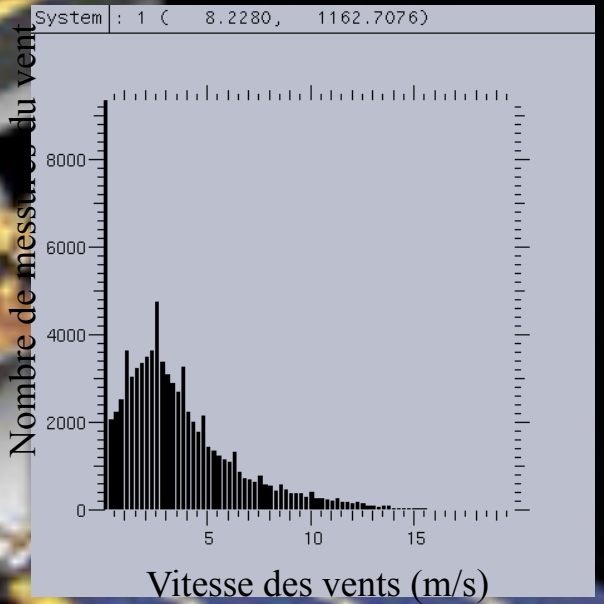


Altimètre



histogramme des hauteurs de vagues altimétriques

Station météo



histogramme des vitesses de vents mesurées par la station météorologique

-**For coastal pass :** cycle discard is often associated with an IB corr. ~zero or strong , Sigma0 near maximum values.
- **For offshore passes** : discard cycles, aren't frequently synchronous with an IB corr ~zero or strong.
Coastal passes: IB is a good candidate for ssh bias discard. (observed on Jason-1, still on OSTM/Jason-2)

Status : Calval tide gauges and GPS mean sea surface

- **2009-05 :** Sensor leveling : done on site, by OCA (Obs. Côte d'Azur) => comparison phase with results from the previous leveling (2001).

- **2009-06** : in situ data reprocessed (Senetosa) from 2002 to 2009-05.

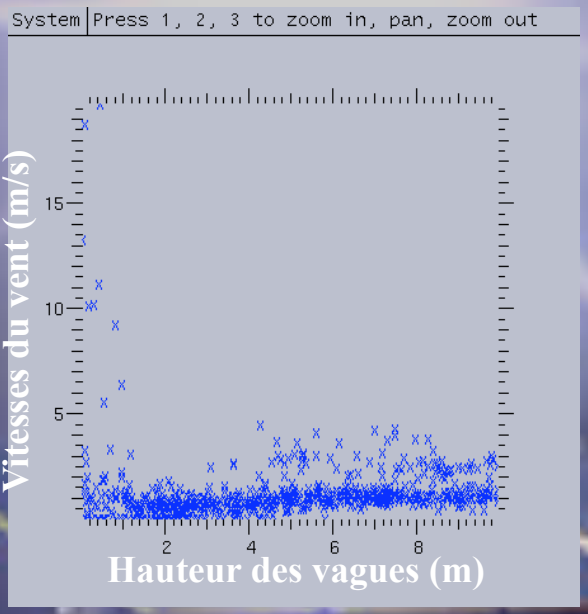
- 2009-07 ->… Sea level files used for Senetosa in situ CalVal activity : FTP access for OSTM community / or anonymous server FTP. Definitions, validations, delivrable time in 2009 to be determined.

THAN  YOU

MERCI

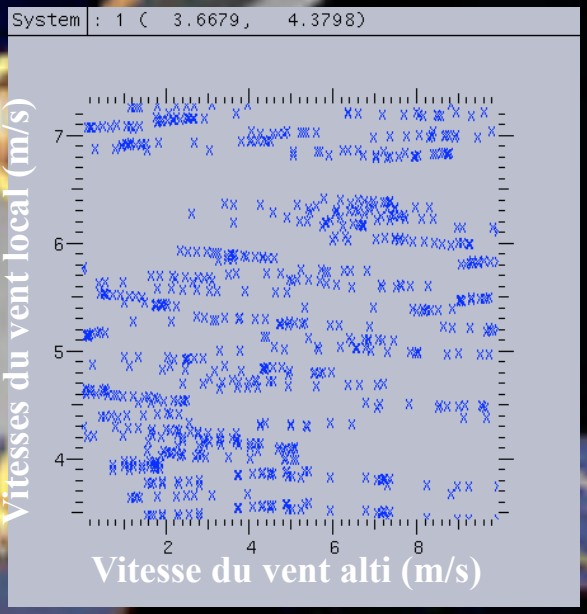
Seattle-2009-06-22

Vents et vagues JASON-1 à Senetosa



Comparaison vent/vagues altimétriques

Vents JASON-1et station météo à Senetosa



Comparaison vent altimétrique/ station météo