

## Orbit comparison : ESOC (Reaper) versus GFZ (Reaper)

Study variable	<b>ESOC orbit (Reaper)</b>
Reference variable	<b>GFZ orbit (Reaper)</b>
Missions	ERS-1 ( <i>e1</i> ), ERS-2 ( <i>e2</i> )
Period	[15636, 19540]

Creation date : 2011/07/05  
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## Study overview

In this study, the orbit solution derived from ESOC developed in the frame of the Reaper project has been compared to the GFZ orbit also developed in the frame of the Reaper project to calculate the ERS-2 and ERS-1 sea-level height (SSH).

The impact of using these both orbits on the SSH calculation has been analyzed for ERS-1 and ERS-2 missions :

- for ERS-1 : from October 1992 (cycle 15) to June 1996 (Cycle 53)
- for ERS-2 : from May 1995 (cycle 1) to July 2003 (Cycle 85)

The Reaper GFZ and ESOC orbits have been uploaded from the following ftp site: <ftp://dgn6.esoc.esa.int/reaper/>. The orbits are computed in the LPOD2005 terrestrial reference frame using the models and input data described in the poster presentation "Improvements in ERS-1 and ERS-2 precise orbit determination" by S. Rudenko, M. Otten, P. Visser, R. Scharroo and T. Schoene, presented at the European Geosciences Union (EGU) General Assembly 2011, Vienna, Austria, 3-8 April 2011 and available as file [ftp://dgn6.esoc.esa.int/reaper/poster\\_EGU-2011.pdf](ftp://dgn6.esoc.esa.int/reaper/poster_EGU-2011.pdf) (S. Rudenko, M. Otten, P. Visser, R. Scharroo, T. Schoene, New improved homogeneous orbits of ERS-1 and ERS-2 satellites, Advances in Space Research, 2011, submitted).

All the validation diagnostics displayed in this report has been performed in agreement with the Sea-Level CCI Product Validation Plan (PVP).

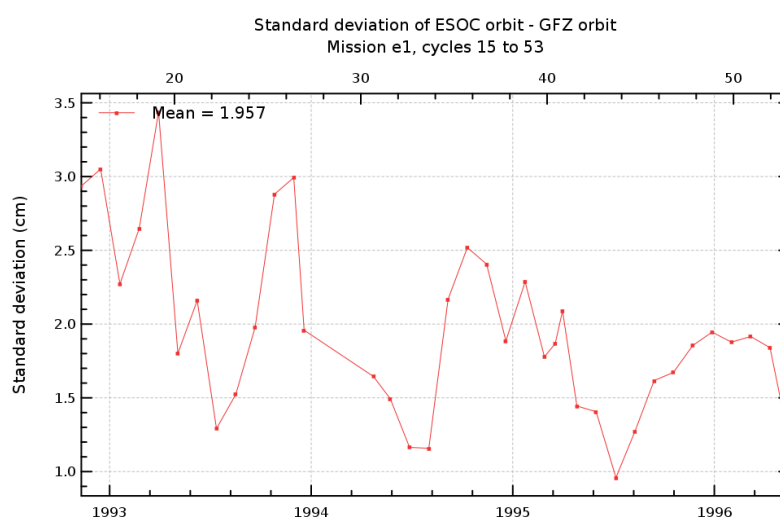
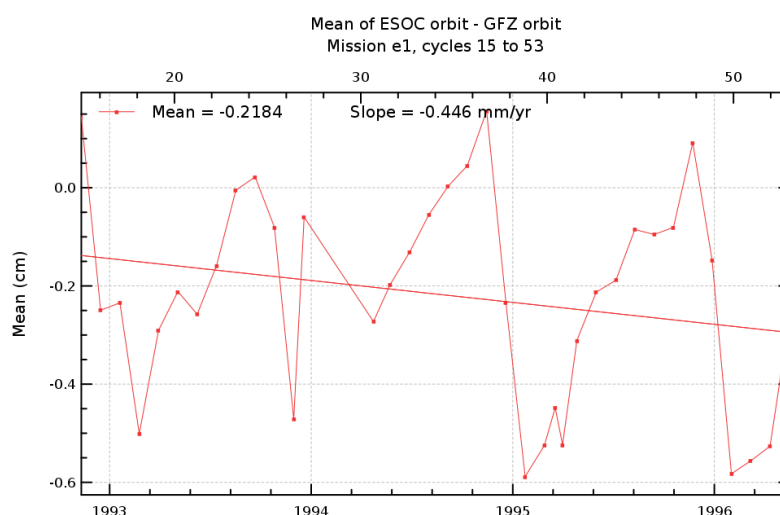
**Diagnostic A001 (mission e1)**

**Name :** Temporal evolution of differences between both altimetric components

**Input data :** Along-track altimetric components

**Description :** The temporal evolution of global statistics (mean, variance, slope) of differences between 2 different standards of a same altimetric component (sea surface height correction, altimeter parameter, orbit) are calculated from a cyclic way (altimeter repetitivity, daily, weekly, monthly) . These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses





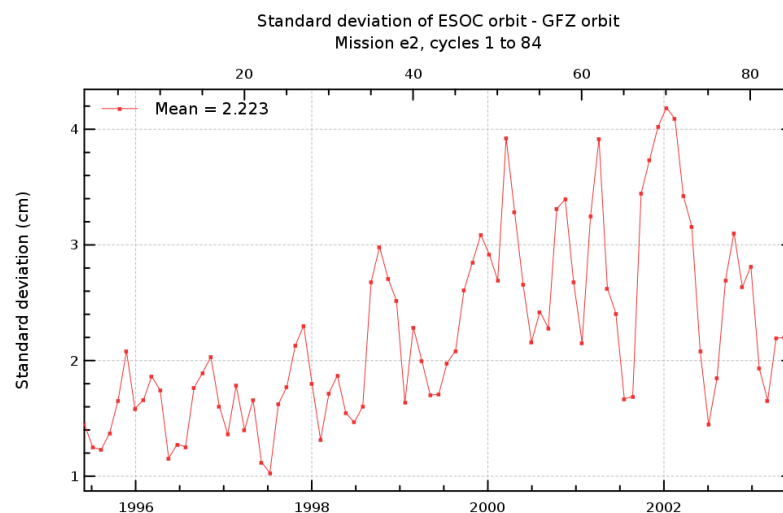
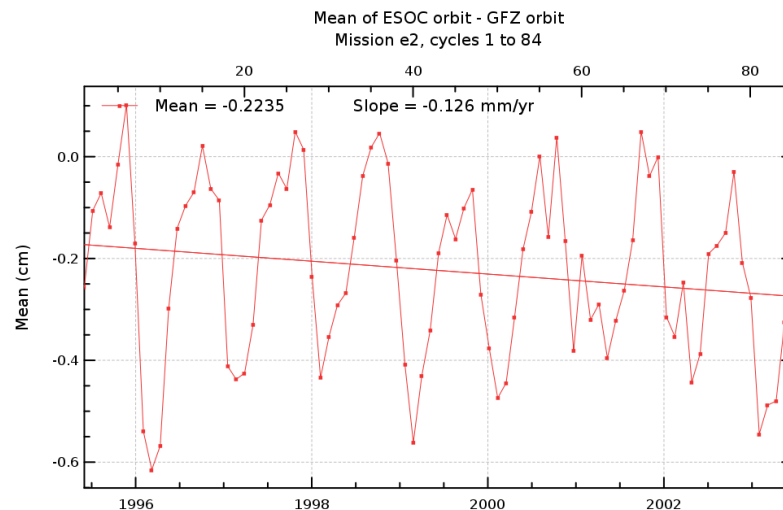
## Diagnostic A001 (mission e2)

**Name :** Temporal evolution of differences between both altimetric components

**Input data :** Along-track altimetric components

**Description :** The temporal evolution of global statistics (mean, variance, slope) of differences between 2 different standards of a same altimetric component (sea surface height correction, altimeter parameter, orbit) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) . These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

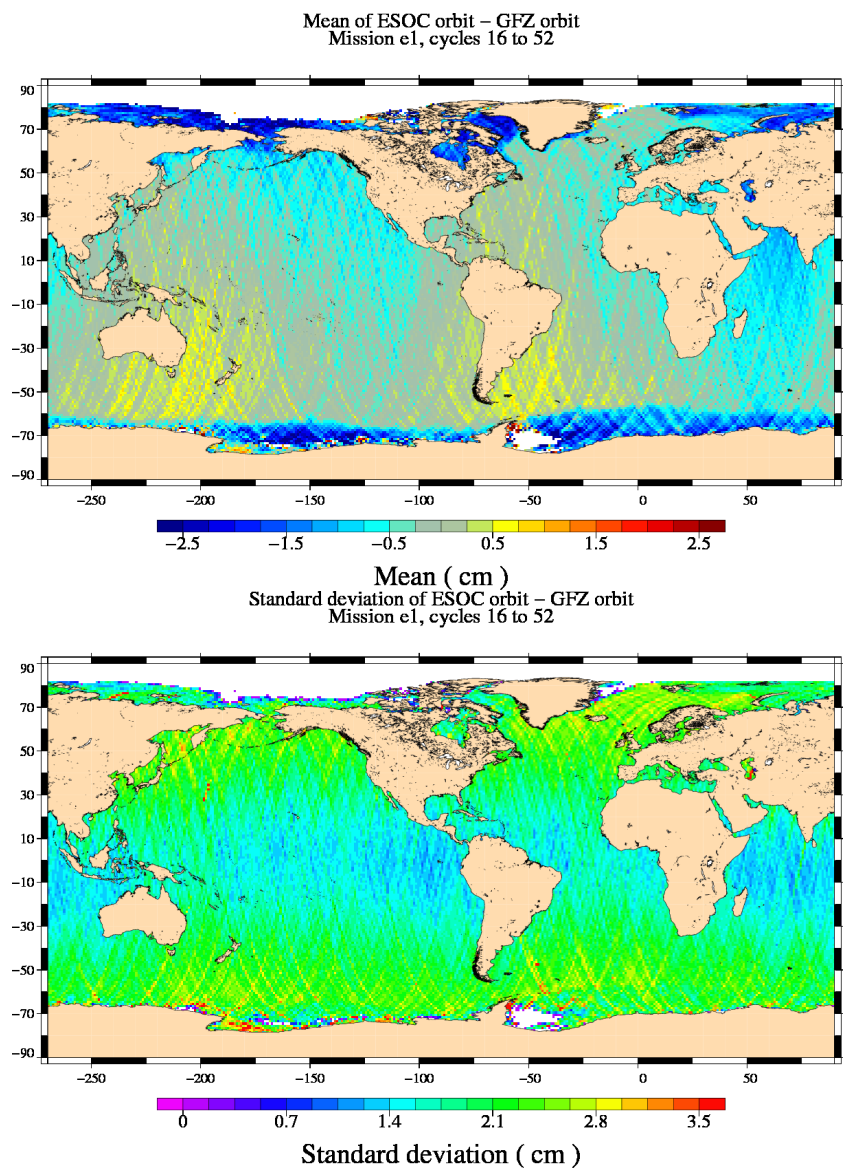


Diagnostic A002 (mission e1)

Name : Map of differences between both altimetric components over all the period

Input data : Along-track altimetric components

Description : The map of global statistics (mean, standard deviation) of differences between 2 different standards of a same altimetric component (sea surface height correction, altimeter parameter, orbit) are calculated over a given period which is the longer as possible to have obtain reliable statically results. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.



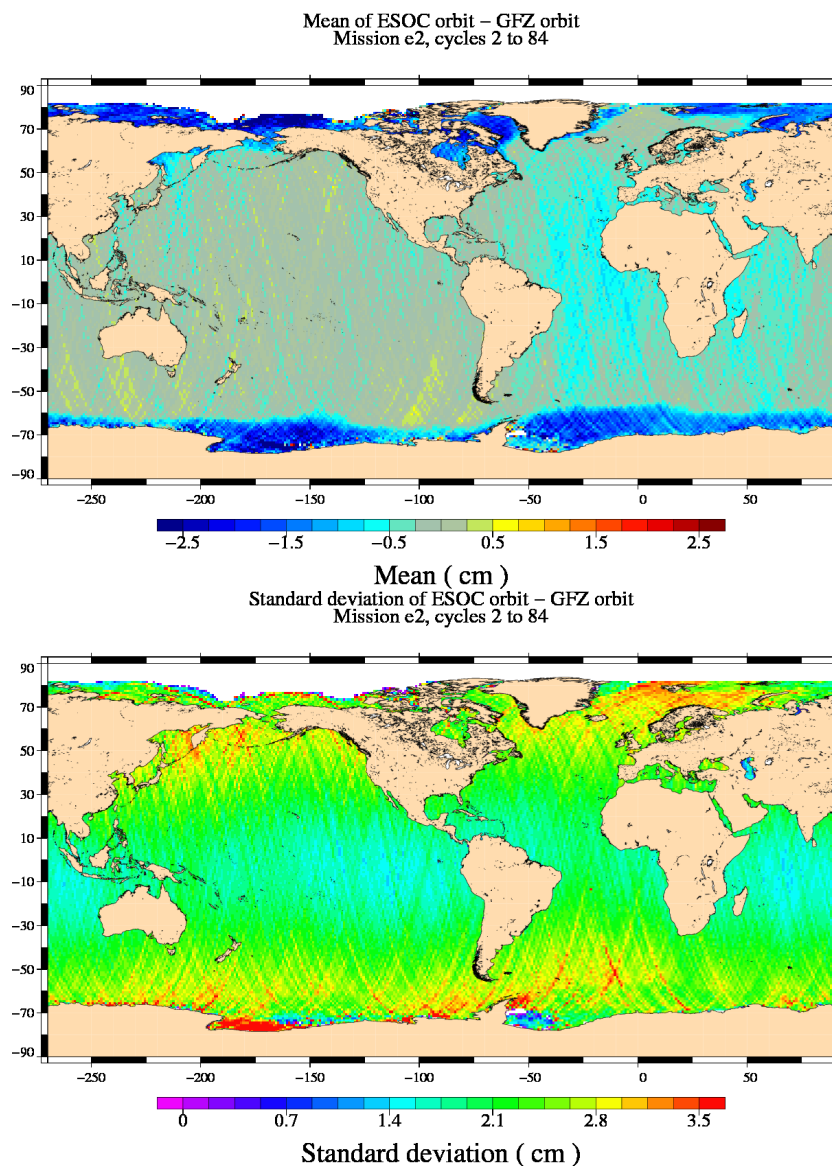
## Diagnostic A002 (mission e2)

**Name :** Map of differences between both altimetric components over all the period

**Input data :** Along-track altimetric components

**Description :** The map of global statistics (mean, standard deviation) of differences between 2 different standards of a same altimetric component (sea surface height correction, altimeter parameter, orbit) are calculated over a given period which is the longer as possible to have obtain reliable statically results. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

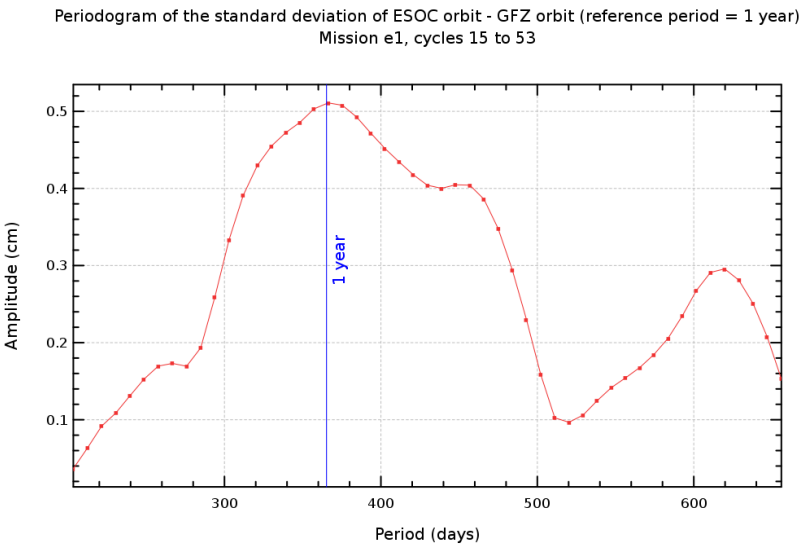
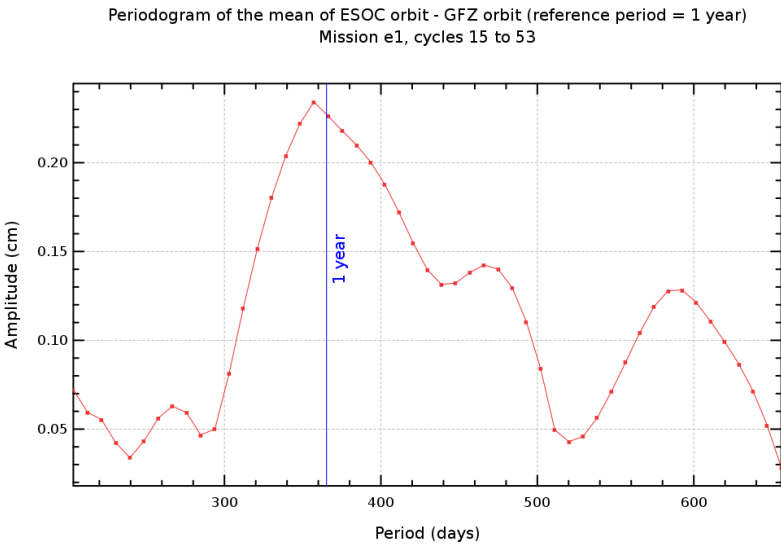


Diagnostic A003\_a (mission e1)

**Name :** Periodogram derived from temporal evolution of altimetric component differences

**Input data :** Along-track altimetric components

**Description :** The periodogram derived from temporal and global altimetric component differences is calculated from cycle by cycle monitoring of altimetric component differences (derived from diagnostic A001). It is calculated from the mean or the variance differences. The Periodogram can be calculated for all the periods, but it can be focused on a dedicated period.



## Diagnostic A003\_b (mission e1)

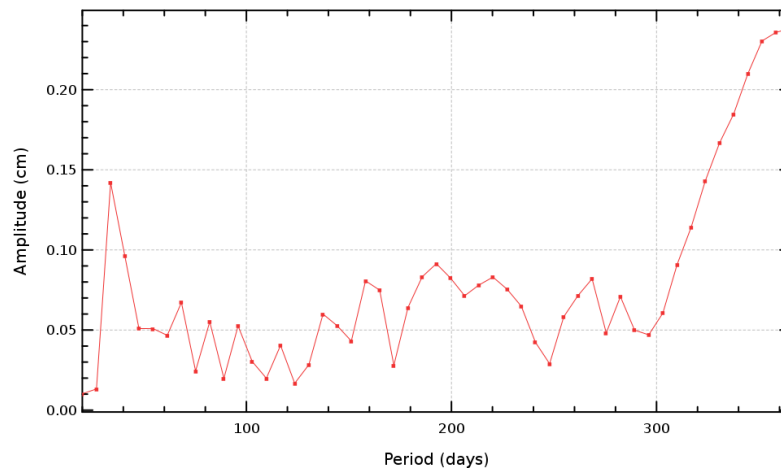
**Name :** Periodogram derived from temporal evolution of altimetric component differences

**Input data :** Along-track altimetric components

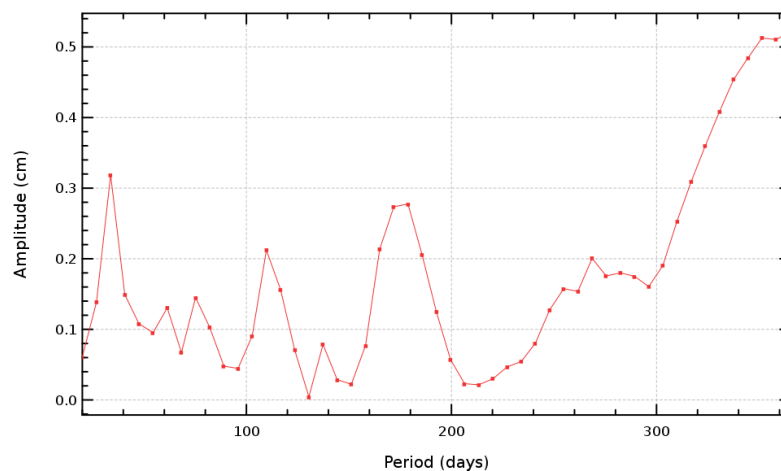
**Description :** The periodogram derived from temporal and global altimetric component differences is calculated from cycle by cycle monitoring of altimetric component differences (derived from diagnostic A001). It is calculated from the mean or the variance differences. The Periodogram can be calculated for all the periods, but it can be focused on a dedicated period.

Diagnostic type : Global internal analyses

Periodogram of the mean of ESOC orbit - GFZ orbit (period = [0, 1 year])  
Mission e1, cycles 15 to 53



Periodogram of the standard deviation of ESOC orbit - GFZ orbit (period = [0, 1 year])  
Mission e1, cycles 15 to 53



## Diagnostic A003\_a (mission e2)

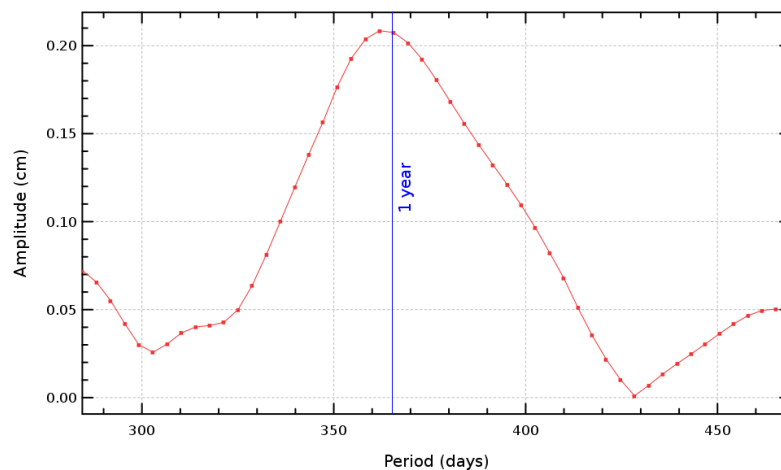
**Name :** Periodogram derived from temporal evolution of altimetric component differences

**Input data :** Along-track altimetric components

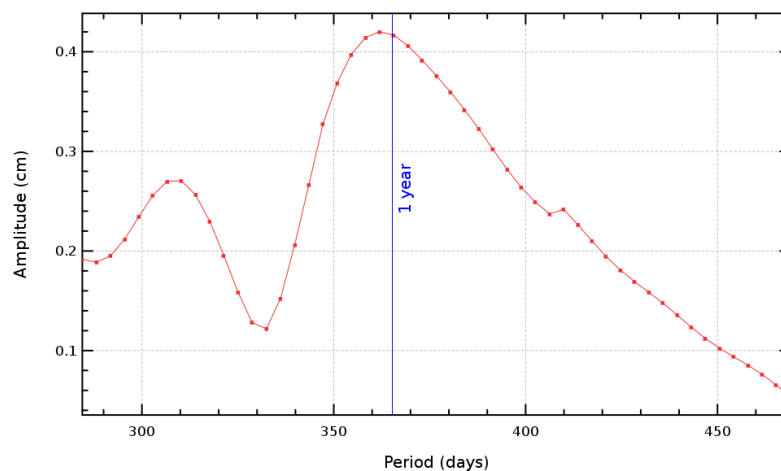
**Description :** The periodogram derived from temporal and global altimetric component differences is calculated from cycle by cycle monitoring of altimetric component differences (derived from diagnostic A001). It is calculated from the mean or the variance differences. The Periodogram can be calculated for all the periods, but it can be focused on a dedicated period.

Diagnostic type : Global internal analyses

Periodogram of the mean of ESOC orbit - GFZ orbit (reference period = 1 year)  
Mission e2, cycles 1 to 84



Periodogram of the standard deviation of ESOC orbit - GFZ orbit (reference period = 1 year)  
Mission e2, cycles 1 to 84



## Diagnostic A003\_b (mission e2)

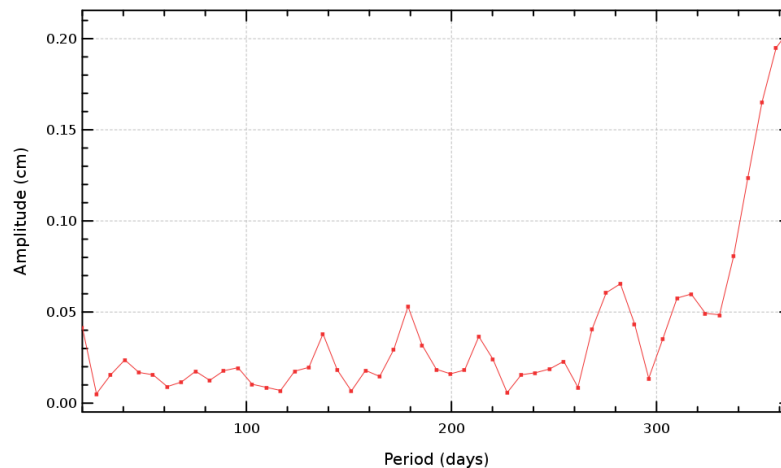
**Name :** Periodogram derived from temporal evolution of altimetric component differences

**Input data :** Along-track altimetric components

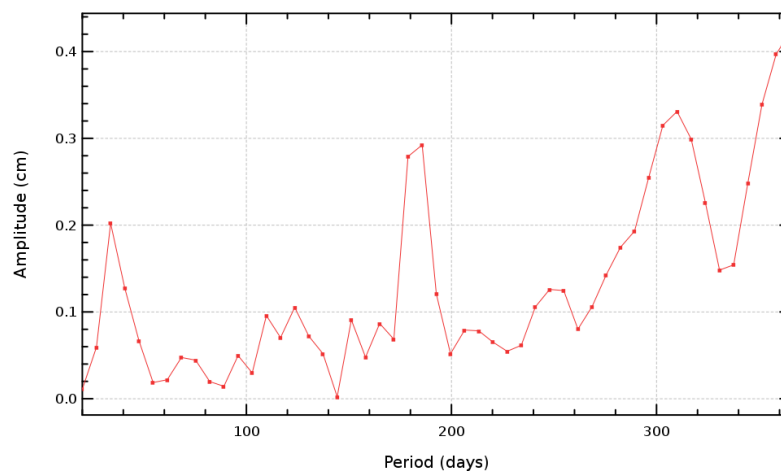
**Description :** The periodogram derived from temporal and global altimetric component differences is calculated from cycle by cycle monitoring of altimetric component differences (derived from diagnostic A001). It is calculated from the mean or the variance differences. The Periodogram can be calculated for all the periods, but it can be focused on a dedicated period.

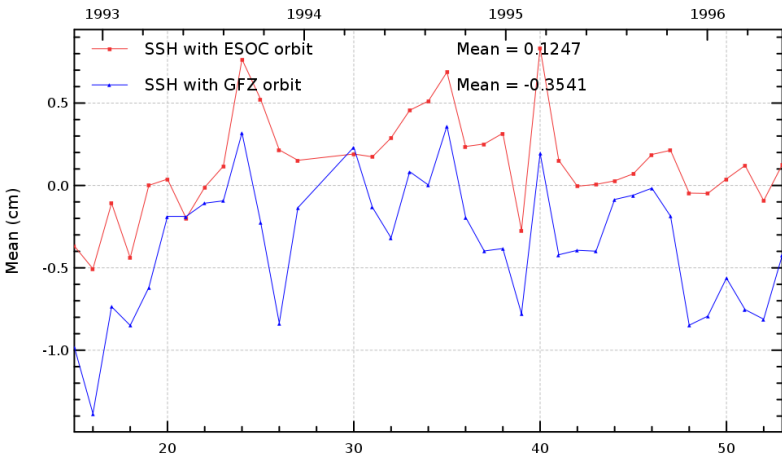
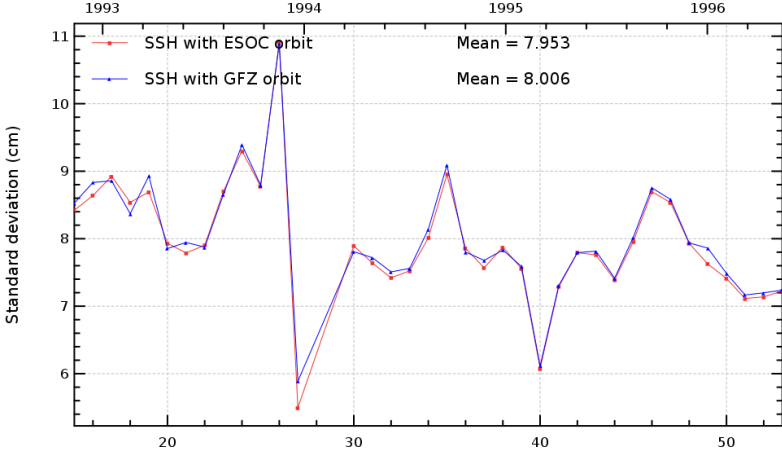
Diagnostic type : Global internal analyses

Periodogram of the mean of ESOC orbit - GFZ orbit (period = [0, 1 year])  
Mission e2, cycles 1 to 84



Periodogram of the standard deviation of ESOC orbit - GFZ orbit (period = [0, 1 year])  
Mission e2, cycles 1 to 84



Diagnostic A101 (mission e1)	
Name : Temporal evolution of SSH crossovers	
Input data : Sea Surface Height (SSH) crossovers	
<p><b>Description :</b> The temporal evolution of global statistics (mean, standard deviation) of SSH differences are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).</p>	
<div><div><div>Mean of SSH crossovers Mission e1, cycles 15 to 53</div><div></div></div><div><div>Standard deviations of SSH crossovers Mission e1, cycles 15 to 53</div><div></div></div></div>	



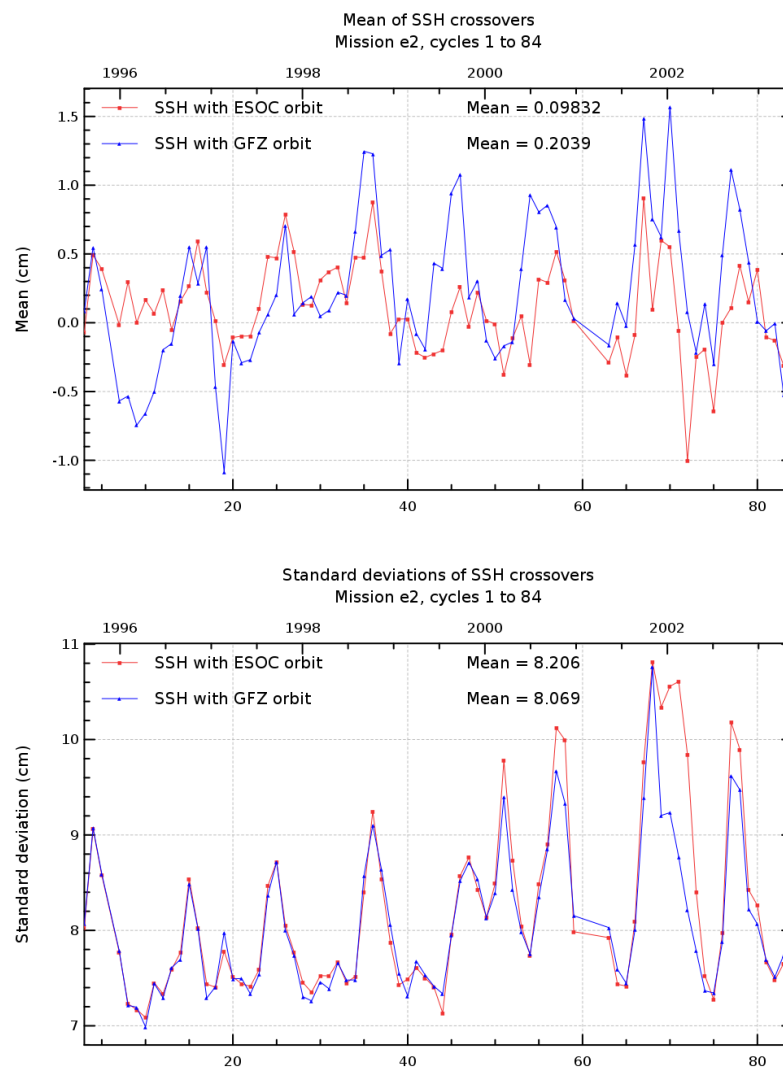
## Diagnostic A101 (mission e2)

**Name :** Temporal evolution of SSH crossovers

**Input data :** Sea Surface Height (SSH) crossovers

**Description :** The temporal evolution of global statistics (mean, standard deviation) of SSH differences are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).

Diagnostic type : Global internal analyses



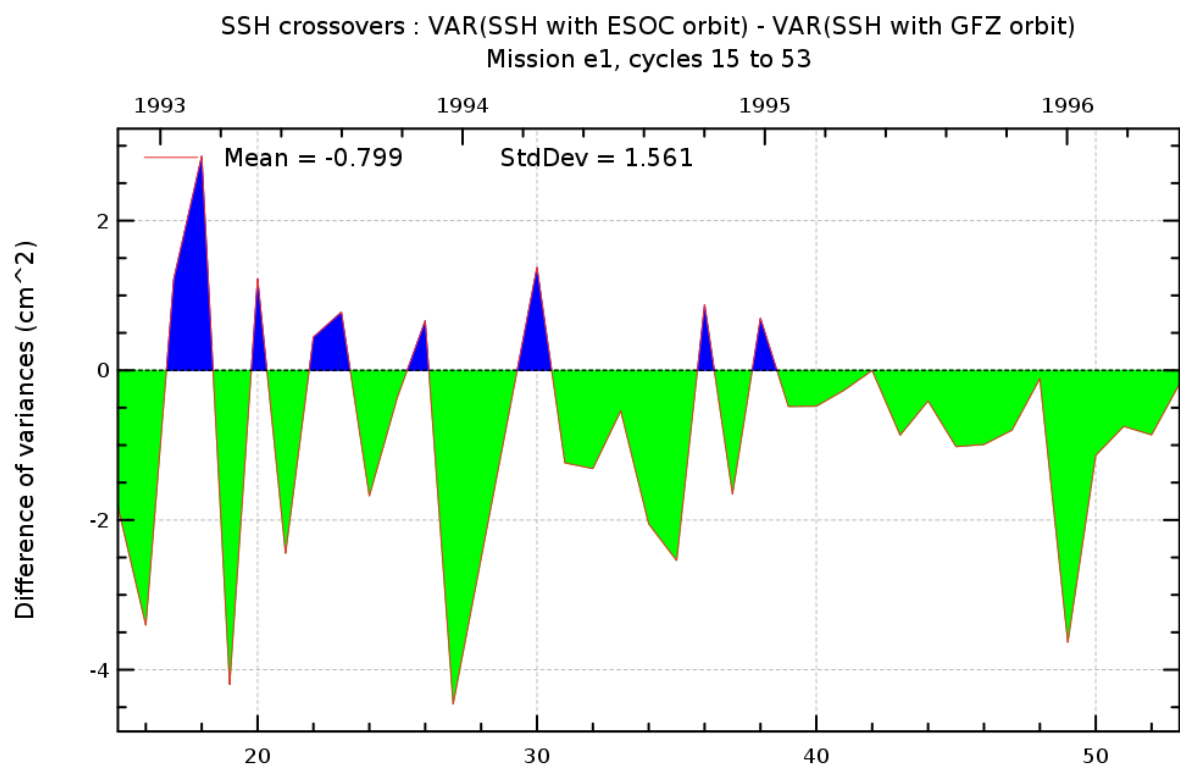
## Diagnostic A102 (mission e1)

**Name :** Differences between temporal evolution of SSH crossovers

**Input data :** Sea Surface Height (SSH) crossovers

**Description :** The difference of temporal evolution between the global statistics (mean, standard deviation) of SSH differences are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).

Diagnostic type : Global internal analyses



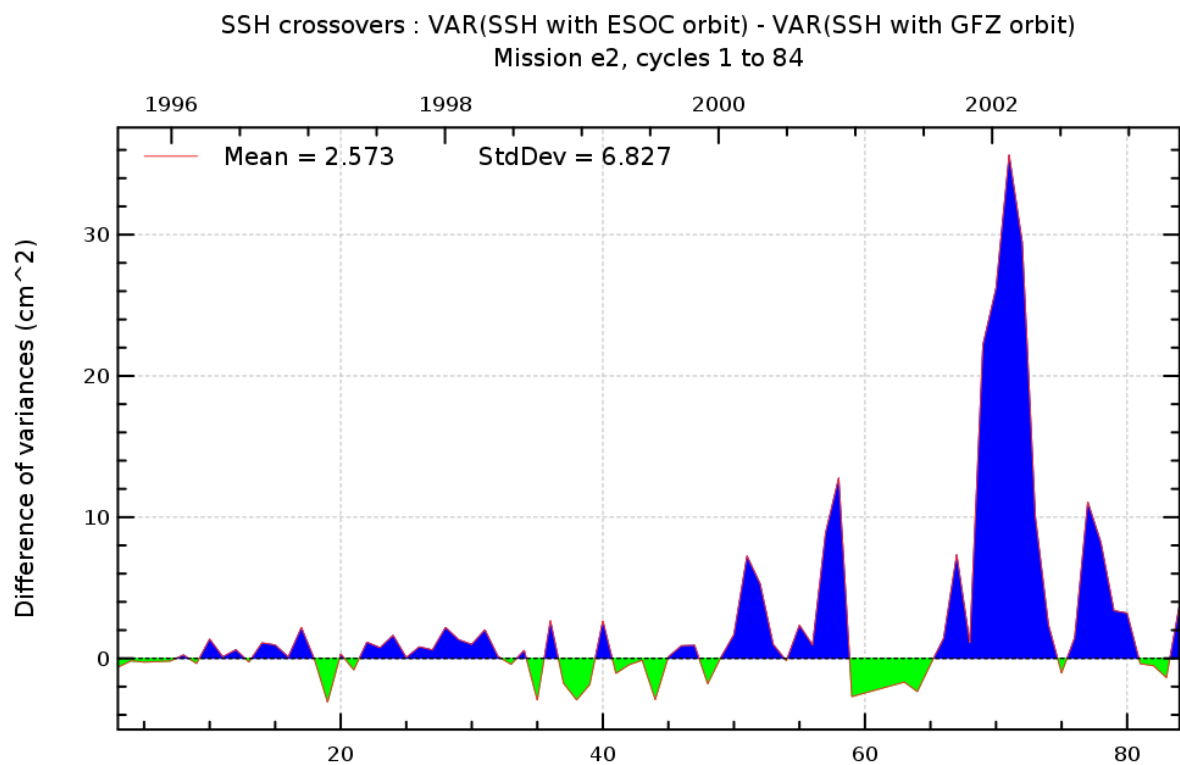
## Diagnostic A102 (mission e2)

**Name :** Differences between temporal evolution of SSH crossovers

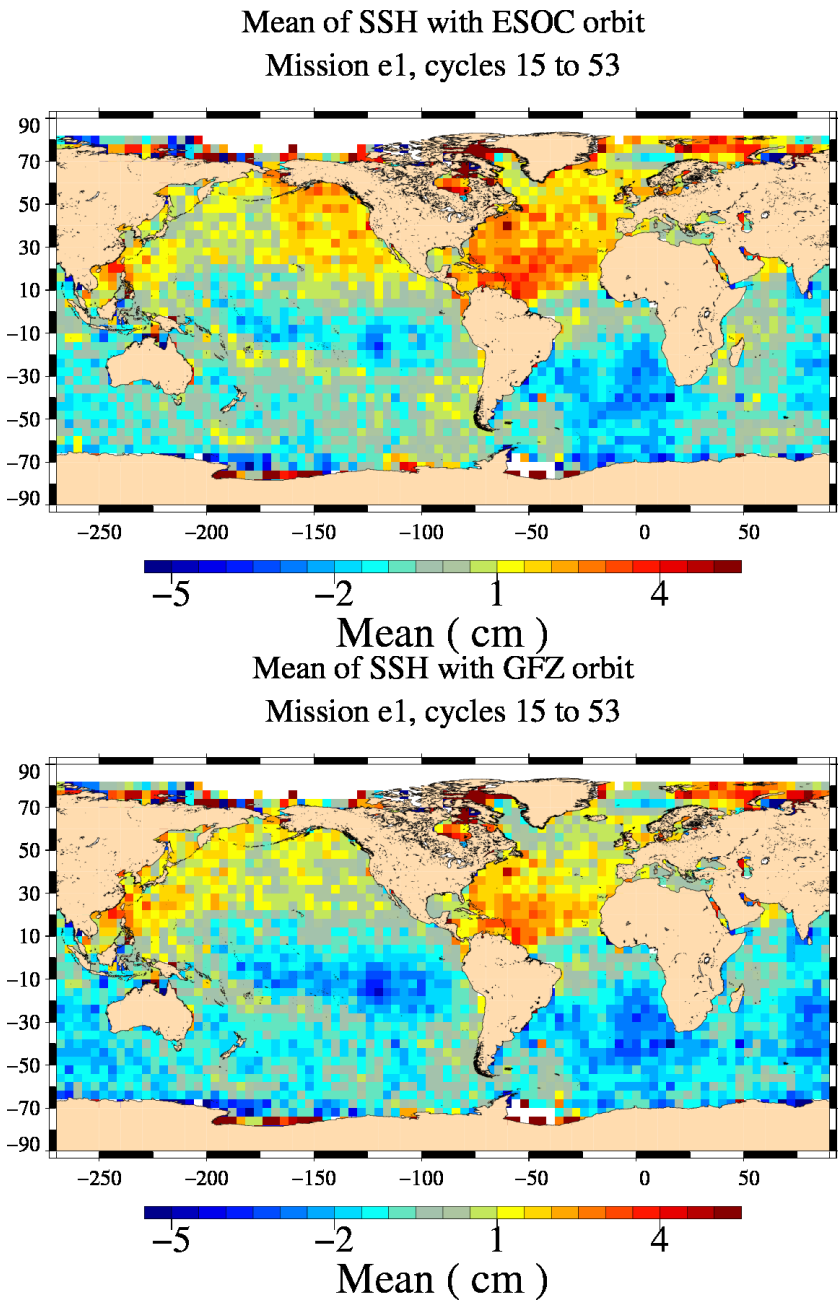
**Input data :** Sea Surface Height (SSH) crossovers

**Description :** The difference of temporal evolution between the global statistics (mean, standard deviation) of SSH differences are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).

Diagnostic type : Global internal analyses



Diagnostic A103 (mission e1)	
Name :	Map of SSH crossovers
Input data :	Sea Surface Height (SSH) crossovers
Description :	The differences between maps of SSH crossovers differences (mean, variance) are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).



## Diagnostic A103 (mission e2)

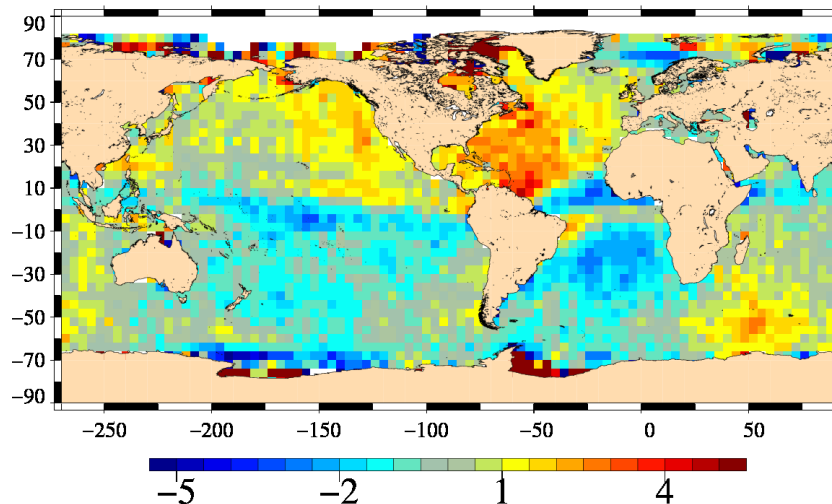
**Name :** Map of SSH crossovers

**Input data :** Sea Surface Height (SSH) crossovers

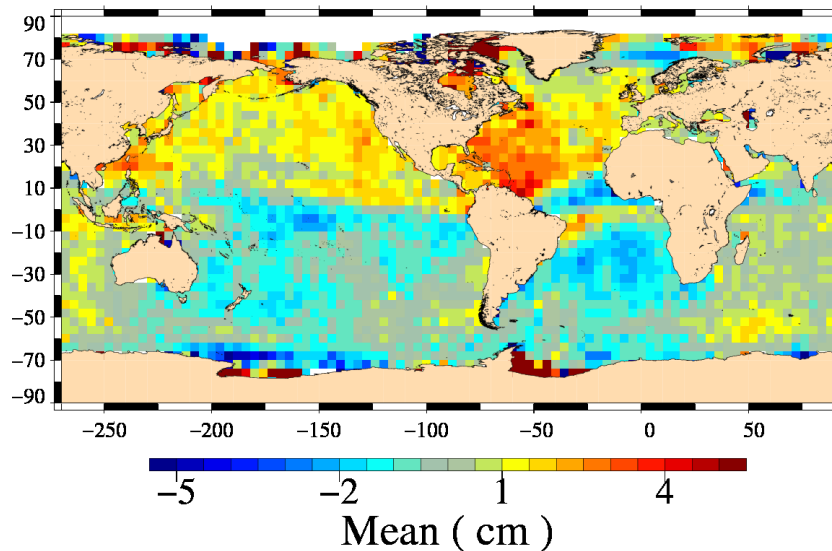
**Description :** The differences between maps of SSH crossovers differences (mean, variance) are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).

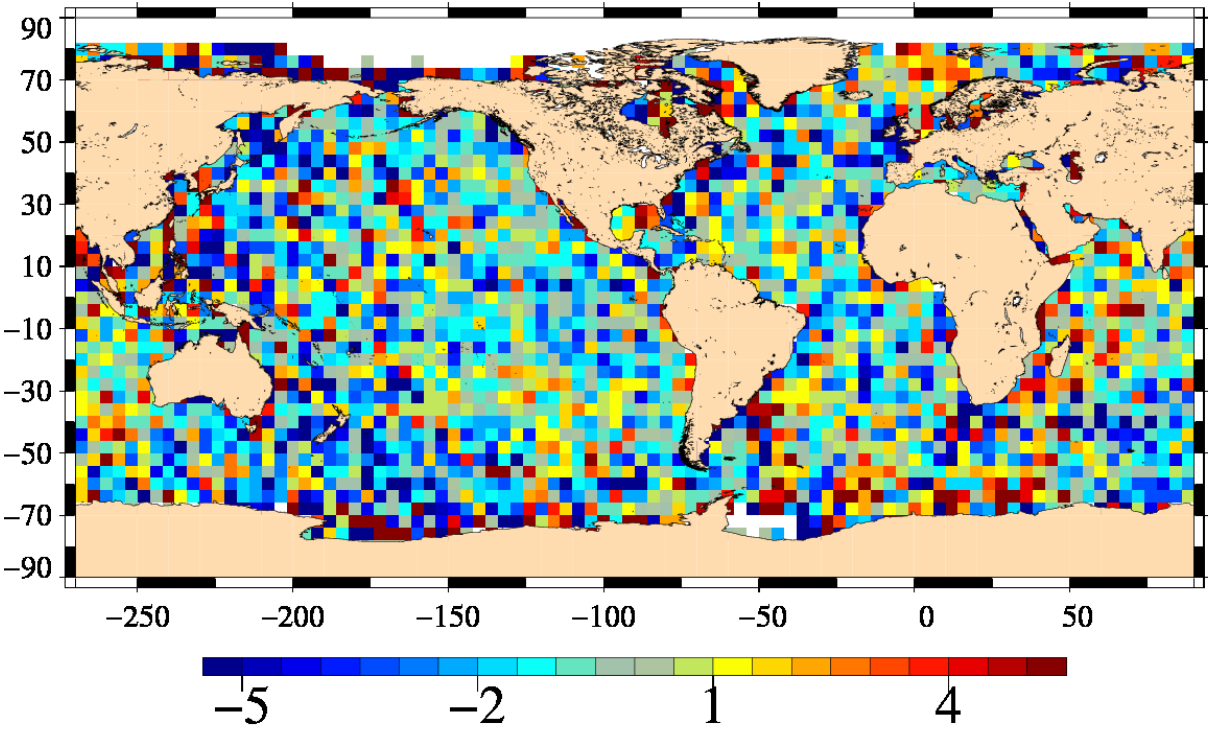
Diagnostic type : Global internal analyses

Mean of SSH with ESOC orbit  
Mission e2, cycles 1 to 84



Mean ( cm )  
Mean of SSH with GFZ orbit  
Mission e2, cycles 1 to 84



Diagnostic type : Global internal analyses	Diagnostic A104 (mission e1)	
	Name : Differences between maps of SSH crossovers	
	Input data : Sea Surface Height (SSH) crossovers	
	Description : The differences between maps of SSH crossovers (derived from diagnostic A103) are calculated from the SSH crossover differences (mean, standard deviation) using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).	
	<div>VAR(SSH with ESOC orbit) – VAR(SSH with GFZ orbit)</div> <div>Mission e1, cycles 15 to 53</div>  <p>SSH crossovers : difference of variances ( cm<sup>2</sup> )</p>	

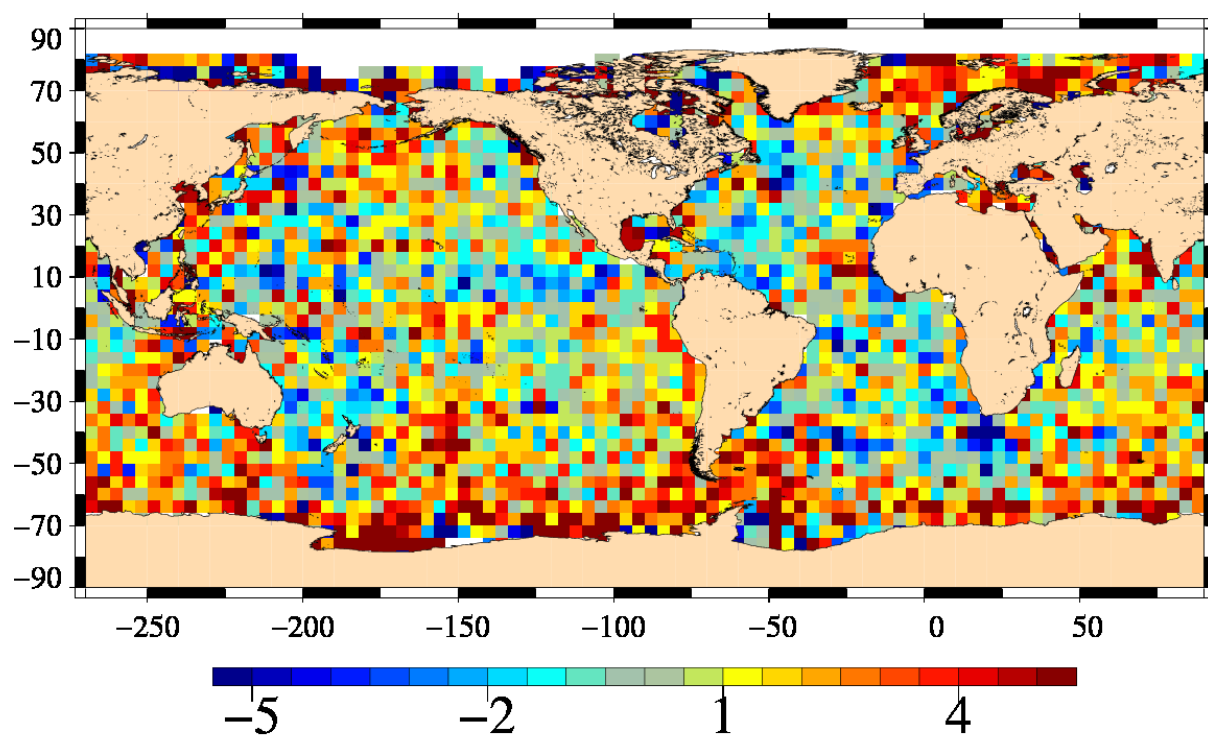
## Diagnostic A104 (mission e2)

**Name :** Differences between maps of SSH crossovers

**Input data :** Sea Surface Height (SSH) crossovers

**Description :** The differences between maps of SSH crossovers (derived from diagnostic A103) are calculated from the SSH crossover differences (mean, standard deviation) using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).

$\text{VAR}(\text{SSH with ESOC orbit}) - \text{VAR}(\text{SSH with GFZ orbit})$   
Mission e2, cycles 1 to 84



SSH crossovers : difference of variances (  $\text{cm}^2$  )

Diagnostic type : Global internal analyses	Diagnostic A201_a (mission e1)																								
	Name : Temporal evolution of Sea Level Anomaly (SLA)																								
	Input data : Along track SLA																								
	<p><b>Description :</b> The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.</p>																								
	<div>Global MSL Mission e1, cycles 15 to 53</div> <table><tr><th>Mission Cycle</th><th>Year</th><th>SLA with ESOC orbit (cm)</th><th>SLA with GFZ orbit (cm)</th></tr><tr><td>15</td><td>1993.0</td><td>41.0</td><td>41.5</td></tr><tr><td>20</td><td>1993.5</td><td>41.8</td><td>42.0</td></tr><tr><td>30</td><td>1994.5</td><td>42.8</td><td>43.2</td></tr><tr><td>40</td><td>1995.5</td><td>43.2</td><td>43.8</td></tr><tr><td>50</td><td>1996.5</td><td>43.8</td><td>44.2</td></tr></table>		Mission Cycle	Year	SLA with ESOC orbit (cm)	SLA with GFZ orbit (cm)	15	1993.0	41.0	41.5	20	1993.5	41.8	42.0	30	1994.5	42.8	43.2	40	1995.5	43.2	43.8	50	1996.5	43.8
Mission Cycle	Year	SLA with ESOC orbit (cm)	SLA with GFZ orbit (cm)																						
15	1993.0	41.0	41.5																						
20	1993.5	41.8	42.0																						
30	1994.5	42.8	43.2																						
40	1995.5	43.2	43.8																						
50	1996.5	43.8	44.2																						



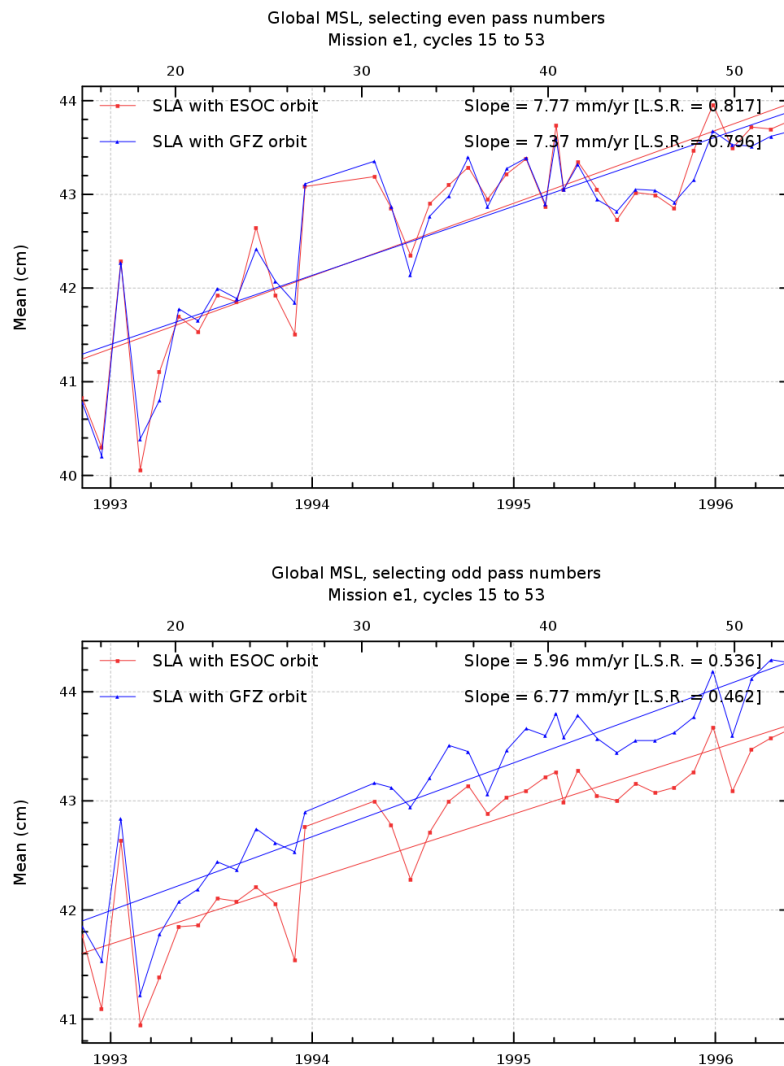
## Diagnostic A201\_b (mission e1)

**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses



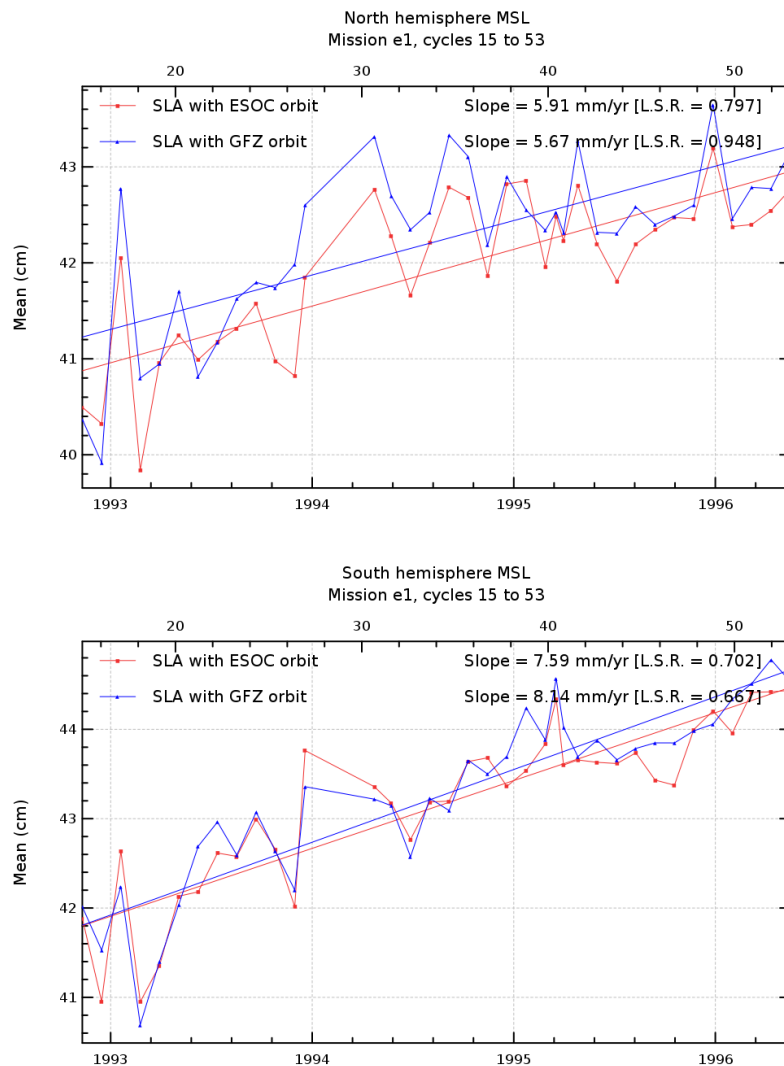
## Diagnostic A201\_c (mission e1)

**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses



## Diagnostic A201\_d (mission e1)

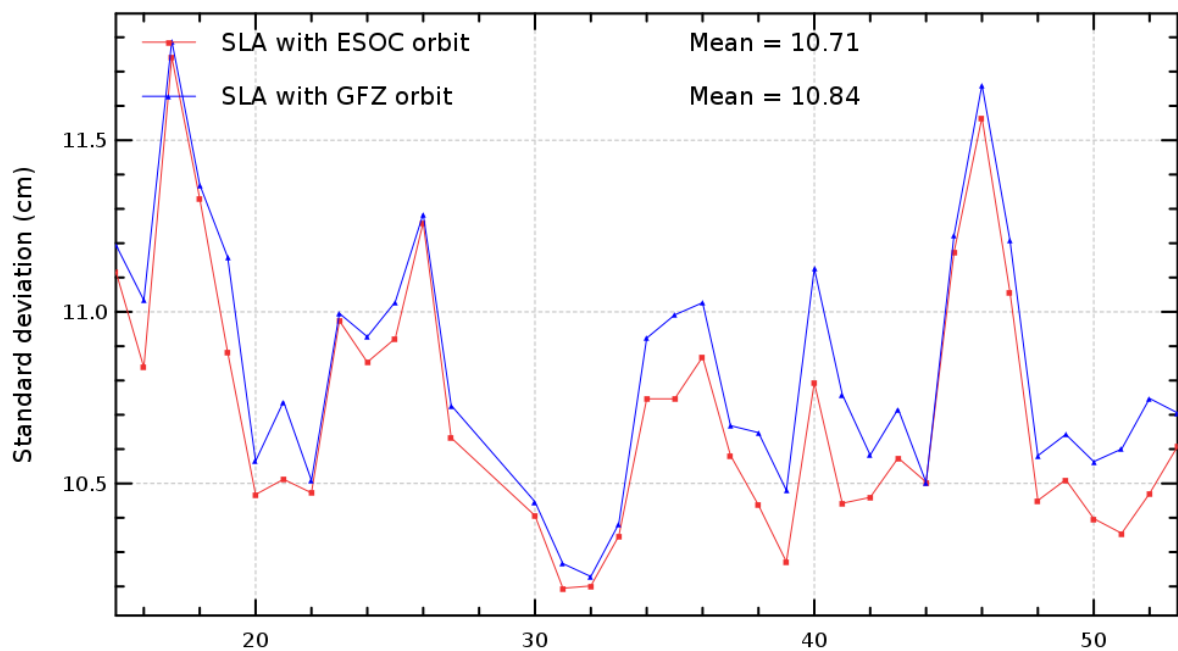
**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses

Global MSL  
Mission e1, cycles 15 to 53



## Diagnostic A201\_e (mission e1)

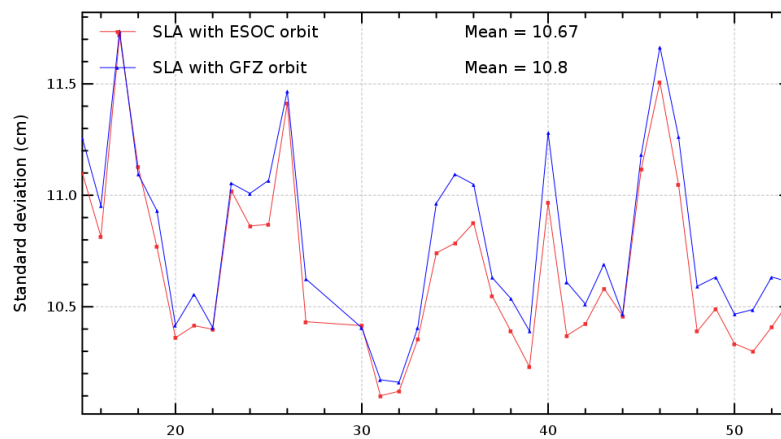
**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

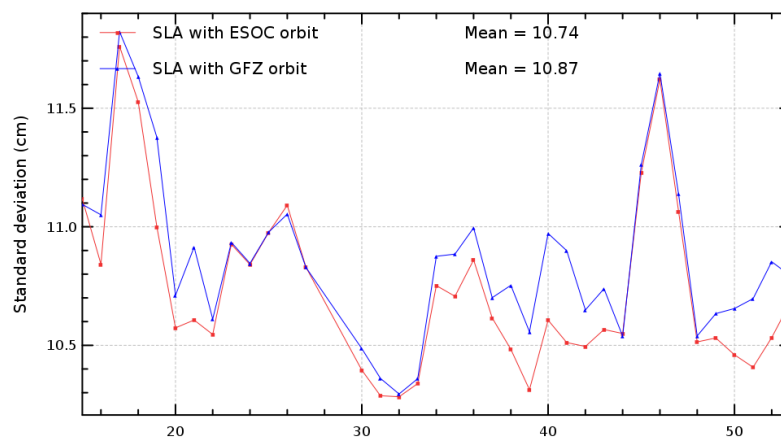
**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses

Global MSL, selecting even pass numbers  
Mission e1, cycles 15 to 53



Global MSL, selecting odd pass numbers  
Mission e1, cycles 15 to 53



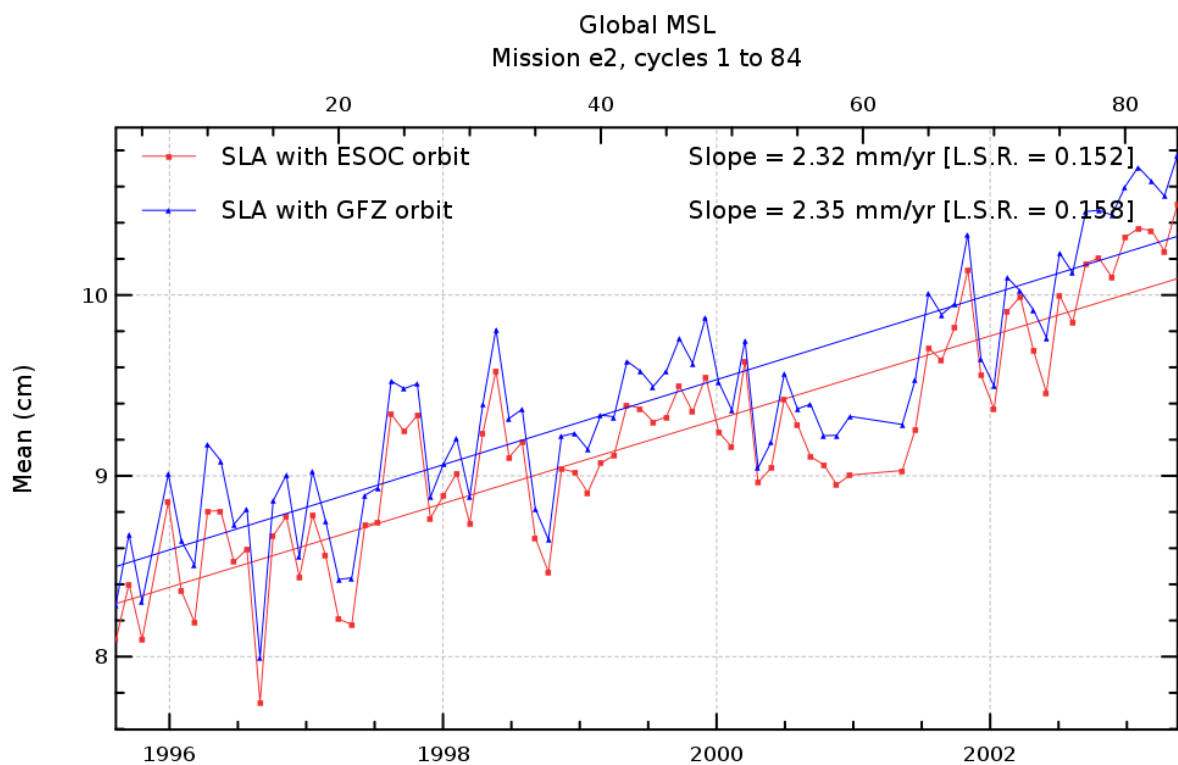
## Diagnostic A201\_a (mission e2)

**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses



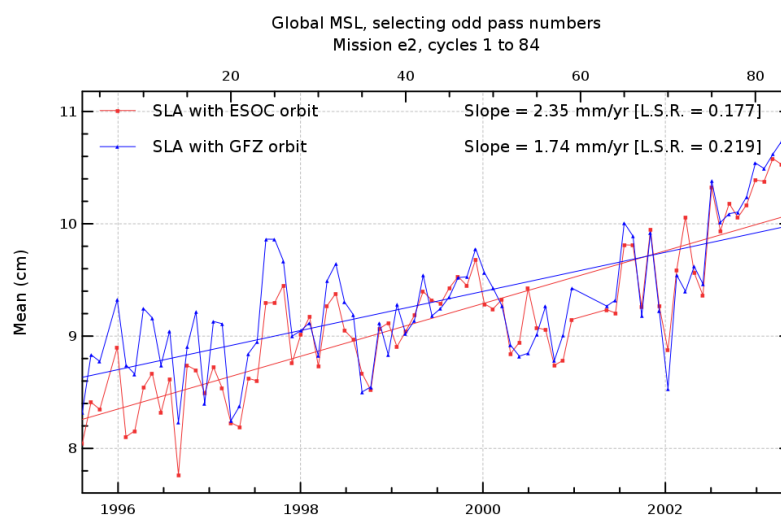
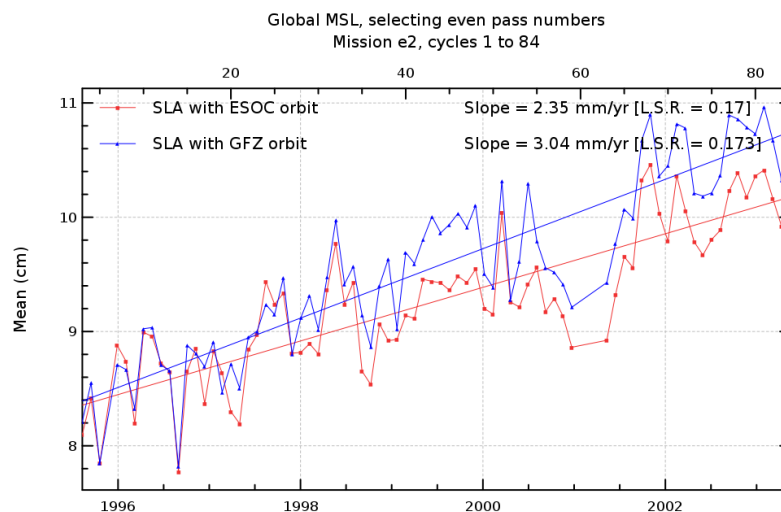
## Diagnostic A201\_b (mission e2)

**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses



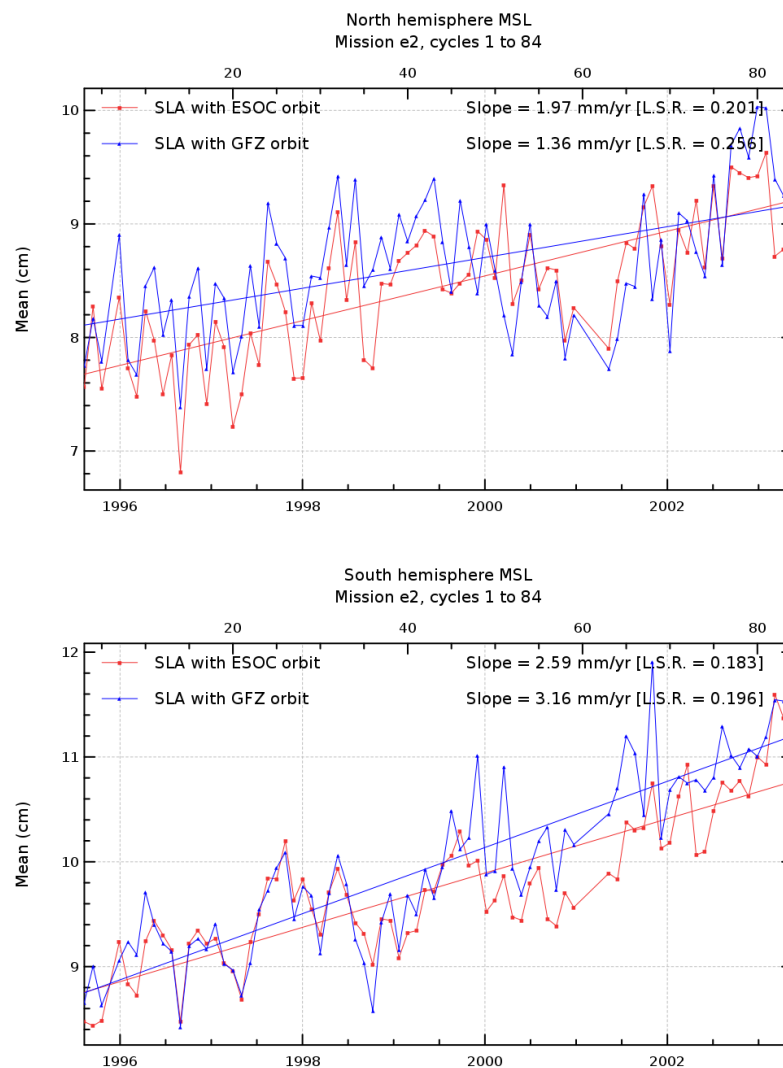
## Diagnostic A201\_c (mission e2)

**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses



## Diagnostic A201\_d (mission e2)

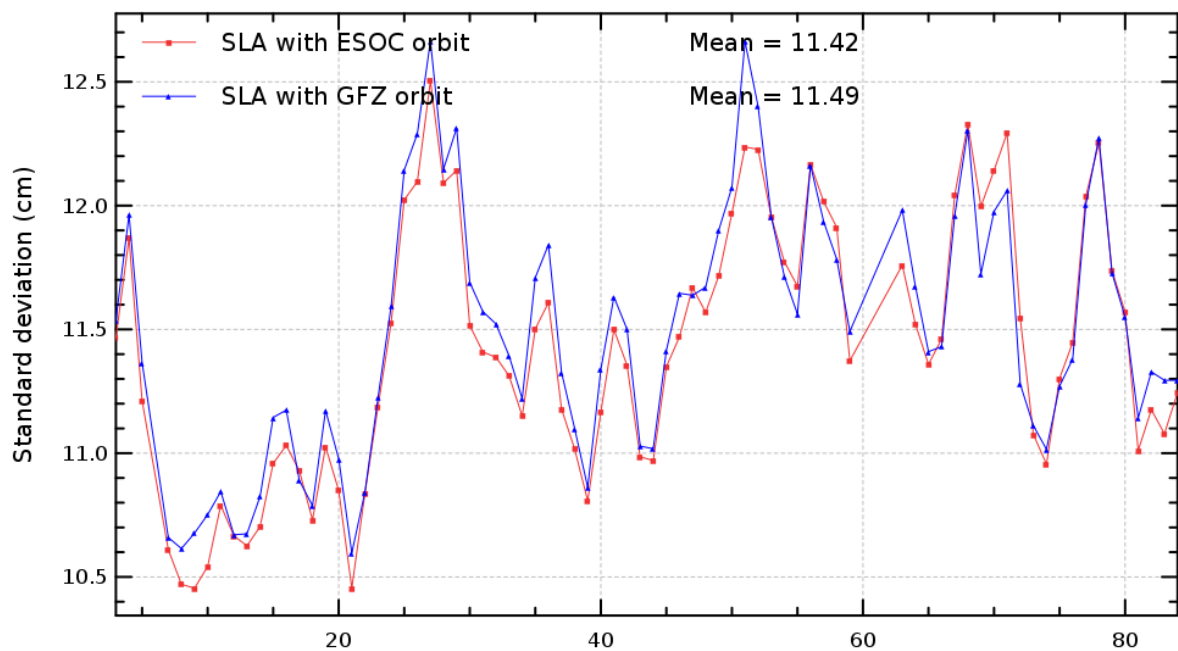
**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses

Global MSL  
Mission e2, cycles 1 to 84





## Diagnostic A201\_e (mission e2)

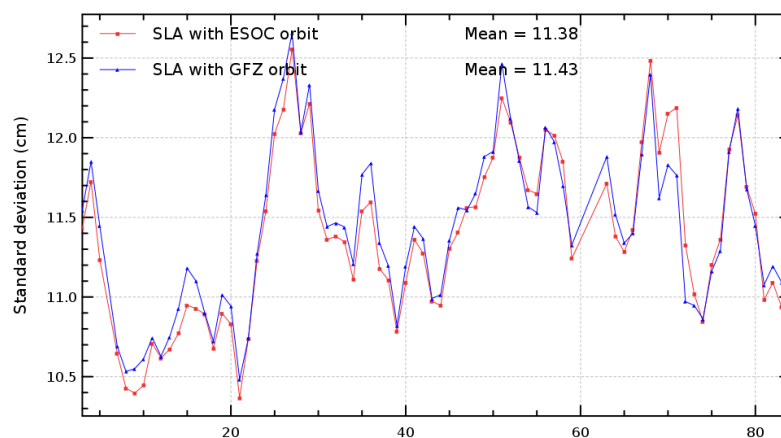
**Name :** Temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

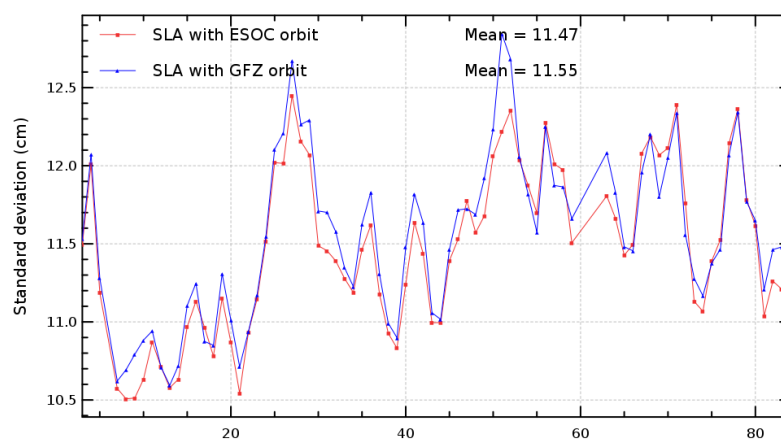
**Description :** The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) , or separating North and South hemispheres.

Diagnostic type : Global internal analyses

Global MSL, selecting even pass numbers  
Mission e2, cycles 1 to 84



Global MSL, selecting odd pass numbers  
Mission e2, cycles 1 to 84



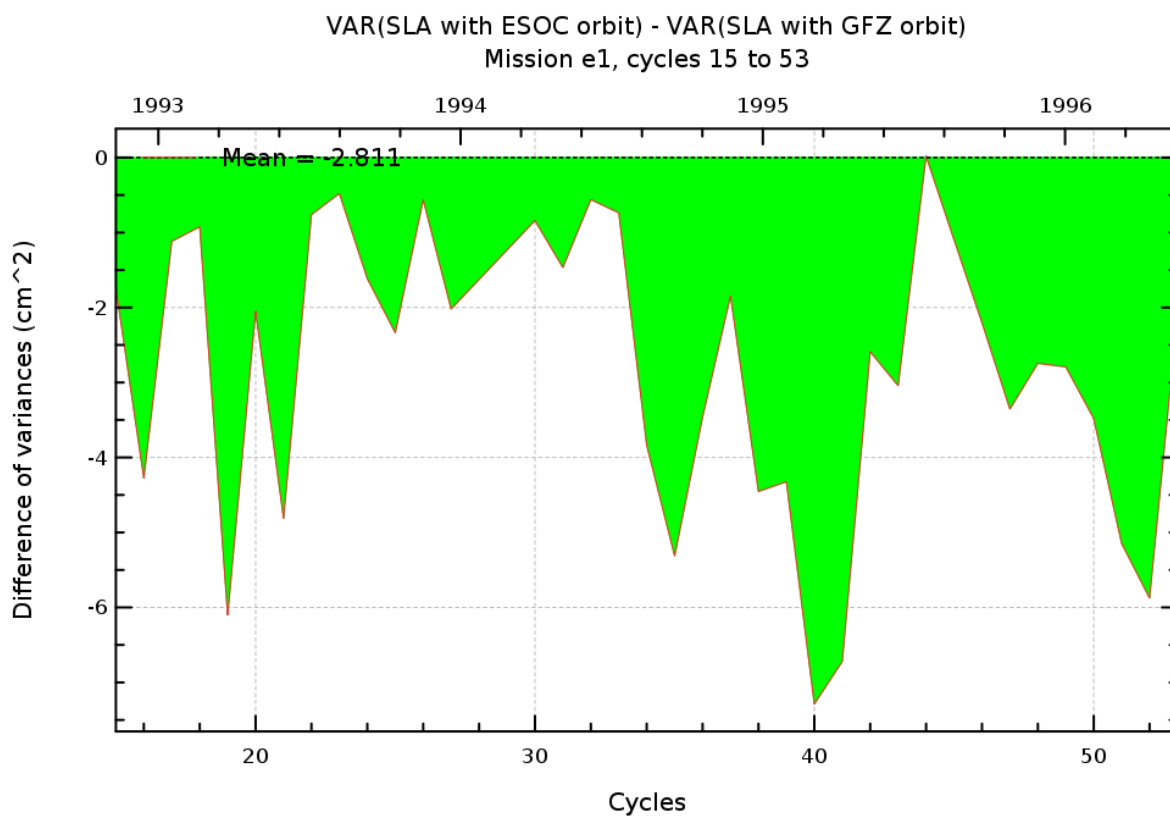
**Diagnostic A202\_a (mission e1)**

**Name :** Differences between temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The differences between temporal evolution of SLA are calculated from statistics derived from diagnostic A201 (mean, variance) using 2 different components in the SLA calculation. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) or separating North and South hemispheres.

Diagnostic type : Global internal analyses



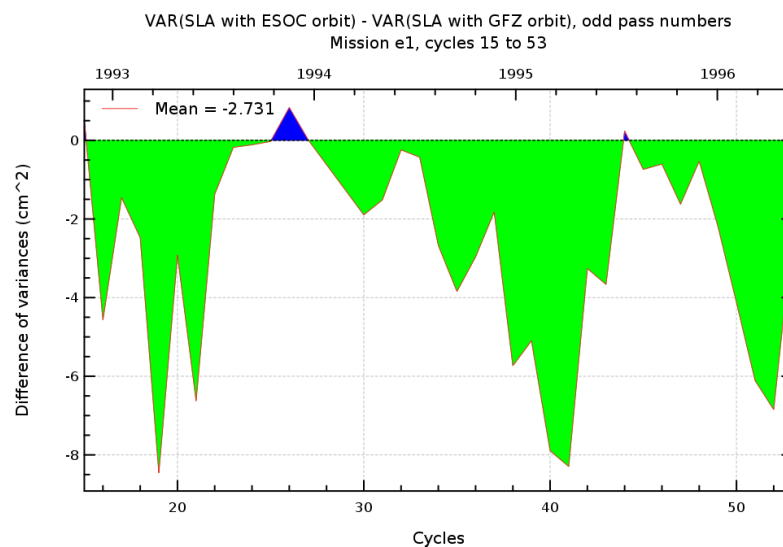
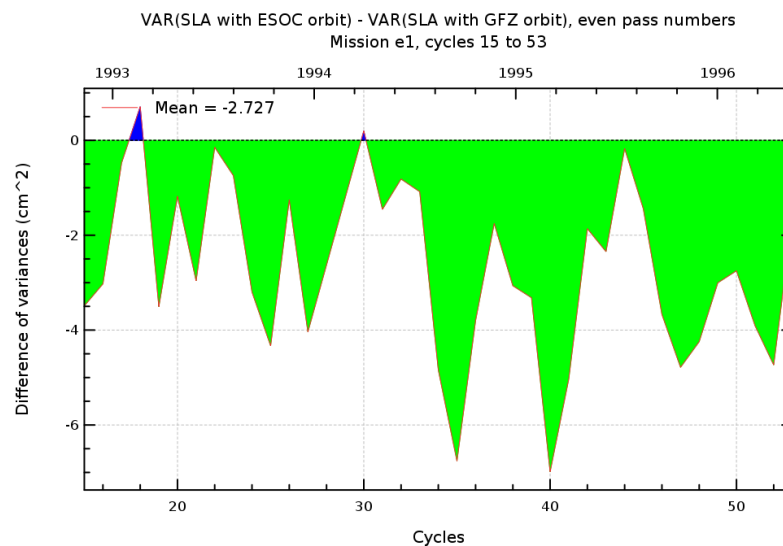
## Diagnostic A202\_b (mission e1)

**Name :** Differences between temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The differences between temporal evolution of SLA are calculated from statistics derived from diagnostic A201 (mean, variance) using 2 different components in the SLA calculation. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) or separating North and South hemispheres.

Diagnostic type : Global internal analyses



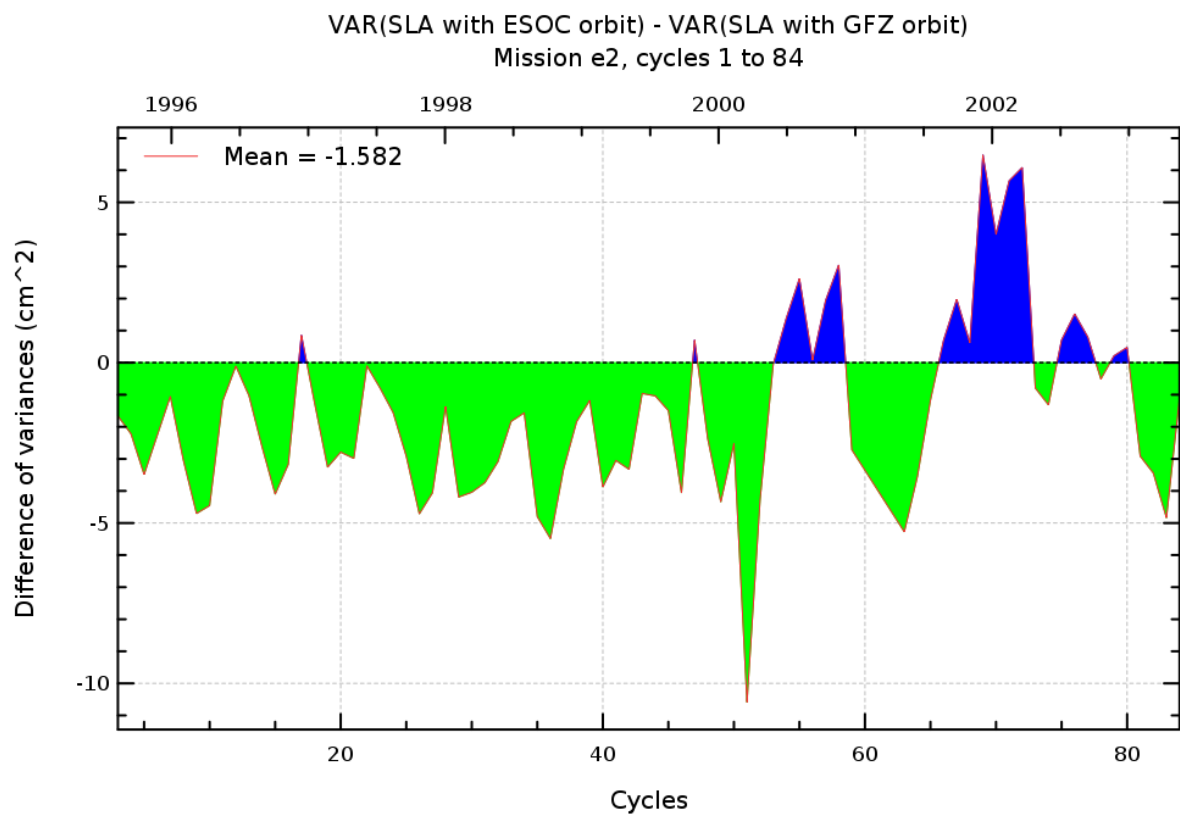
## Diagnostic A202\_a (mission e2)

**Name :** Differences between temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The differences between temporal evolution of SLA are calculated from statistics derived from diagnostic A201 (mean, variance) using 2 different components in the SLA calculation. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) or separating North and South hemispheres.

Diagnostic type : Global internal analyses



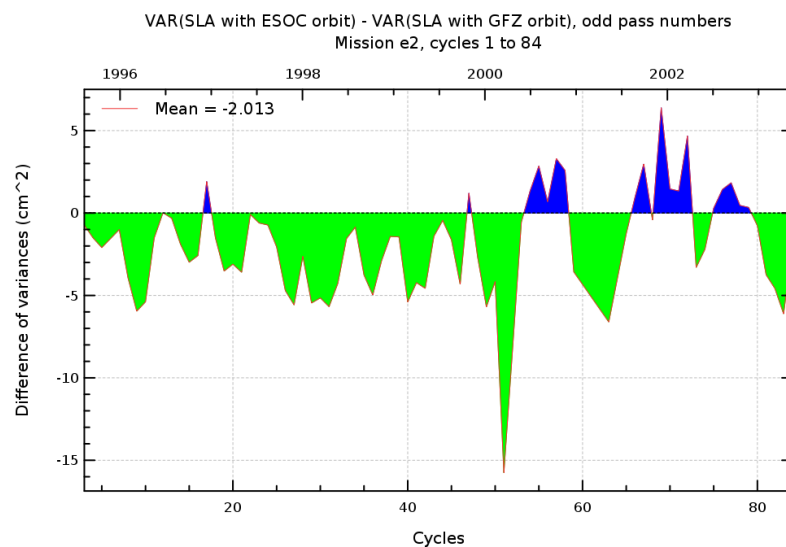
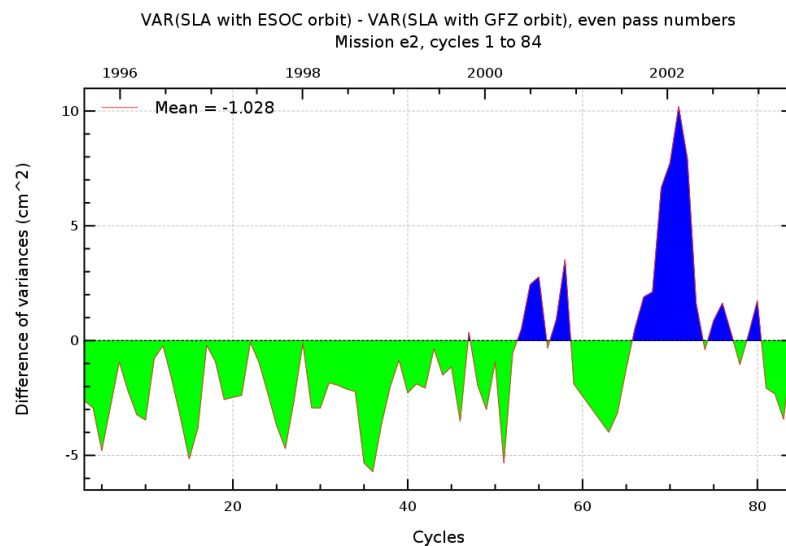
## Diagnostic A202\_b (mission e2)

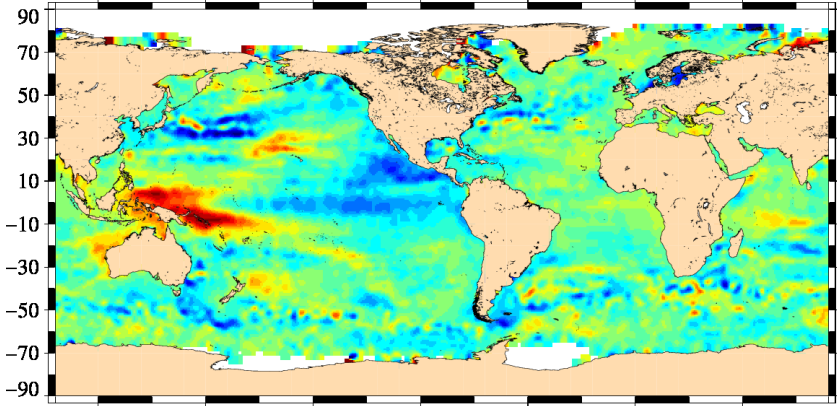
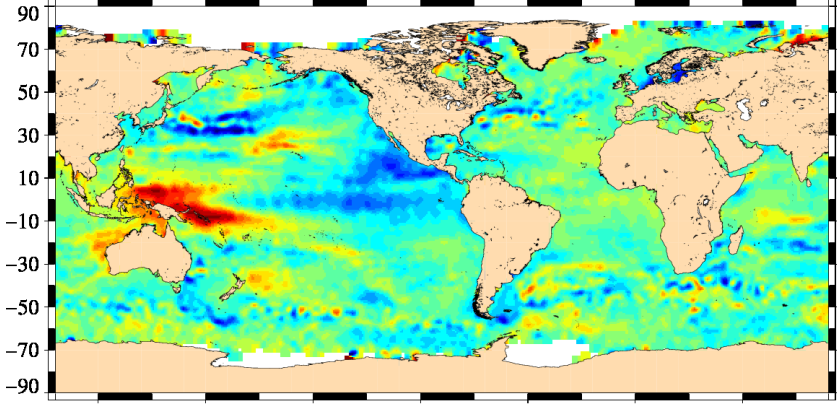
**Name :** Differences between temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The differences between temporal evolution of SLA are calculated from statistics derived from diagnostic A201 (mean, variance) using 2 different components in the SLA calculation. They are calculated globally, but also separating ascending and descending passes (except for SLA Grids) or separating North and South hemispheres.

Diagnostic type : Global internal analyses



Diagnostic type : Global internal analyses	Diagnostic A203_a (mission e1)	
	Name : Map of Sea Level Anomaly (SLA) over all the period	
	Input data : Along track SLA	
	Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.	
	<div>SLA with ESOC orbit trends</div> <div>Mission e1, cycles 15 to 53</div>  <div>-50.08211 -16.0454 17.99132 52.02803</div> <div>Trends (mm/yr)</div> <div>SLA with GFZ orbit trends</div> <div>Mission e1, cycles 15 to 53</div>  <div>-50.58 -16.11 18.36 52.83</div> <div>Trends (mm/yr)</div>	

## Diagnostic A203\_b (mission e1)

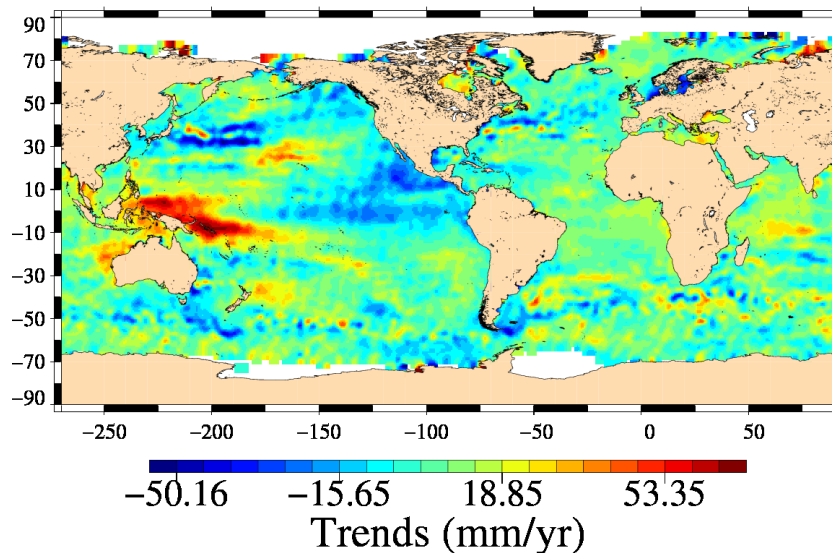
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA

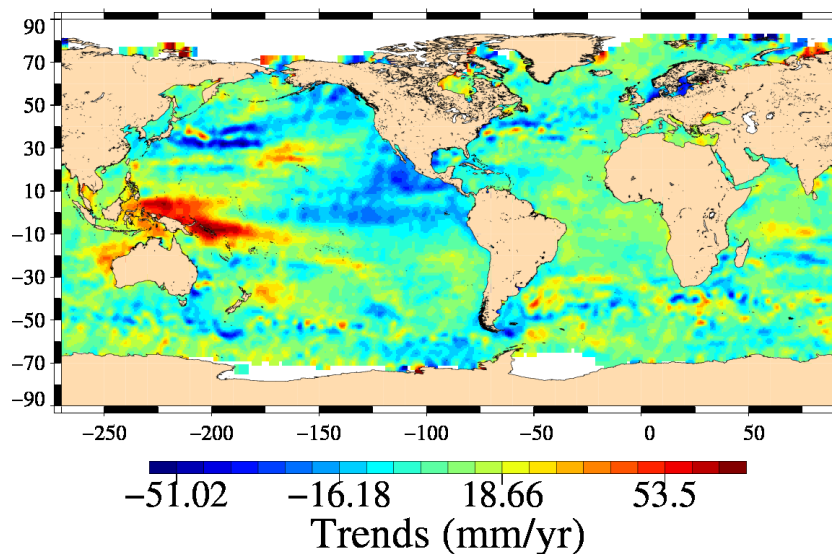
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with ESOC orbit trends : even pass numbers  
Mission e1, cycles 15 to 53



SLA with GFZ orbit trends : even pass numbers  
Mission e1, cycles 15 to 53



## Diagnostic A203\_c (mission e1)

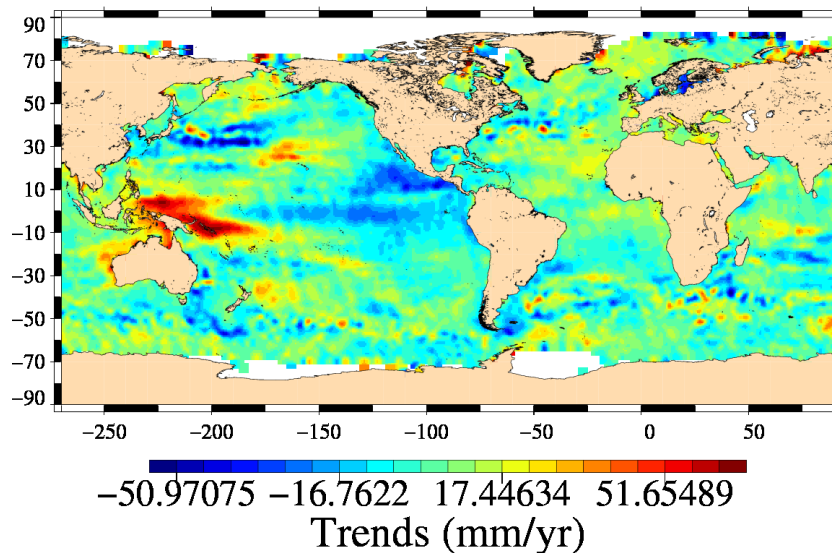
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA

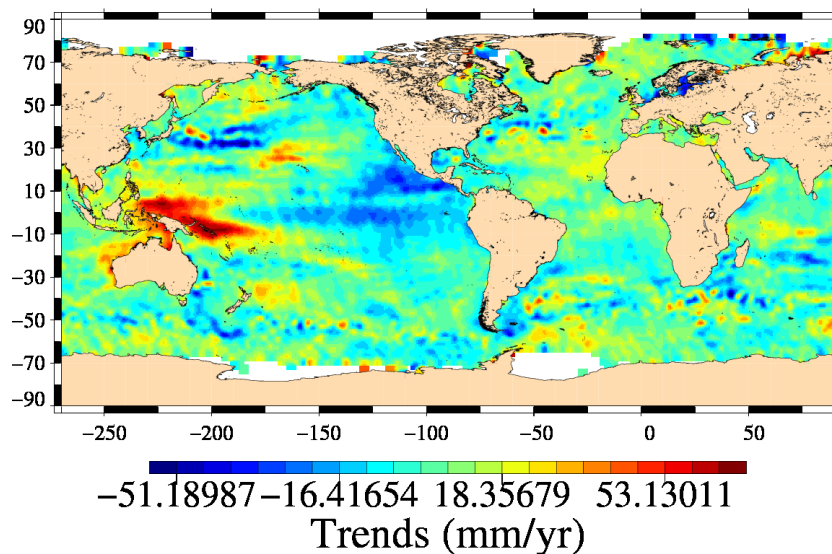
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with ESOC orbit trends : odd pass numbers  
Mission e1, cycles 15 to 53



SLA with GFZ orbit trends : odd pass numbers  
Mission e1, cycles 15 to 53





## Diagnostic A203\_a (mission e2)

**Name :** Map of Sea Level Anomaly (SLA) over all the period

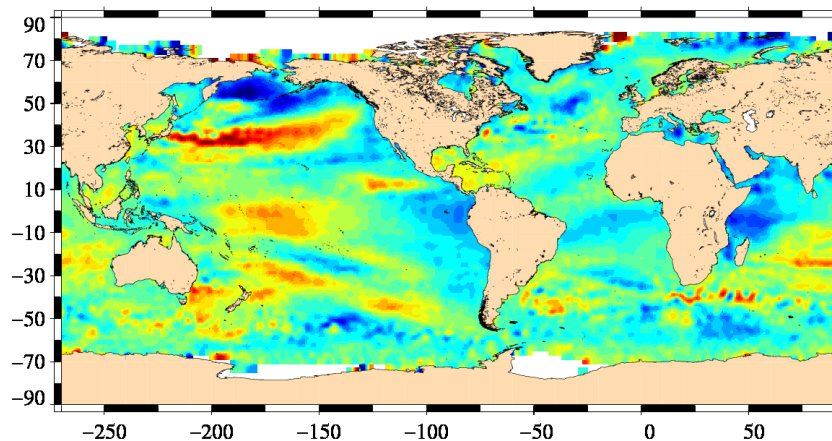
**Input data :** Along track SLA

**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with ESOC orbit trends

Mission e2, cycles 1 to 84

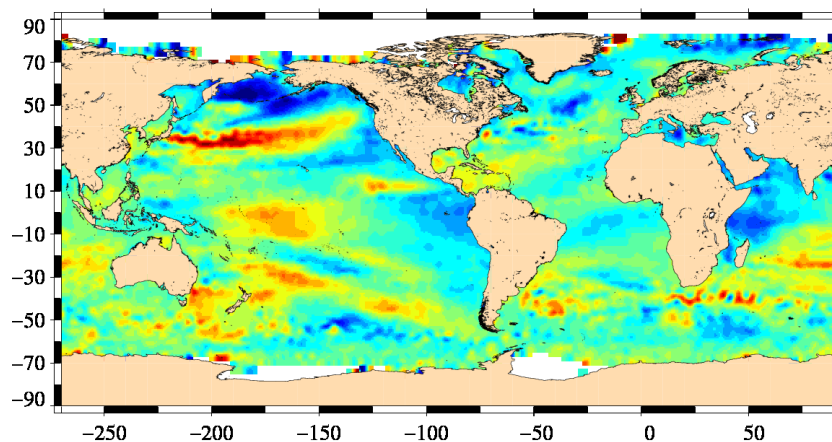


-20.15775 -6.81249 6.53277 19.87802

Trends (mm/yr)

SLA with GFZ orbit trends

Mission e2, cycles 1 to 84



-20.24714 -6.8266 6.59395 20.0145

Trends (mm/yr)

## Diagnostic A203\_b (mission e2)

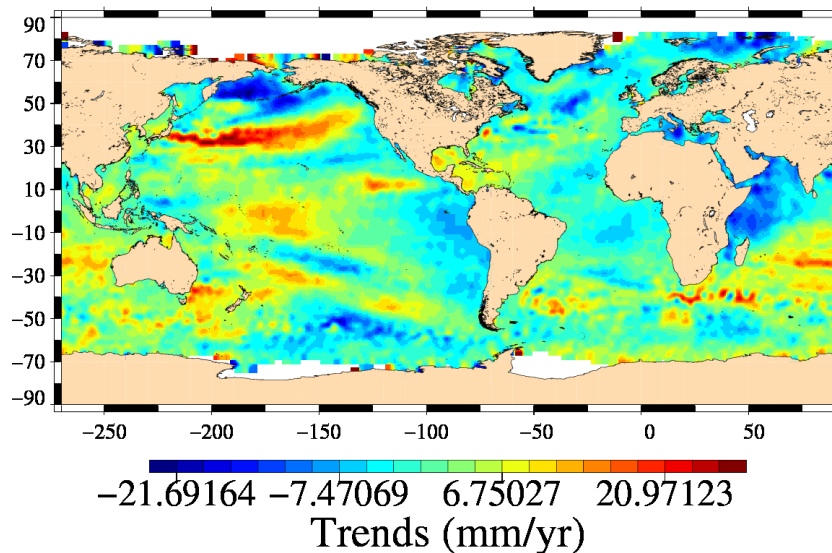
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA

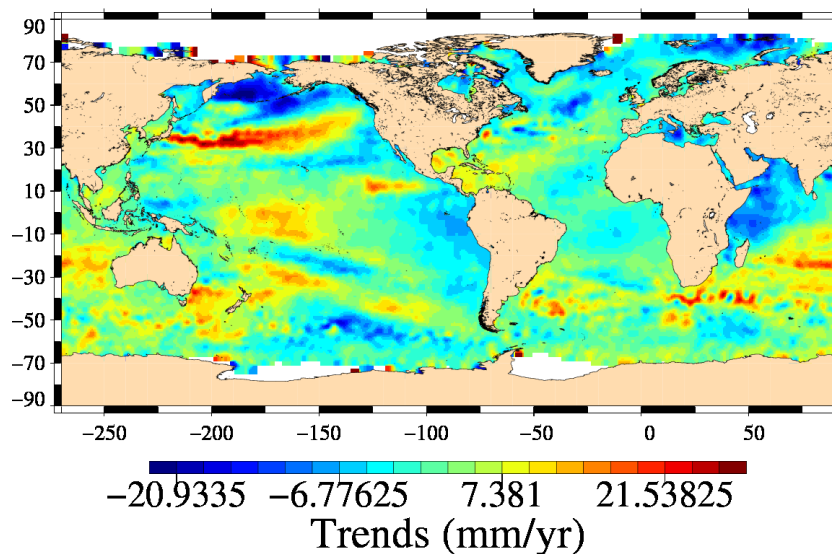
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with ESOC orbit trends : even pass numbers  
Mission e2, cycles 1 to 84



SLA with GFZ orbit trends : even pass numbers  
Mission e2, cycles 1 to 84



## Diagnostic A203\_c (mission e2)

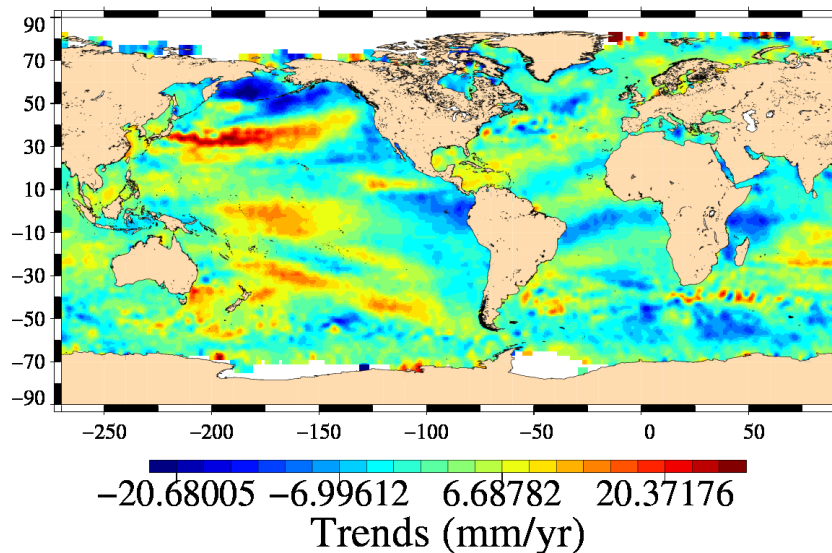
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA

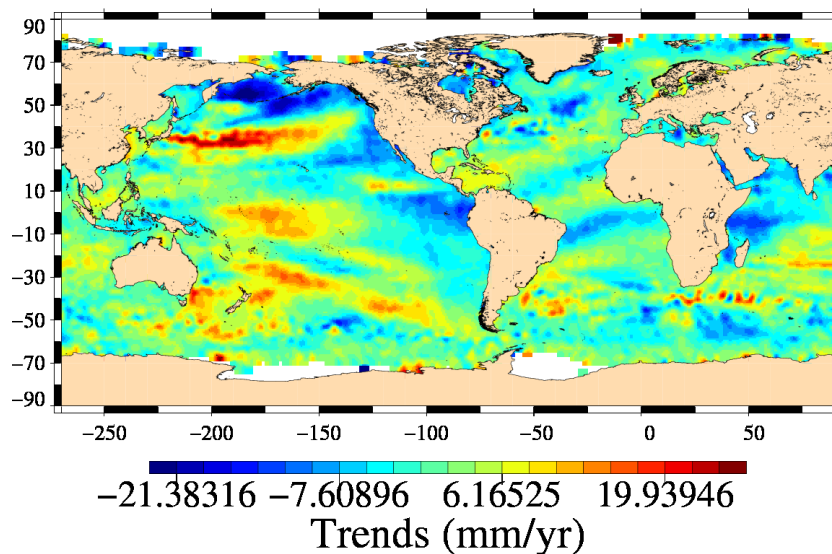
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

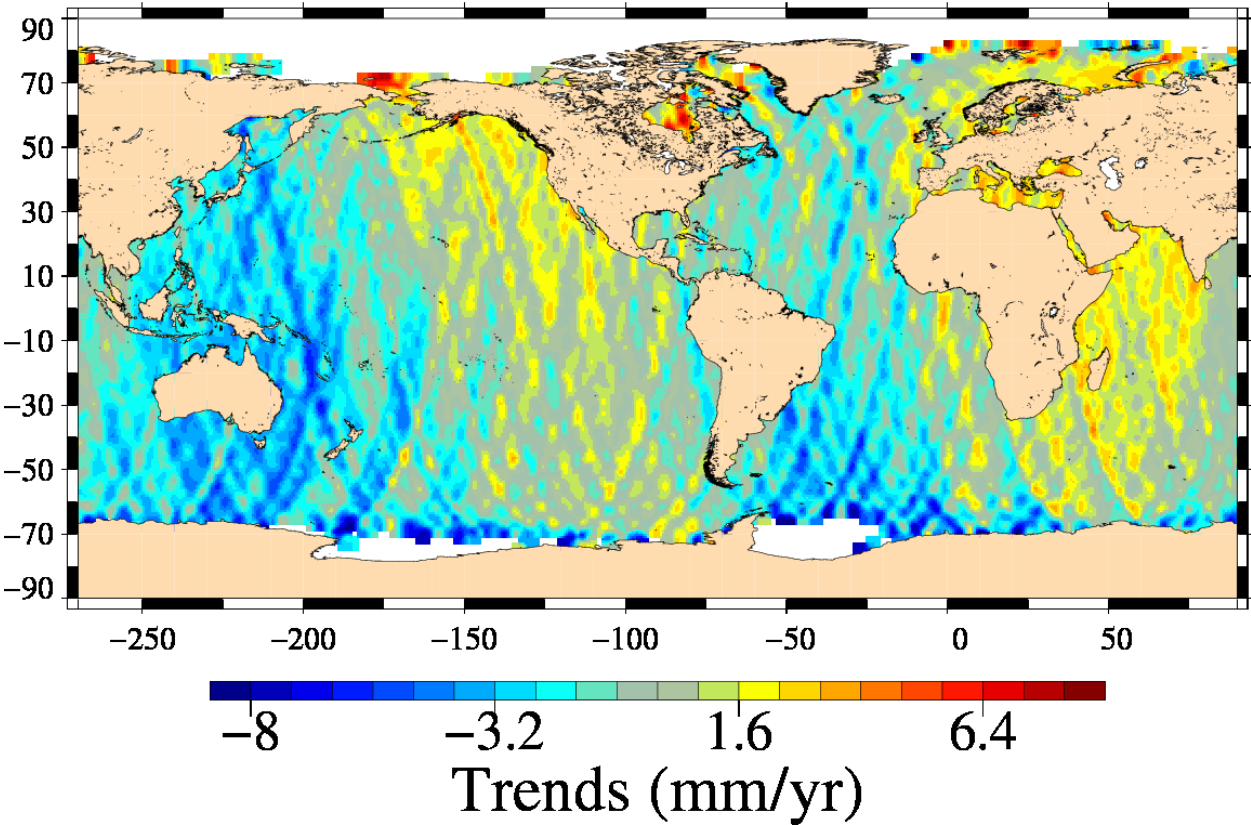
Diagnostic type : Global internal analyses

SLA with ESOC orbit trends : odd pass numbers  
Mission e2, cycles 1 to 84



SLA with GFZ orbit trends : odd pass numbers  
Mission e2, cycles 1 to 84



Diagnostic type : Global internal analyses	Diagnostic A204_a (mission e1)	
	Name : Differences between maps of SLA	
	Input data : Along track SLA	
	Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).	
	<div>SLA with ESOC orbit trends – SLA with GFZ orbit trends</div> <div>Mission e1, cycles 15 to 53</div> 	

## Diagnostic A204\_b (mission e1)

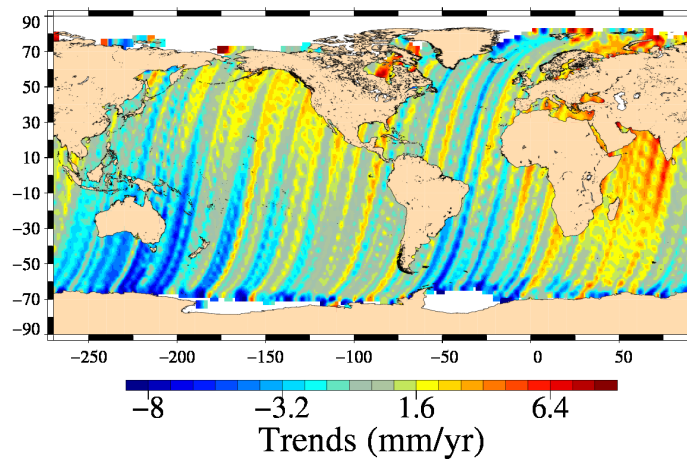
**Name :** Differences between maps of SLA

**Input data :** Along track SLA

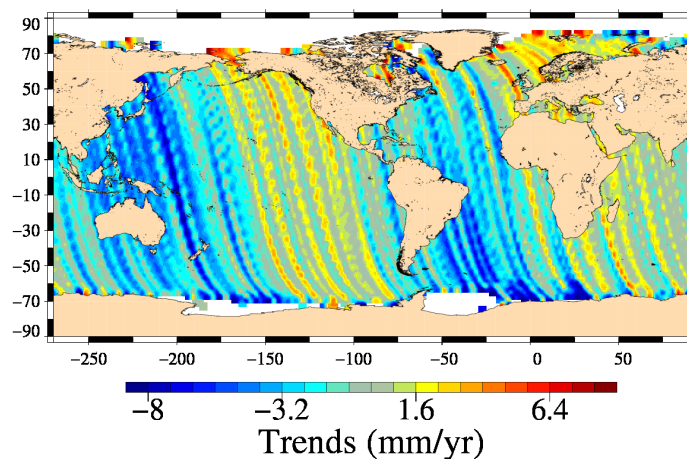
**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).

Diagnostic type : Global internal analyses

SLA with ESOC orbit trends – SLA with GFZ orbit trends : even pass number  
Mission e1, cycles 15 to 53



SLA with ESOC orbit trends – SLA with GFZ orbit trends : odd pass numbers  
Mission e1, cycles 15 to 53





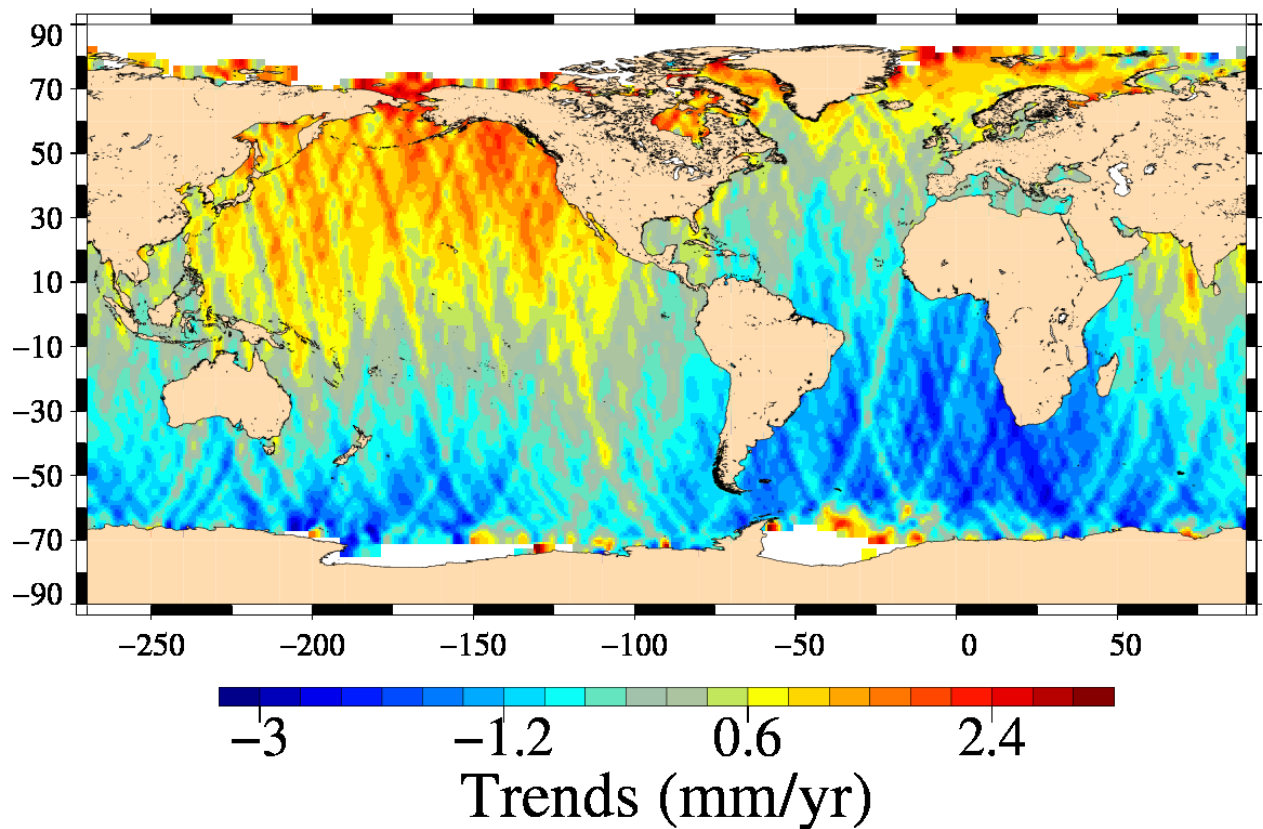
## Diagnostic A204\_a (mission e2)

**Name :** Differences between maps of SLA

**Input data :** Along track SLA

**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).

SLA with ESOC orbit trends – SLA with GFZ orbit trends  
Mission e2, cycles 1 to 84



## Diagnostic A204\_b (mission e2)

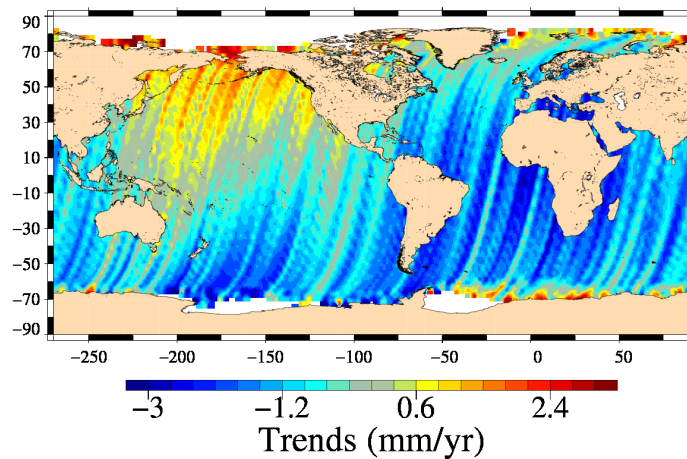
**Name :** Differences between maps of SLA

**Input data :** Along track SLA

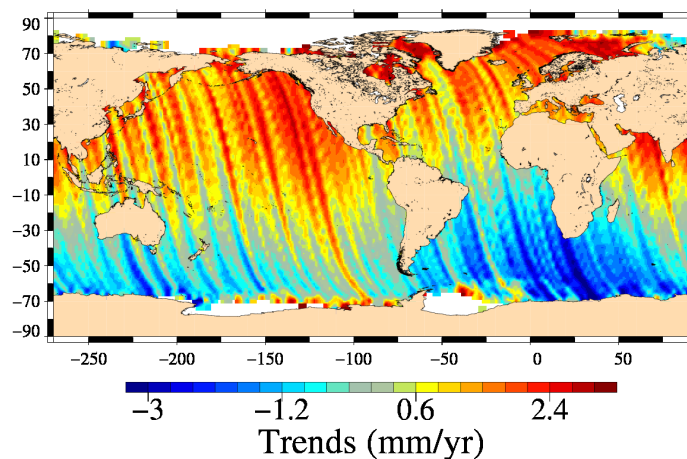
**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).

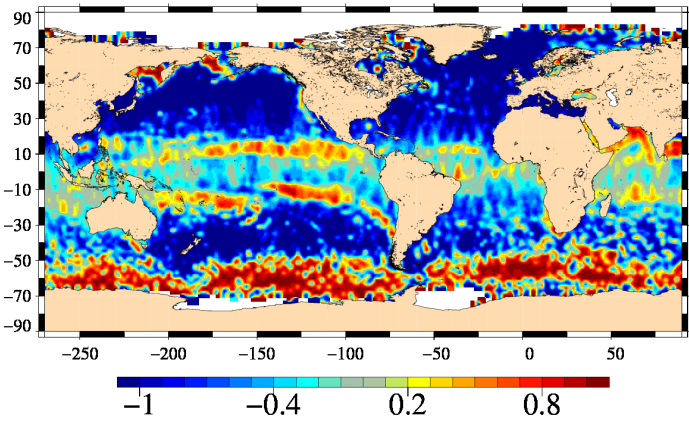
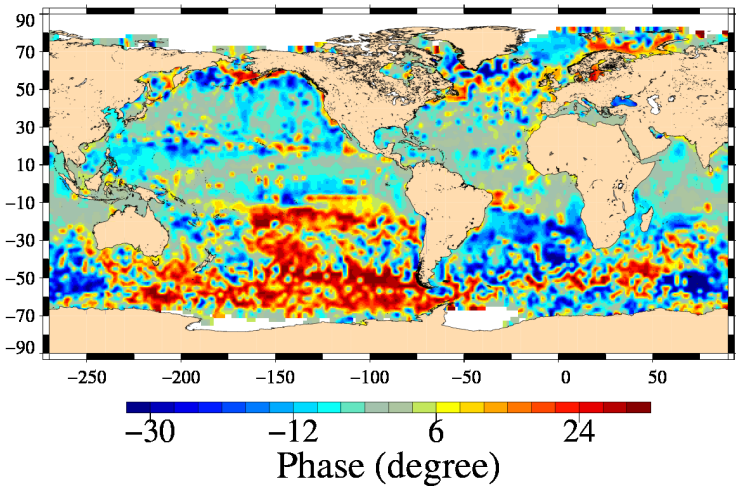
Diagnostic type : Global internal analyses

SLA with ESOC orbit trends – SLA with GFZ orbit trends : even pass number  
Mission e2, cycles 1 to 84



SLA with ESOC orbit trends – SLA with GFZ orbit trends : odd pass numbers  
Mission e2, cycles 1 to 84



Diagnostic type : Global internal analyses	Diagnostic A205_a (mission e1)	
	Name : Differences between maps of SLA (2)	
	Input data : Along track SLA	
	Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).	
	<p>SLA with ESOC orbit amplitude – SLA with GFZ orbit amplitude : annual sign Mission e1, cycles 15 to 53</p>  <p>Amplitude (cm)</p> <p>SLA with ESOC orbit phase – SLA with GFZ orbit phase : annual sign Mission e1, cycles 15 to 53</p>  <p>Phase (degree)</p>	



## Diagnostic A205\_b (mission e1)

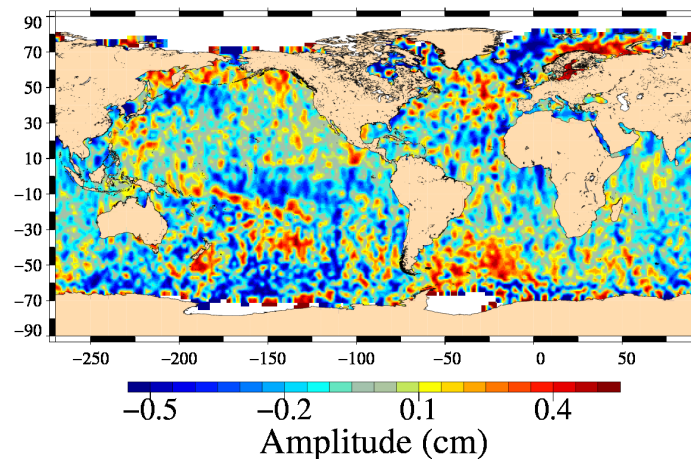
**Name :** Differences between maps of SLA (2)

**Input data :** Along track SLA

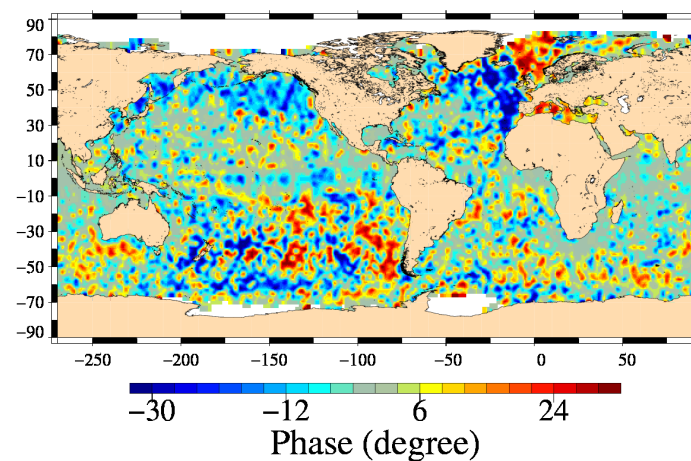
**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).

Diagnostic type : Global internal analyses

with ESOC orbit amplitude – SLA with GFZ orbit amplitude : semi-annual signal  
Mission e1, cycles 15 to 53



SLA with ESOC orbit phase – SLA with GFZ orbit phase : semi-annual signal  
Mission e1, cycles 15 to 53



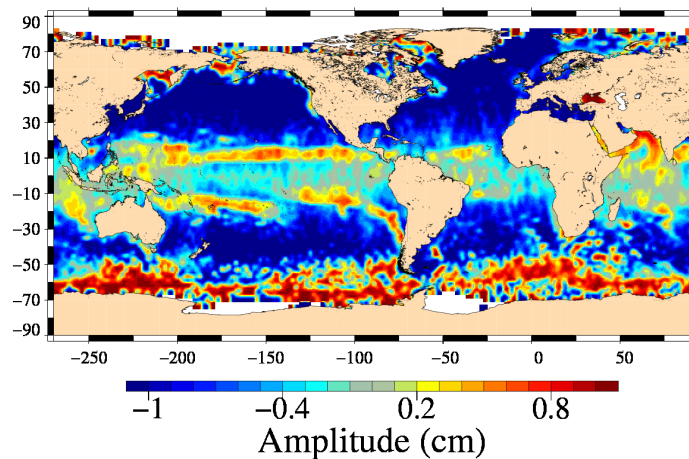
## Diagnostic A205\_a (mission e2)

**Name :** Differences between maps of SLA (2)

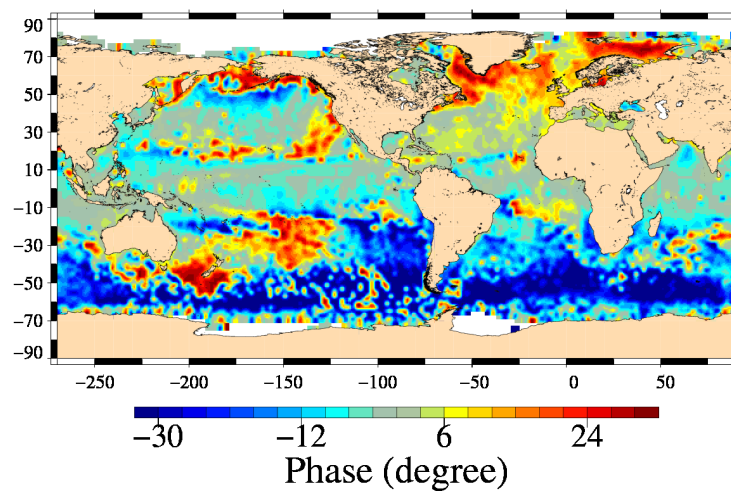
**Input data :** Along track SLA

**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).

SLA with ESOC orbit amplitude – SLA with GFZ orbit amplitude : annual signal  
Mission e2, cycles 1 to 84



SLA with ESOC orbit phase – SLA with GFZ orbit phase : annual signal  
Mission e2, cycles 1 to 84



## Diagnostic A205\_b (mission e2)

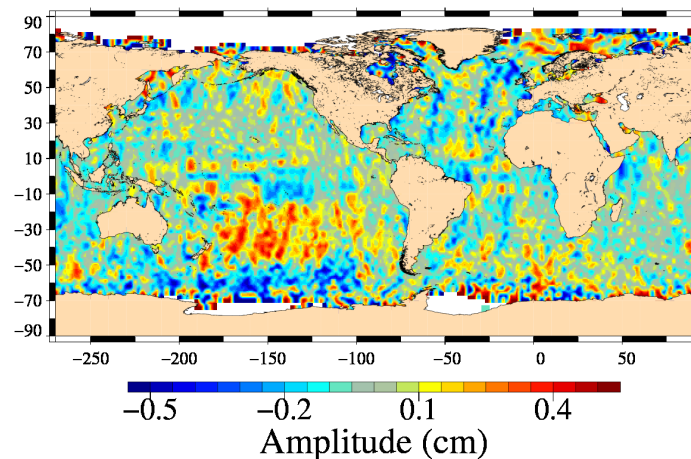
**Name :** Differences between maps of SLA (2)

**Input data :** Along track SLA

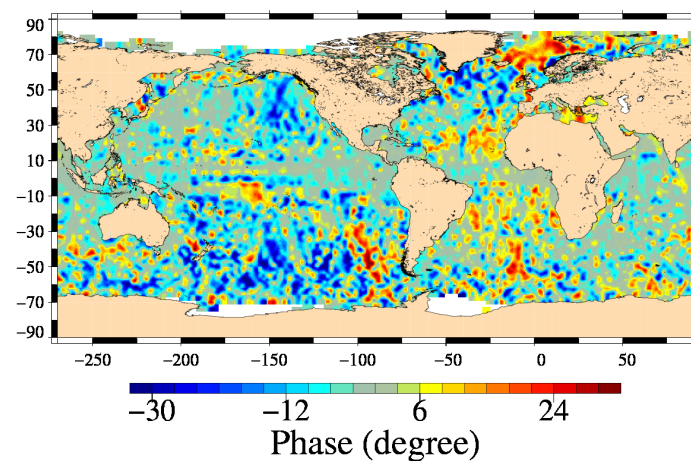
**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).

Diagnostic type : Global internal analyses

with ESOC orbit amplitude – SLA with GFZ orbit amplitude : semi-annual signal  
Mission e2, cycles 1 to 84



SLA with ESOC orbit phase – SLA with GFZ orbit phase : semi-annual signal  
Mission e2, cycles 1 to 84

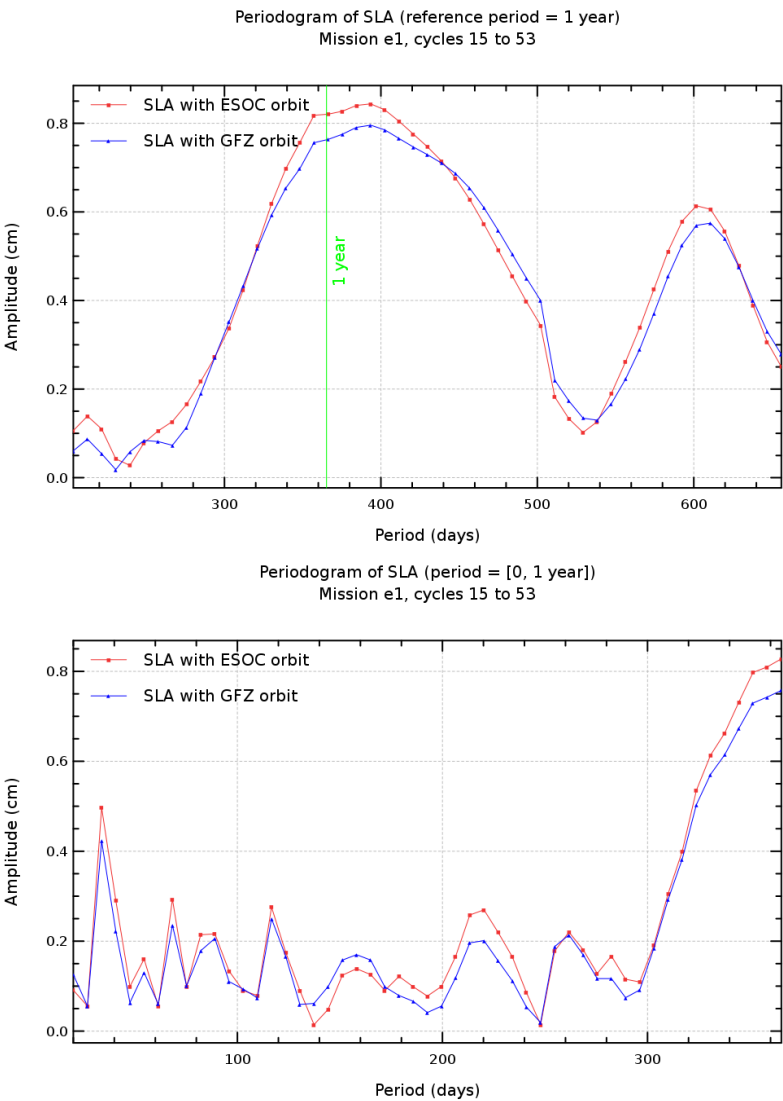


Diagnostic A206\_a (mission e1)

Name : Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

Input data : Along track SLA

Description : The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data series are plotted as a periodogram.



## Diagnostic A206\_b (mission e1)

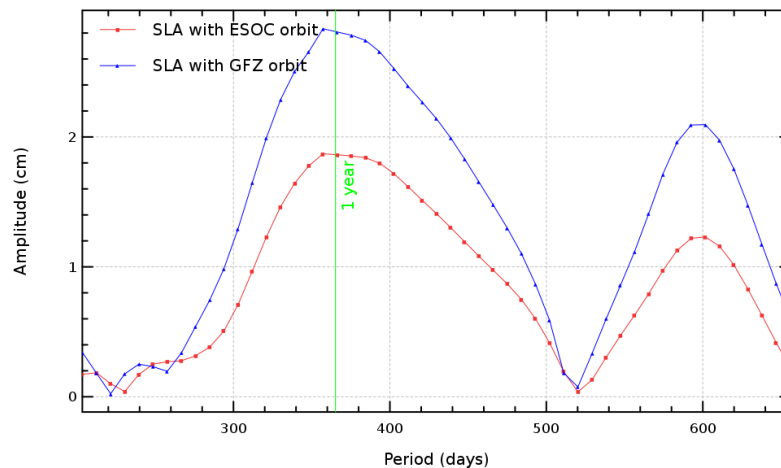
**Name :** Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

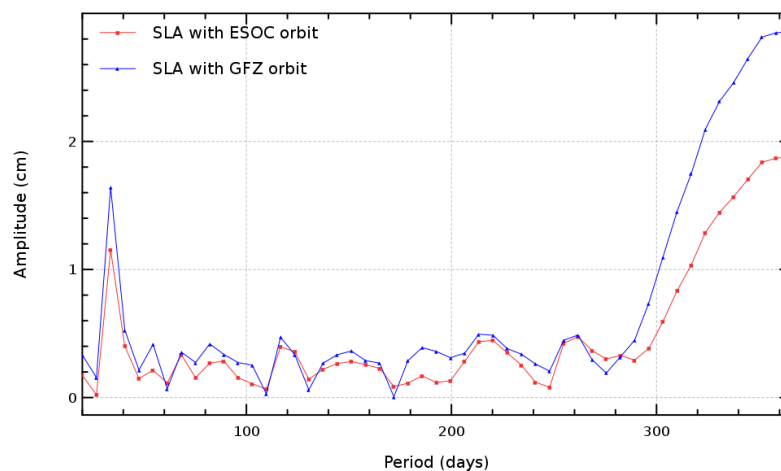
**Description :** The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data series are plotted as a periodogram.

Diagnostic type : Global internal analyses

Periodogram of north hemisphere SLA (reference period = 1 year)  
Mission e1, cycles 15 to 53



Periodogram of north hemisphere SLA (period = [0, 1 year])  
Mission e1, cycles 15 to 53



## Diagnostic A206\_c (mission e1)

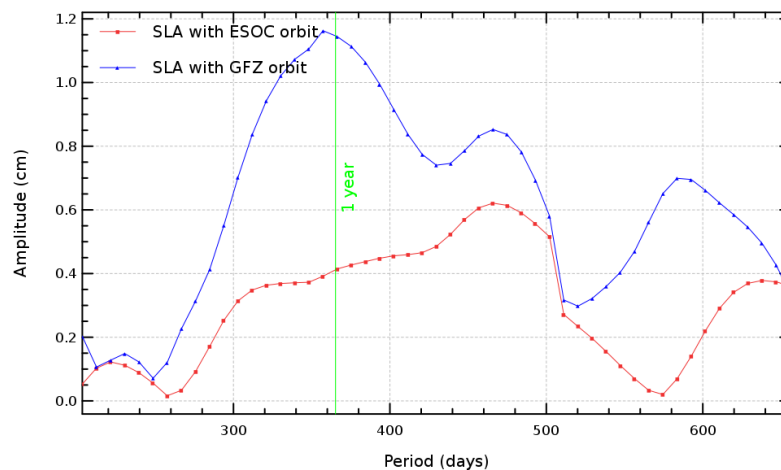
**Name :** Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

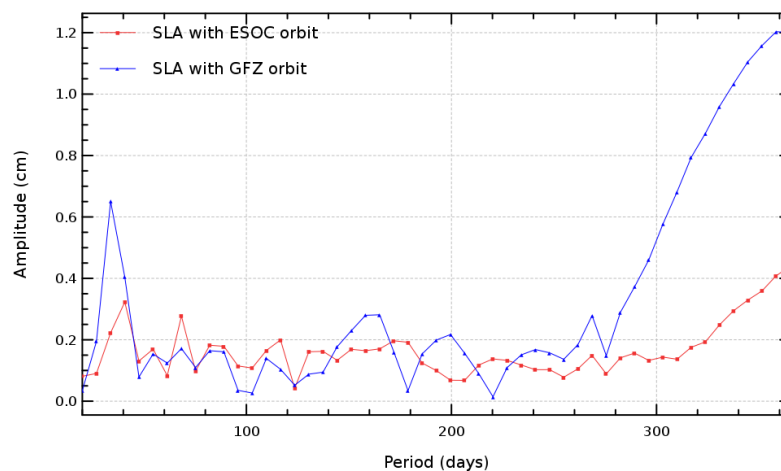
**Description :** The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data series are plotted as a periodogram.

Diagnostic type : Global internal analyses

Periodogram of south hemisphere SLA (reference period = 1 year)  
Mission e1, cycles 15 to 53



Periodogram of south hemisphere SLA (period = [0, 1 year])  
Mission e1, cycles 15 to 53



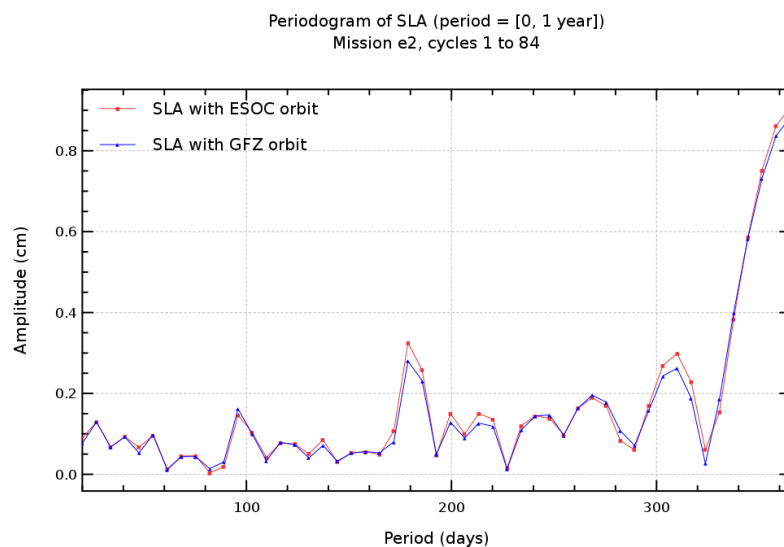
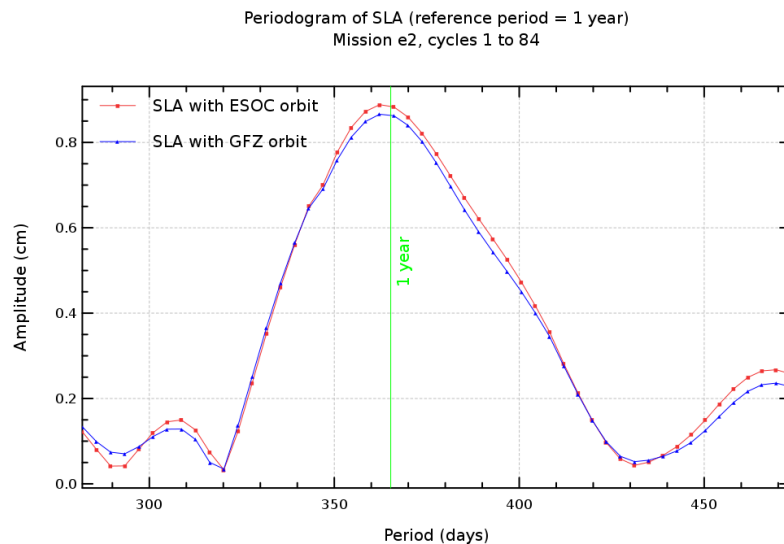
## Diagnostic A206\_a (mission e2)

**Name :** Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data series are plotted as a periodogram.

Diagnostic type : Global internal analyses



## Diagnostic A206\_b (mission e2)

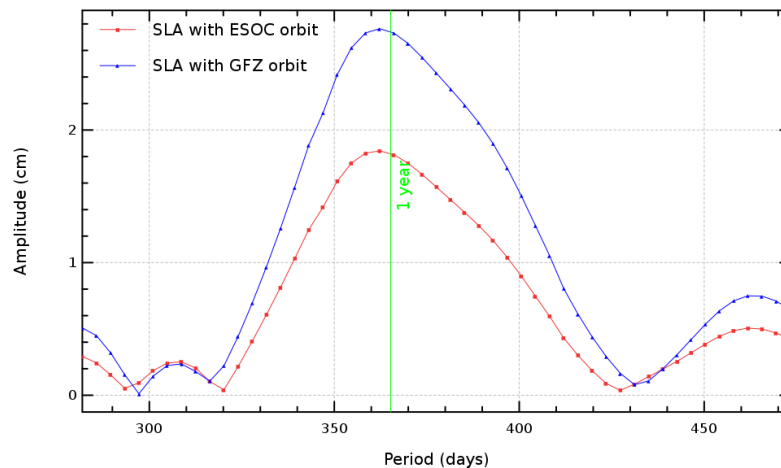
**Name :** Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

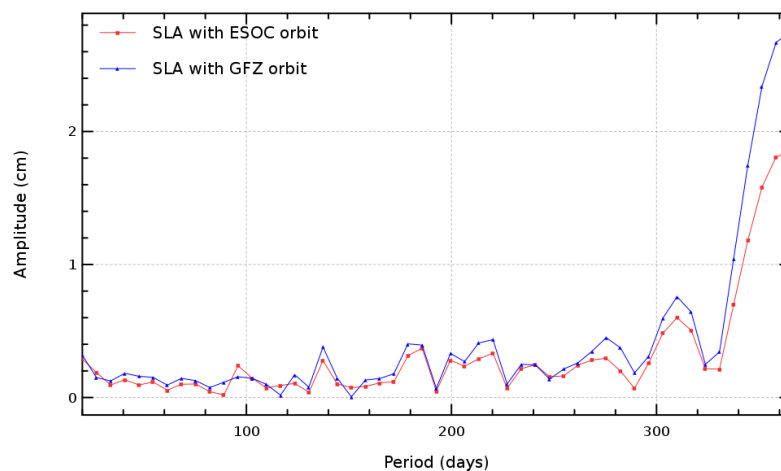
**Description :** The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data series are plotted as a periodogram.

Diagnostic type : Global internal analyses

Periodogram of north hemisphere SLA (reference period = 1 year)  
Mission e2, cycles 1 to 84



Periodogram of north hemisphere SLA (period = [0, 1 year])  
Mission e2, cycles 1 to 84





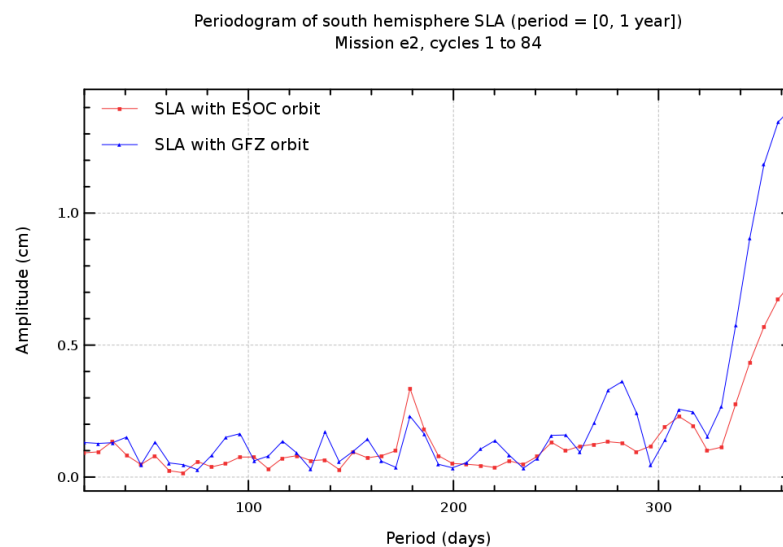
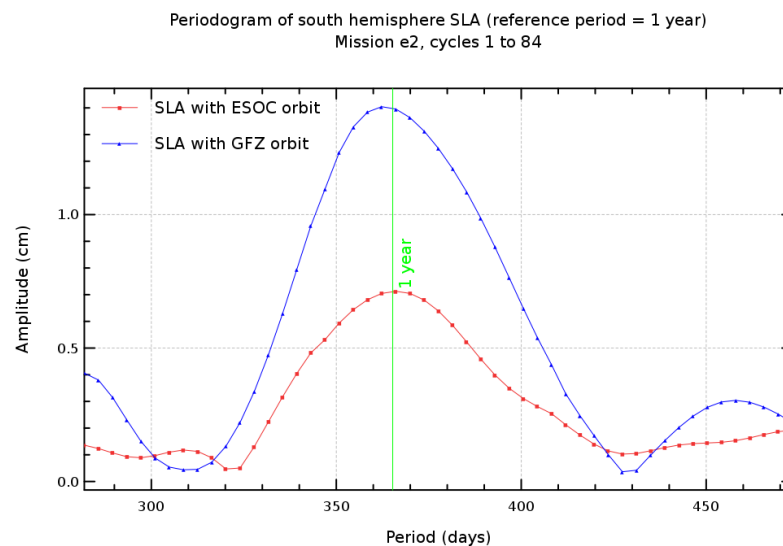
## Diagnostic A206\_c (mission e2)

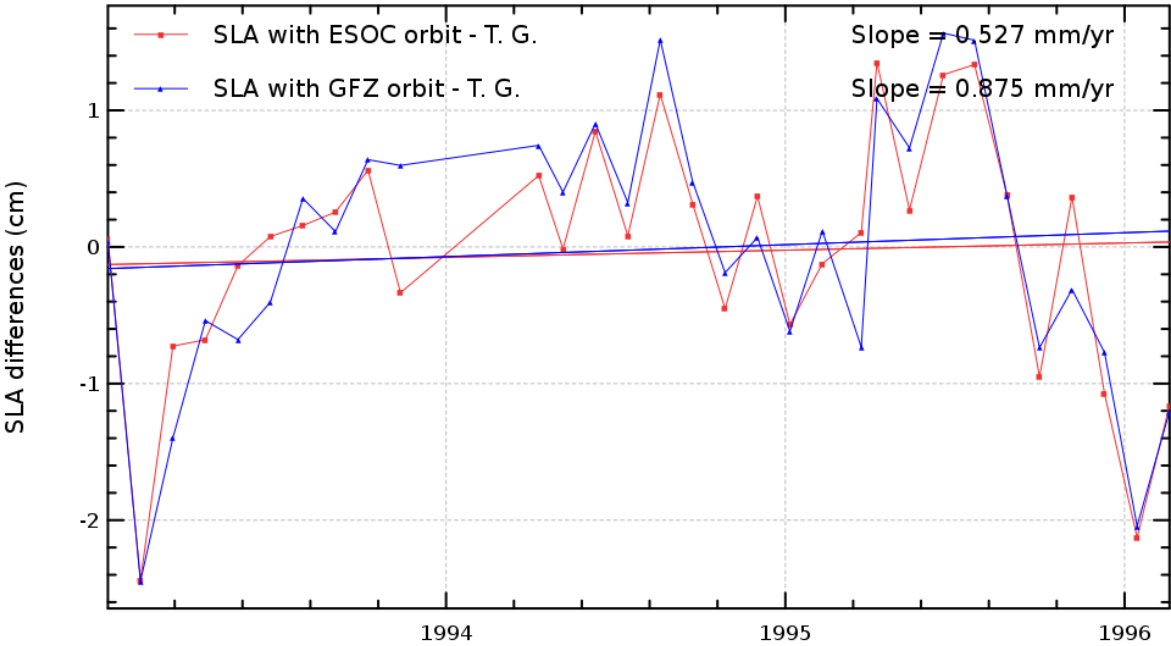
**Name :** Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA

**Description :** The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data series are plotted as a periodogram.

Diagnostic type : Global internal analyses



Diagnostic type : Altimetry and in-situ data comparison	Diagnostic C001 (mission e1)	
	Name : Temporal evolution of SSH differences between tide gauges and altimetry measurements	
	Input data : Tide gauges SSH measurements	
	<p>Description : The temporal evolution of global statistics (mean, variance, slope) of SSH differences between tide gauges and altimeter measurements are calculated from a cyclic way (altimeter repetivity) using successively both altimetric components in SSH calculation. The altimetric and tide gauges data are colocated with criteria of maximum of correlation, and tide gauges used are derived from global networks (GLOSS/CLIVAR, REFMAR).</p>	
	<p>SLA differences : altimetry measurements - tide gauges Mission e1, cycles 15 to 53</p> 	

## Diagnostic C001 (mission e2)

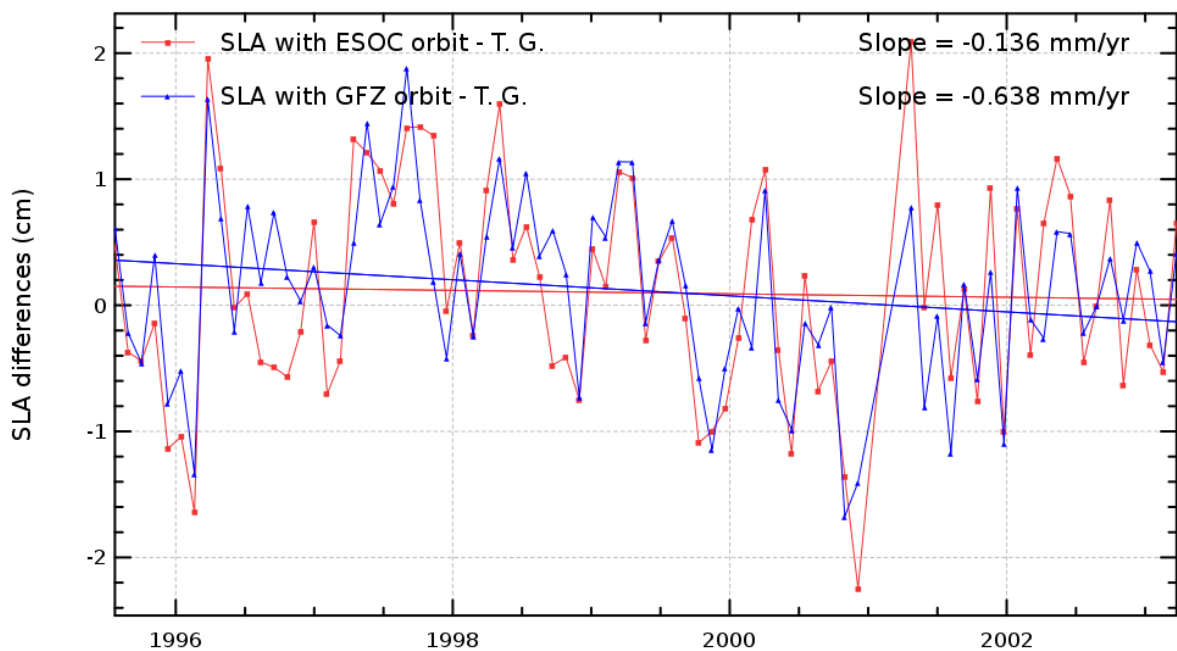
**Name :** Temporal evolution of SSH differences between tide gauges and altimetry measurements

**Input data :** Tide gauges SSH measurements

**Description :** The temporal evolution of global statistics (mean, variance, slope) of SSH differences between tide gauges and altimeter measurements are calculated from a cyclic way (altimeter repetitivity) using successively both altimetric components in SSH calculation. The altimetric and tide gauges data are colocated with criteria of maximum of correlation, and tide gauges used are derived from global networks (GLOSS/CLIVAR, REFMAR).

Diagnostic type : Altimetry and in-situ data comparison

SLA differences : altimetry measurements - tide gauges  
Mission e2, cycles 1 to 84



**Diagnostic C002 (mission e1)**

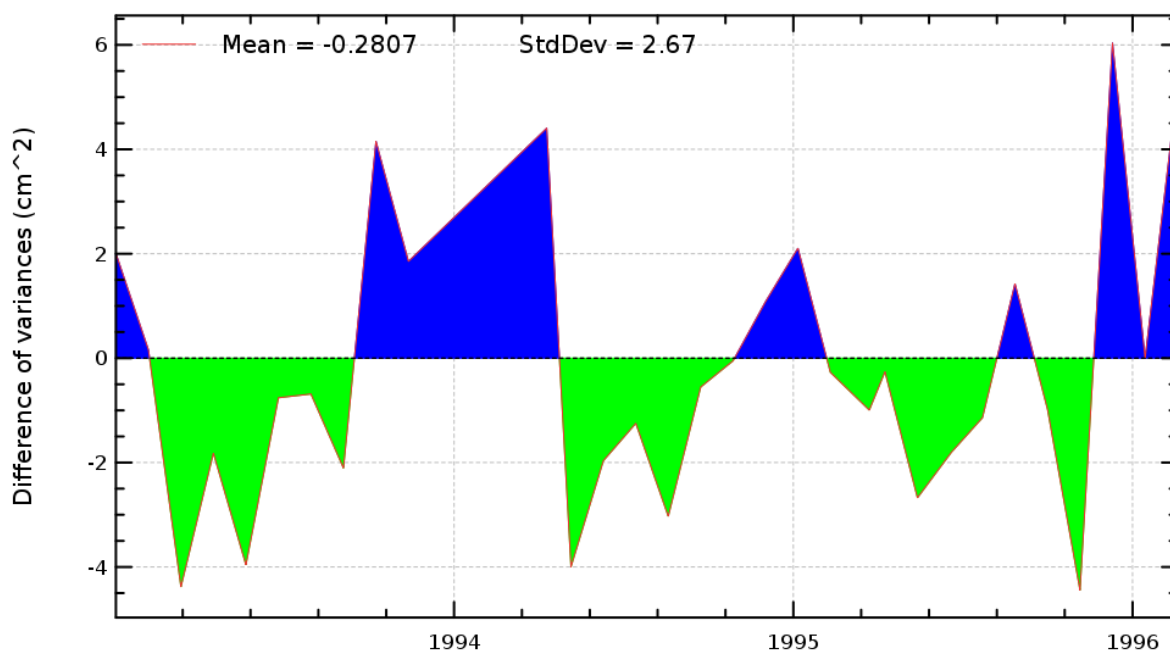
**Name :** Differences of temporal evolution of SSH differences between tide gauges and altimetry measurements

**Input data :** Tide gauges SSH measurements

**Description :** The difference between temporal evolution of global statistics of differences between tide gauge and altimeter data differences are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in altimetric SSH calculation. The altimetric and tide gauges data are collocated with criteria of maximum of correlation, and tide gauges used are derived from global networks as GLOSS/CLIVAR.

Diagnostic type : Altimetry and in-situ data comparison

Difference of variances :  $\text{VAR}(\text{SLA with ESOC orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit} - \text{T. G.})$   
Mission e1, cycles 15 to 53



## Diagnostic C002 (mission e2)

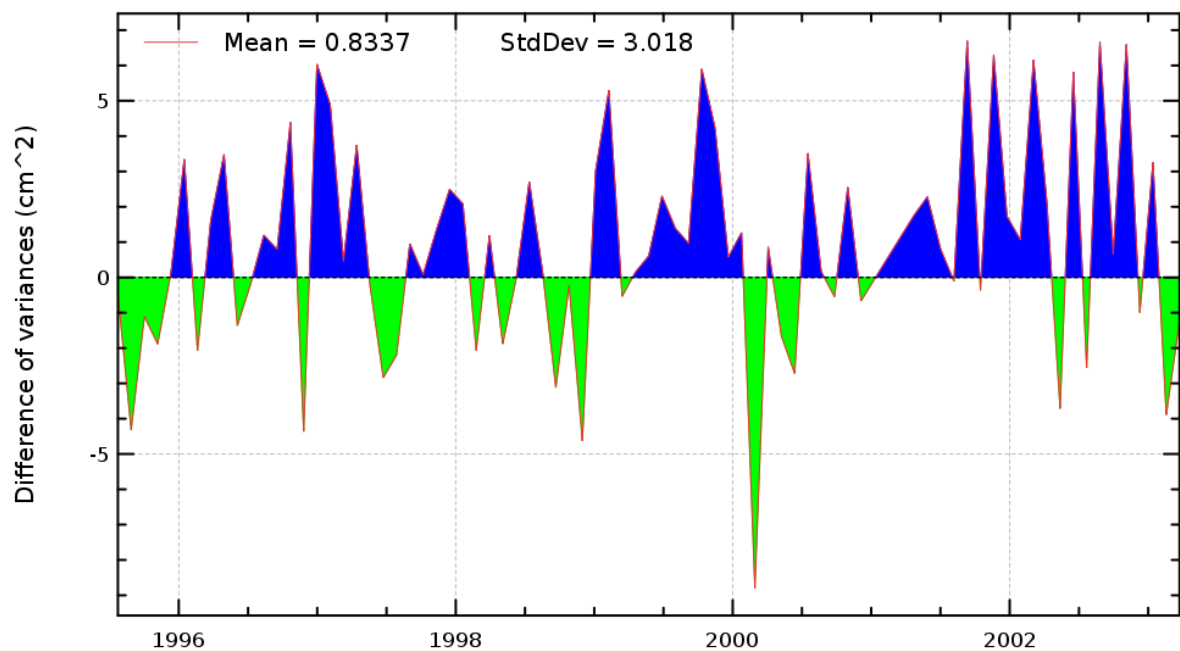
**Name :** Differences of temporal evolution of SSH differences between tide gauges and altimetry measurements

**Input data :** Tide gauges SSH measurements

**Description :** The difference between temporal evolution of global statistics of differences between tide gauge and altimeter data differences are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in altimetric SSH calculation. The altimetric and tide gauges data are collocated with criteria of maximum of correlation, and tide gauges used are derived from global networks as GLOSS/CLIVAR.

Diagnostic type : Altimetry and in-situ data comparison

Difference of variances :  $\text{VAR}(\text{SLA with ESOC orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit} - \text{T. G.})$   
Mission e2, cycles 1 to 84

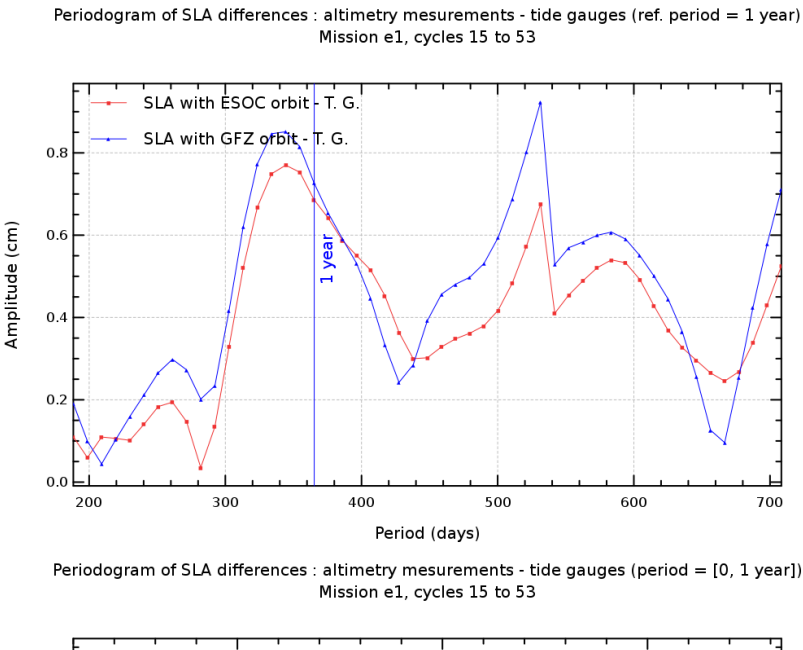


Diagnostic C003 (mission e1)

**Name :** Periodogram derived from temporal evolution of SSH differences between tide gauges and altimetry

**Input data :** Tide gauges SSH measurements

**Description :** The periodogram derived from temporal evolution of altimetric and tide gauges SSH differences is calculated using successively both altimetric components in the altimetric SSH. The periodogram is calculated from the mean or variance statistics and it can be displayed for all the whole time period or a dedicated one



## Diagnostic C003 (mission e2)

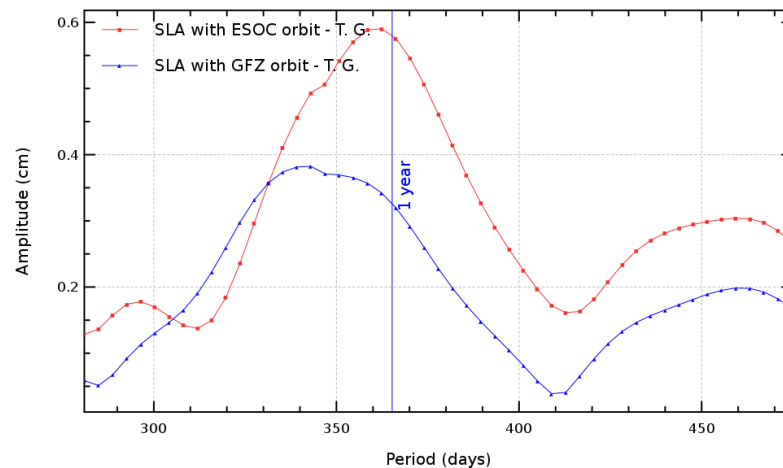
**Name :** Periodogram derived from temporal evolution of SSH differences between tide gauges and altimetry

**Input data :** Tide gauges SSH measurements

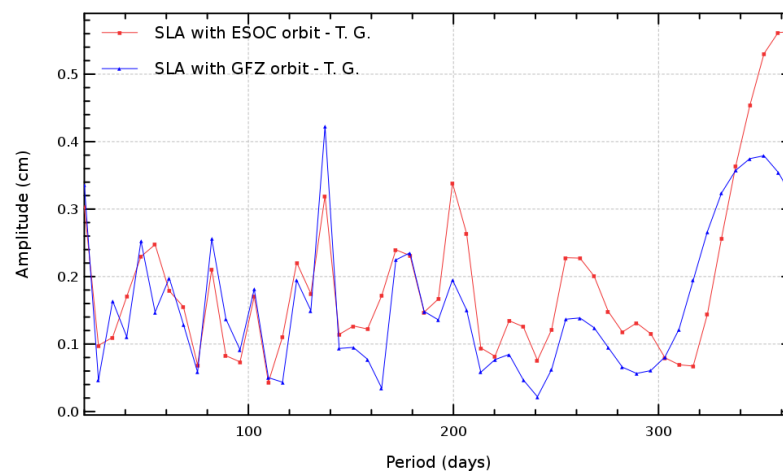
**Description :** The periodogram derived from temporal evolution of altimetric and tide gauges SSH differences is calculated using successively both altimetric components in the altimetric SSH. The periodogram is calculated from the mean or variance statistics and it can be displayed for all the whole time period or a dedicated one

Diagnostic type : Altimetry and in-situ data comparison

Periodogram of SLA differences : altimetry measurements - tide gauges (ref. period = 1 year)  
Mission e2, cycles 1 to 84



Periodogram of SLA differences : altimetry measurements - tide gauges (period = [0, 1 year])  
Mission e2, cycles 1 to 84



## Diagnostic C004 (mission e1)

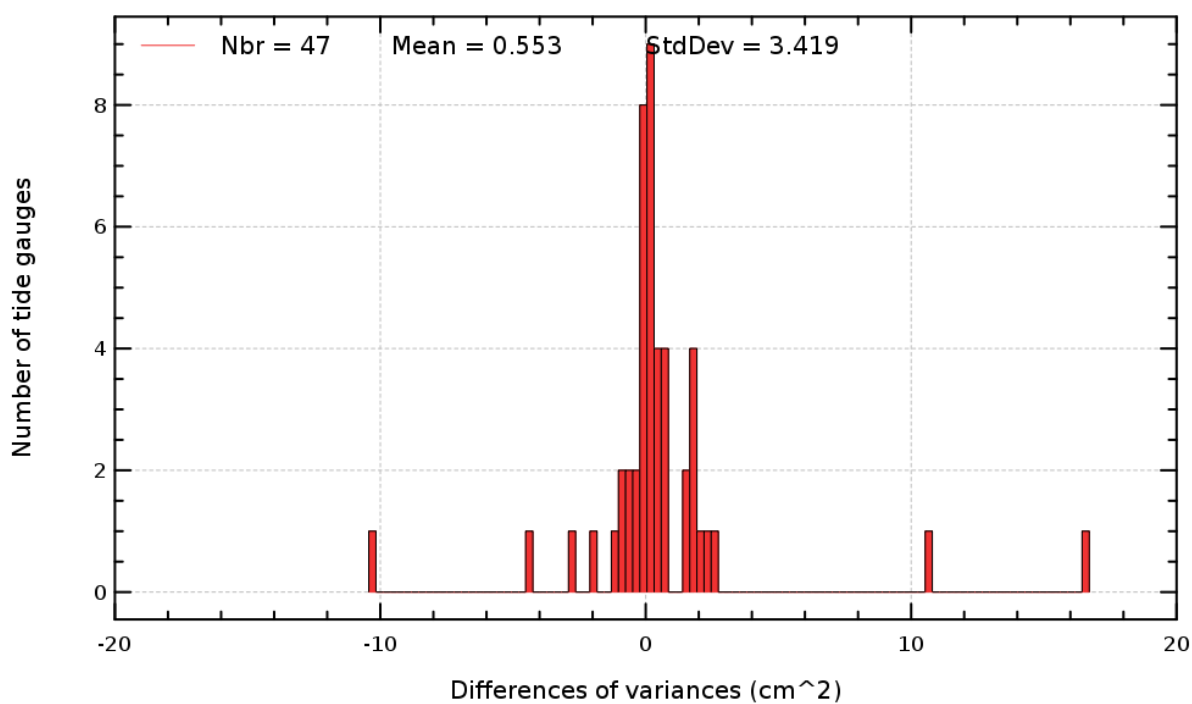
**Name :** Histograms of differences between tide gauges and altimeter SSH differences

**Input data :** Tide gauges SSH measurements

**Description :** The difference of histograms between altimeter and tide gauge SSH differences is computed from the elementary statistics (mean, variance) at each tide gauge using successively both altimetric components in the altimetry SSH.

Diagnostic type : Altimetry and in-situ data comparison

Histogram of the difference of variances :  $\text{VAR}(\text{SLA with ESOC orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit} - \text{T. G.})$   
Mission e1, cycles 15 to 53





## Diagnostic C004 (mission e2)

**Name :** Histograms of differences between tide gauges and altimeter SSH differences

**Input data :** Tide gauges SSH measurements

**Description :** The difference of histograms between altimeter and tide gauge SSH differences is computed from the elementary statistics (mean, variance) at each tide gauge using successively both altimetric components in the altimetry SSH.

Diagnostic type : Altimetry and in-situ data comparison

Histogram of the difference of variances :  $\text{VAR}(\text{SLA with ESOC orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit} - \text{T. G.})$   
Mission e2, cycles 1 to 84

