

Orbit comparison : COMBINED (Reaper) versus GFZ (Reaper)

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

Creation date : 2011/07/13

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Study overview

In this study, the REAPER orbit solution (combined solution derived from ESOC, GFZ and DEOS orbit center productions) 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 COMBINED orbit solutions 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 (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 repetivity, daily, weekly, monthly) . These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.	
<div><div><div>Mean of COMBINED orbit - GFZ orbit</div><div>Mission e1, cycles 16 to 52</div><div><div>1993</div><div>1994</div><div>1995</div><div>1996</div></div><div><div>Mean = -0.1766</div><div>Slope = -0.00374</div></div><div><div>0.0</div><div>-0.1</div><div>-0.2</div><div>-0.3</div><div>-0.4</div></div><div><div>20</div><div>30</div><div>40</div><div>50</div></div><div>Cycles</div></div><div><div>Standard deviation of COMBINED orbit - GFZ orbit</div><div>Mission e1, cycles 16 to 52</div><div><div>1993</div><div>1994</div><div>1995</div><div>1996</div></div><div><div>Mean = 1.346</div></div><div><div>3</div><div>2</div><div>1</div></div><div><div>20</div><div>30</div><div>40</div><div>50</div></div><div>Cycles</div></div></div>	

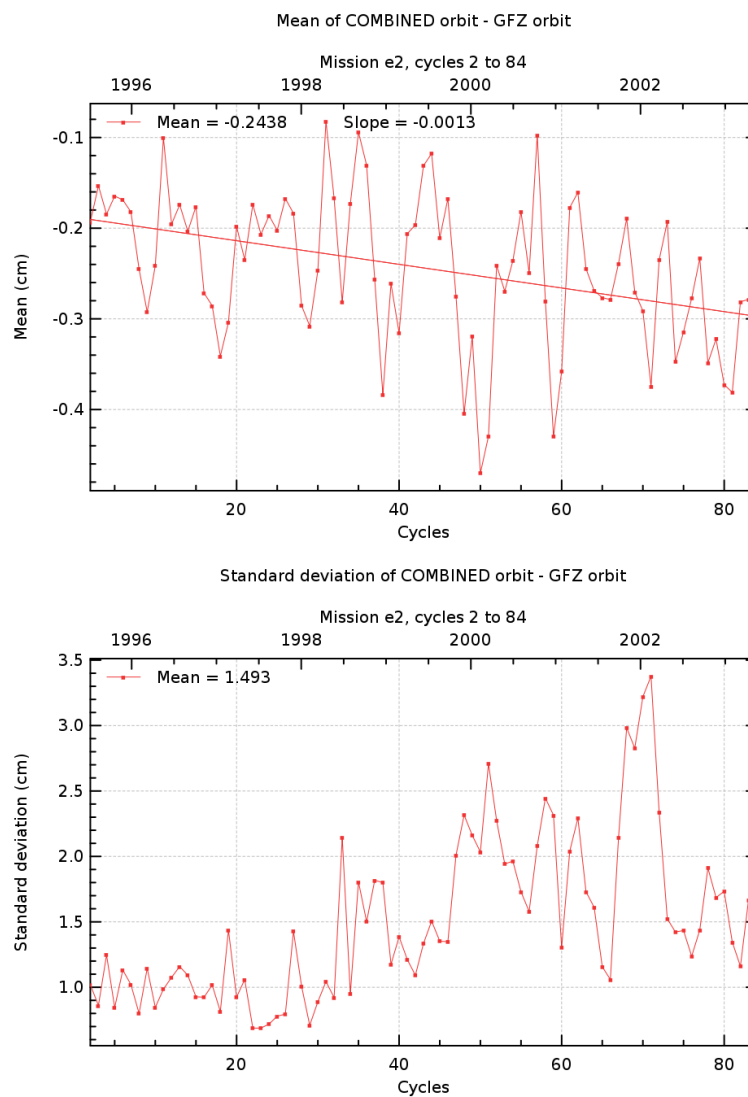
Diagnostic A001 (mission e2)

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

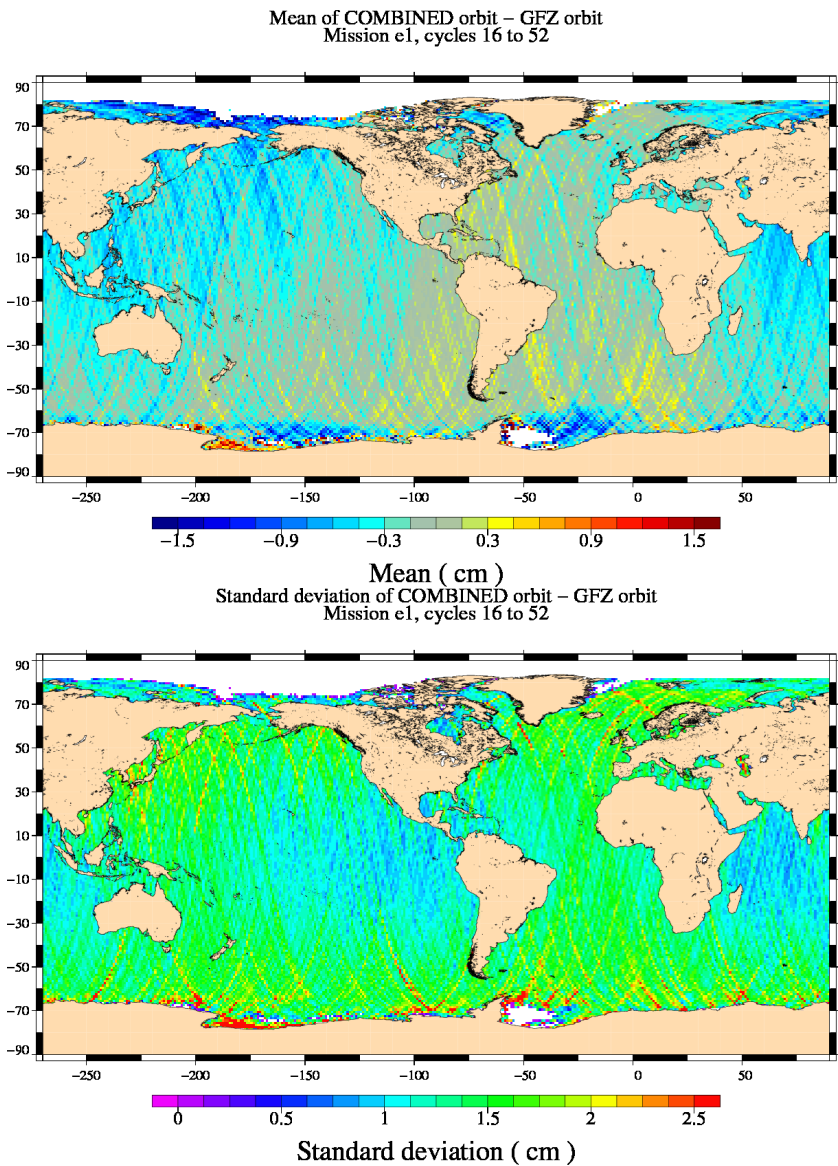


Diagnostic A002 (mission e1)

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.



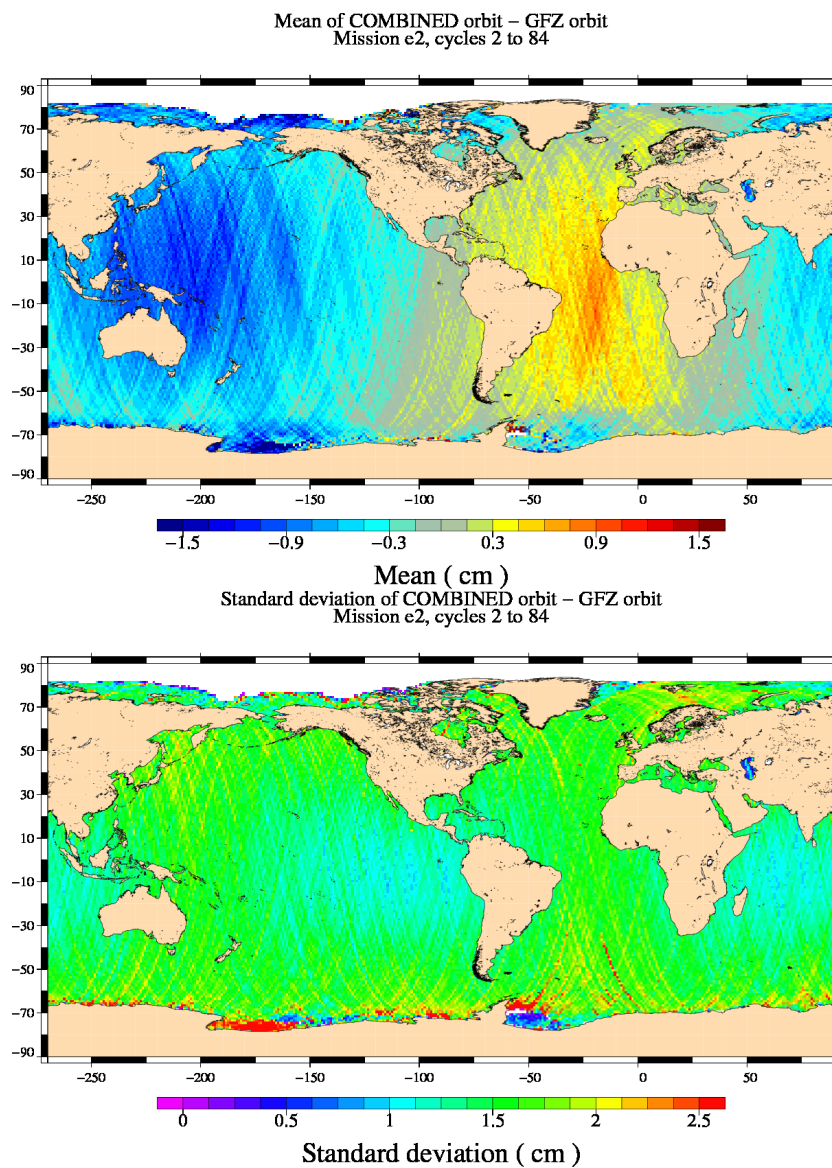
Diagnostic A002 (mission e2)

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

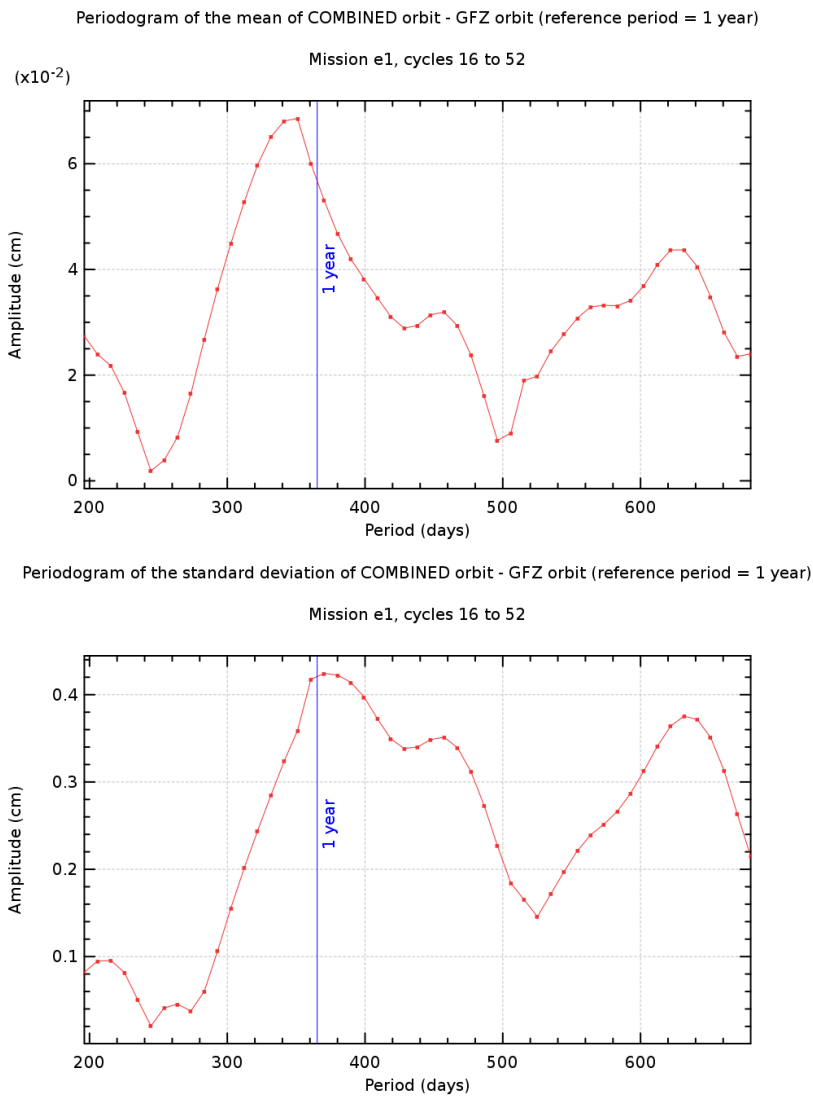


Diagnostic A003_a (mission e1)

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.

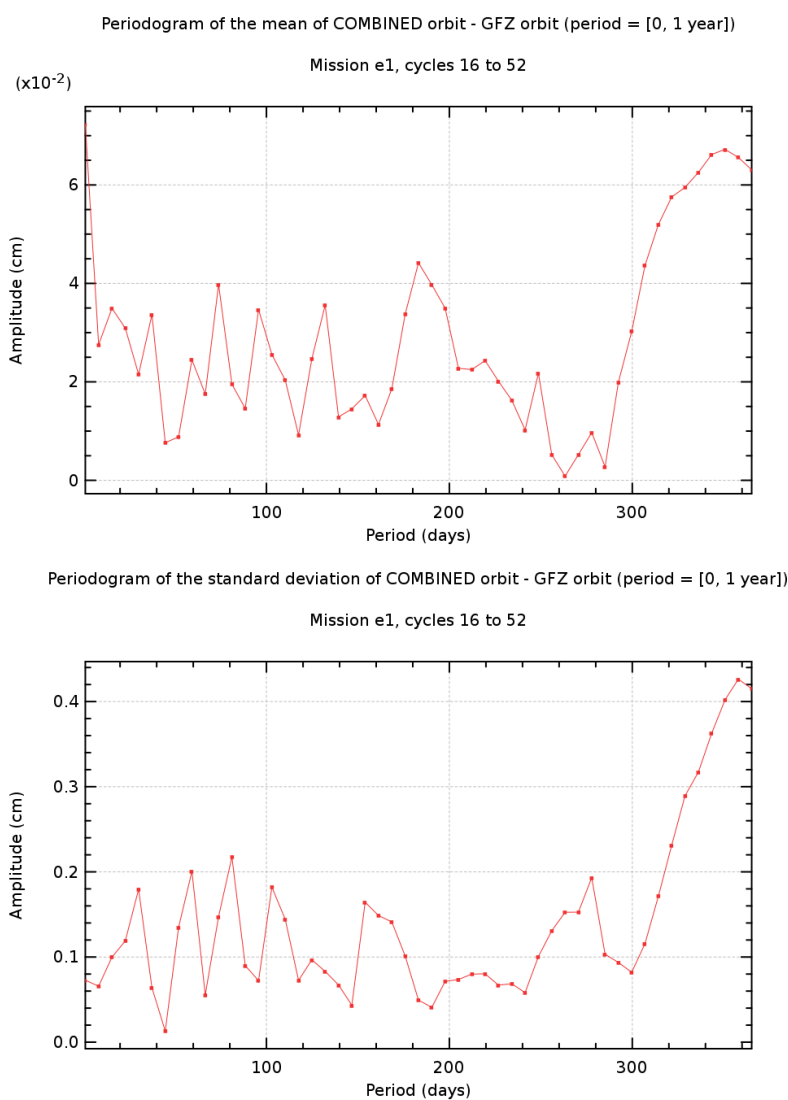


Diagnostic A003_b (mission e1)

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.

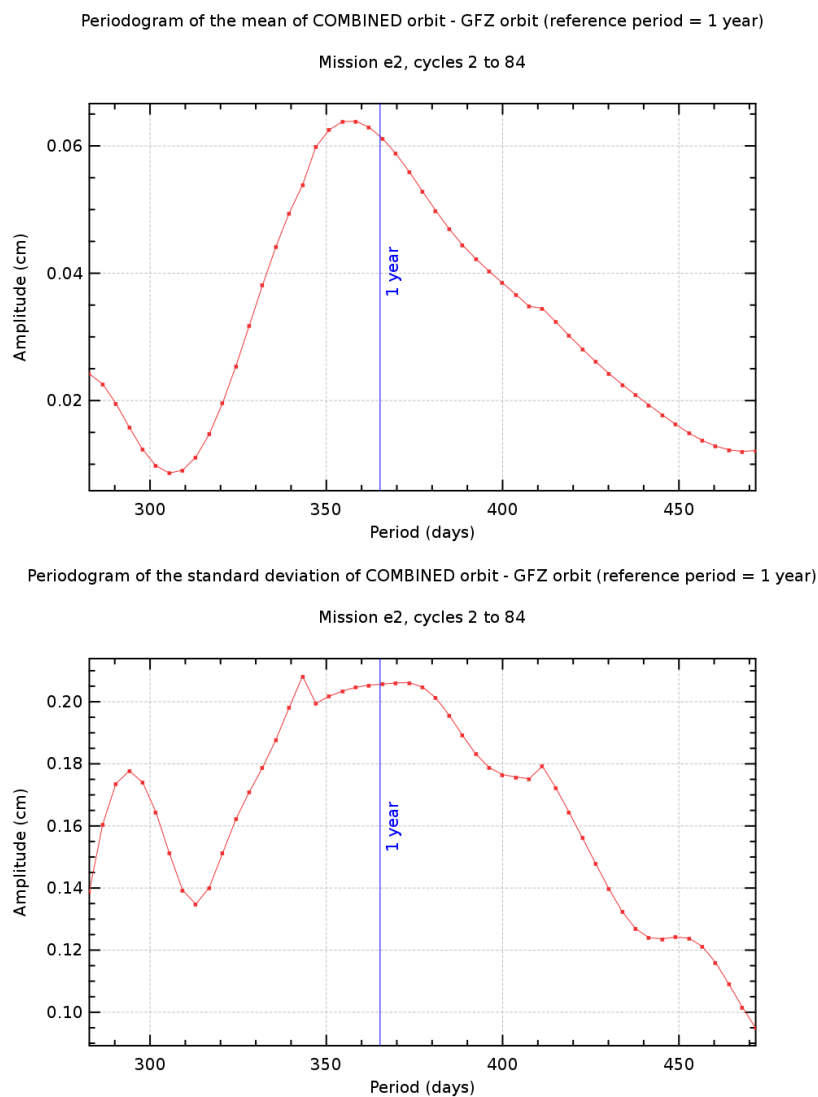


Diagnostic A003_a (mission e2)

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 A003_b (mission e2)

Name : Periodogram derived from temporal evolution of altimetric component differences

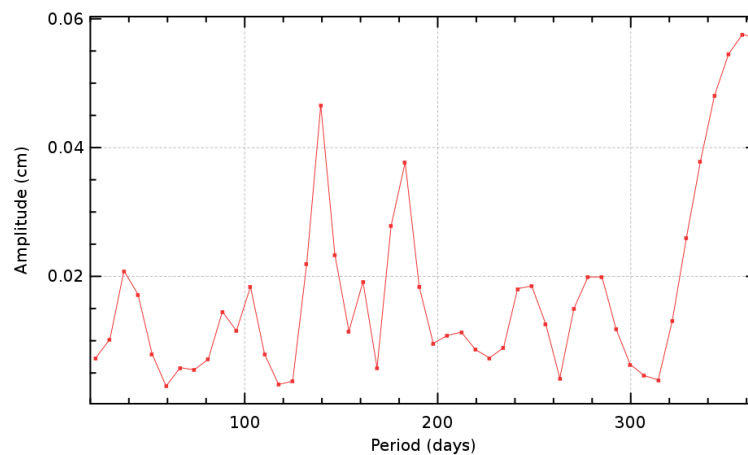
Input data : Along-track altimetric components

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

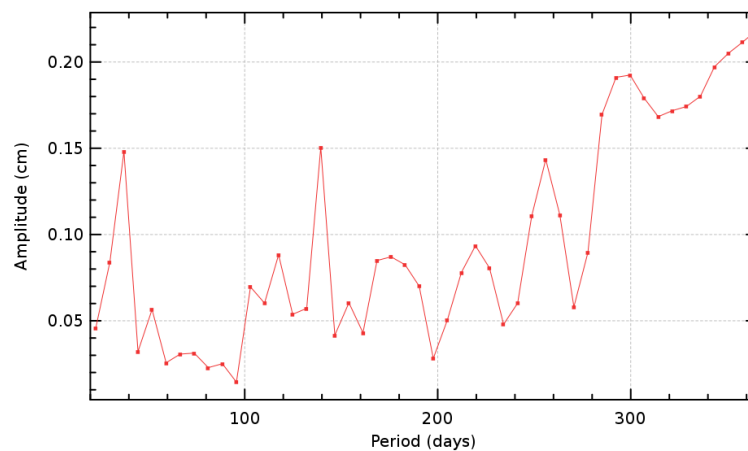
Periodogram of the mean of COMBINED orbit - GFZ orbit (period = [0, 1 year])

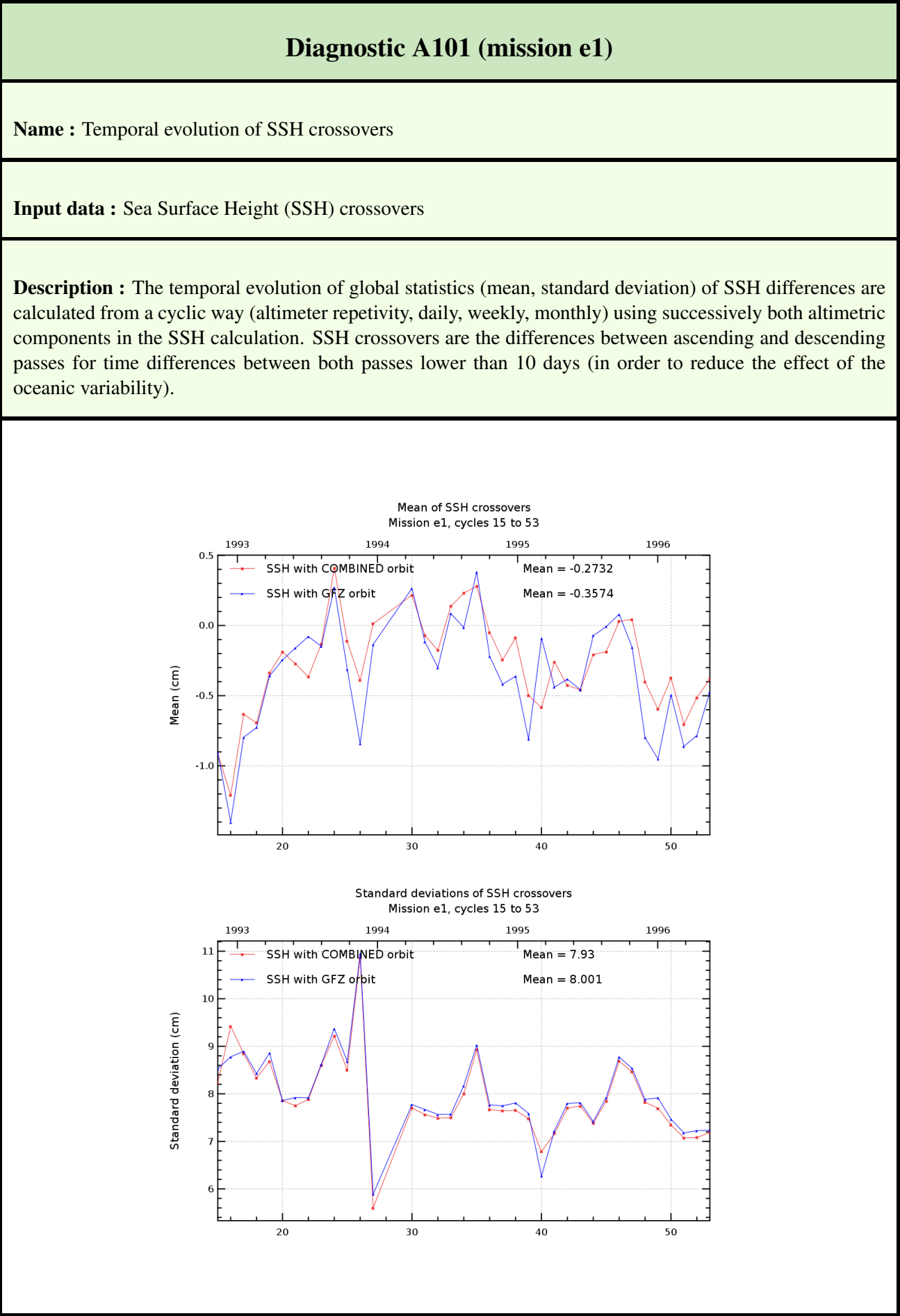
Mission e2, cycles 2 to 84



Periodogram of the standard deviation of COMBINED orbit - GFZ orbit (period = [0, 1 year])

Mission e2, cycles 2 to 84





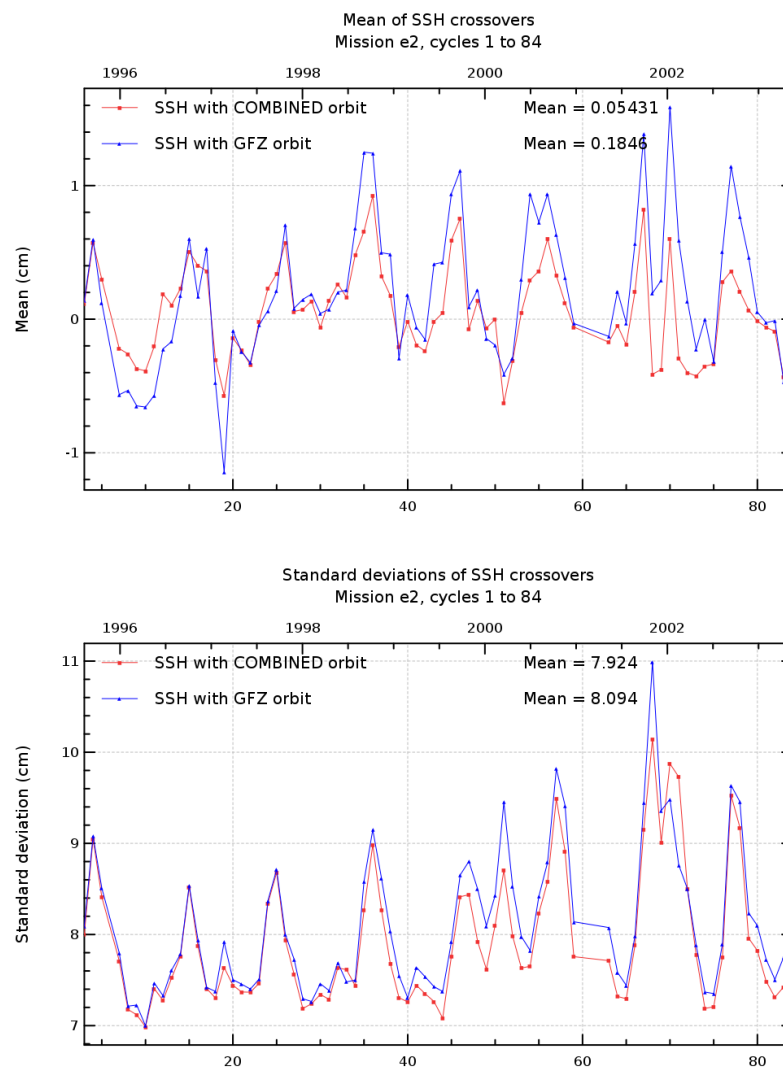
Diagnostic A101 (mission e2)

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



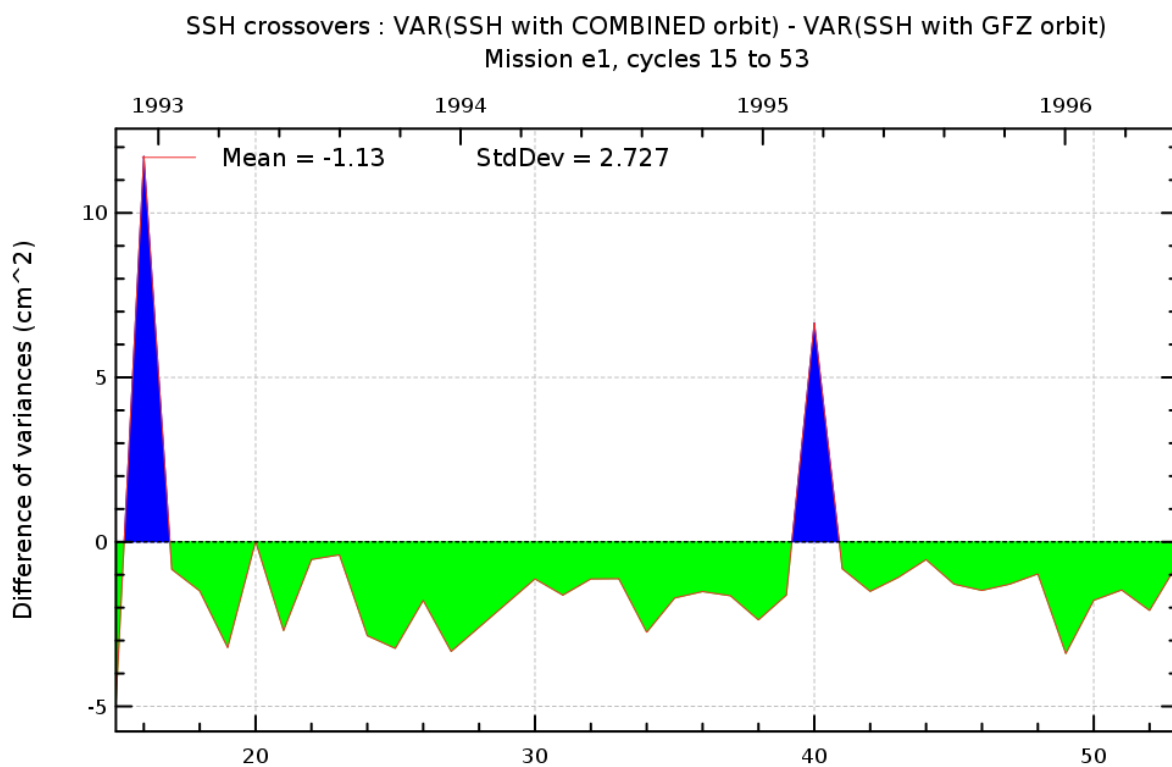
Diagnostic A102 (mission e1)

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



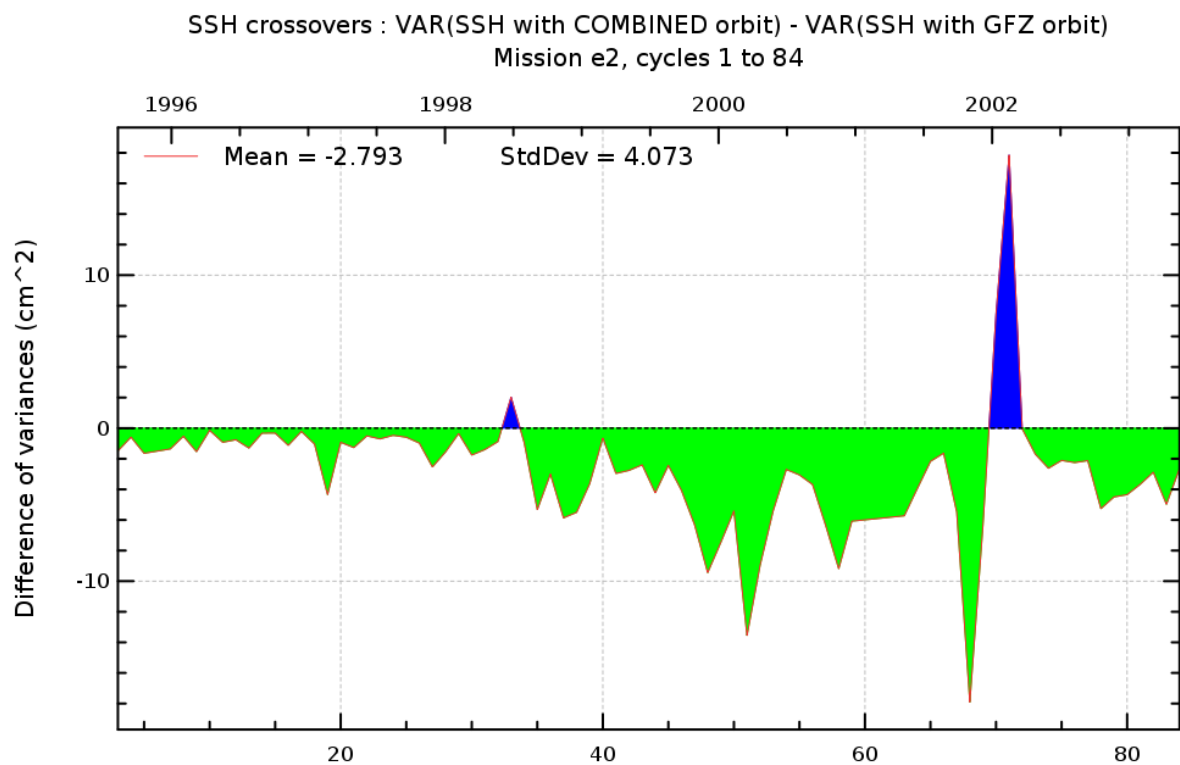
Diagnostic A102 (mission e2)

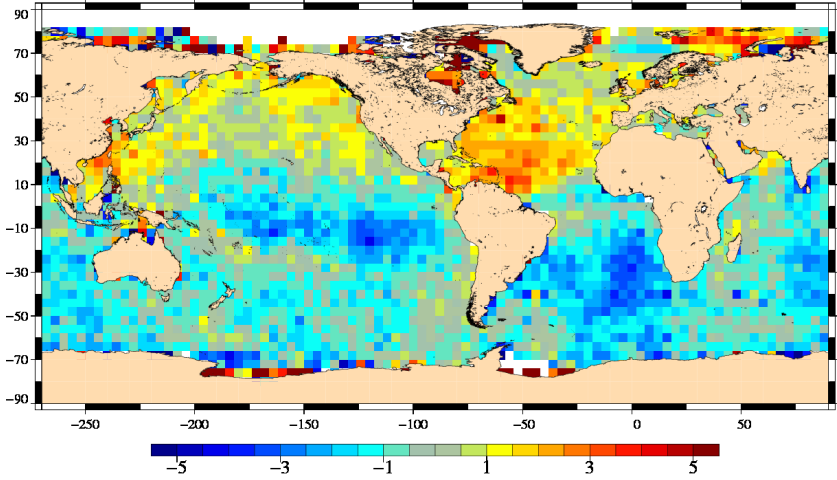
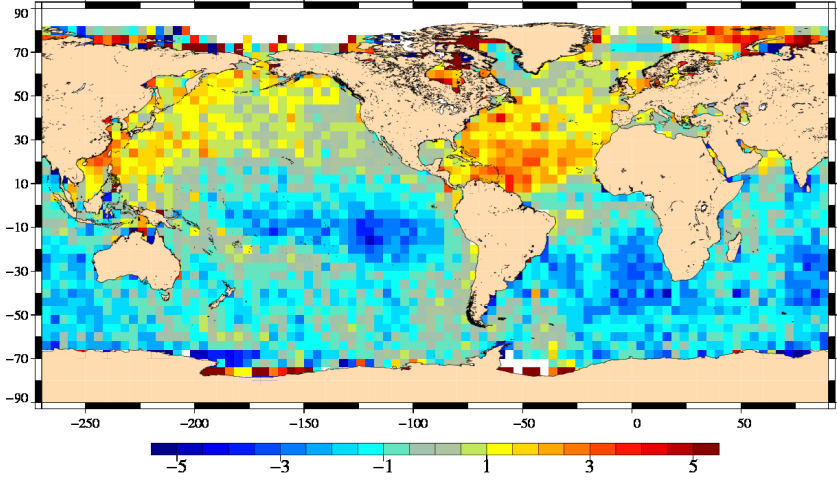
Name : Differences between temporal evolution of SSH crossovers

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	
<p>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).</p>	
<div><div><div>Mean of SSH with COMBINED orbit Mission e1, cycles 16 to 52</div><div>Mean (cm)</div></div><div><div>Mean of SSH with GFZ orbit Mission e1, cycles 16 to 52</div><div>Mean (cm)</div></div></div>	

Diagnostic A103 (mission e2)

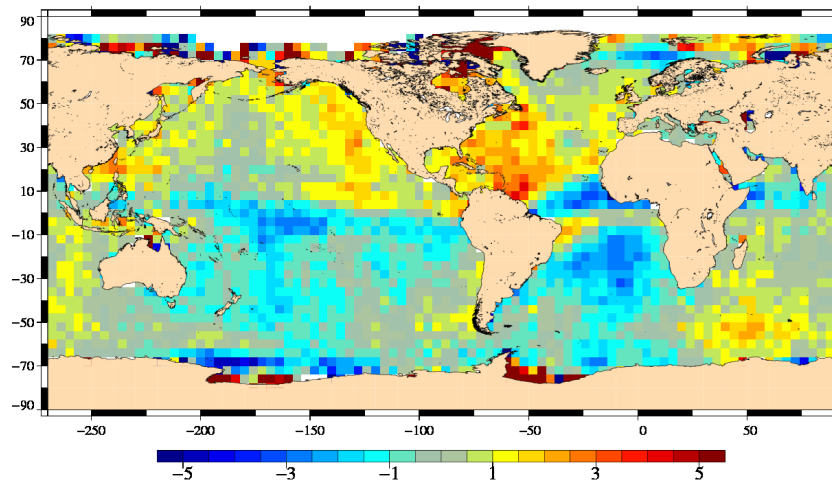
Name : Map of SSH crossovers

Input data : Sea Surface Height (SSH) crossovers

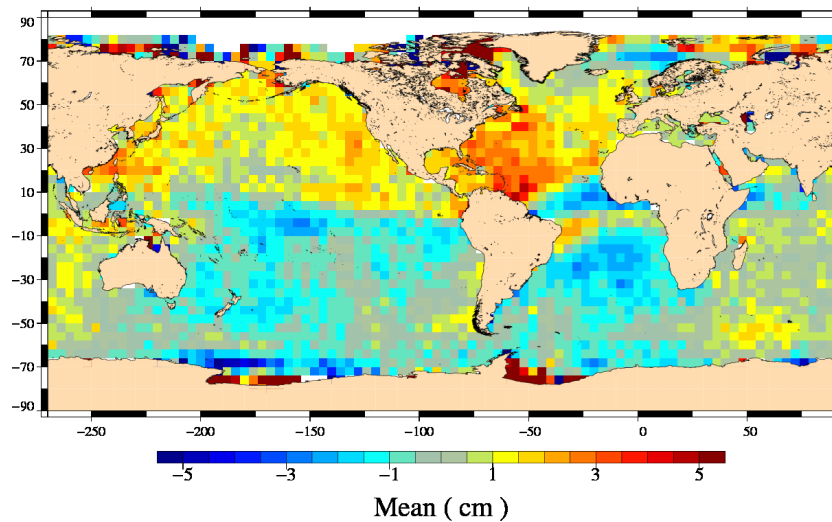
Description : The differences between maps of SSH crossovers differences (mean, variance) are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than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

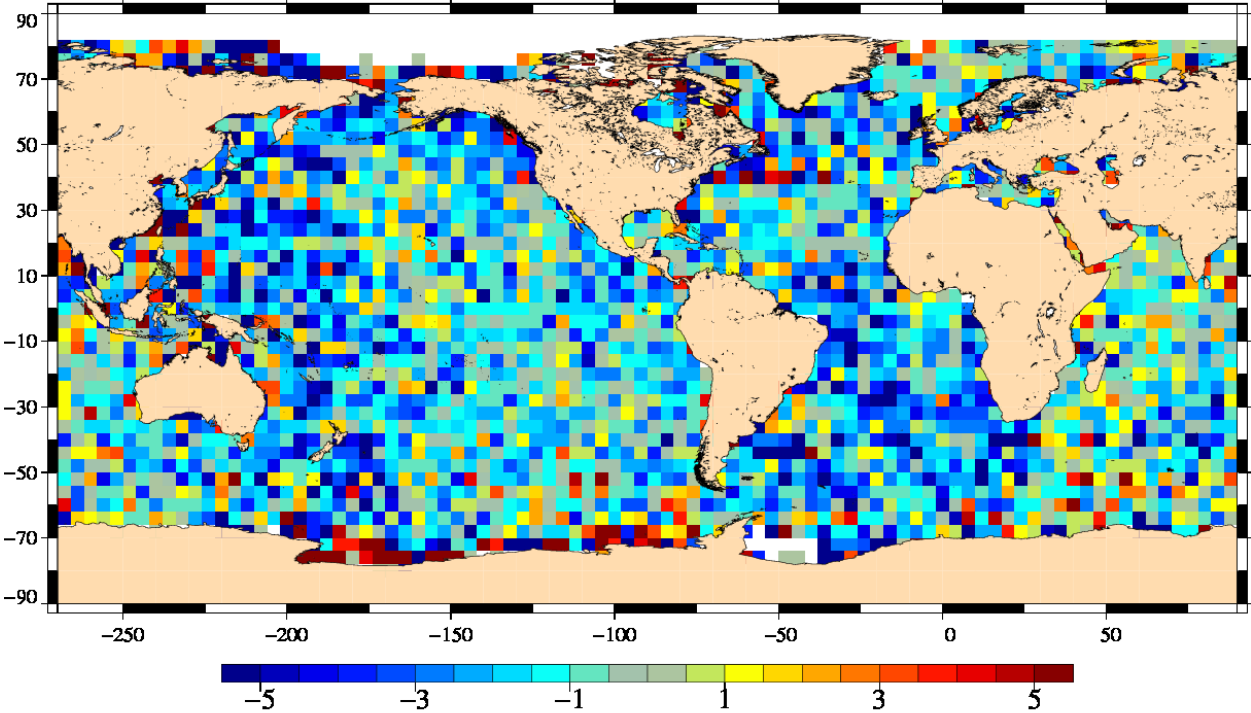
Diagnostic type : Global internal analyses

Mean of SSH with COMBINED orbit
Mission e2, cycles 2 to 84



Mean (cm)
Mean of SSH with GFZ orbit
Mission e2, cycles 2 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	
	<p>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).</p>	
	<div><div>VAR(SSH with COMBINED orbit) – VAR(SSH with GFZ orbit) Mission e1, cycles 16 to 52</div><div>SSH crossovers : difference of variances (cm^2)</div></div>	

Diagnostic A104 (mission e2)

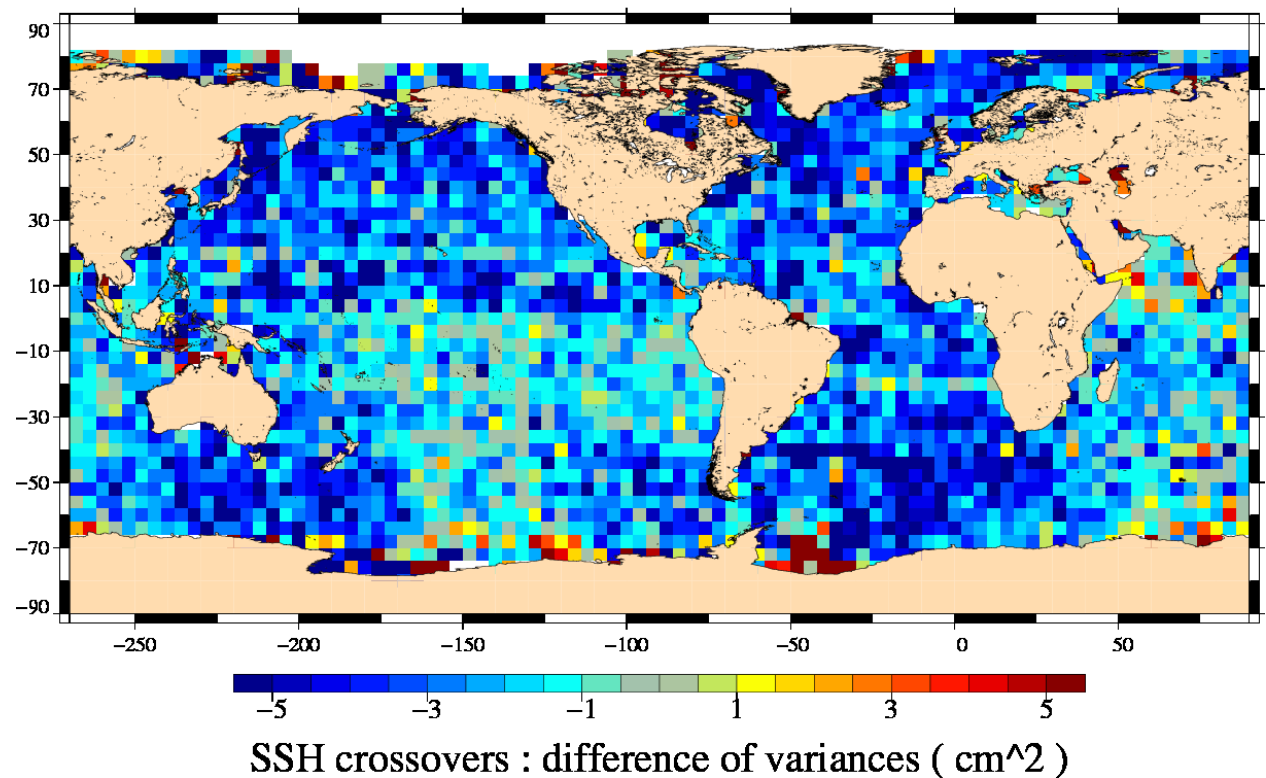
Name : Differences between maps of SSH crossovers

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).

Diagnostic type : Global internal analyses

$\text{VAR}(\text{SSH with COMBINED orbit}) - \text{VAR}(\text{SSH with GFZ orbit})$
Mission e2, cycles 2 to 84



Diagnostic type : Global internal analyses	Diagnostic A201_a (mission e1)																																								
	Name : Temporal evolution of Sea Level Anomaly (SLA)																																								
	Input data : Along track SLA																																								
	<p>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.</p>																																								
	<div>Global MSL Mission e1, cycles 15 to 53</div> <p>The graph displays the temporal evolution of Sea Level Anomaly (SLA) statistics for Mission e1, cycles 15 to 53. The y-axis represents the Mean (cm) from 41 to 44. The x-axis represents Mission cycles from 15 to 53, with corresponding years 1993, 1994, 1995, and 1996 marked. Two data series are plotted: SLA with COMBINED orbit (red line with square markers) and SLA with GFZ orbit (blue line with triangle markers). Both series show a clear upward trend. Linear regression lines are fitted to both series, with slopes of 6.96 mm/yr (L.S.R. = 0.6) for the COMBINED orbit and 7.23 mm/yr (L.S.R. = 0.6) for the GFZ orbit.</p> <table><tr><th>Mission Cycle</th><th>Year</th><th>SLA with COMBINED orbit (cm)</th><th>SLA with GFZ orbit (cm)</th></tr><tr><td>15</td><td>1993</td><td>41.0</td><td>41.5</td></tr><tr><td>20</td><td>1993</td><td>41.8</td><td>42.0</td></tr><tr><td>25</td><td>1993</td><td>42.2</td><td>42.5</td></tr><tr><td>30</td><td>1994</td><td>42.8</td><td>43.0</td></tr><tr><td>35</td><td>1994</td><td>43.2</td><td>43.5</td></tr><tr><td>40</td><td>1995</td><td>43.8</td><td>44.0</td></tr><tr><td>45</td><td>1995</td><td>44.2</td><td>44.5</td></tr><tr><td>50</td><td>1996</td><td>44.8</td><td>45.0</td></tr><tr><td>53</td><td>1996</td><td>45.2</td><td>45.5</td></tr></table>		Mission Cycle	Year	SLA with COMBINED orbit (cm)	SLA with GFZ orbit (cm)	15	1993	41.0	41.5	20	1993	41.8	42.0	25	1993	42.2	42.5	30	1994	42.8	43.0	35	1994	43.2	43.5	40	1995	43.8	44.0	45	1995	44.2	44.5	50	1996	44.8	45.0	53	1996	45.2
Mission Cycle	Year	SLA with COMBINED orbit (cm)	SLA with GFZ orbit (cm)																																						
15	1993	41.0	41.5																																						
20	1993	41.8	42.0																																						
25	1993	42.2	42.5																																						
30	1994	42.8	43.0																																						
35	1994	43.2	43.5																																						
40	1995	43.8	44.0																																						
45	1995	44.2	44.5																																						
50	1996	44.8	45.0																																						
53	1996	45.2	45.5																																						

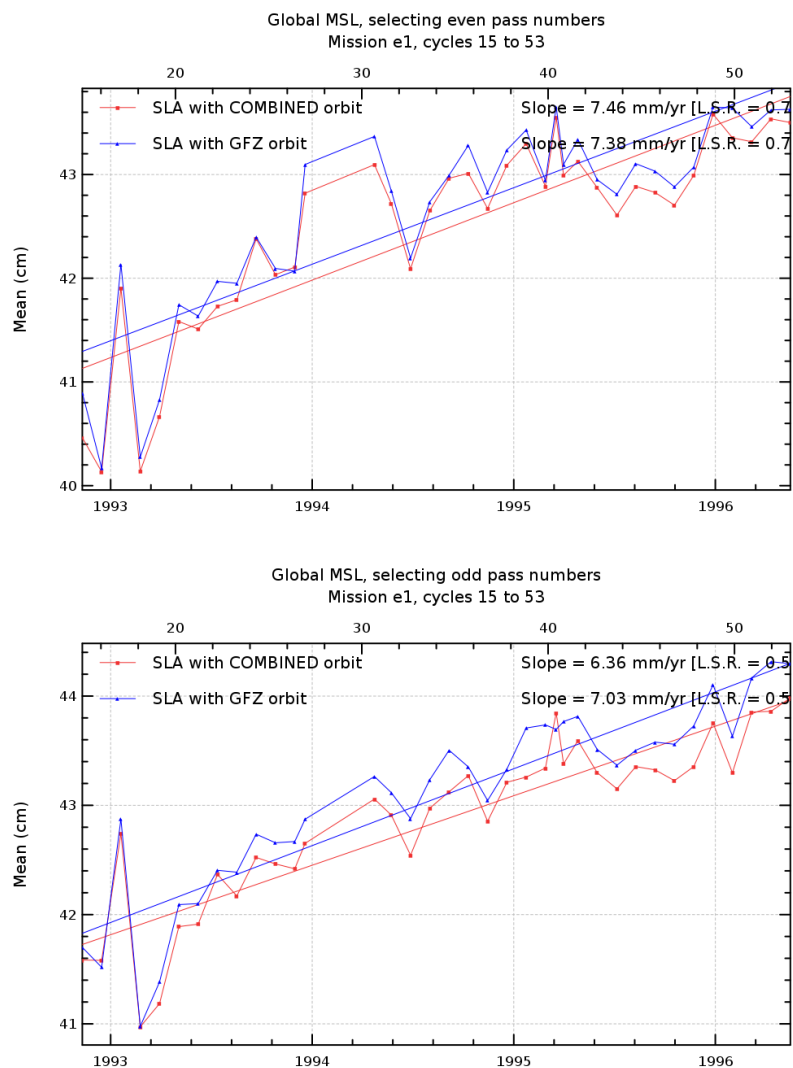
Diagnostic A201_b (mission e1)

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



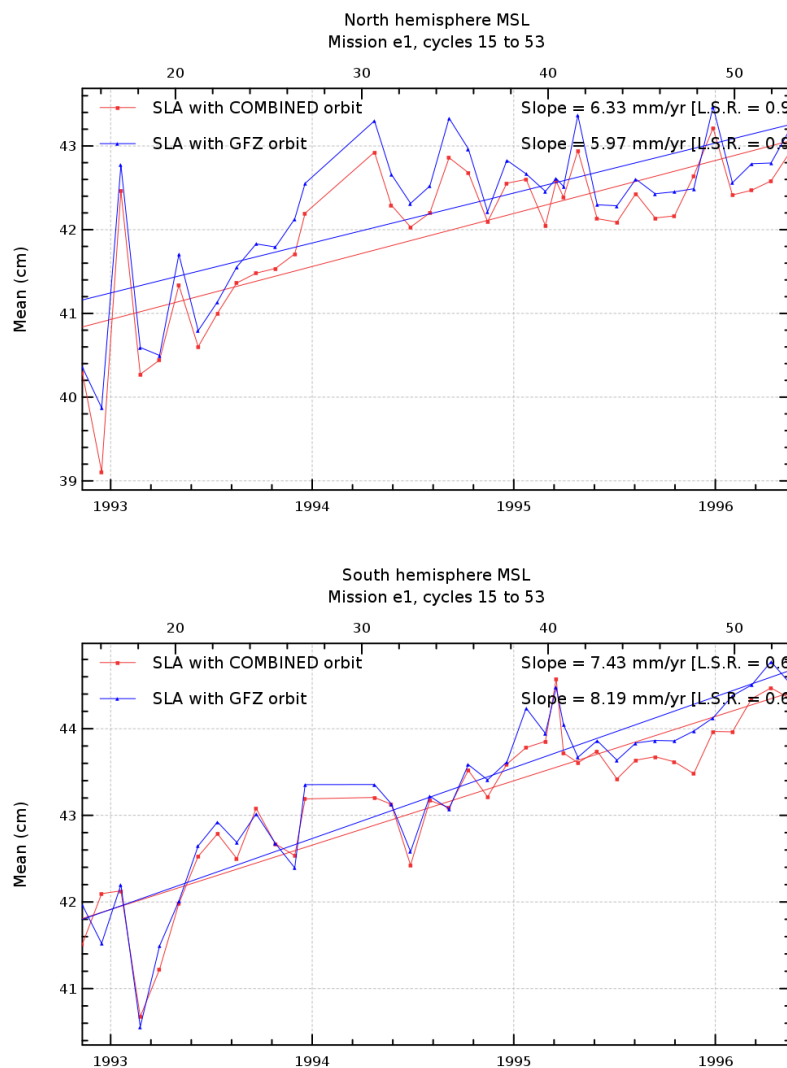
Diagnostic A201_c (mission e1)

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)

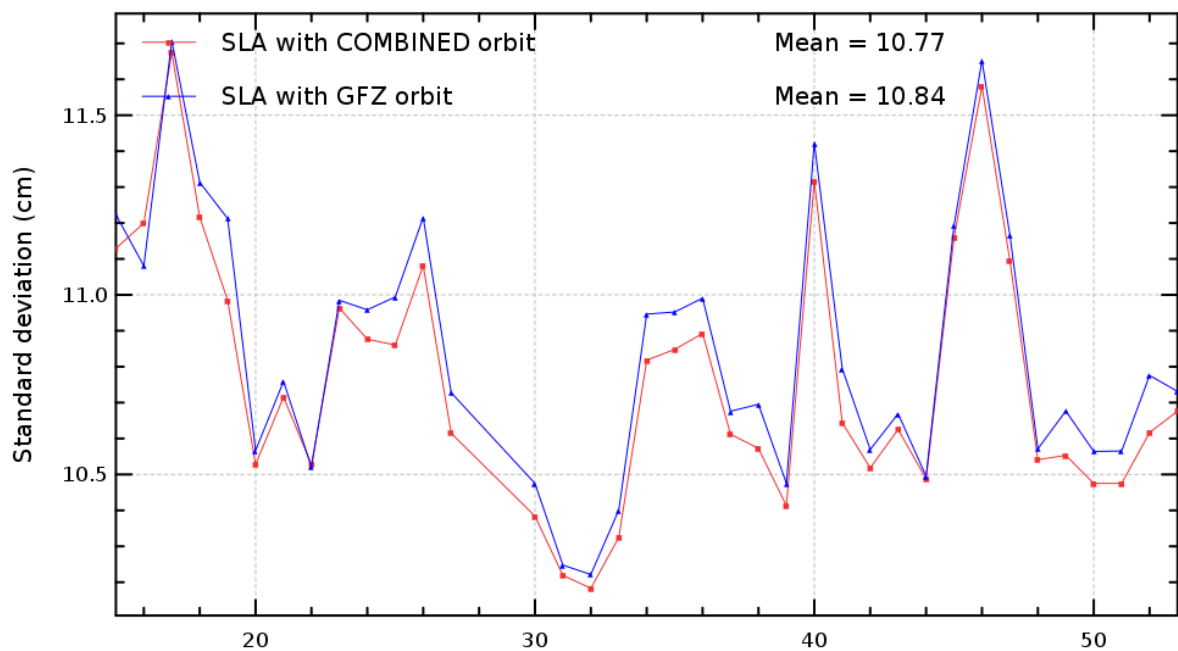
Name : Temporal evolution of Sea Level Anomaly (SLA)

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)

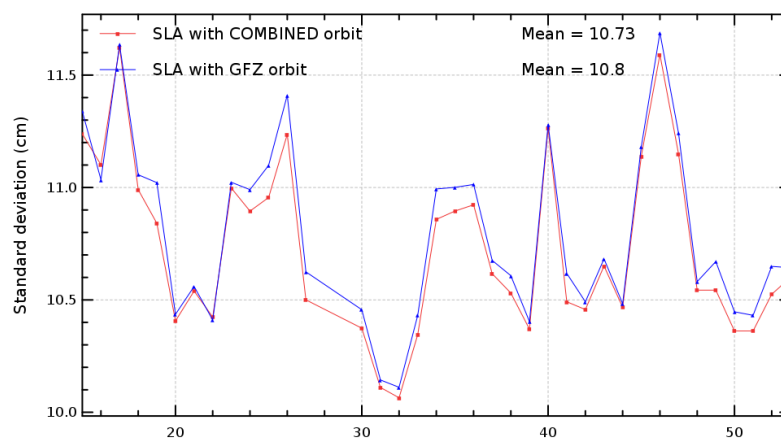
Name : Temporal evolution of Sea Level Anomaly (SLA)

Input data : Along track SLA

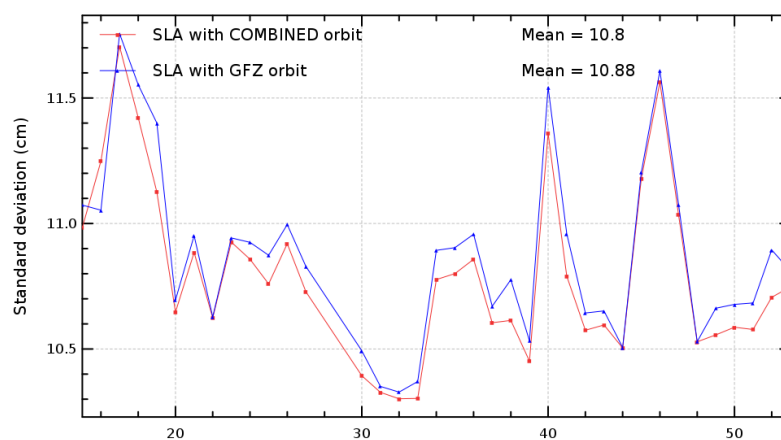
Description : The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after 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



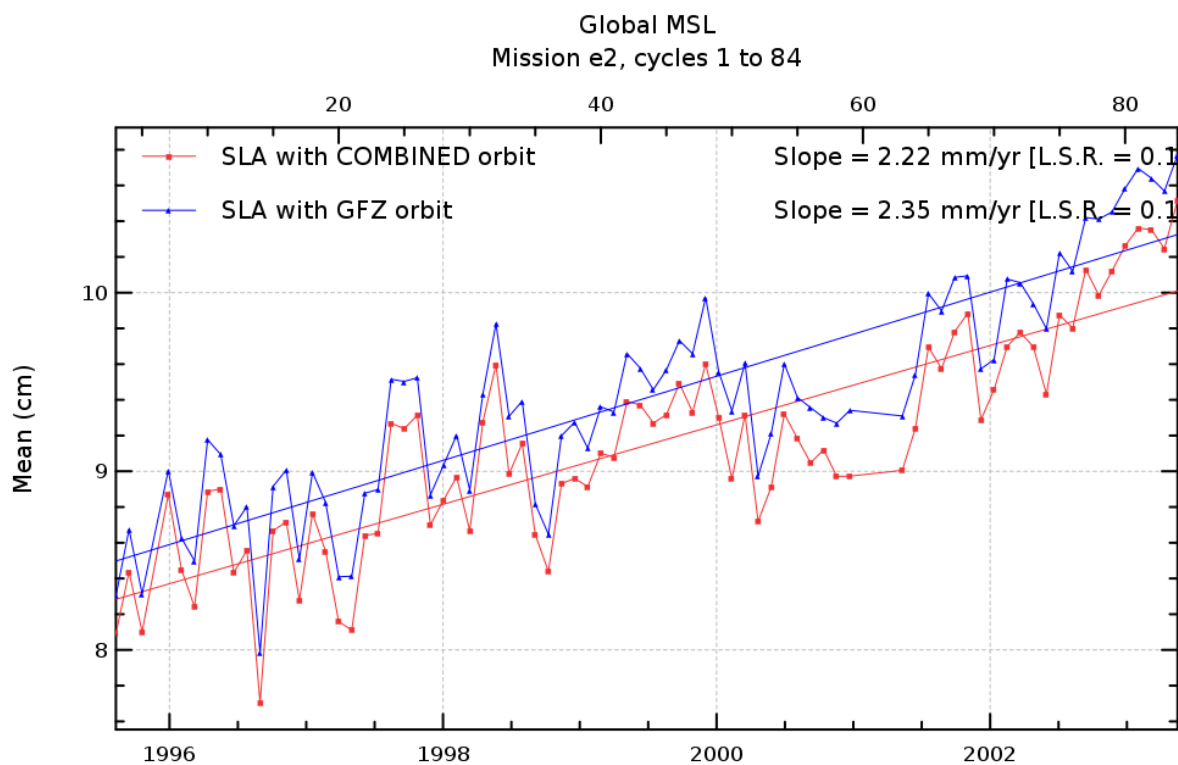
Diagnostic A201_a (mission e2)

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



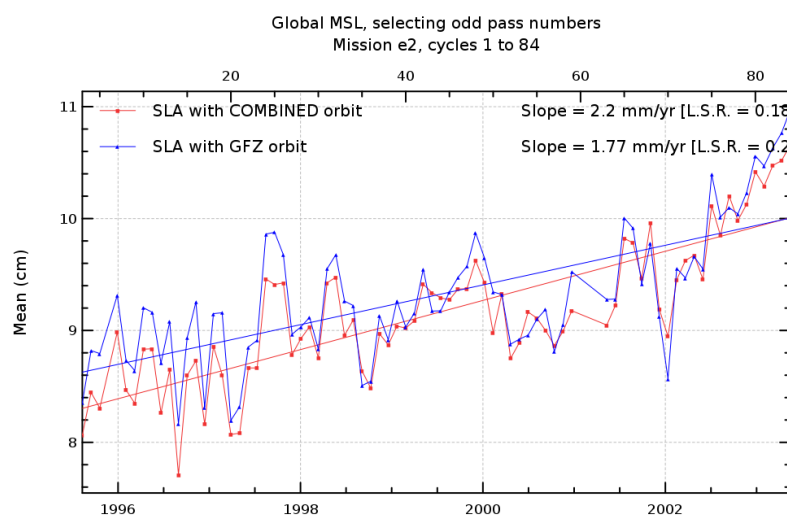
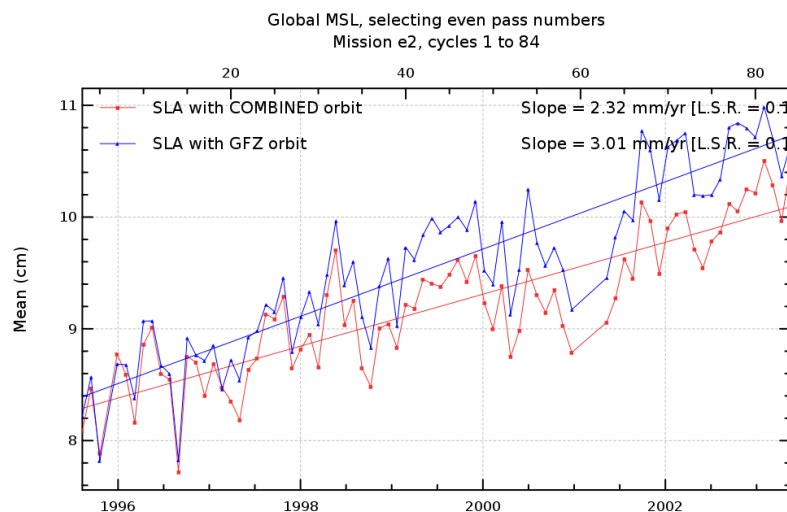
Diagnostic A201_b (mission e2)

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



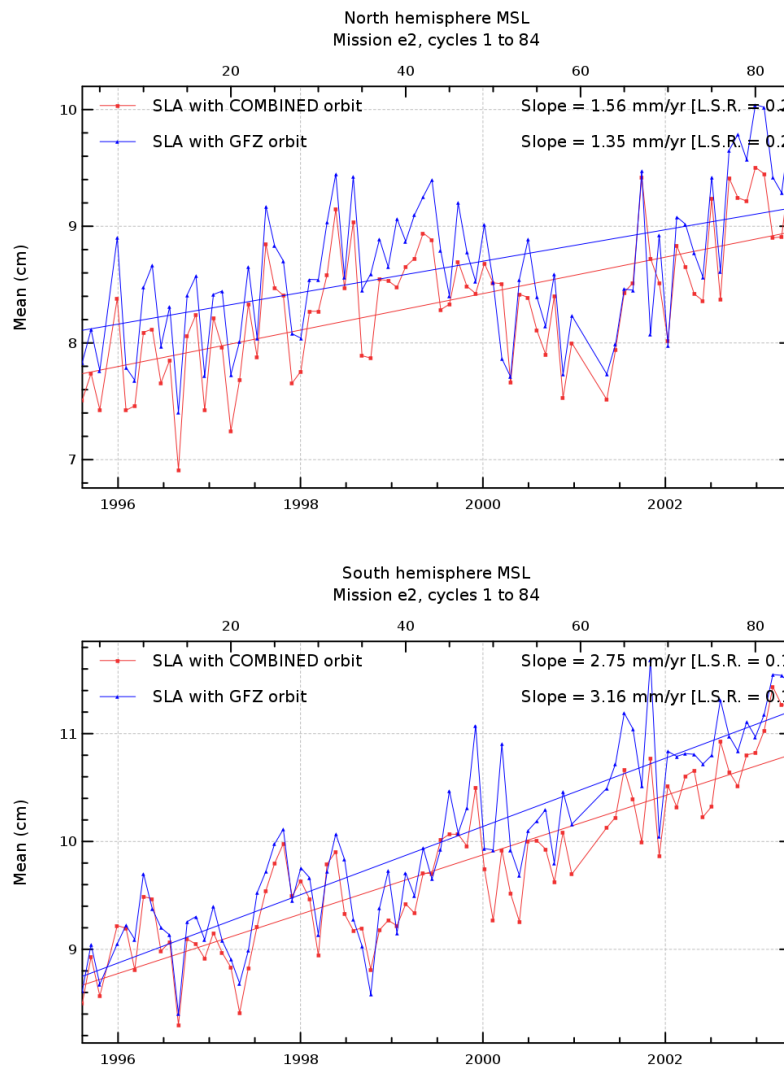
Diagnostic A201_c (mission e2)

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)

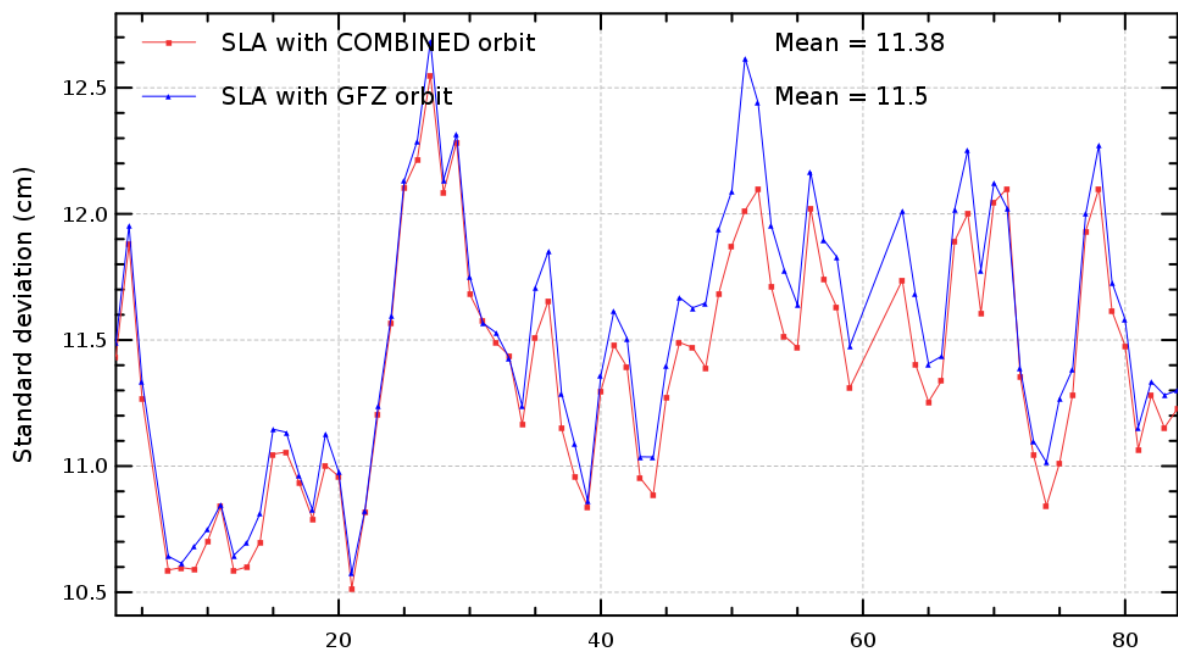
Name : Temporal evolution of Sea Level Anomaly (SLA)

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)

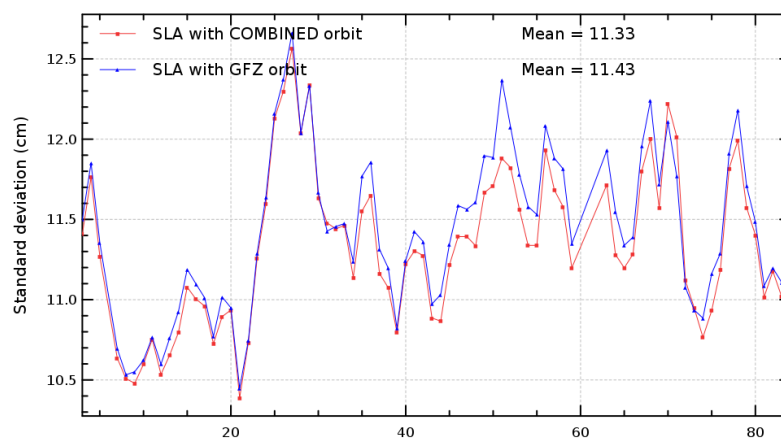
Name : Temporal evolution of Sea Level Anomaly (SLA)

Input data : Along track SLA

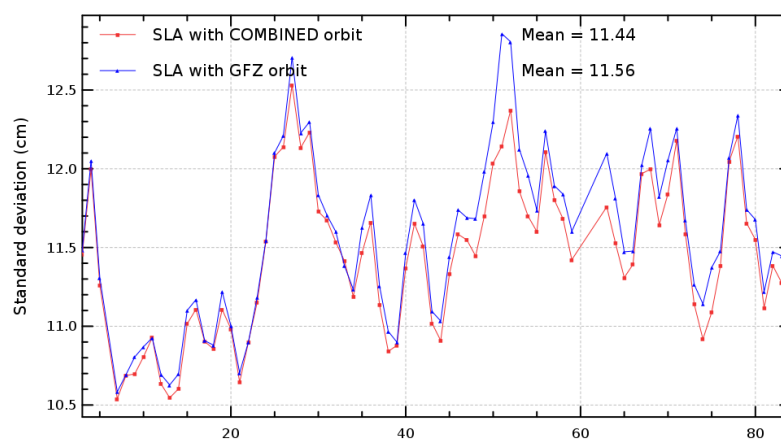
Description : The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after 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



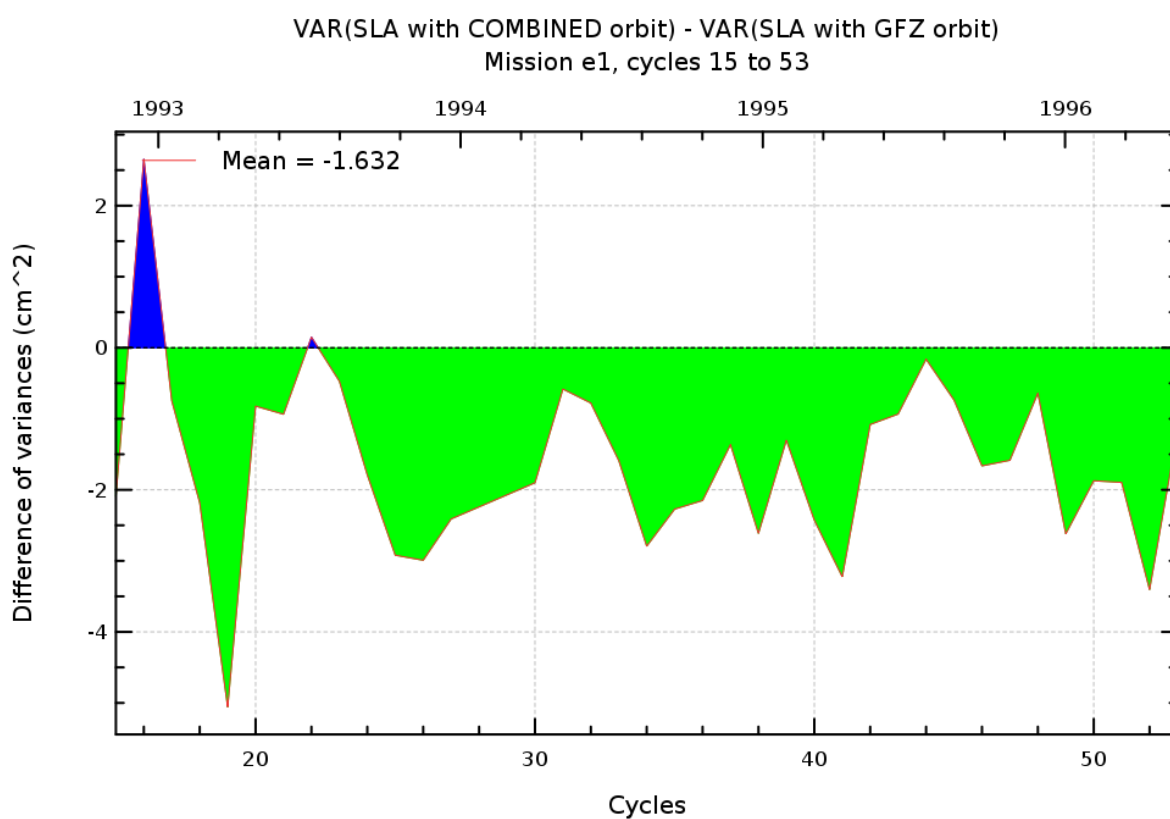
Diagnostic A202_a (mission e1)

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



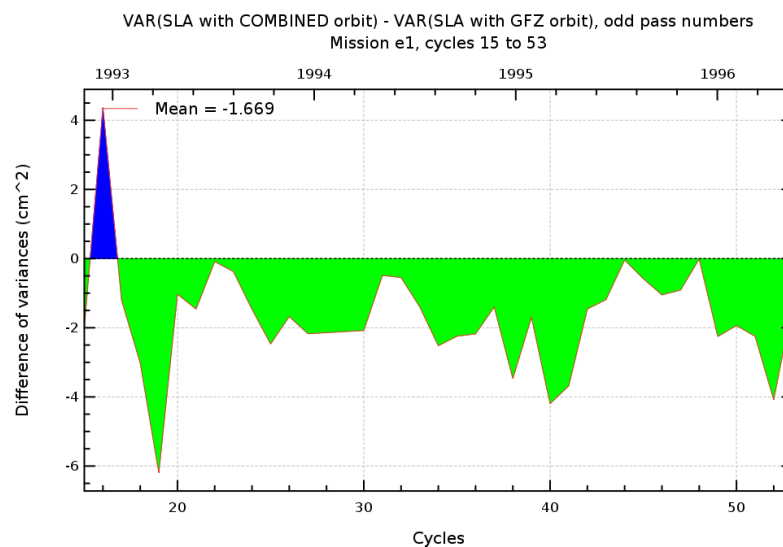
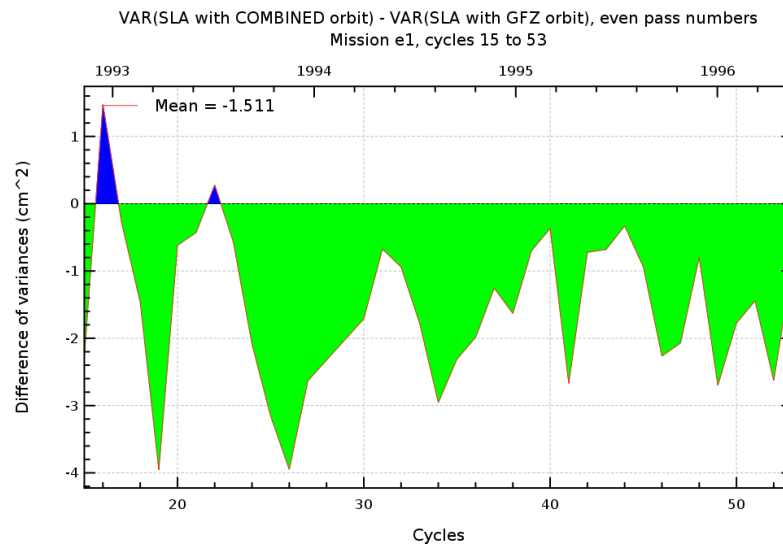
Diagnostic A202_b (mission e1)

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



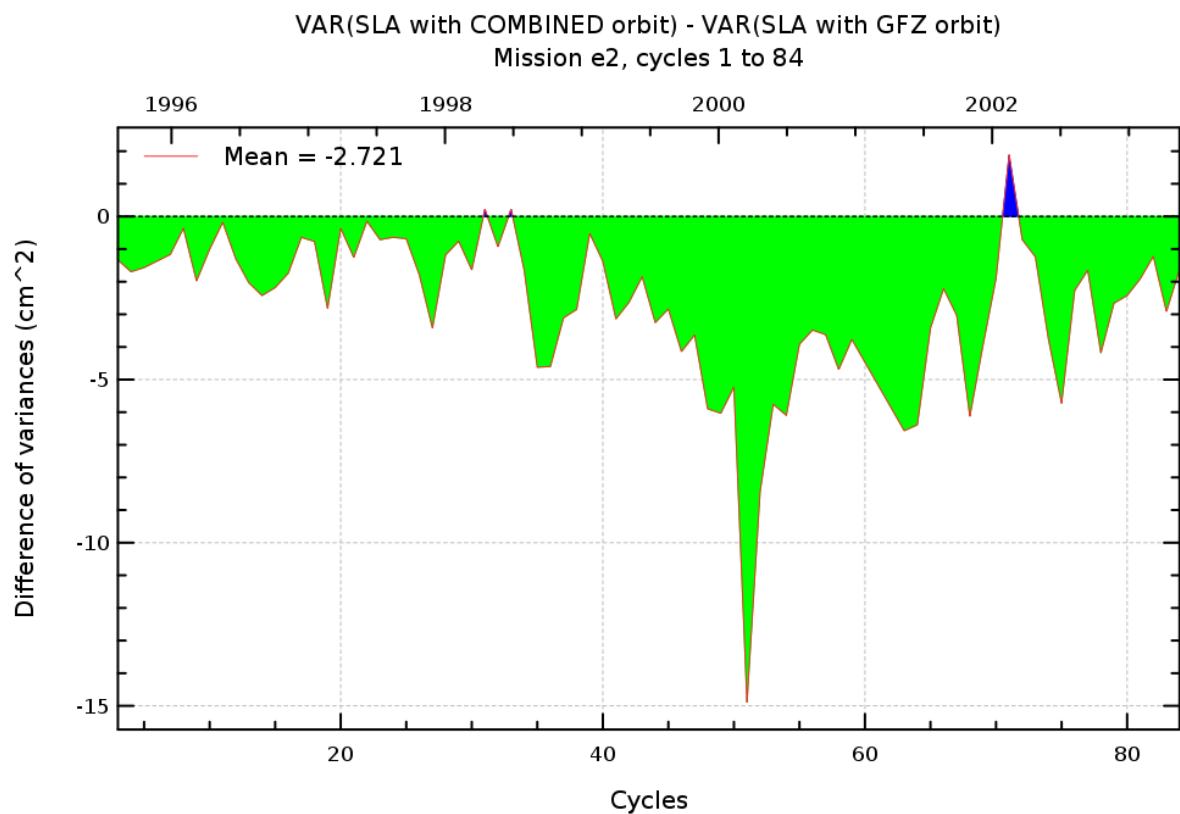
Diagnostic A202_a (mission e2)

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



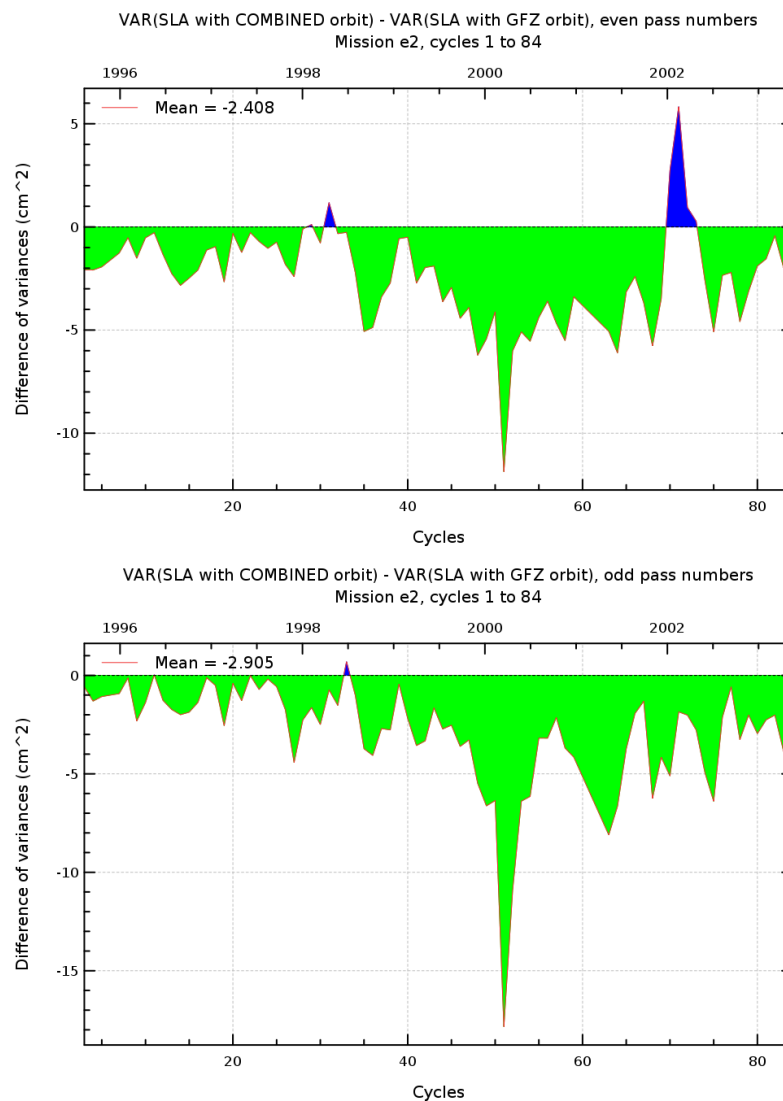
Diagnostic A202_b (mission e2)

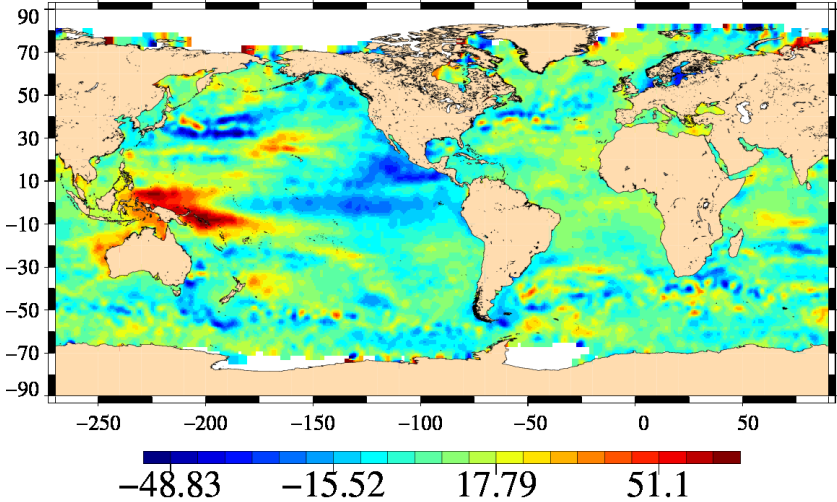
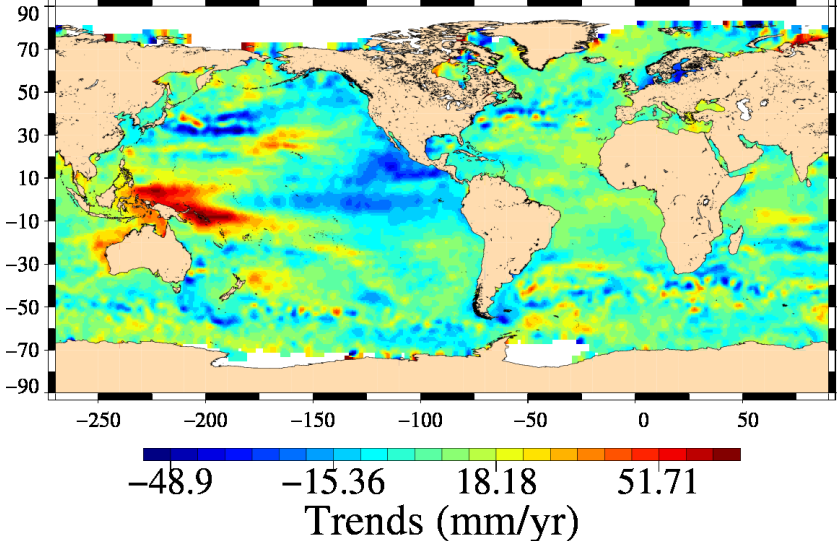
Name : Differences between temporal evolution of Sea Level Anomaly (SLA)

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 COMBINED orbit trends Mission e1, cycles 15 to 53</div>  <div>Trends (mm/yr) SLA with GFZ orbit trends Mission e1, cycles 15 to 53</div> 	

Diagnostic A203_b (mission e1)

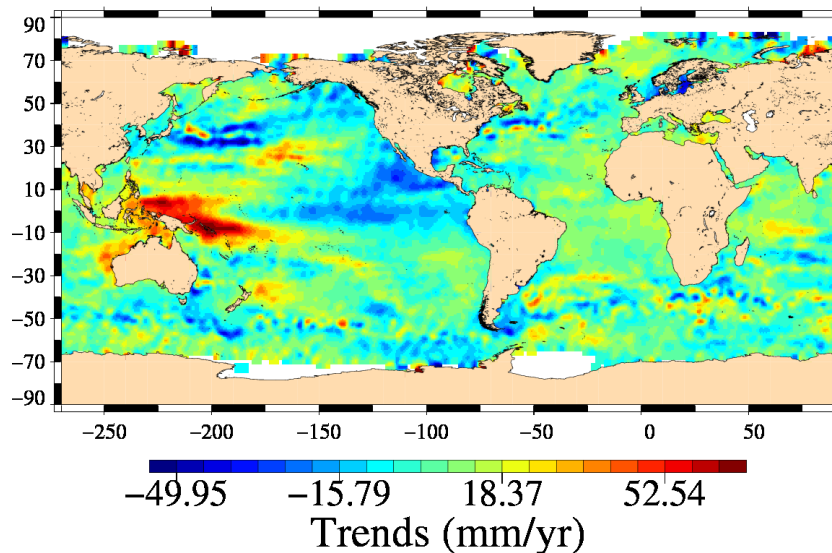
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

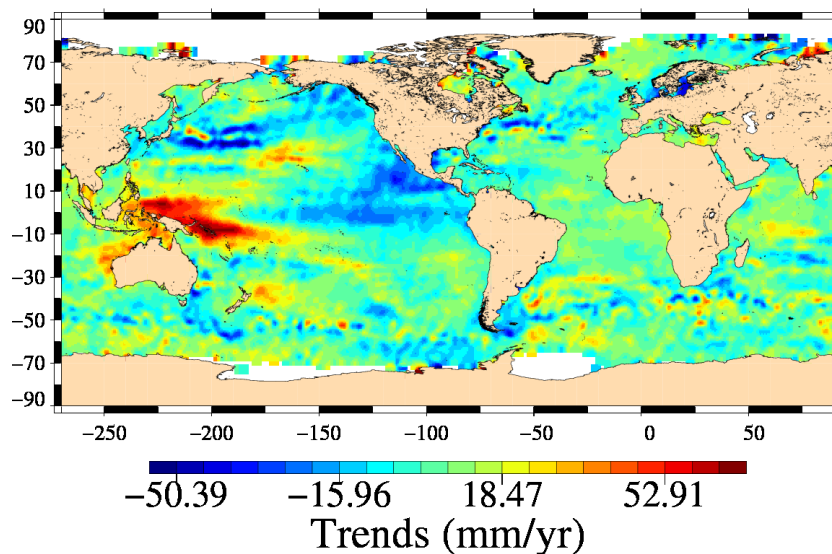
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with COMBINED 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)

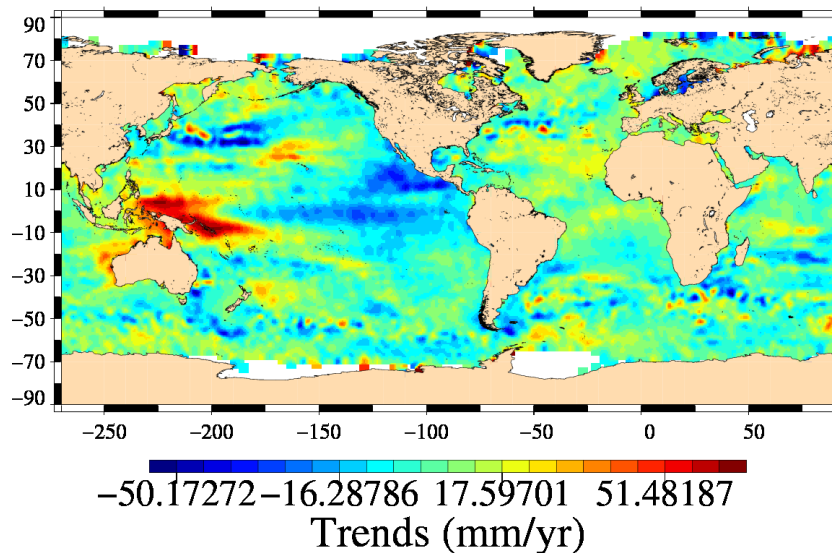
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

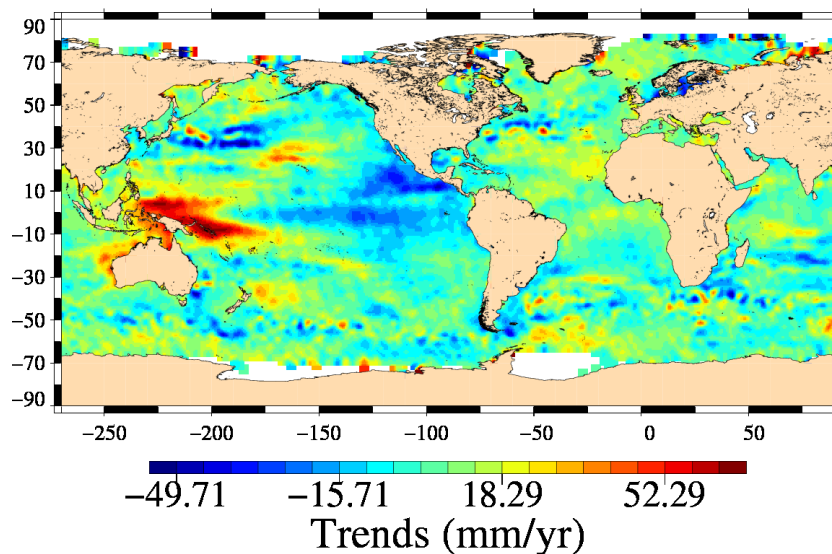
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with COMBINED 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)

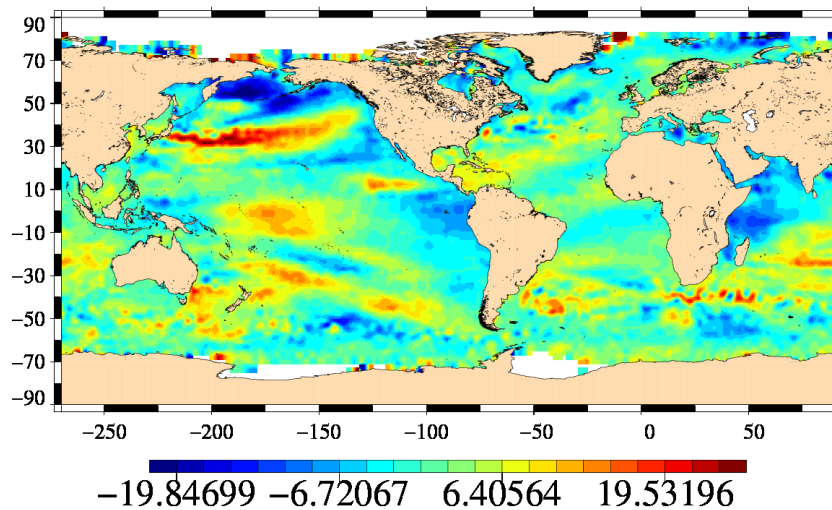
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

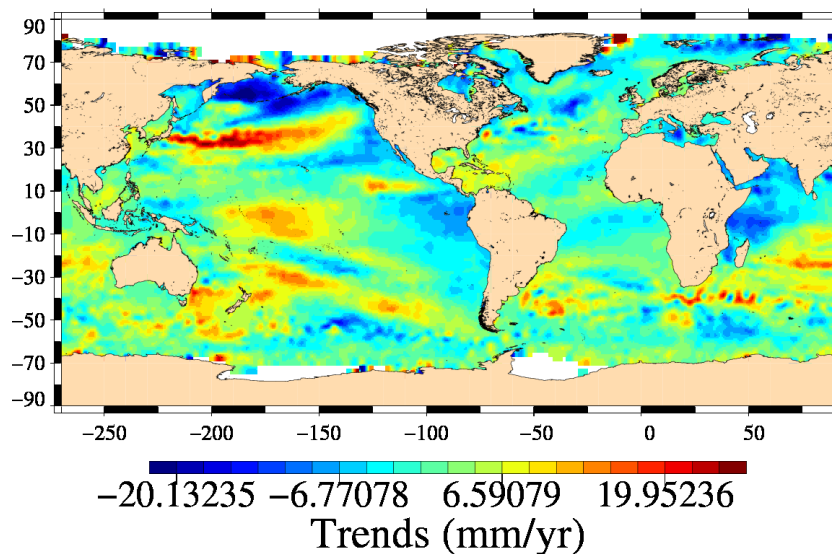
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with COMBINED orbit trends
Mission e2, cycles 1 to 84



Mission e2, cycles 1 to 84



Diagnostic A203_b (mission e2)

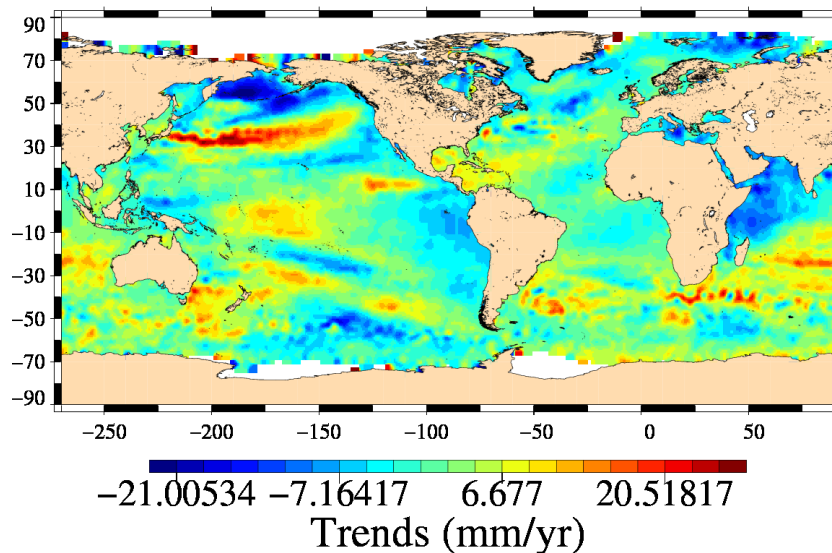
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

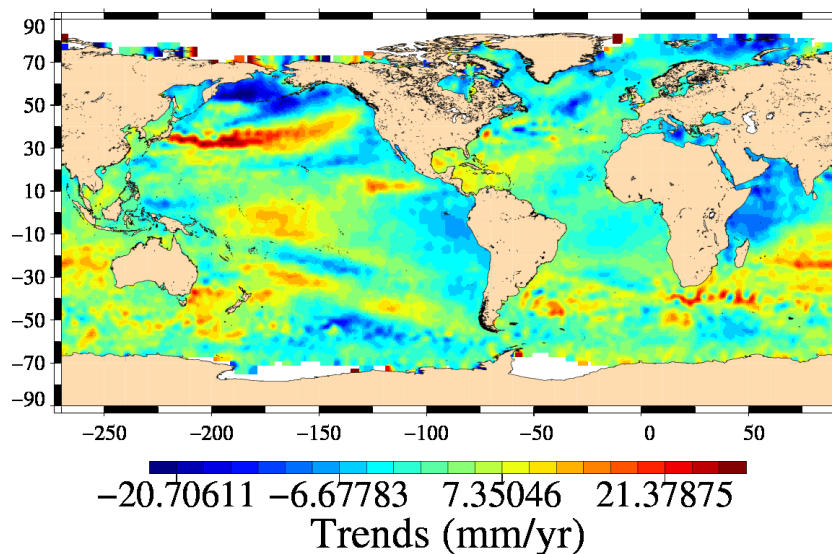
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with COMBINED 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)

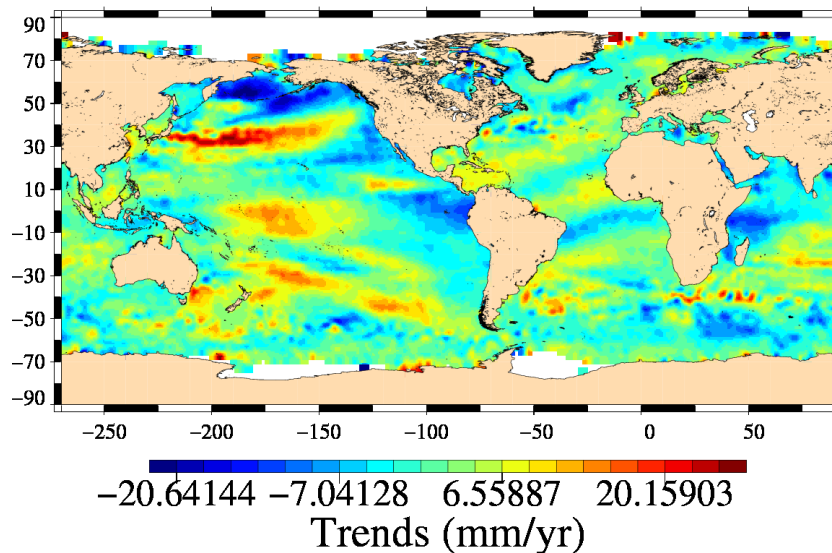
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

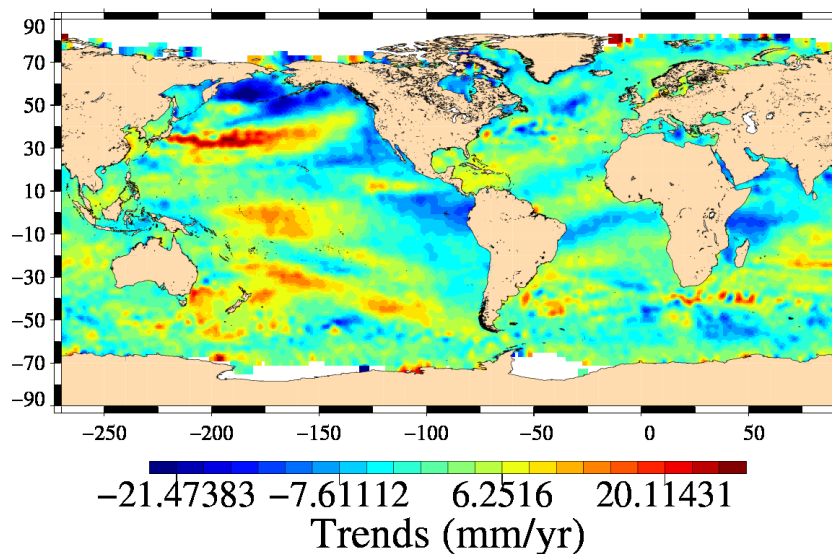
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

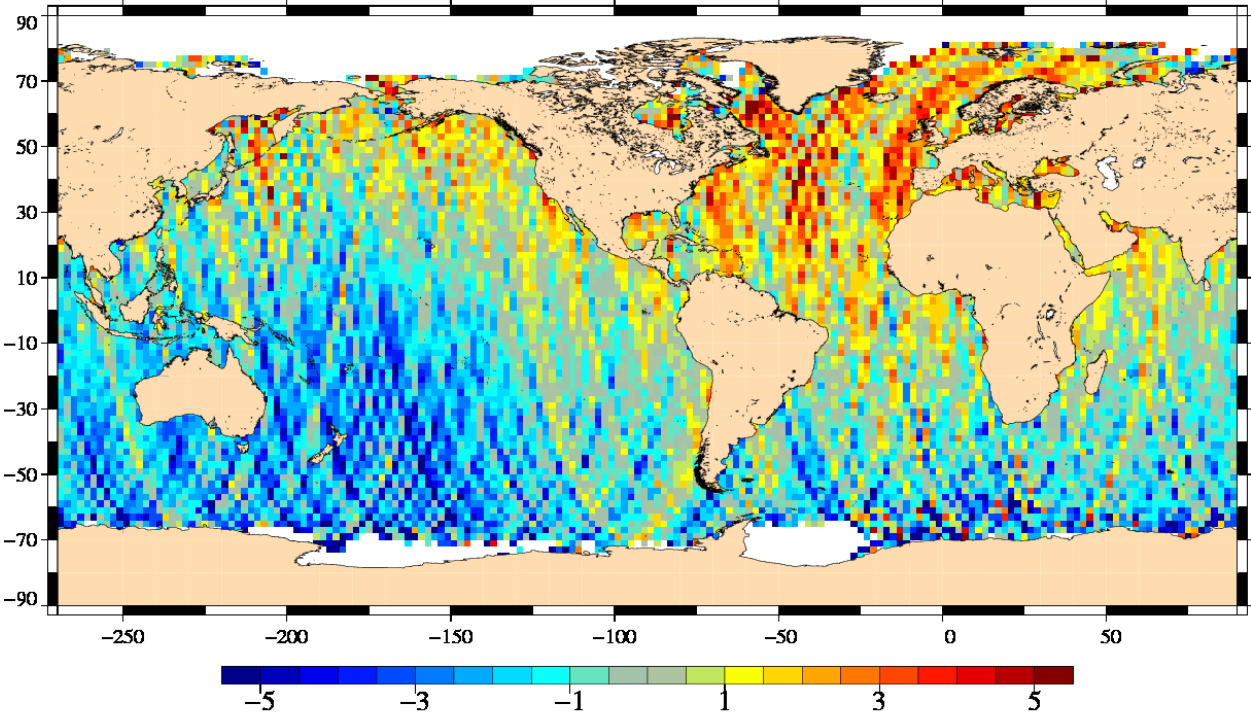
Diagnostic type : Global internal analyses

SLA with COMBINED 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 COMBINED orbit – SLA with GFZ orbit : trends Mission e1, cycles 16 to 52</div>  <p>Trends (mm/yr)</p>	

Diagnostic A204_b (mission e1)

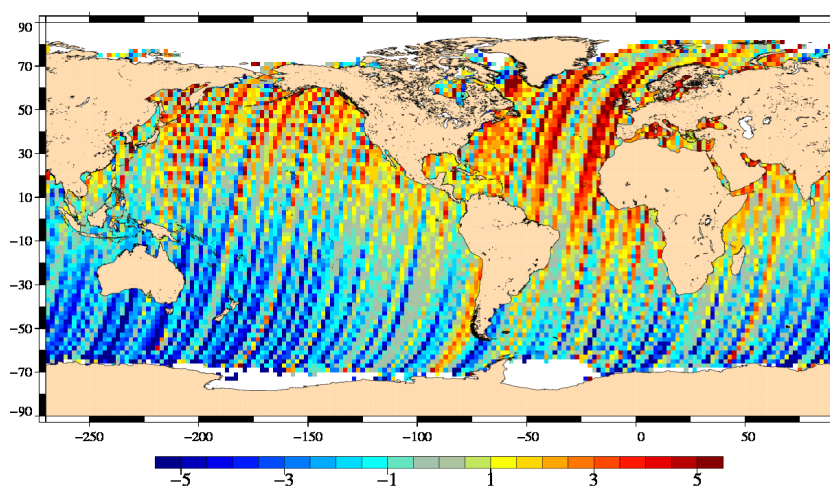
Name : Differences between maps of SLA

Input data : Along track SLA

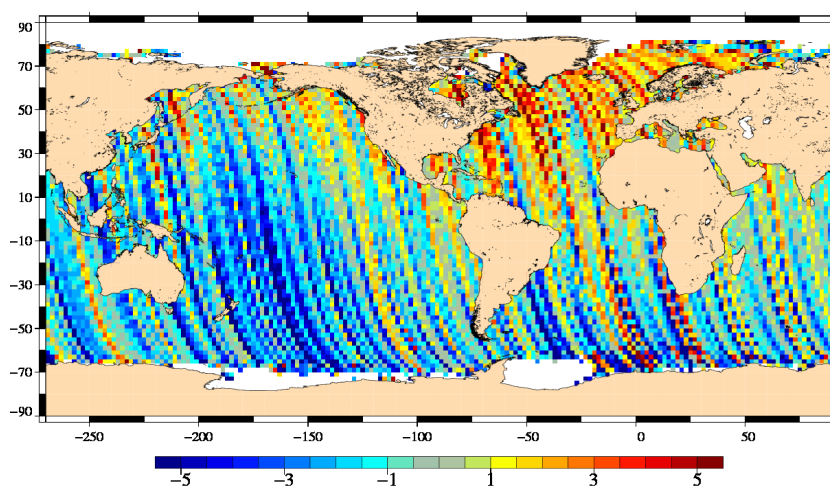
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

SLA with COMBINED orbit – SLA with GFZ orbit : trends, even pass numbers
Mission e1, cycles 16 to 52



Trends (mm/yr)
SLA with COMBINED orbit – SLA with GFZ orbit : trends, odd pass numbers
Mission e1, cycles 16 to 52



Trends (mm/yr)

Diagnostic A204_a (mission e2)

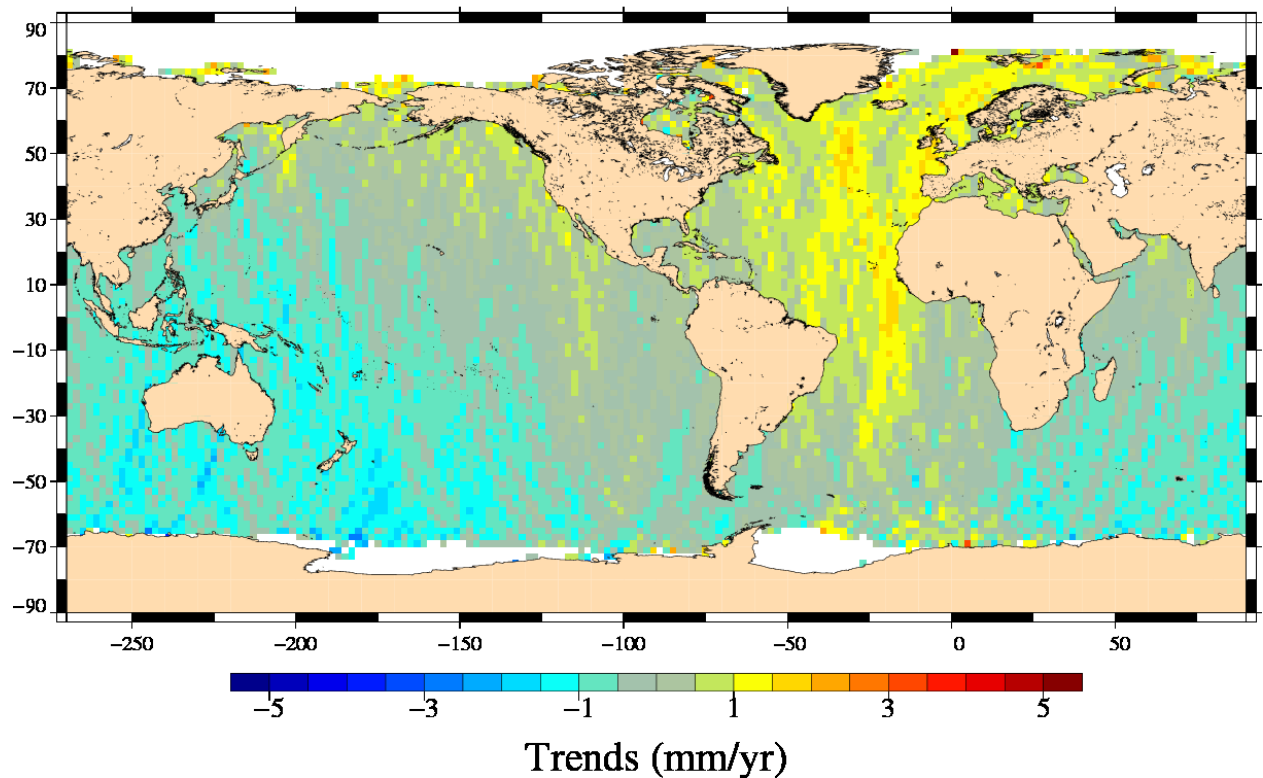
Name : Differences between maps of SLA

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).

Diagnostic type : Global internal analyses

SLA with COMBINED orbit – SLA with GFZ orbit : trends
Mission e2, cycles 2 to 84



Diagnostic A204_b (mission e2)

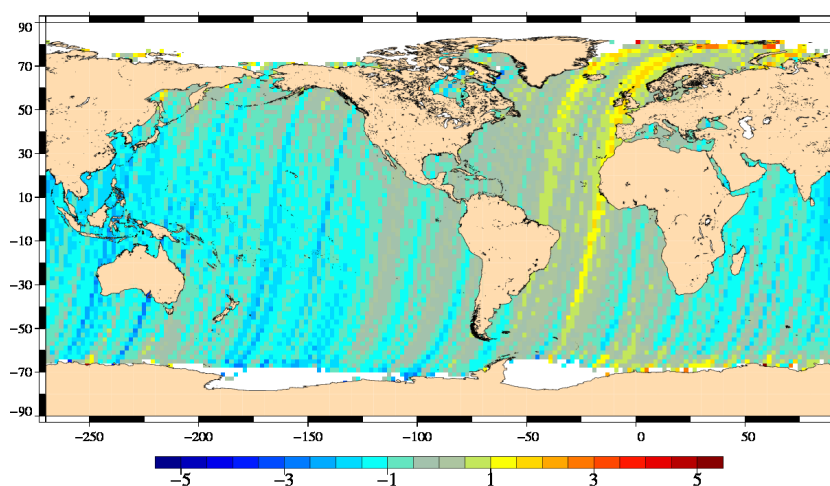
Name : Differences between maps of SLA

Input data : Along track SLA

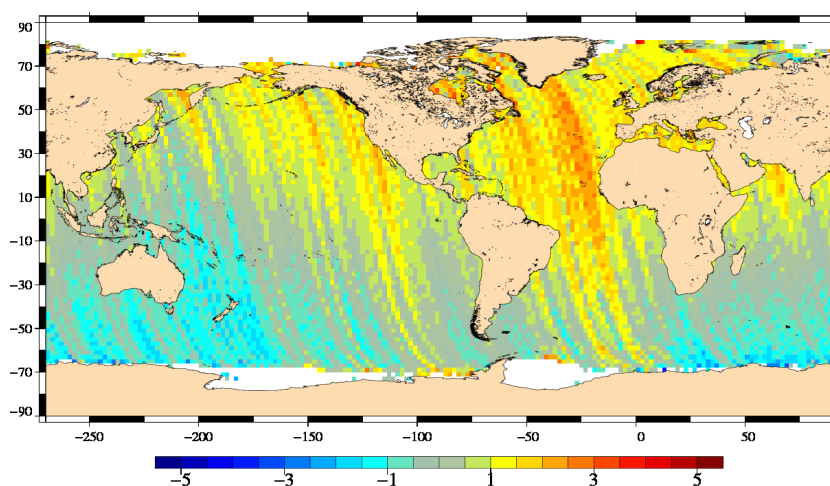
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

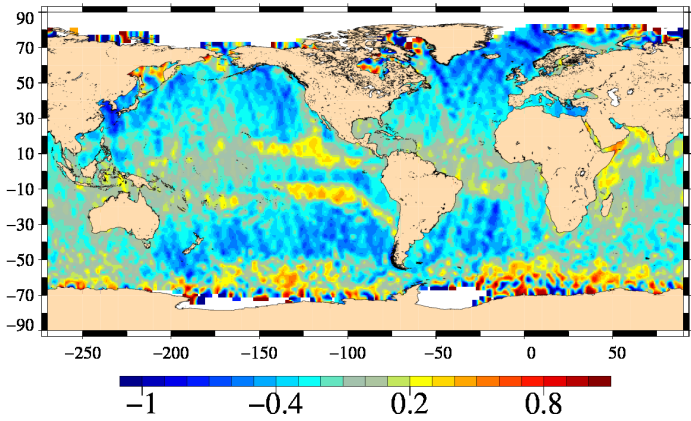
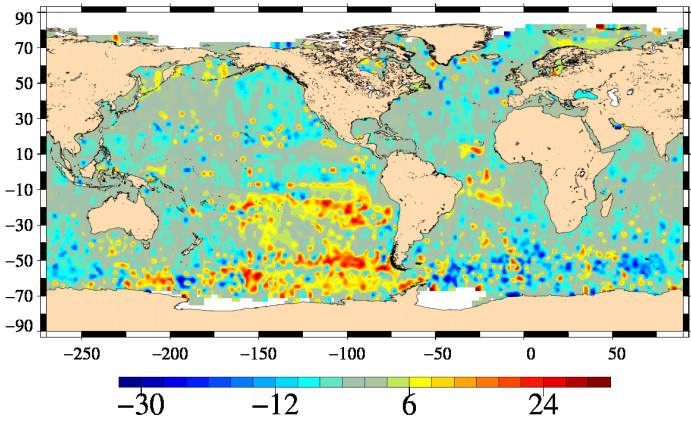
SLA with COMBINED orbit – SLA with GFZ orbit : trends, even pass numbers
Mission e2, cycles 2 to 84



Trends (mm/yr)
SLA with COMBINED orbit – SLA with GFZ orbit : trends, odd pass numbers
Mission e2, cycles 2 to 84



Trends (mm/yr)

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).	
	<div>with COMBINED orbit amplitude – SLA with GFZ orbit amplitude : annual s Mission e1, cycles 15 to 53</div> <div><p>A global map showing the difference in Sea Level Anomaly (SLA) amplitude between COMBINED and GFZ orbit amplitudes for mission e1, cycles 15 to 53. The map uses a color scale from -1 to 0.8 cm, with blue representing negative values and red representing positive values. The map shows significant variations across the globe, with higher positive differences in the Southern Ocean and lower differences in the Northern Hemisphere.</p><p>Amplitude (cm)</p></div> <div>LA with COMBINED orbit phase – SLA with GFZ orbit phase : annual signa Mission e1, cycles 15 to 53</div> <div><p>A global map showing the difference in SLA phase between COMBINED and GFZ orbit phases for mission e1, cycles 15 to 53. The map uses a color scale from -30 to 24 degrees, with blue representing negative values and red representing positive values. The map shows significant variations across the globe, with higher positive differences in the Southern Ocean and lower differences in the Northern Hemisphere.</p><p>Phase (degree)</p></div>	

Diagnostic A205_b (mission e1)

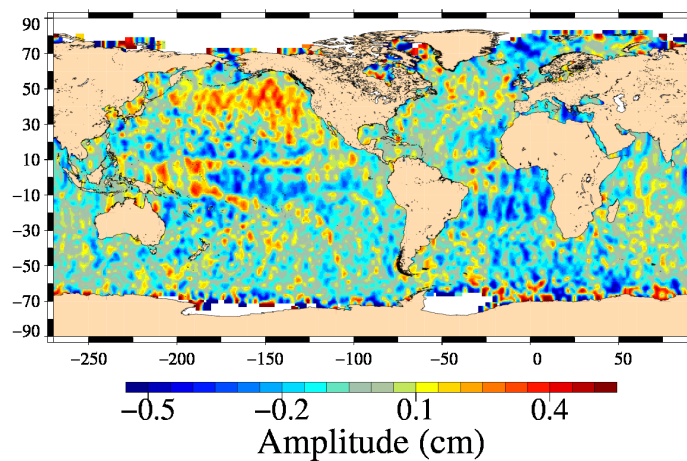
Name : Differences between maps of SLA (2)

Input data : Along track SLA

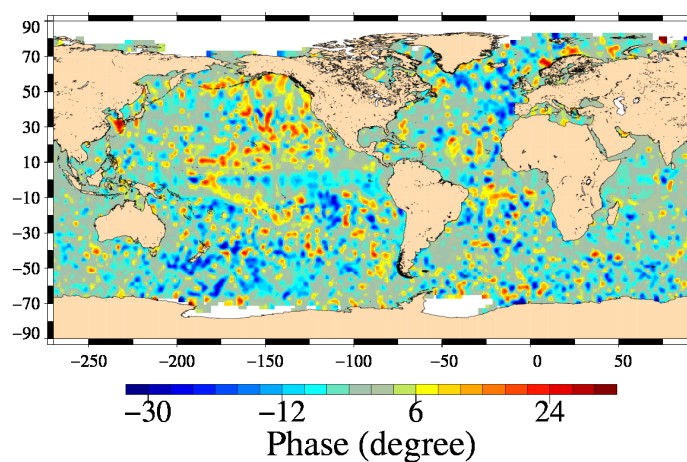
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

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



h with COMBINED orbit phase – SLA with GFZ orbit phase : semi-annual si
Mission e1, cycles 15 to 53



Diagnostic A205_a (mission e2)

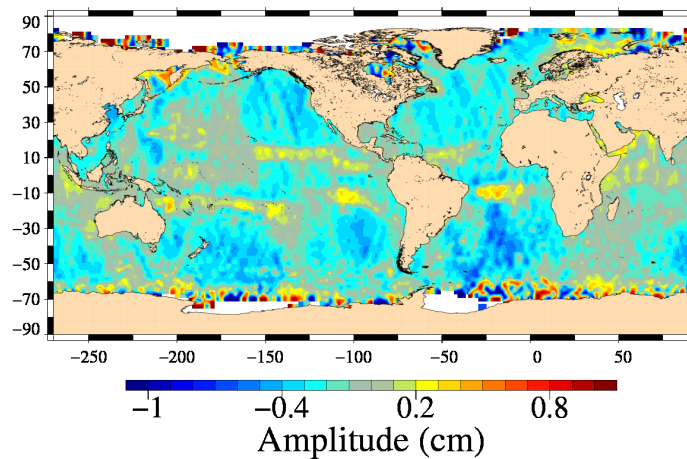
Name : Differences between maps of SLA (2)

Input data : Along track SLA

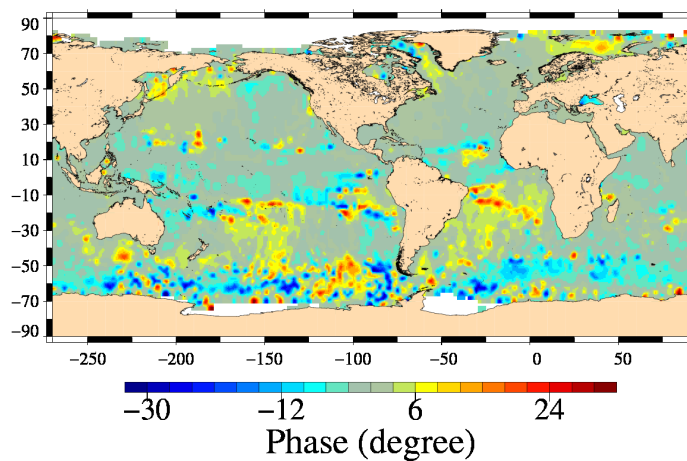
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

with COMBINED orbit amplitude – SLA with GFZ orbit amplitude : annual s
Mission e2, cycles 1 to 84



LA with COMBINED orbit phase – SLA with GFZ orbit phase : annual signa
Mission e2, cycles 1 to 84



Diagnostic A205_b (mission e2)

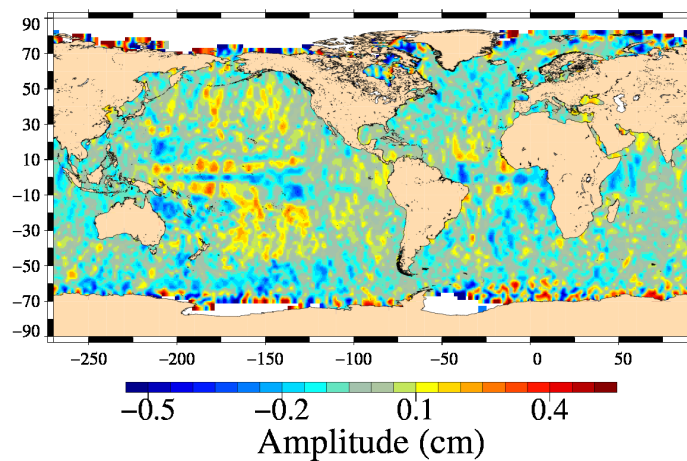
Name : Differences between maps of SLA (2)

Input data : Along track SLA

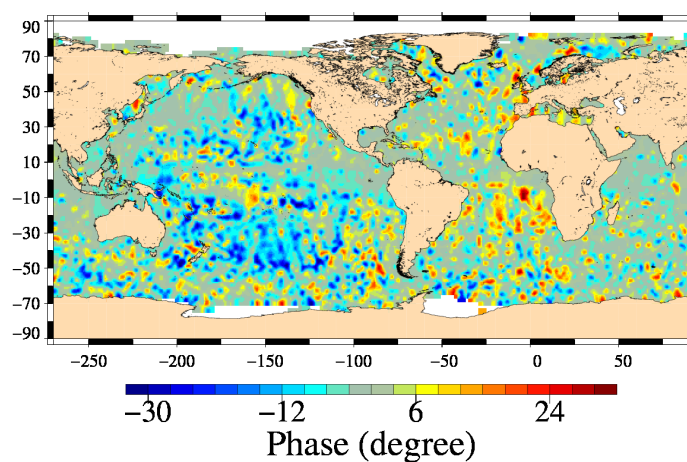
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

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



λ with COMBINED orbit phase – SLA with GFZ orbit phase : semi-annual si
Mission e2, cycles 1 to 84

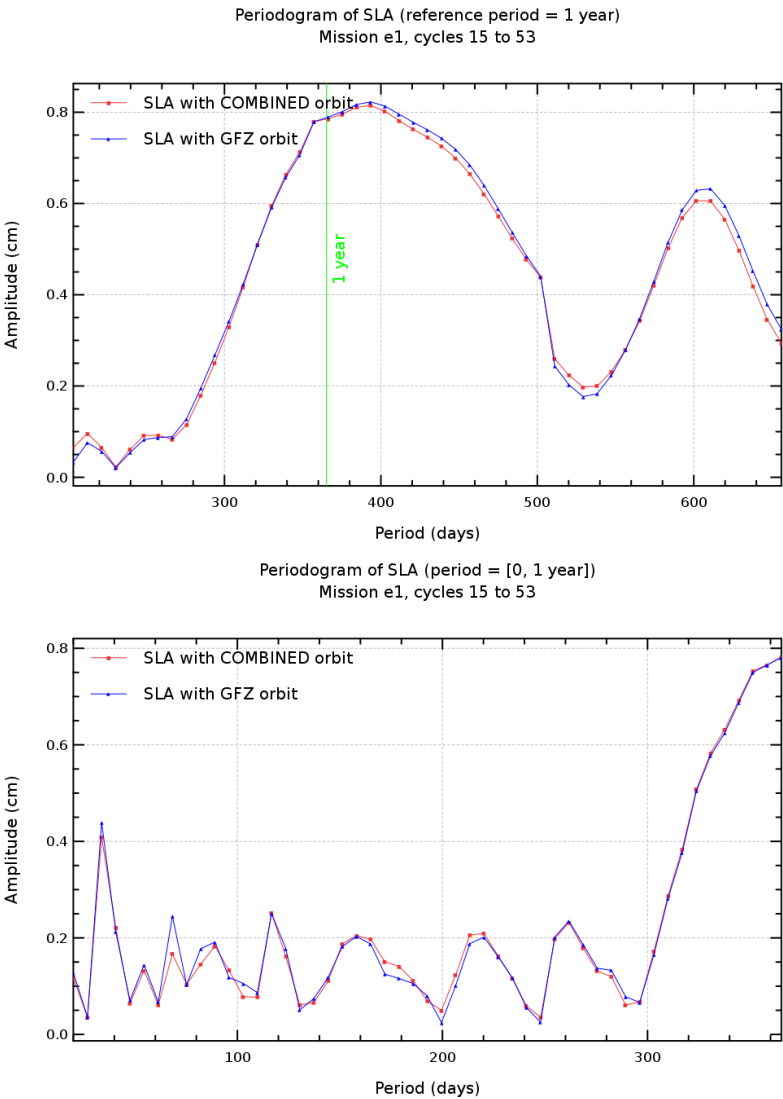


Diagnostic A206_a (mission e1)

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.



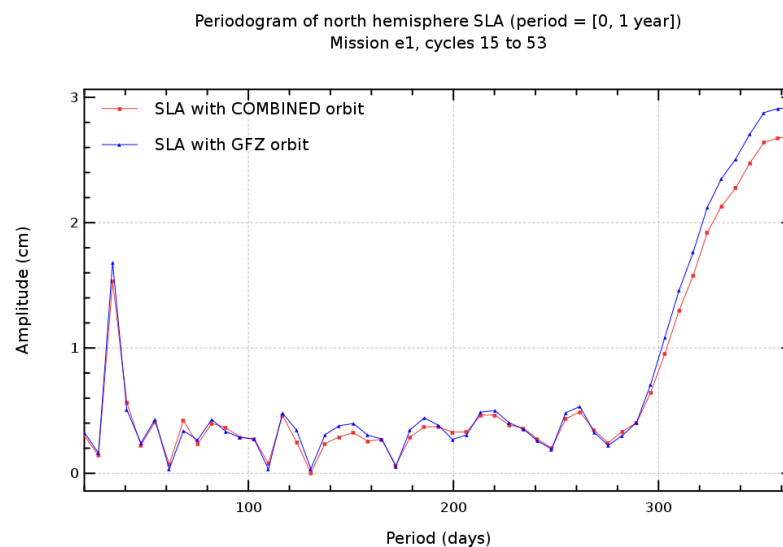
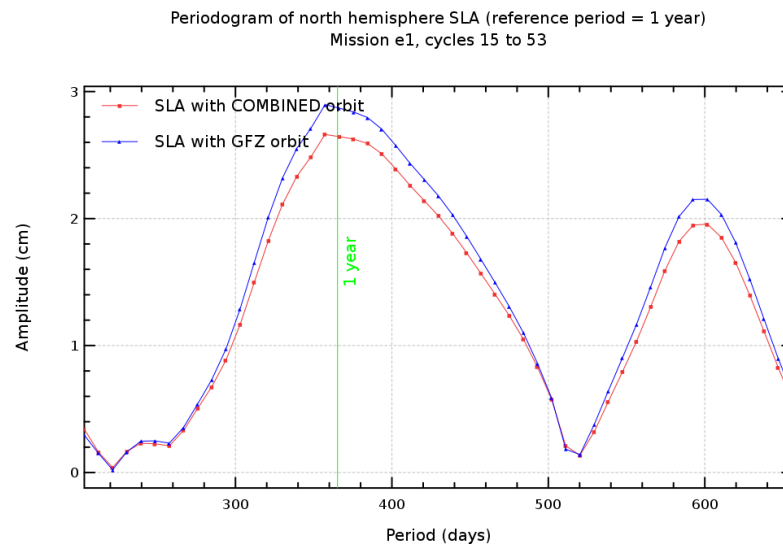
Diagnostic A206_b (mission e1)

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



Diagnostic A206_c (mission e1)

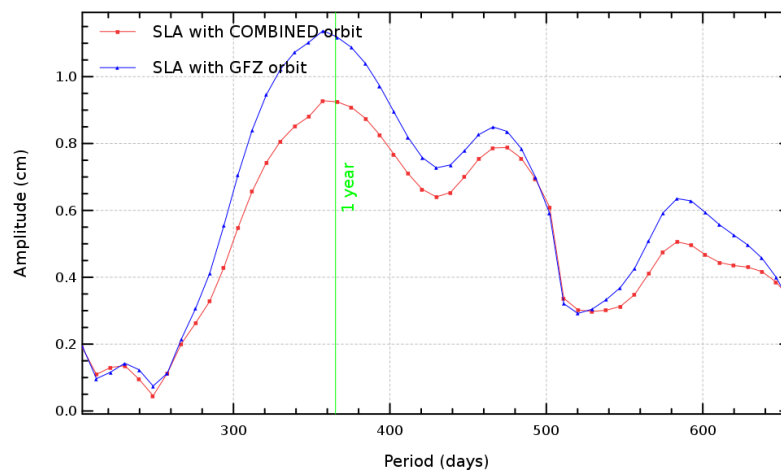
Name : Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

Input data : Along track SLA

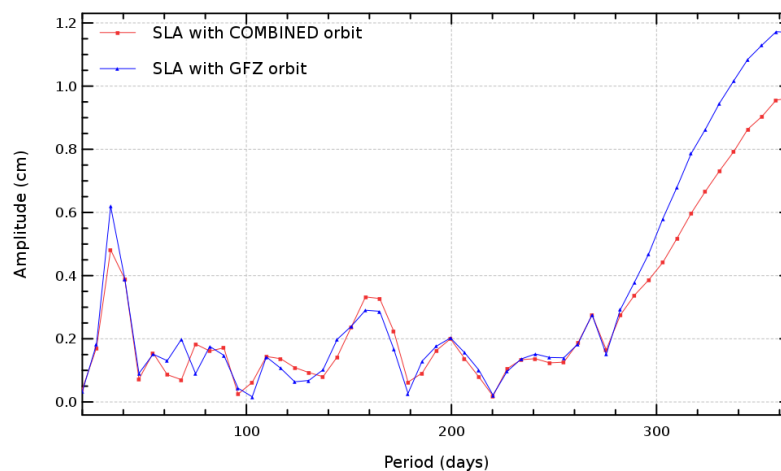
Description : The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data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



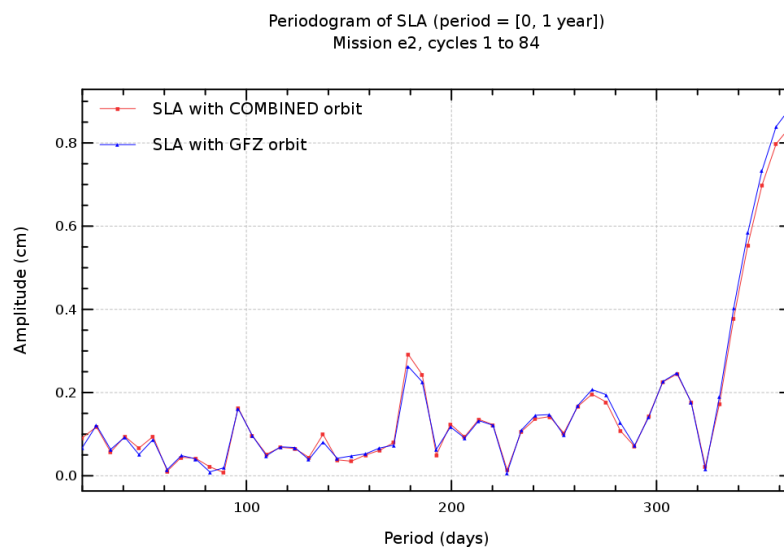
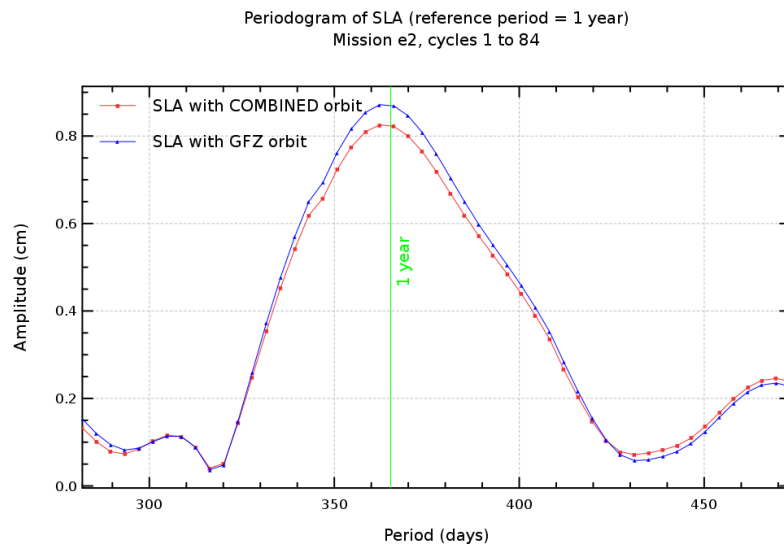
Diagnostic A206_a (mission e2)

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)

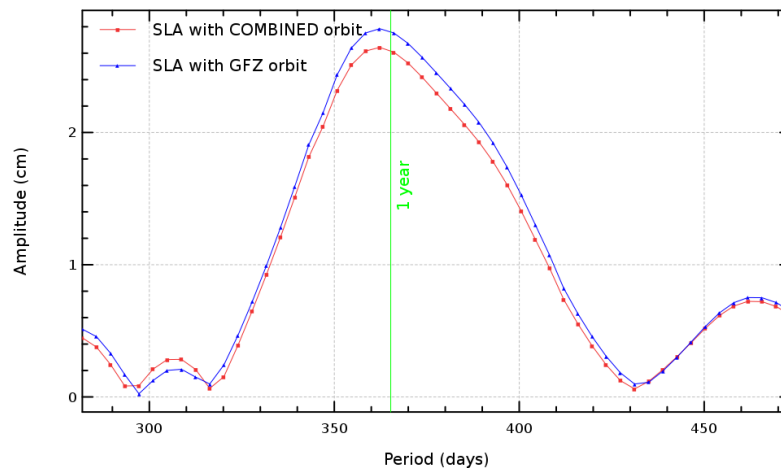
Name : Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

Input data : Along track SLA

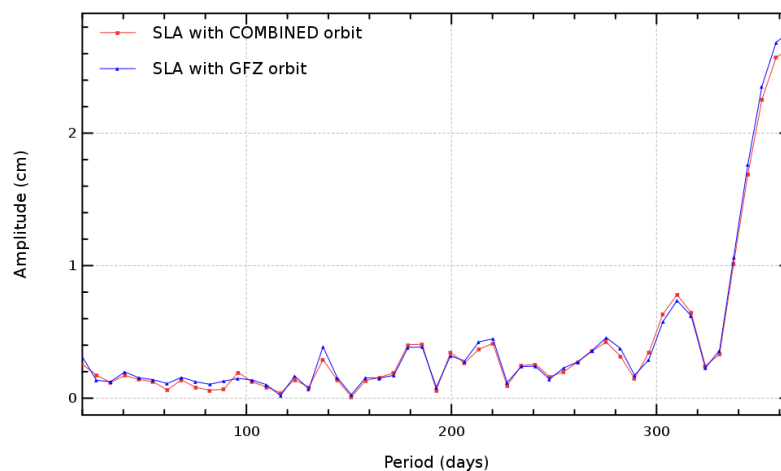
Description : The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data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



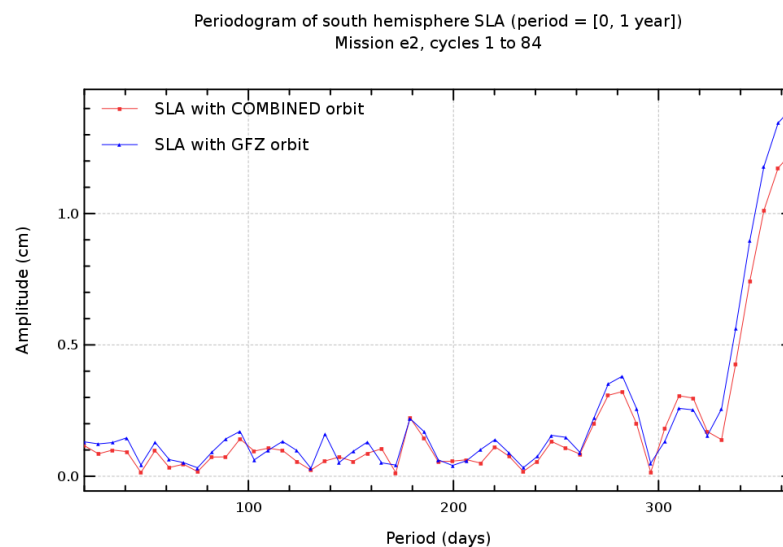
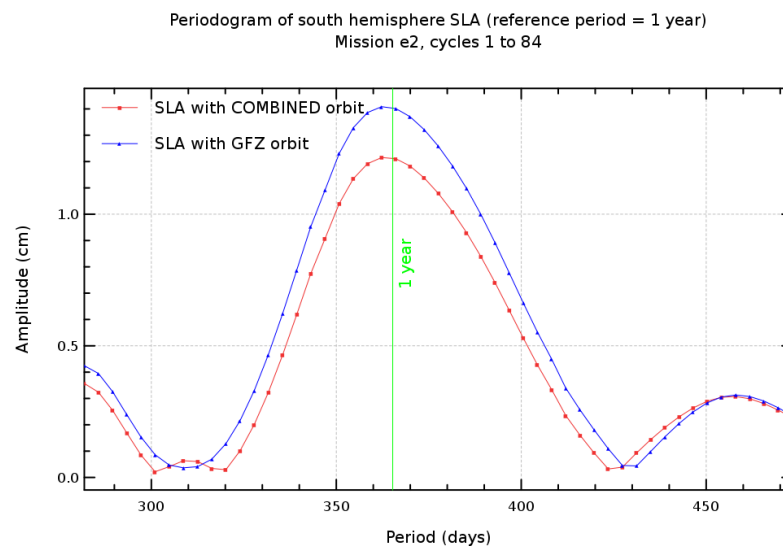
Diagnostic A206_c (mission e2)

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												
	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).												
	<div>SLA differences : altimetry measurements - tide gauges</div> <div>Mission e1, cycles 16 to 52</div> <p>The graph displays the temporal evolution of Sea Level Anomaly (SLA) differences between altimetry measurements and tide gauge measurements for Mission e1, covering cycles 16 to 52. The y-axis represents SLA differences in centimeters (cm), ranging from -2 to 1. The x-axis shows the years 1994, 1995, and 1996. Two data series are plotted: 'SLA with COMBINED orbit - T. G.' (red line with square markers) and 'SLA with GFZ orbit - T. G.' (blue line with triangle markers). Both series show significant fluctuations over time. The red line has a negative slope of -0.0413 m, and the blue line has a positive slope of 0.265 mm.</p> <table border="1"><thead><tr><th>Year</th><th>SLA with COMBINED orbit - T. G. (cm)</th><th>SLA with GFZ orbit - T. G. (cm)</th></tr></thead><tbody><tr><td>1994</td><td>-1.5</td><td>-1.5</td></tr><tr><td>1995</td><td>-1.2</td><td>-1.0</td></tr><tr><td>1996</td><td>-1.8</td><td>-1.5</td></tr></tbody></table>		Year	SLA with COMBINED orbit - T. G. (cm)	SLA with GFZ orbit - T. G. (cm)	1994	-1.5	-1.5	1995	-1.2	-1.0	1996	-1.8
Year	SLA with COMBINED orbit - T. G. (cm)	SLA with GFZ orbit - T. G. (cm)											
1994	-1.5	-1.5											
1995	-1.2	-1.0											
1996	-1.8	-1.5											

Diagnostic C001 (mission e2)

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

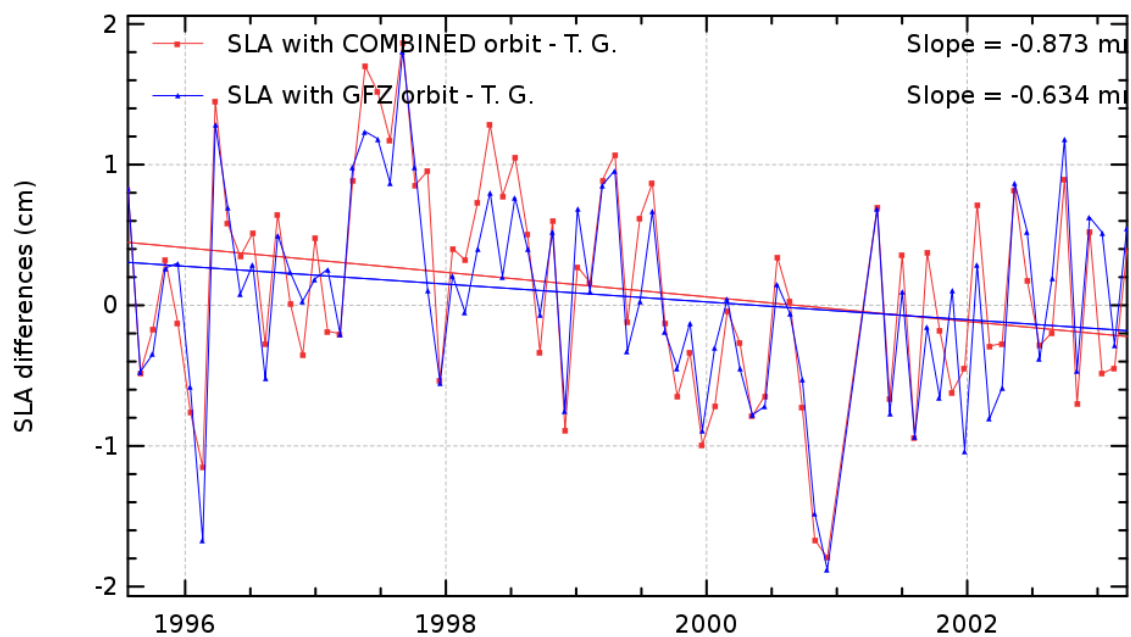
Input data : Tide gauges SSH measurements

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 repetivity) using successively both altimetric components in 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 (GLOSS/CLIVAR, REFMAR).

Diagnostic type : Altimetry and in-situ data comparison

SLA differences : altimetry measurements - tide gauges

Mission e2, cycles 2 to 84



Diagnostic C002 (mission e1)

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

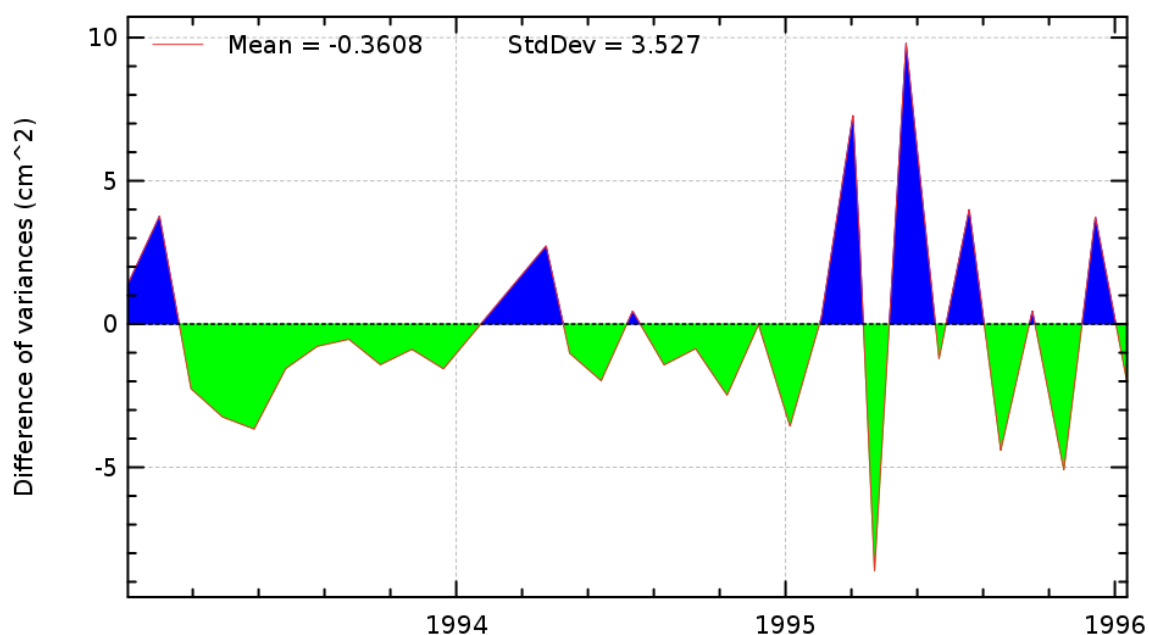
Input data : Tide gauges SSH measurements

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 : $\text{VAR}(\text{SLA with COMBINED orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit} - \text{T. G.})$

Mission e1, cycles 16 to 52



Diagnostic C002 (mission e2)

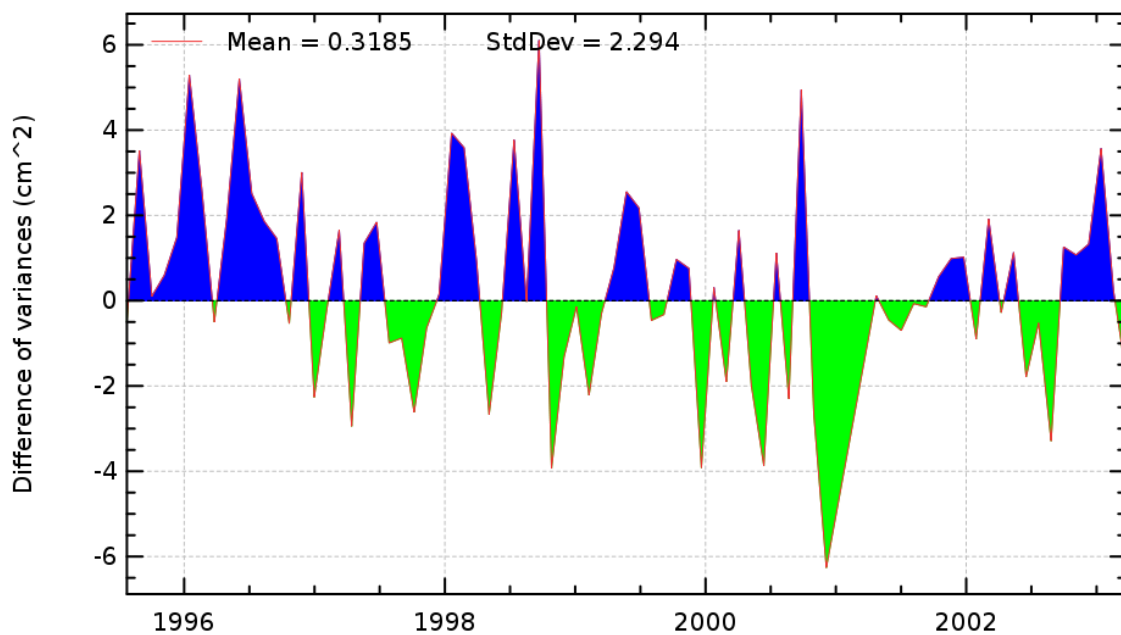
Name : Differences of temporal evolution of SSH differences between tide gauges and altimetry measurements

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.

Difference of variances : $\text{VAR}(\text{SLA with COMBINED orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit} - \text{T. G.})$

Mission e2, cycles 2 to 84

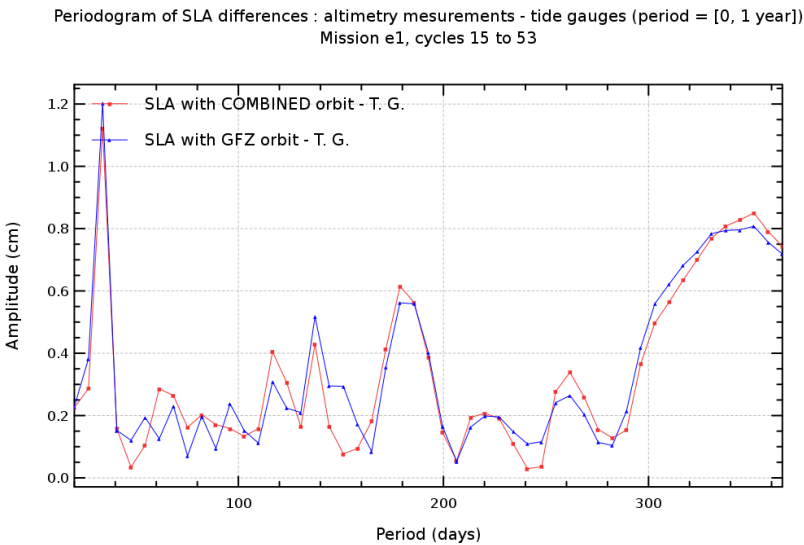
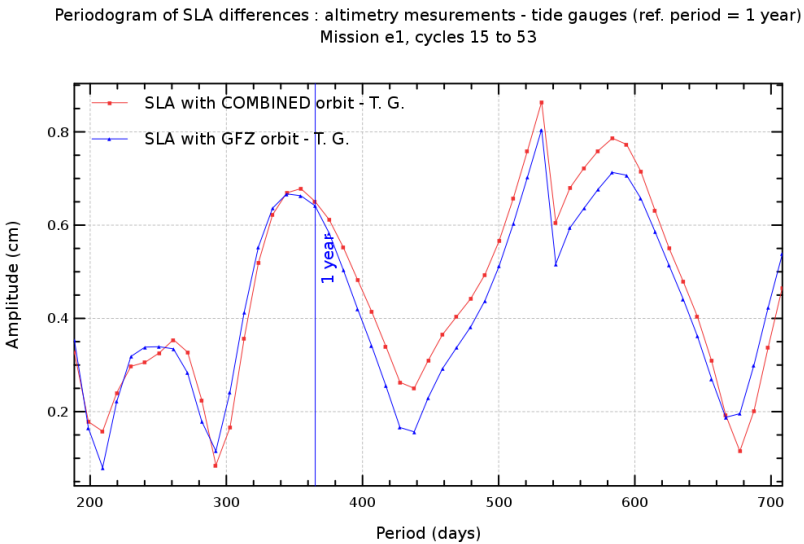


Diagnostic C003 (mission e1)

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



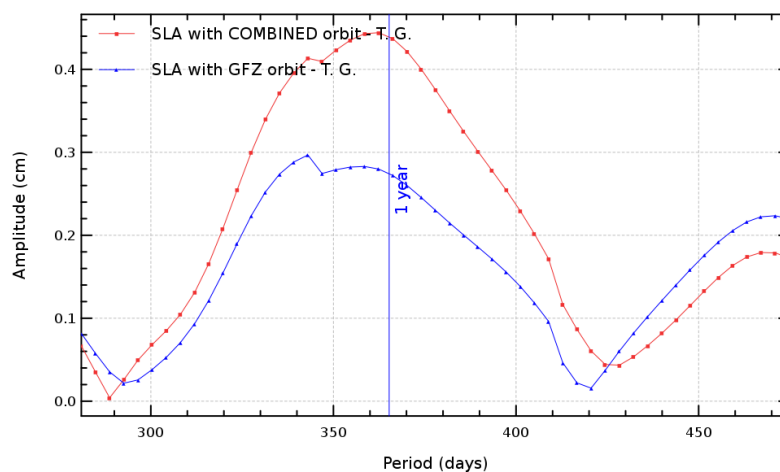
Diagnostic C003 (mission e2)

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

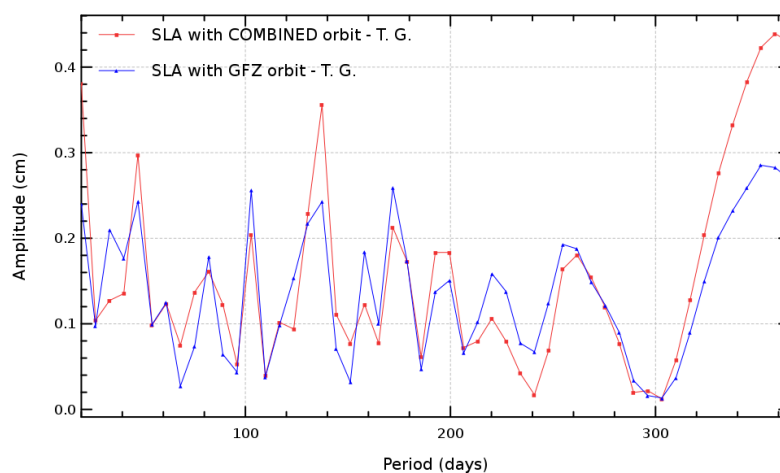
Input data : Tide gauges SSH measurements

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

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)

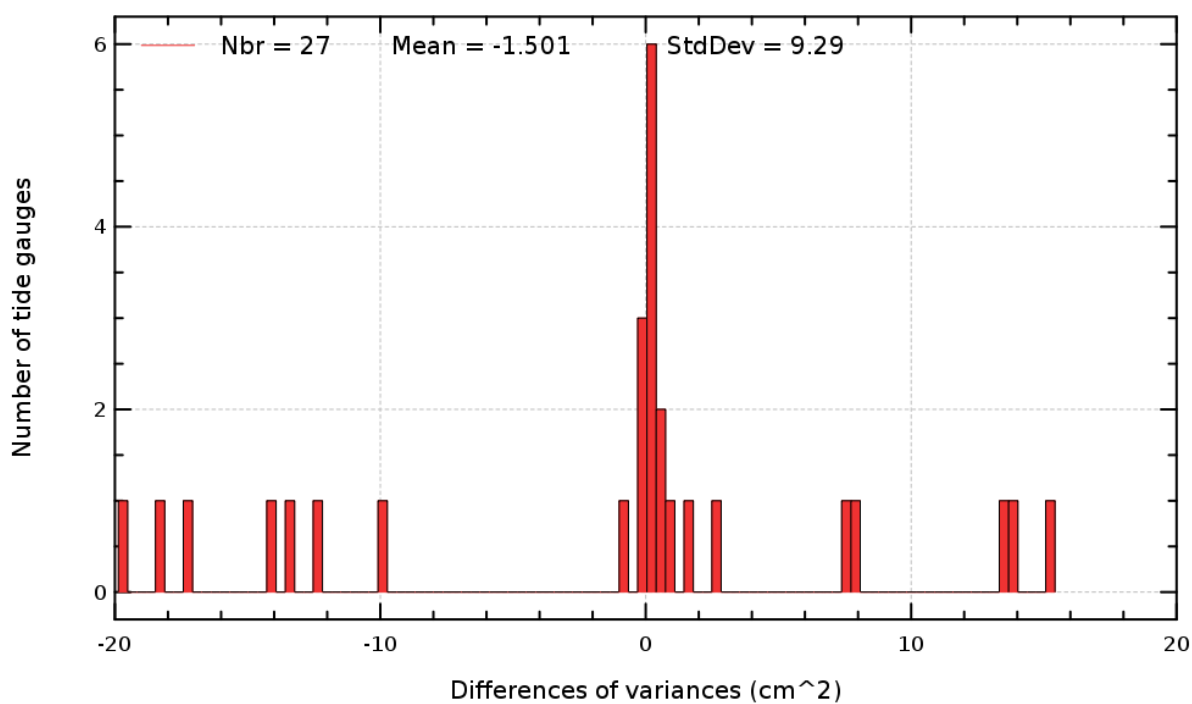
Name : Histograms of differences between tide gauges and altimeter SSH differences

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 : $\text{VAR}(\text{SLA with COMBINED orbit} - \text{T. G.}) - \text{VAR}(\text{SLA with GFZ orbit})$
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.

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

