

## Ionospheric models comparison: NIC09 versus Bent

Study variable	<b>NIC09 model for e1 and e2 cycles 1-36</b>  <b>GIM model for e2 cycles 37-85</b>
Reference variable	<b>Bent model for e1 and e2 cycles 1-36</b>  <b>GIM model for e2 cycles 37-85</b>
Missions	ERS-1 ( <i>e1</i> ), ERS-2 ( <i>e2</i> )
Period	[15636, 19540]

**Contents**

<b>Study overview</b>	<b>3</b>
<b>A001</b>	<b>4</b>
<b>A002</b>	<b>6</b>
<b>A003</b>	<b>8</b>
<b>A101</b>	<b>12</b>
<b>A102</b>	<b>14</b>
<b>A103</b>	<b>16</b>
<b>A104</b>	<b>18</b>
<b>A201</b>	<b>20</b>
<b>A202</b>	<b>26</b>
<b>A203</b>	<b>30</b>
<b>A204</b>	<b>36</b>
<b>A206</b>	<b>40</b>

## Study overview

The aim of this study is to compare the ionospheric correction NIC09 model to Bent model. To do so, a correction using a combination of the NIC09 model and GIM model is compared to a correction using the combination of Bent and GIM models to calculate ERS-1 and ERS-2 sea-level height (SSH).

The impact of using these models on the SSH calculation have 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 June 2003 (Cycle 85)

The correction derived from NIC09 model is described in Scharroo R., W. H. F. Smith, 2010, "A GPS-based climatology for the total electron content in the ionosphere", *Journal of Geophysical Research*, VOL 115, doi:10.1029/2009JA0014719. And the GIM correction is the one described in <http://iono.jpl.nasa.gov/gim.html>

The studied correction is then:

- NIC09 model for ERS-1 and ERS-2 until cycle 36 ERS-2 (October 1998)
- GIM correction for ERS-2 from cycle 37 (October 1998)

and it is compared to the correction given by:

- Bent model for cycles 1 to 36 (May 1995 to October 1998) described in Llewellyn, S.K. and R.B. Bent, 1973: "Documentation and Description of the Bent ionospheric model", AFCRL-TR-73-0657.
- GIM model for cycles 37 to 85 (October 1998 to June 2003)

Note that in another RRDP, the comparison between NIC09 for cycles 1 to 85 (contrary to the combined correction NIC09+GIM made here) and BENT+GIM is performed. The interest of using different corrections along all the period is to study the long-term impact of such combinations on the mean sea level.

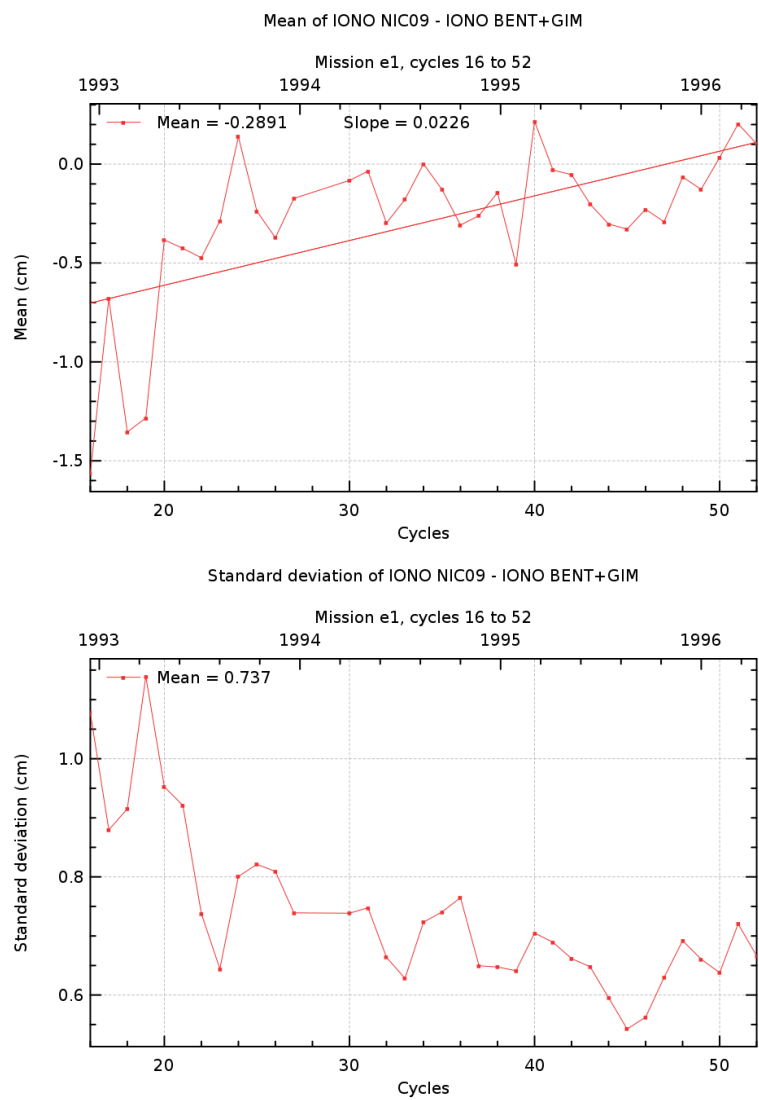
All the validation diagnostics displayed in this report have been performed in agreement with the Sea-Level CCI Product Validation Plan (PVP).

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.



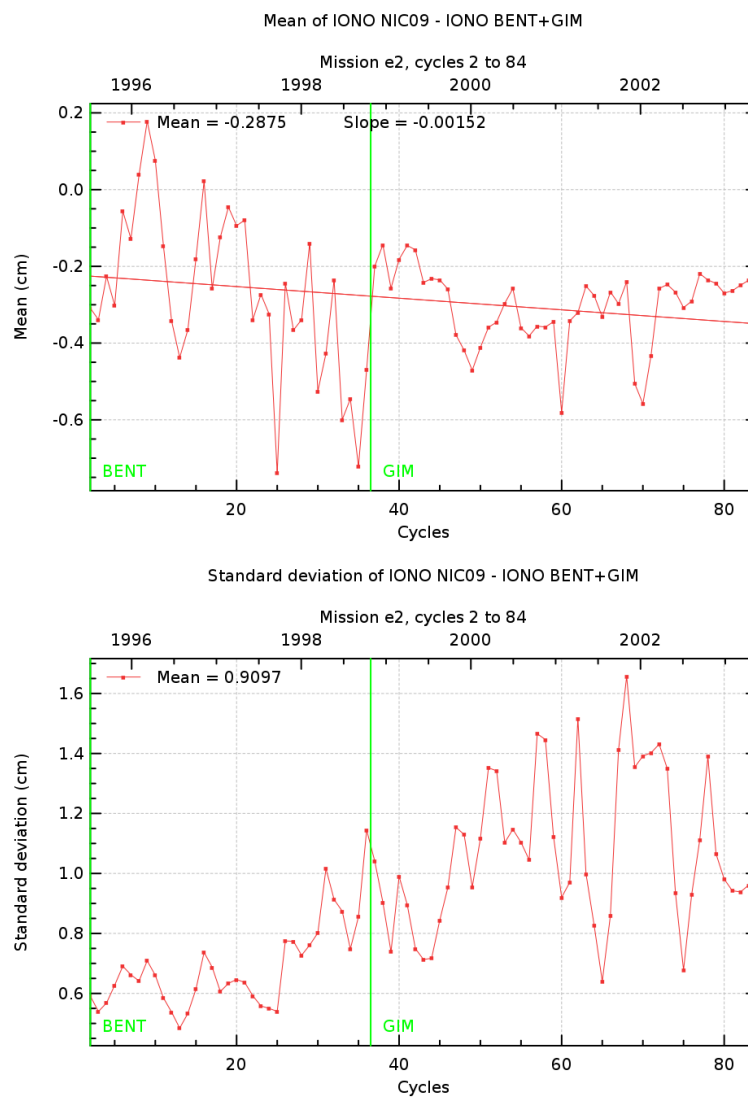
## Diagnostic A001 (mission e2)

**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

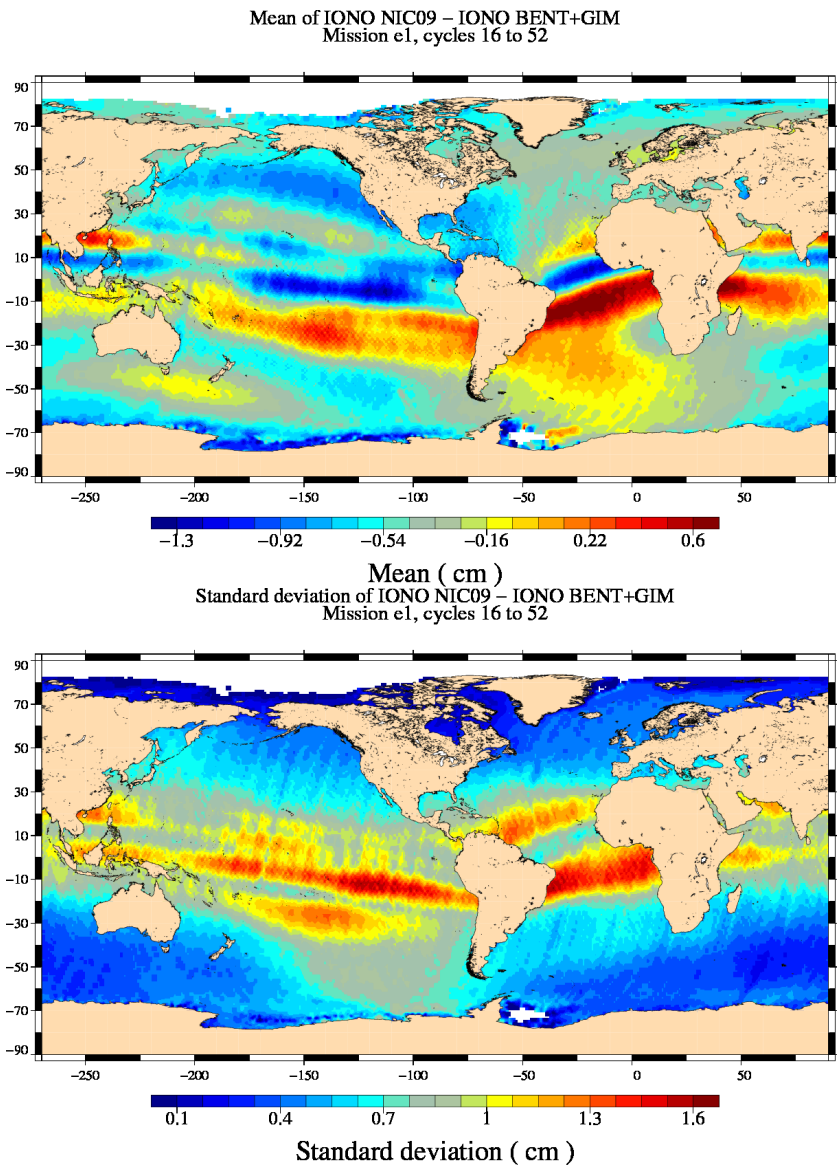


Diagnostic A002 (mission e1)

**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.



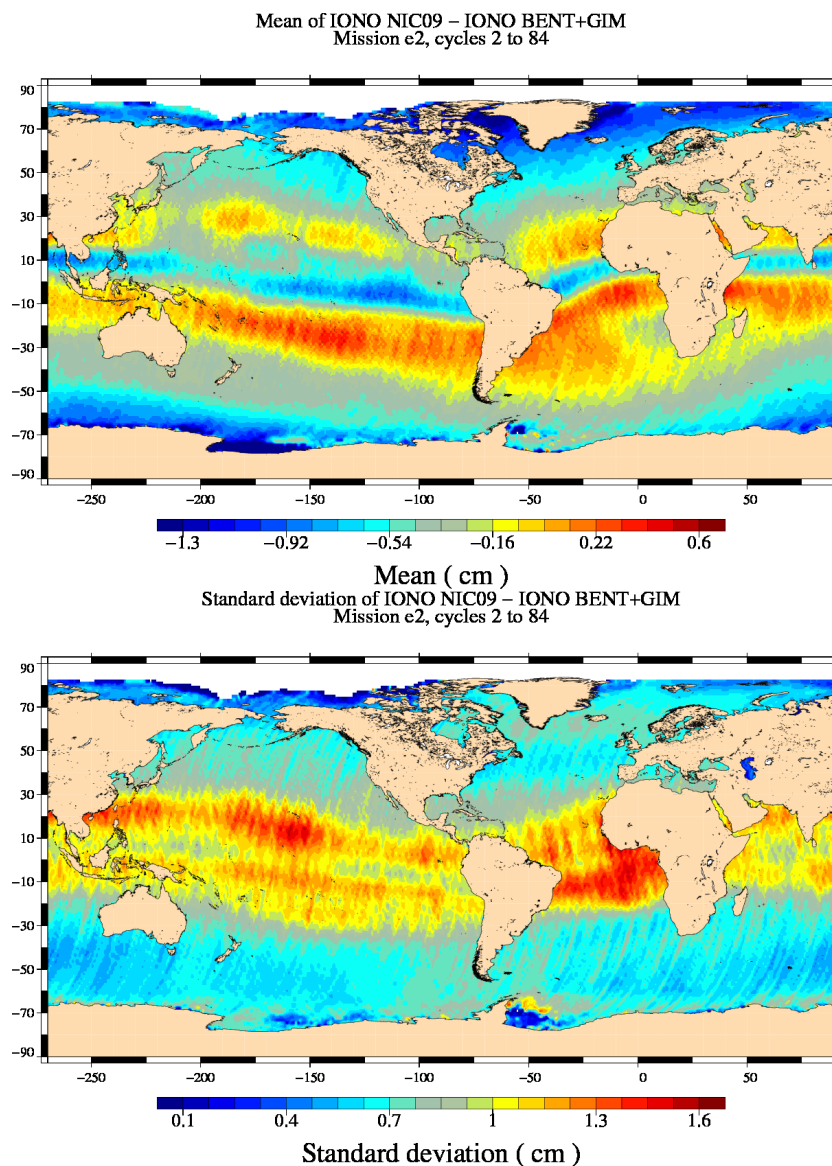
## Diagnostic A002 (mission e2)

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

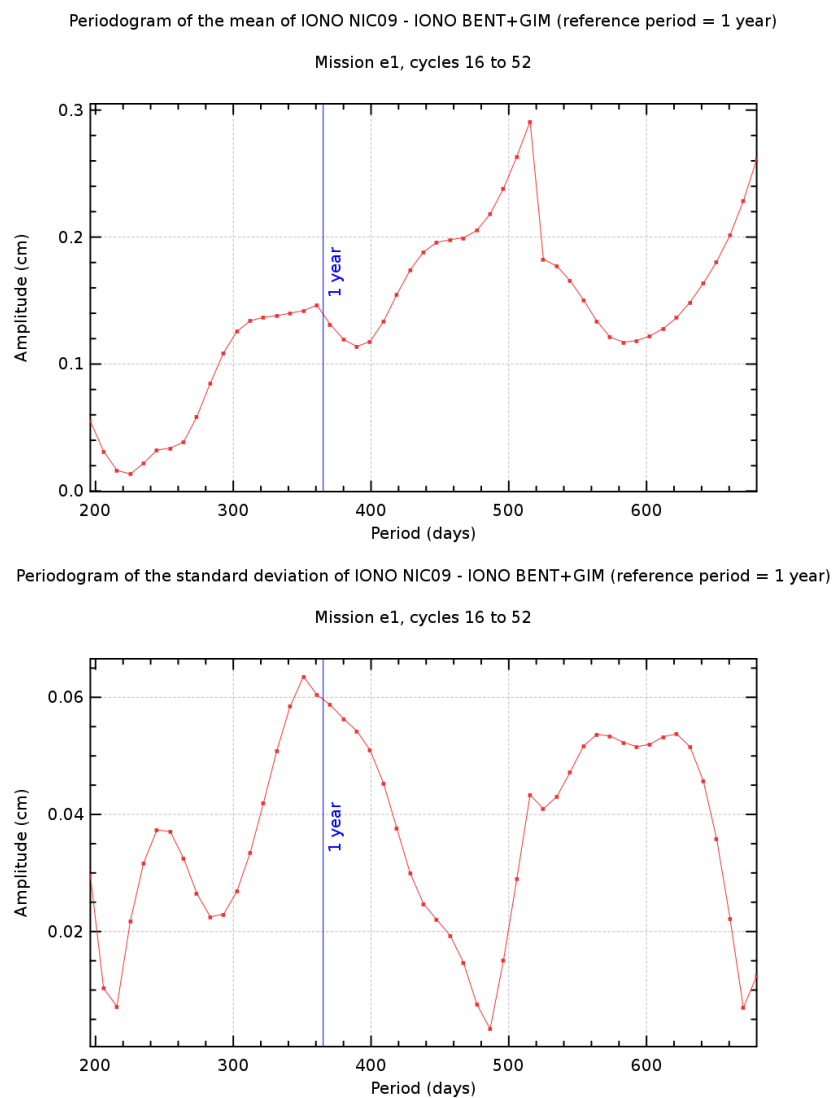
**Input data :** Along-track altimetric components

**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

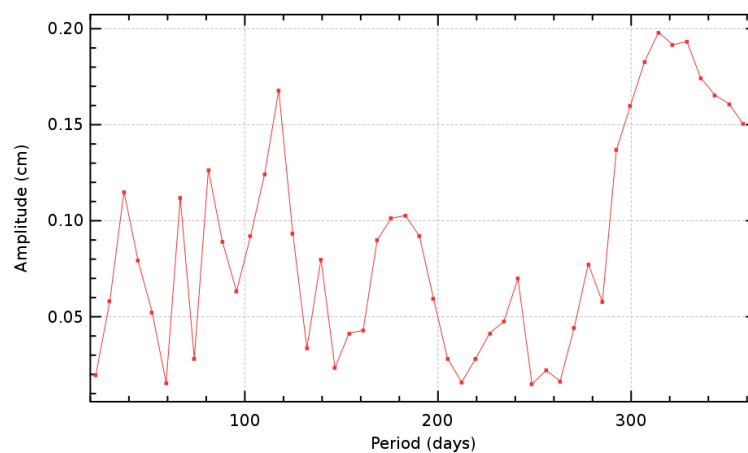
**Input data :** Along-track altimetric components

**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

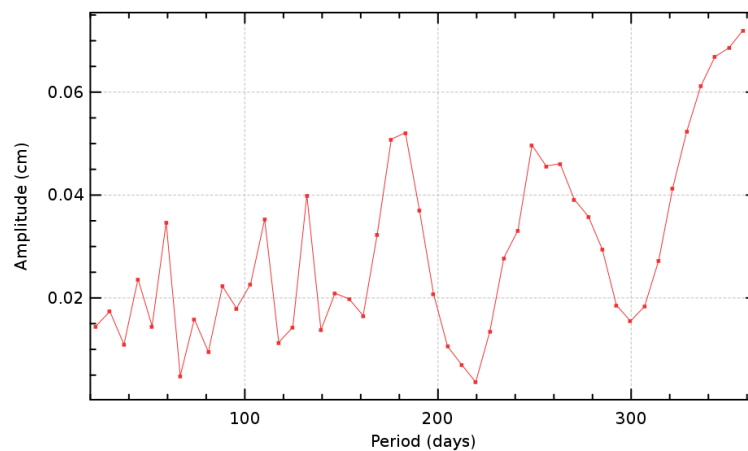
Periodogram of the mean of IONO NIC09 - IONO BENT+GIM (period = [0, 1 year])

Mission e1, cycles 16 to 52



Periodogram of the standard deviation of IONO NIC09 - IONO BENT+GIM (period = [0, 1 year])

Mission e1, cycles 16 to 52

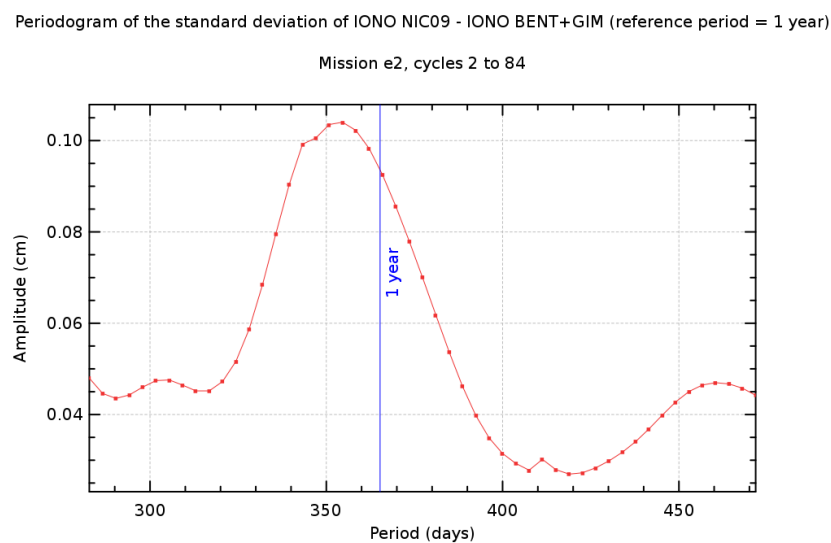
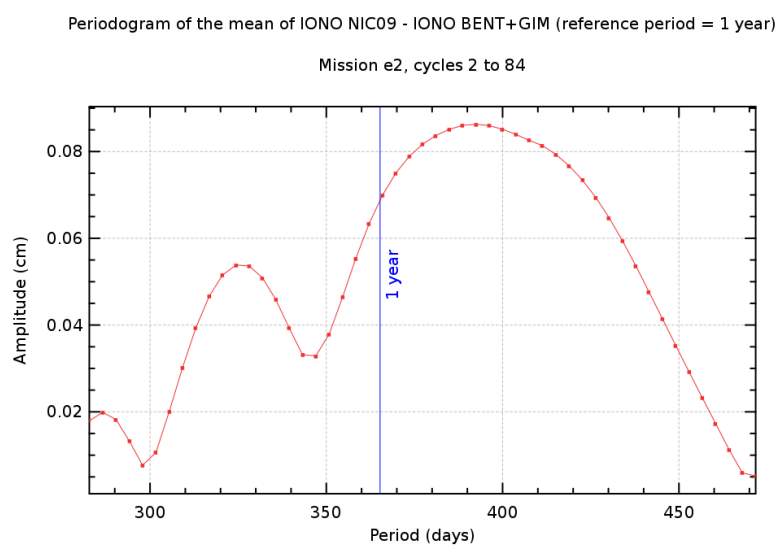


## Diagnostic A003\_a (mission e2)

**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

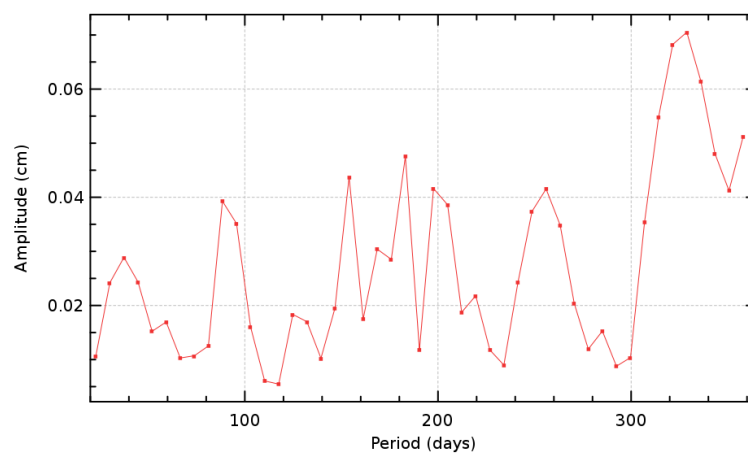
**Input data :** Along-track altimetric components

**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

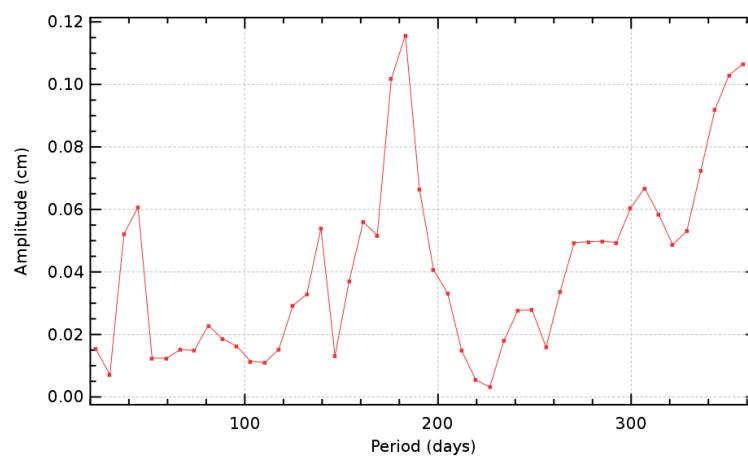
Periodogram of the mean of IONO NIC09 - IONO BENT+GIM (period = [0, 1 year])

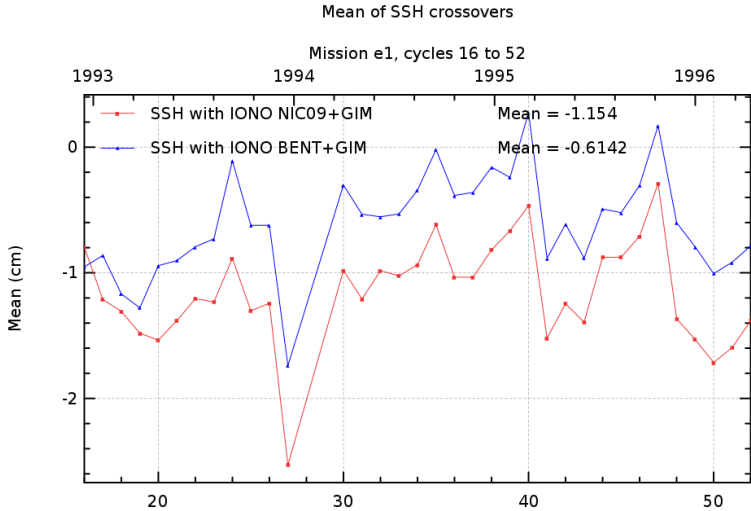
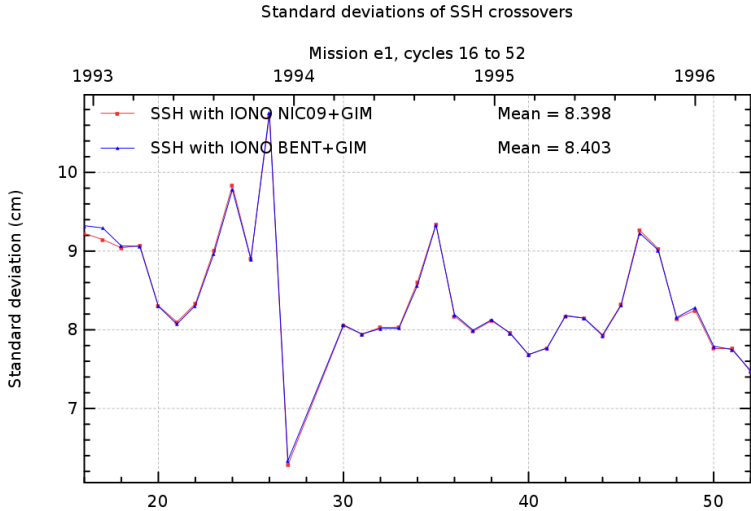
Mission e2, cycles 2 to 84



Periodogram of the standard deviation of IONO NIC09 - IONO BENT+GIM (period = [0, 1 year])

Mission e2, cycles 2 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>Mean of SSH crossovers</div><div>Mission e1, cycles 16 to 52</div><div></div></div> <div><div>Standard deviations of SSH crossovers</div><div>Mission e1, cycles 16 to 52</div><div></div></div>	

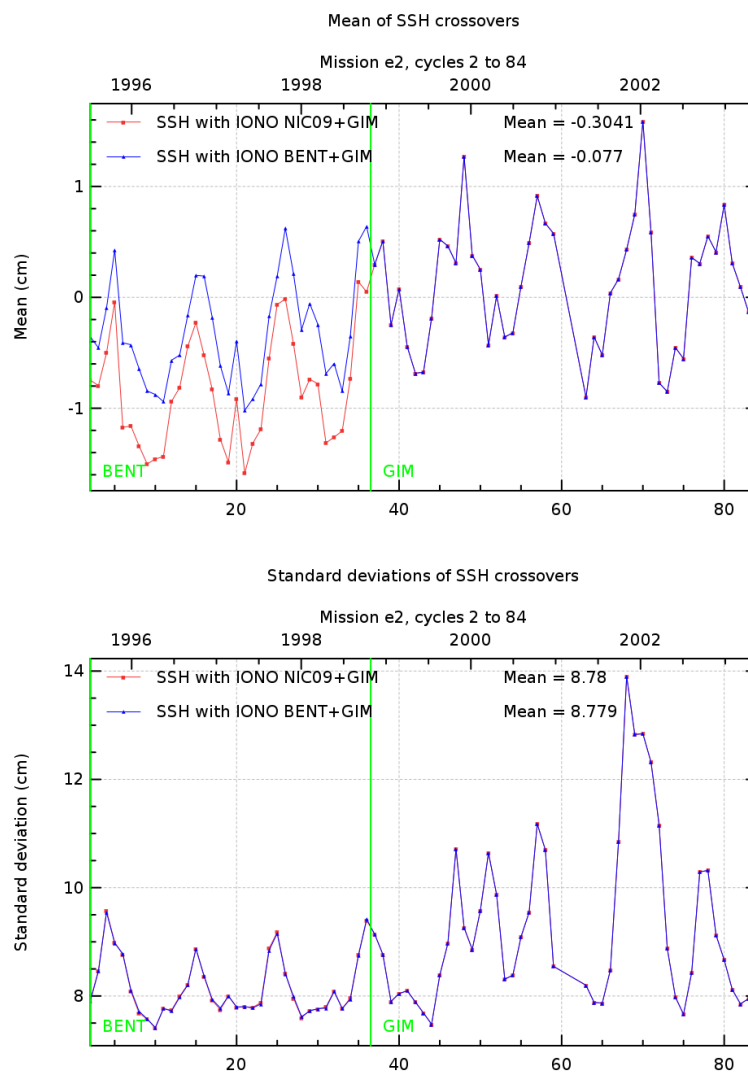
## Diagnostic A101 (mission e2)

**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



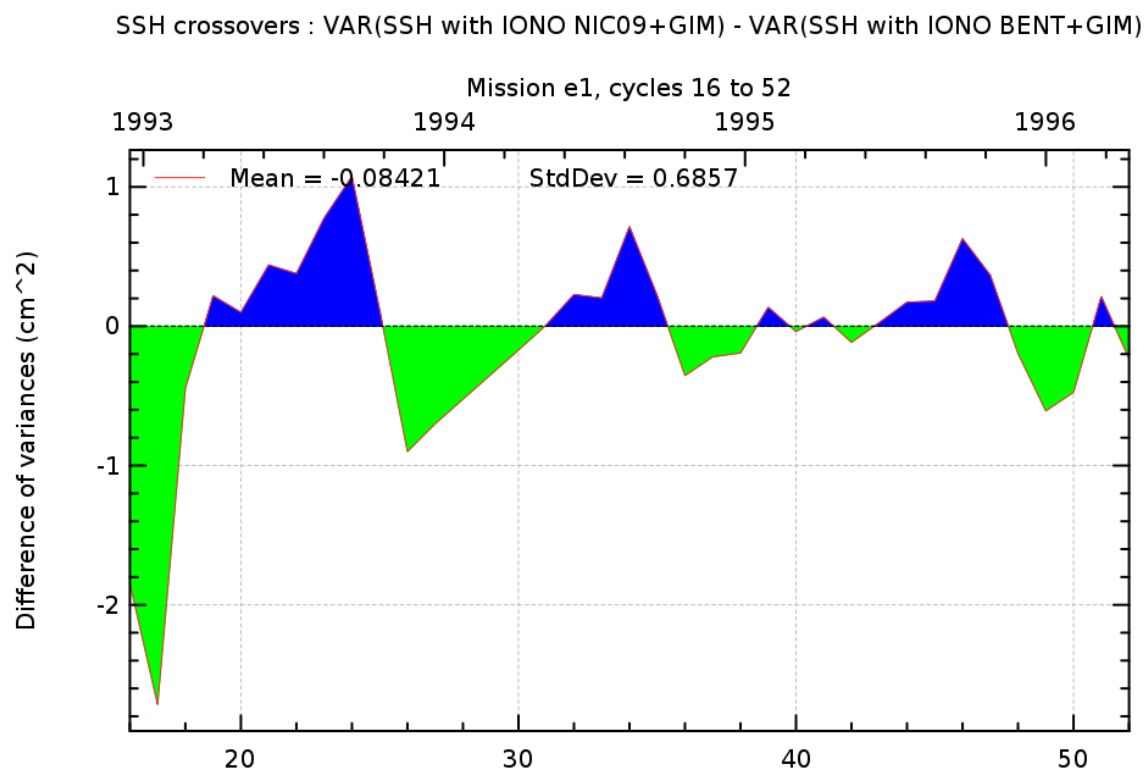
## Diagnostic A102 (mission e1)

**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



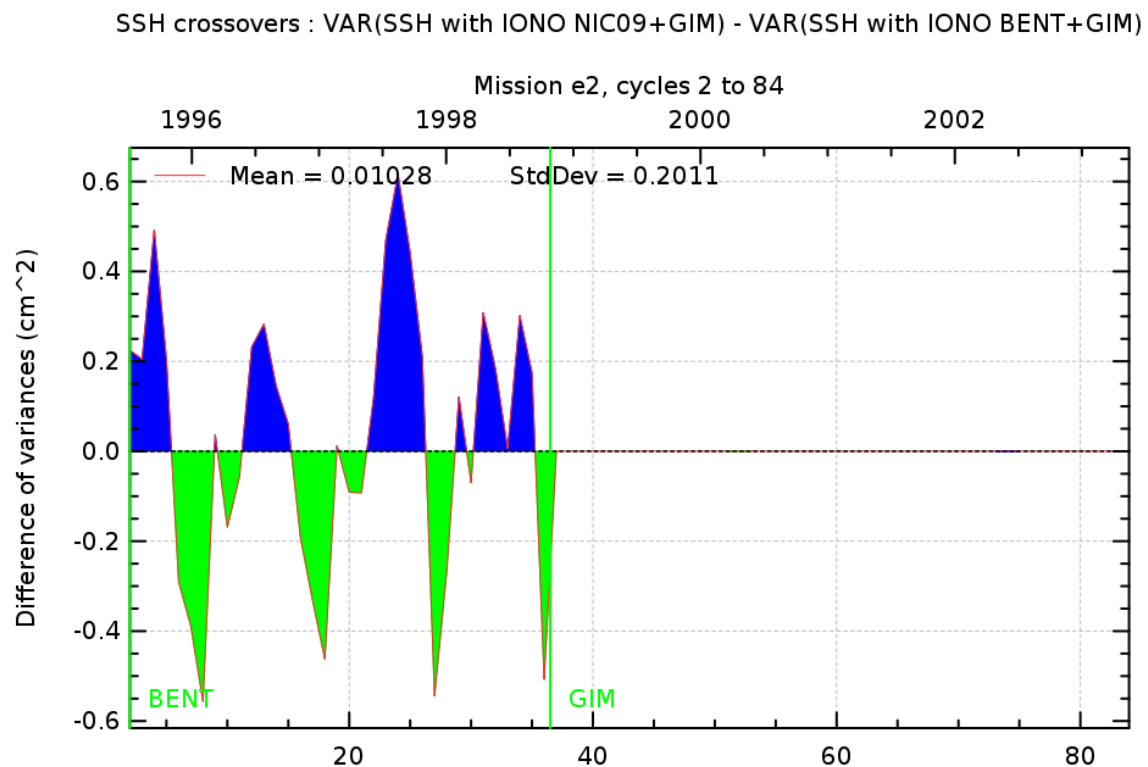
## Diagnostic A102 (mission e2)

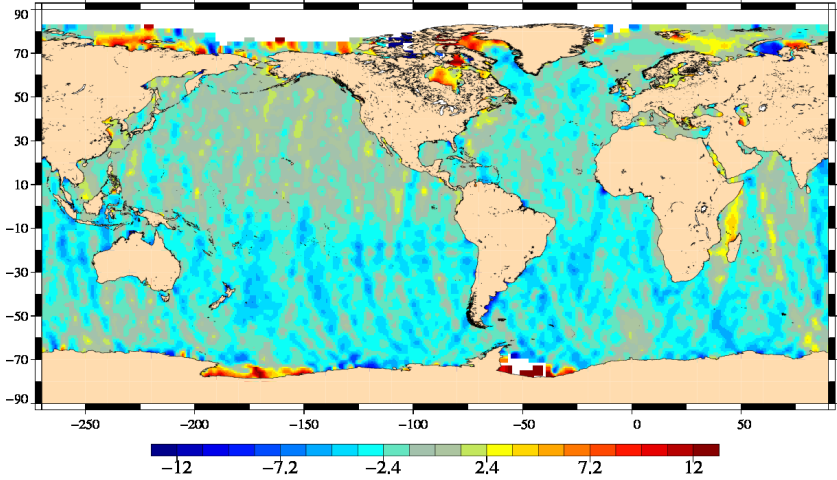
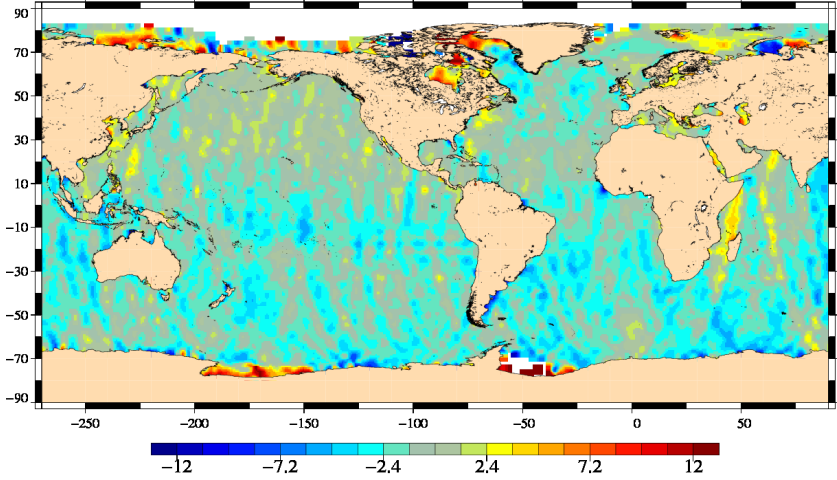
**Name :** Differences between temporal evolution of SSH crossovers

**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	
<p><b>Description :</b> 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 IONO NIC09+GIM Mission e1, cycles 16 to 52</div><div>Mean ( cm )</div></div><div><div>Mean of SSH with IONO BENT+GIM Mission e1, cycles 16 to 52</div><div>Mean ( cm )</div></div></div>	



## Diagnostic A103 (mission e2)

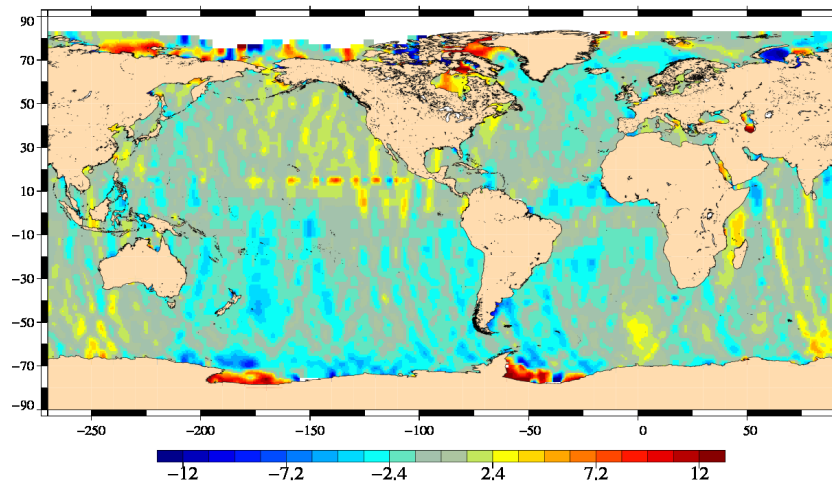
**Name :** Map of SSH crossovers

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

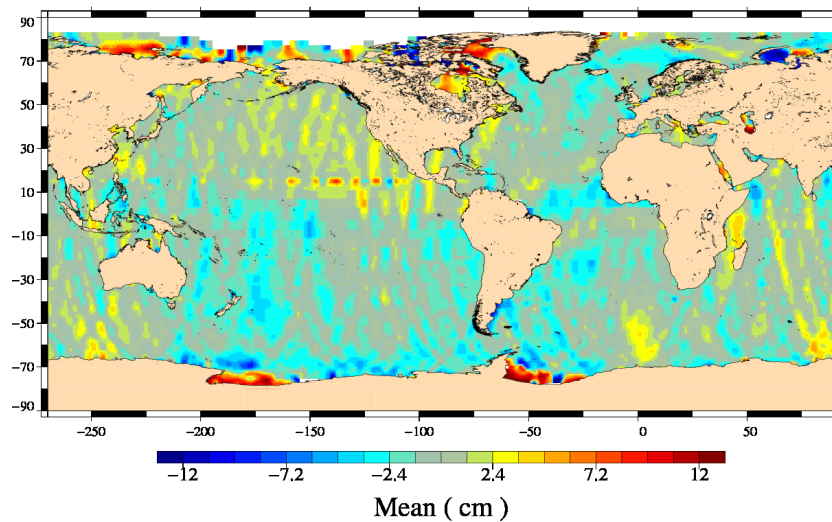
**Description :** The differences between maps of SSH crossovers differences (mean, variance) are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower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

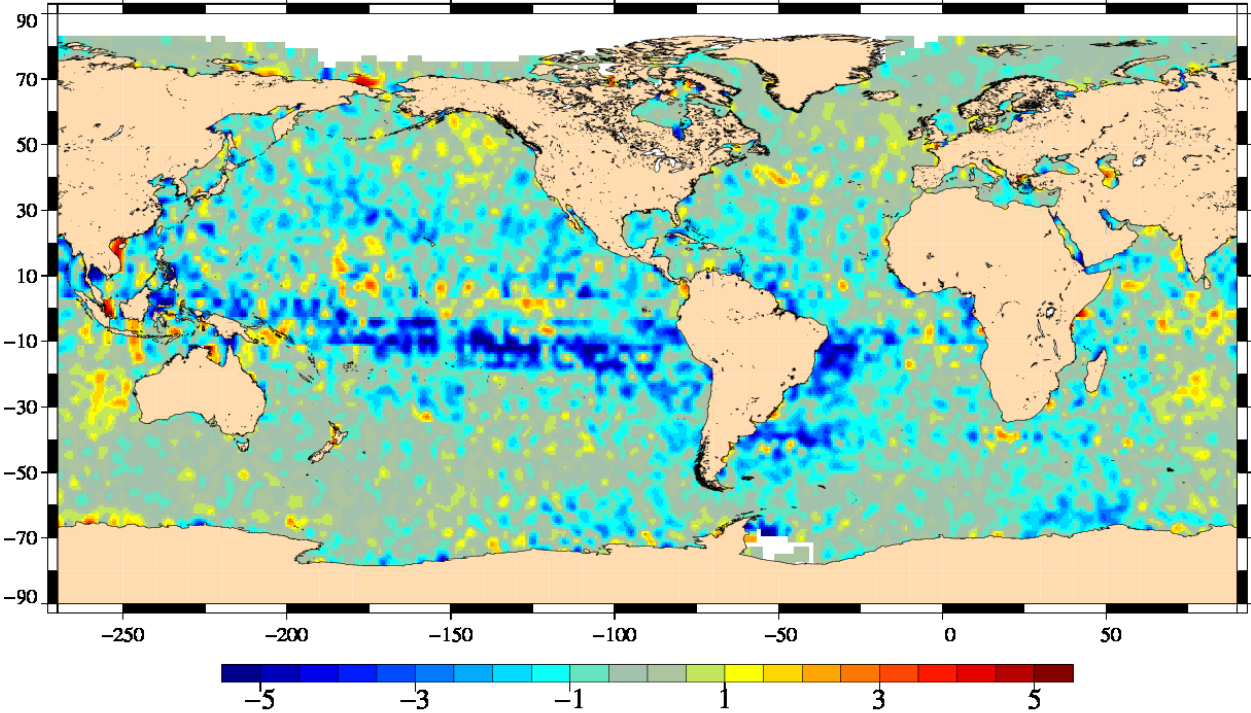
Diagnostic type : Global internal analyses

Mean of SSH with IONO NIC09+GIM  
Mission e2, cycles 2 to 84



Mean ( cm )  
Mean of SSH with IONO BENT+GIM  
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>	
	<p>VAR(SSH with IONO NIC09+GIM) – VAR(SSH with IONO BENT+GIM) Mission e1, cycles 16 to 52</p>  <p>SSH crossovers : difference of variances ( cm^2 )</p> <p>The figure is a global map showing the difference in variance of Sea Surface Height (SSH) crossovers between two altimetry models: IONO NIC09+GIM and IONO BENT+GIM. The map covers the entire globe from 90°N to 90°S and 250°W to 50°E. The color scale ranges from -5 to 5 cm², with blue representing negative values and red representing positive values. The map shows significant spatial variability, with higher positive differences (red/orange) concentrated in the tropical Pacific and Indian Oceans, and higher negative differences (blue) in the tropical Atlantic and parts of the Southern Ocean. The equatorial region shows a prominent band of negative differences.</p>	

## Diagnostic A104 (mission e2)

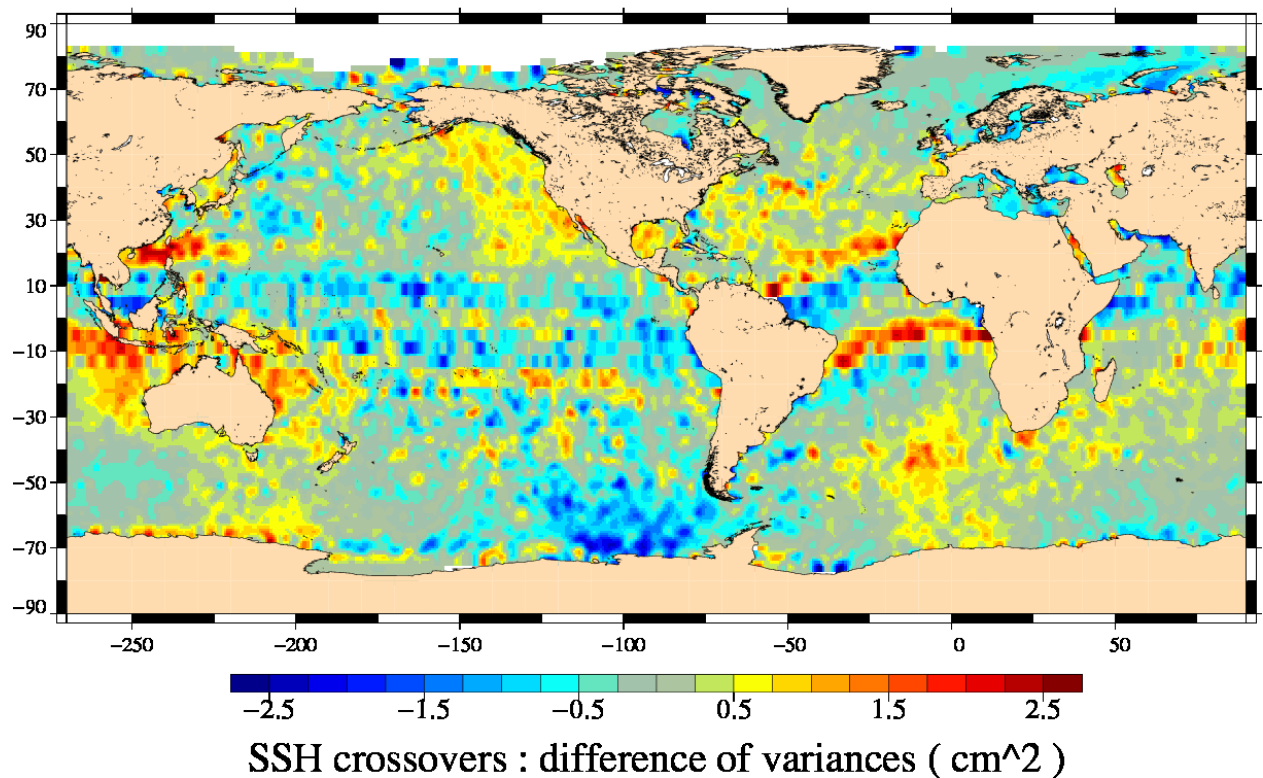
**Name :** Differences between maps of SSH crossovers

**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).

Diagnostic type : Global internal analyses

$\text{VAR}(\text{SSH with IONO NIC09+GIM}) - \text{VAR}(\text{SSH with IONO BENT+GIM})$   
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 / SLA Grids combined between all missions	
	<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</div> <div>Mission e1, cycles 16 to 52</div> <div><div>20304050</div><div>SLA with IONO NIC09+GIM</div><div>SLA with IONO BENT+GIM</div><div>Slope = 3.48 mm/yr [L.S.R. = 0]</div><div>Slope = 6.19 mm/yr [L.S.R. = 0]</div><div>MSL (cm)</div><div>1993199419951996</div></div>	

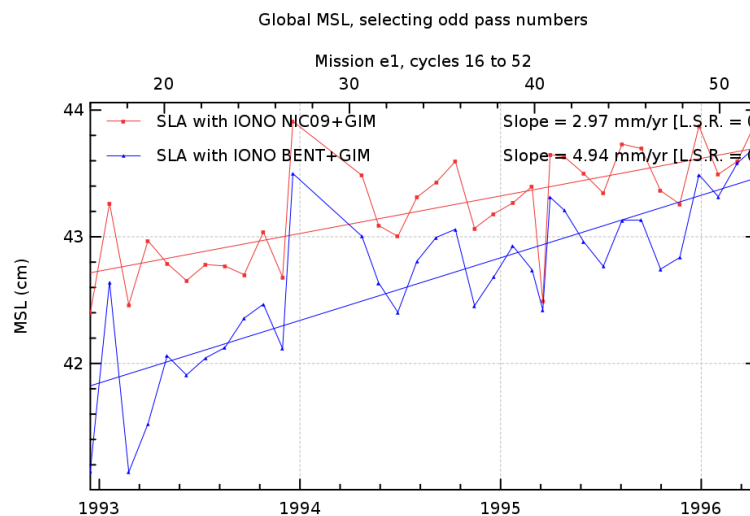
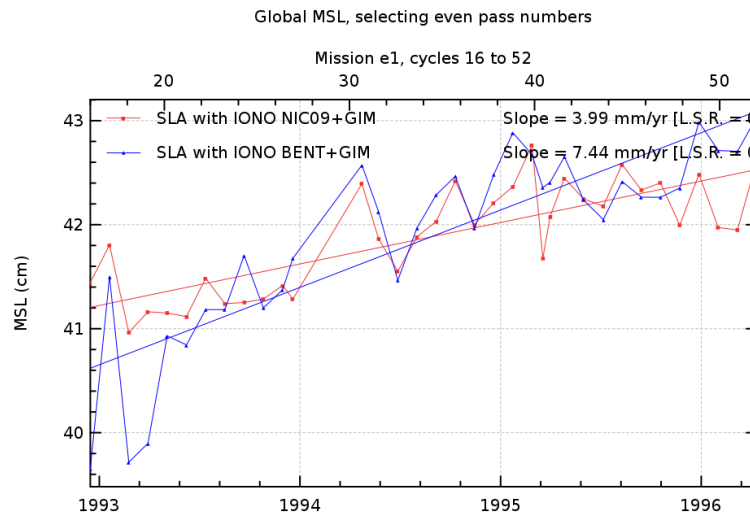
## Diagnostic A201\_b (mission e1)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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



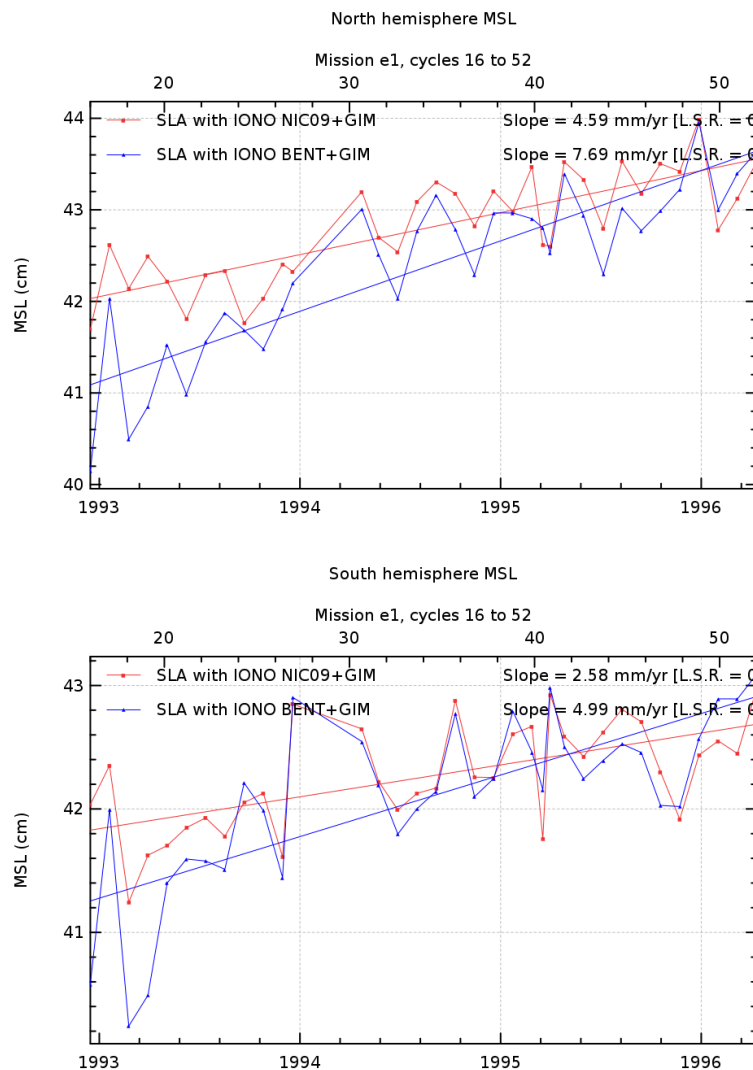
## Diagnostic A201\_c (mission e1)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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



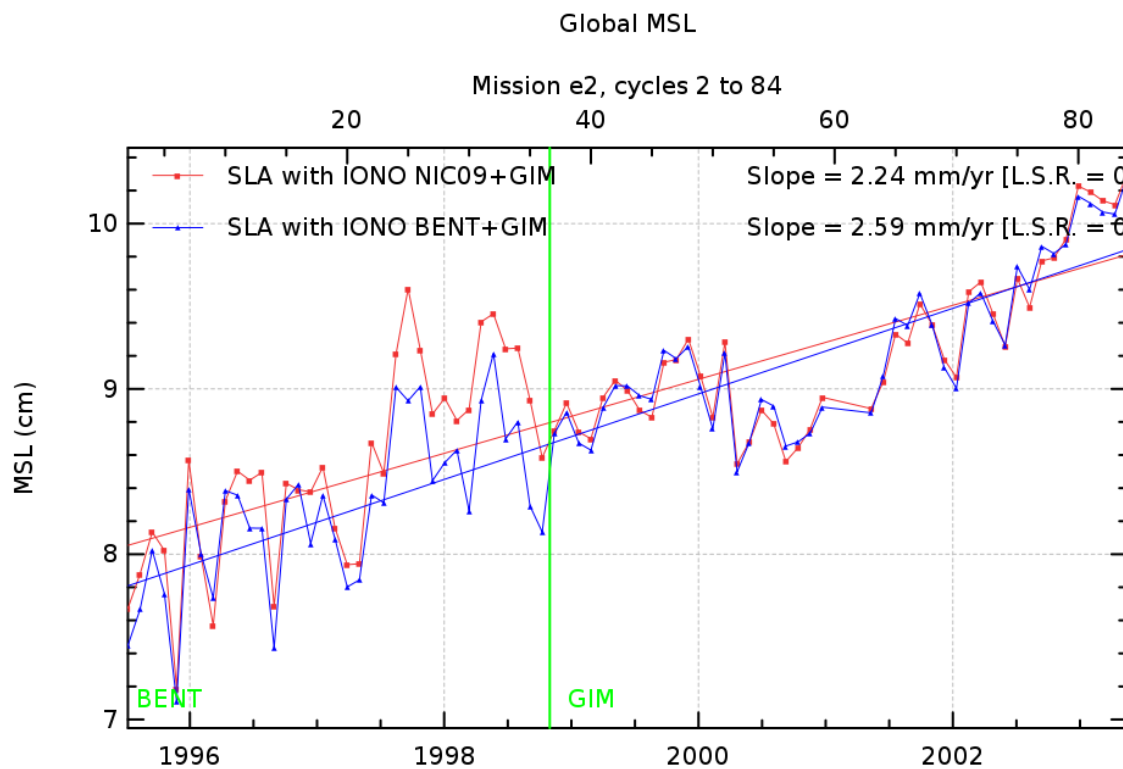
## Diagnostic A201\_a (mission e2)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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





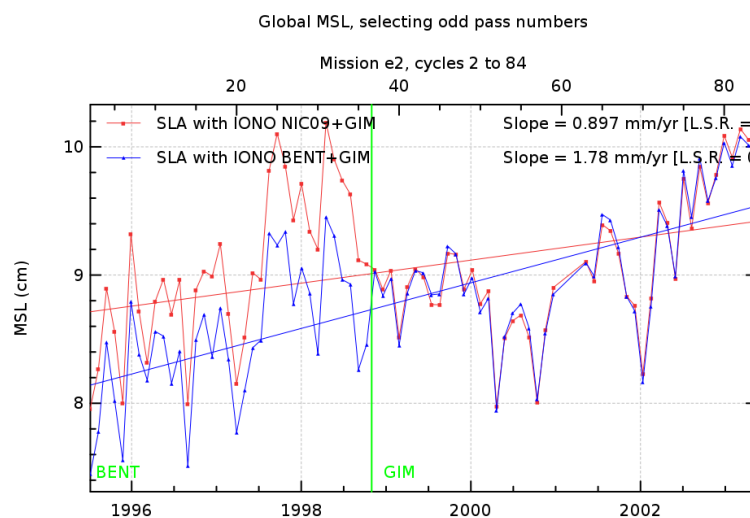
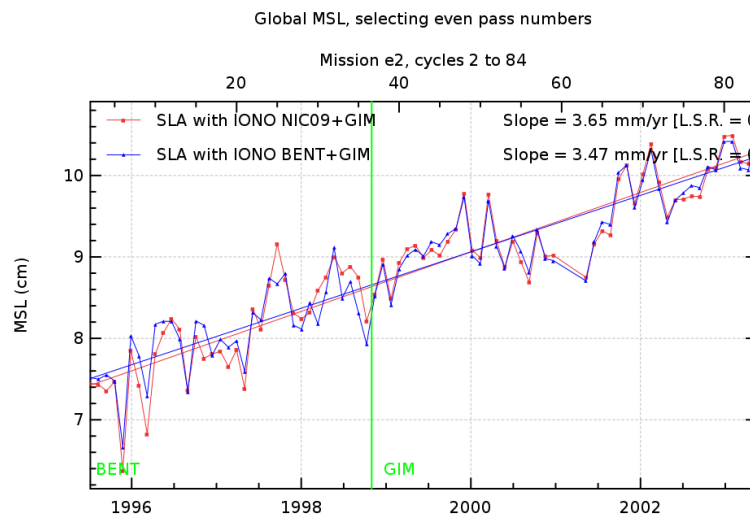
## Diagnostic A201\_b (mission e2)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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





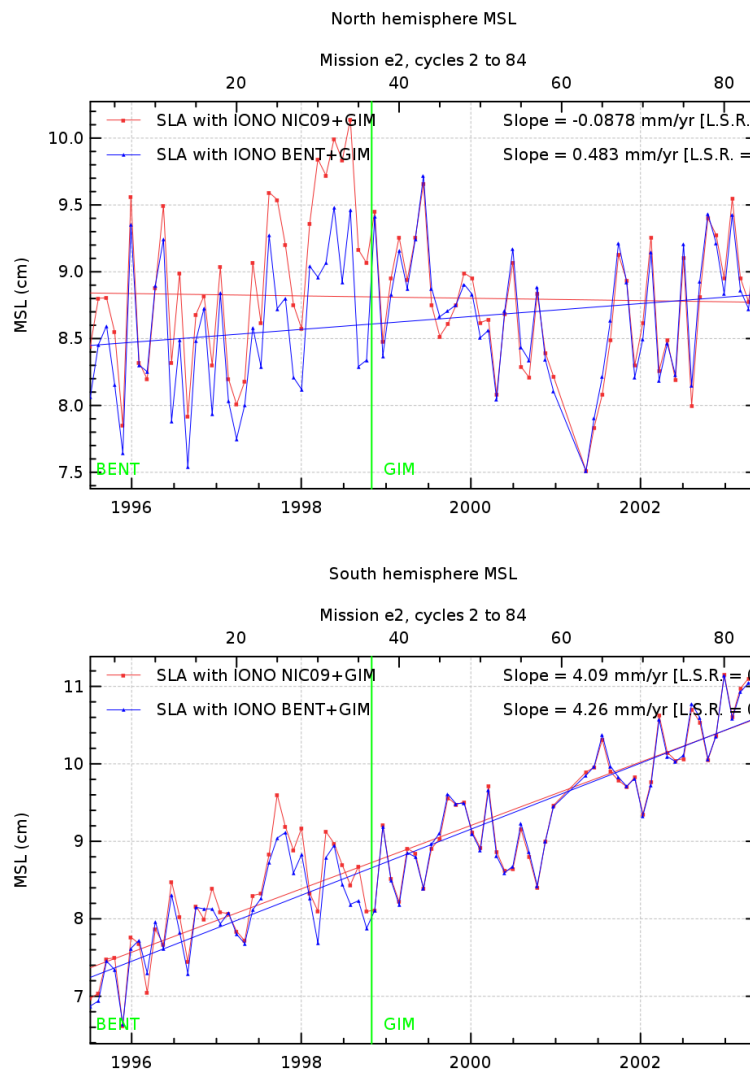
## Diagnostic A201\_c (mission e2)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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 type : Global internal analyses	Diagnostic A202_a (mission e1)	
	Name : Differences of temporal evolution of Sea Level Anomaly (SLA)	
	Input data : Along track SLA / SLA Grids combined between all missions	
	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.	
	<div>VAR(SLA with IONO NIC09+GIM) - VAR(SLA with IONO BENT+GIM)</div> <div>Mission e1, cycles 16 to 52</div> <div>1993199419951996</div> <div>Mean = -0.05718</div> <div>1</div> <div>0</div> <div>-1</div> <div>Difference of variances (cm^2)</div> <div>20304050</div> <div>Cycles</div>	

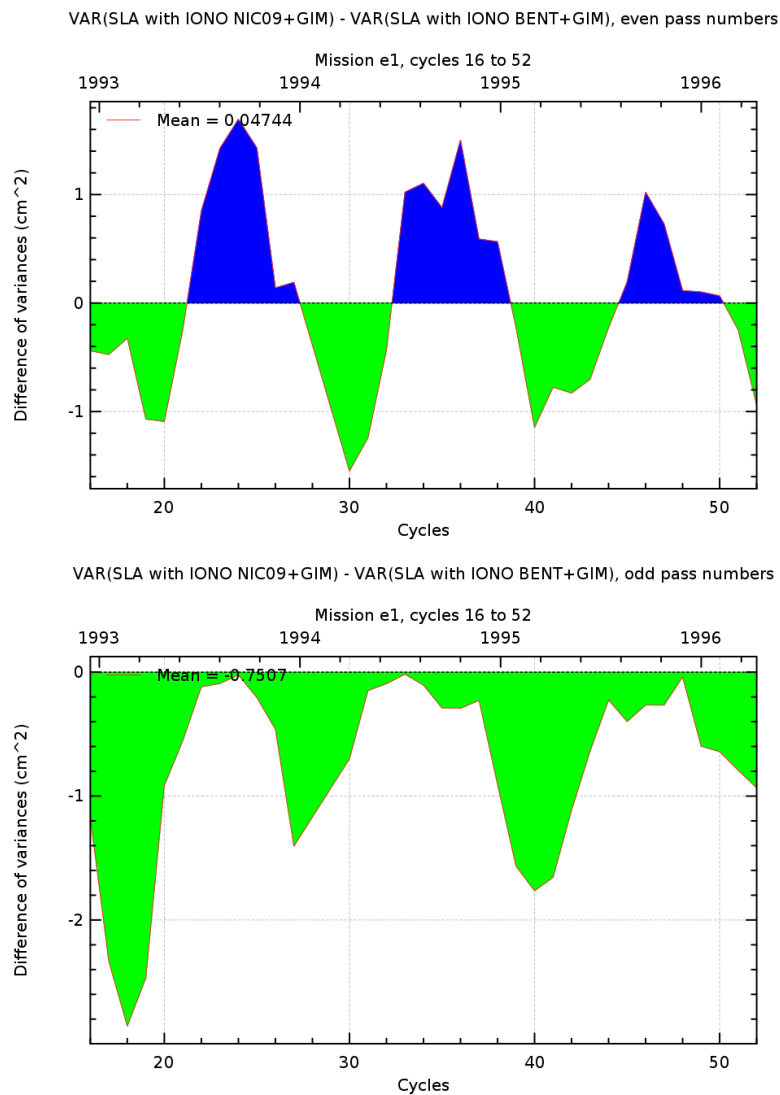
## Diagnostic A202\_b (mission e1)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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



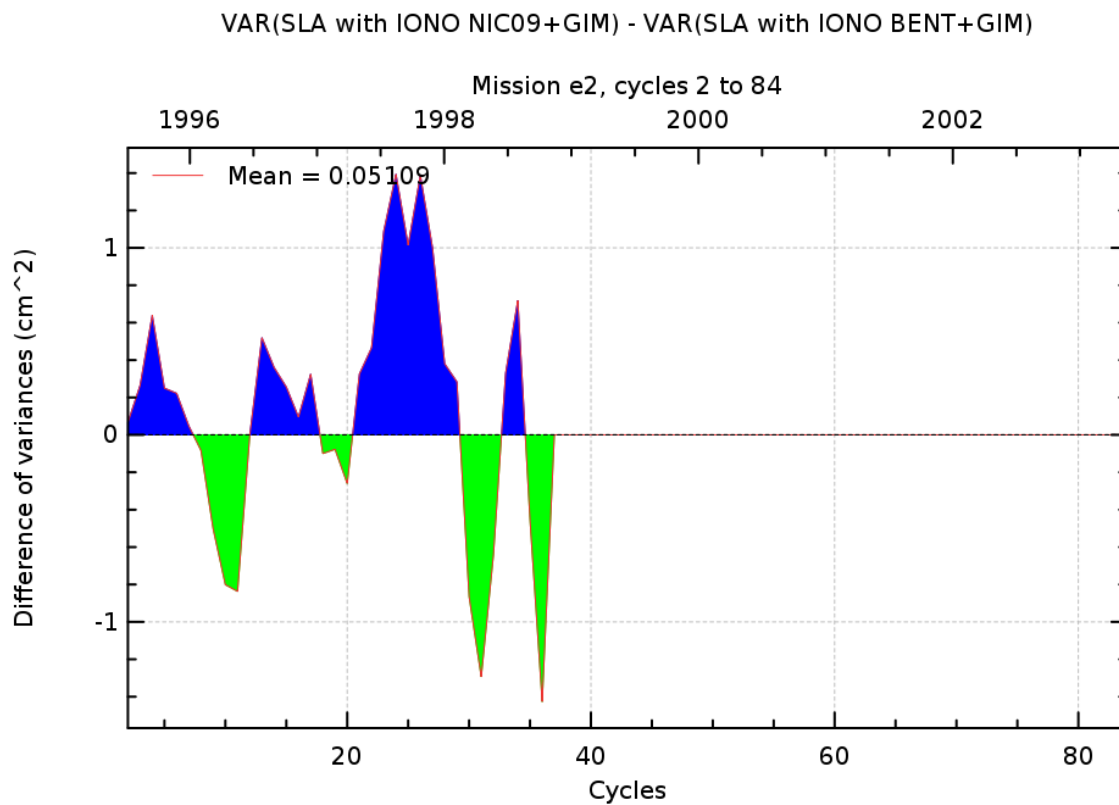
## Diagnostic A202\_a (mission e2)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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



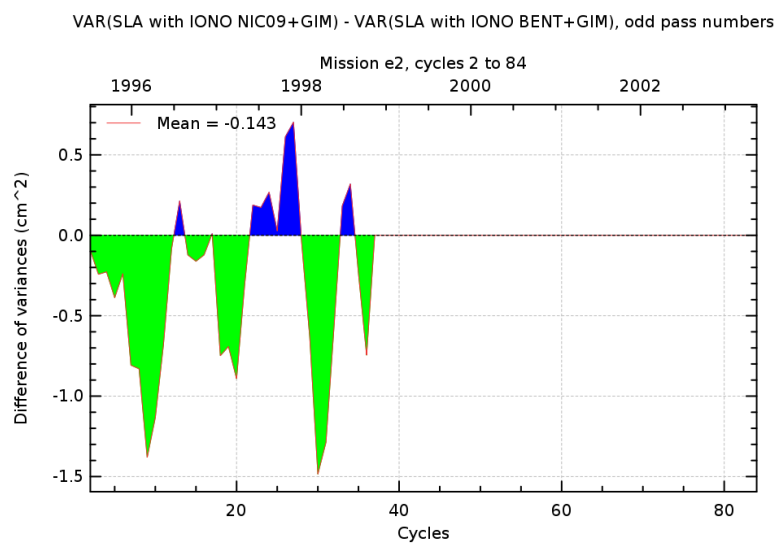
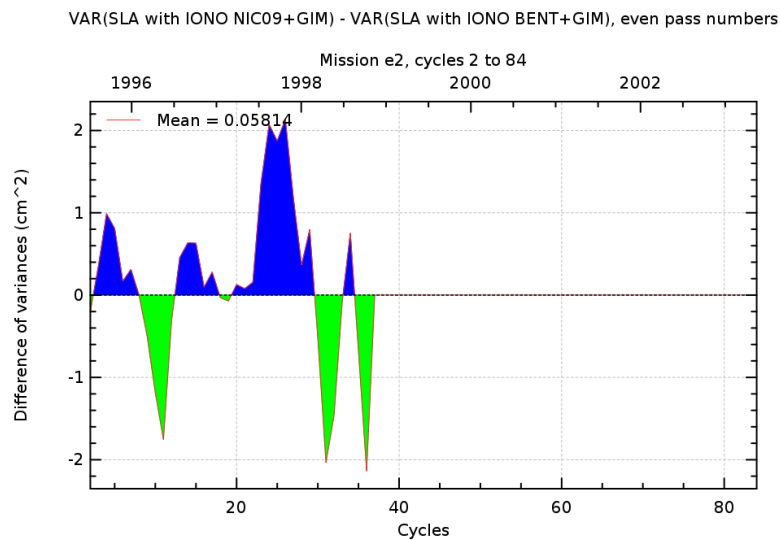
## Diagnostic A202\_b (mission e2)

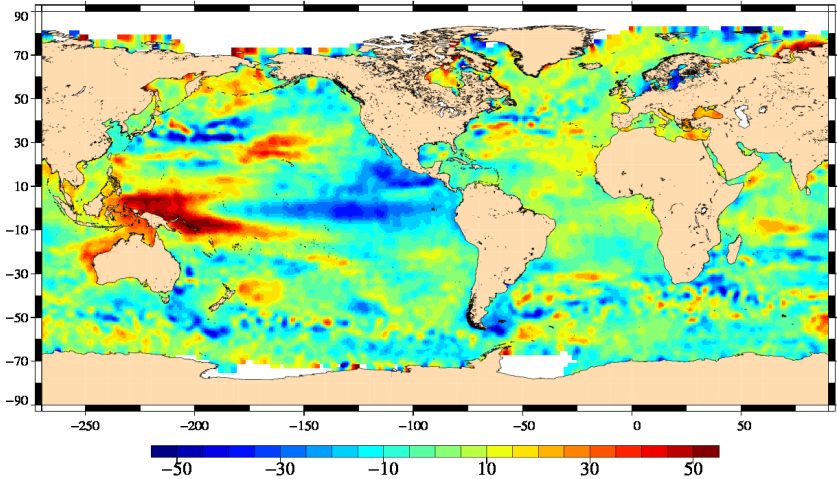
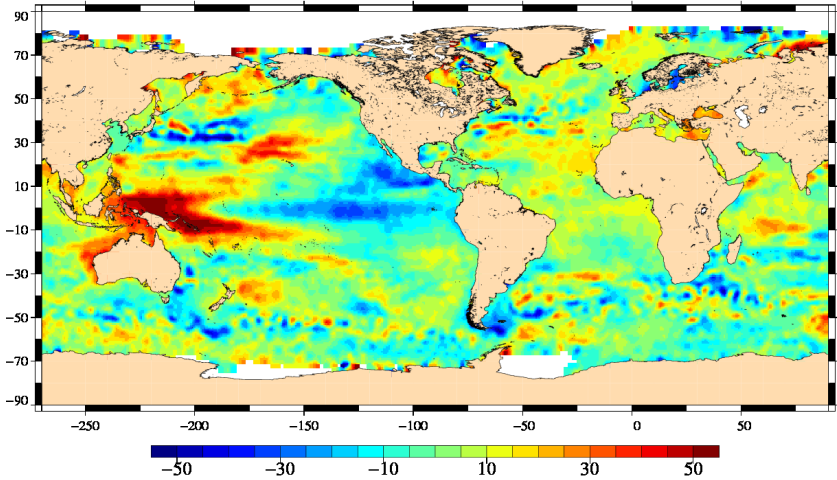
**Name :** Differences of temporal evolution of Sea Level Anomaly (SLA)

**Input data :** Along track SLA / SLA Grids combined between all missions

**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 / SLA Grids combined between all missions	
	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 IONO NIC09+GIM : trends Mission e1, cycles 16 to 52</div>  <div>Trends (mm/yr)</div> <div>SLA with IONO BENT+GIM : trends Mission e1, cycles 16 to 52</div>  <div>Trends (mm/yr)</div>	

## Diagnostic A203\_b (mission e1)

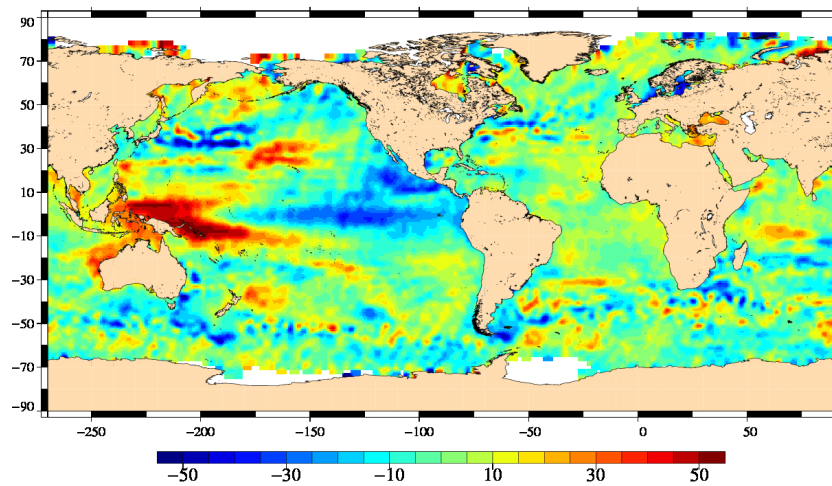
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA / SLA Grids combined between all missions

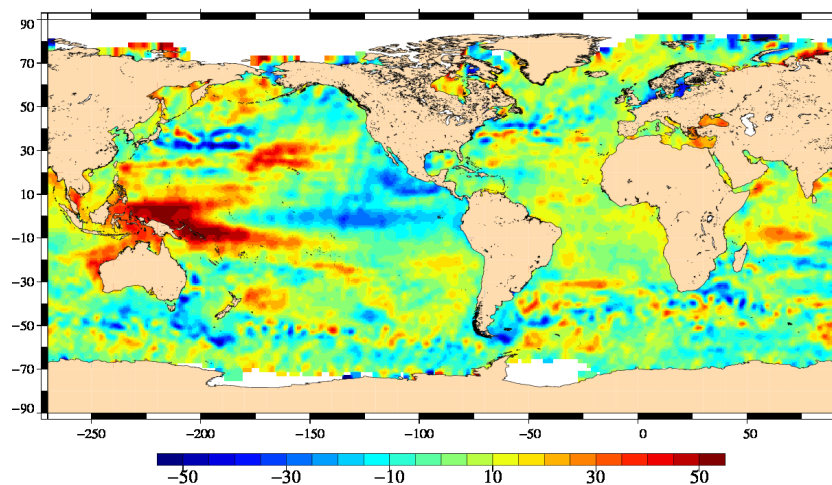
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with IONO NIC09+GIM : trends, even pass numbers  
Mission e1, cycles 16 to 52



Trends (mm/yr)  
SLA with IONO BENT+GIM : trends, even pass numbers  
Mission e1, cycles 16 to 52



Trends (mm/yr)

## Diagnostic A203\_c (mission e1)

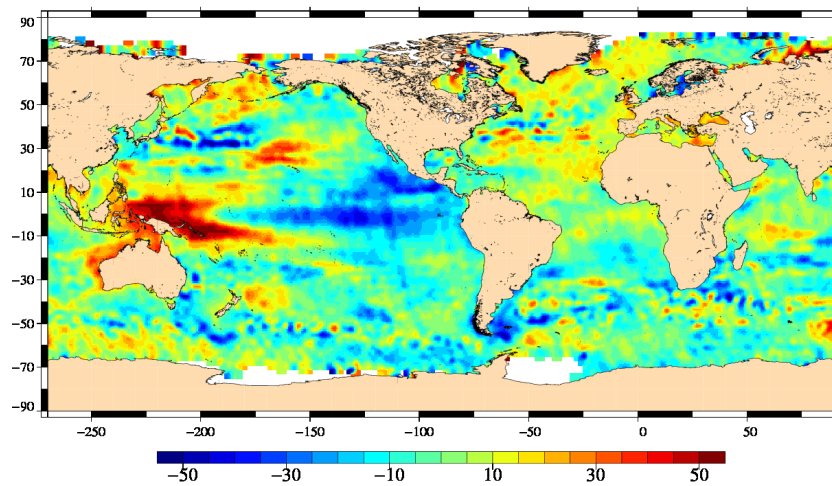
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA / SLA Grids combined between all missions

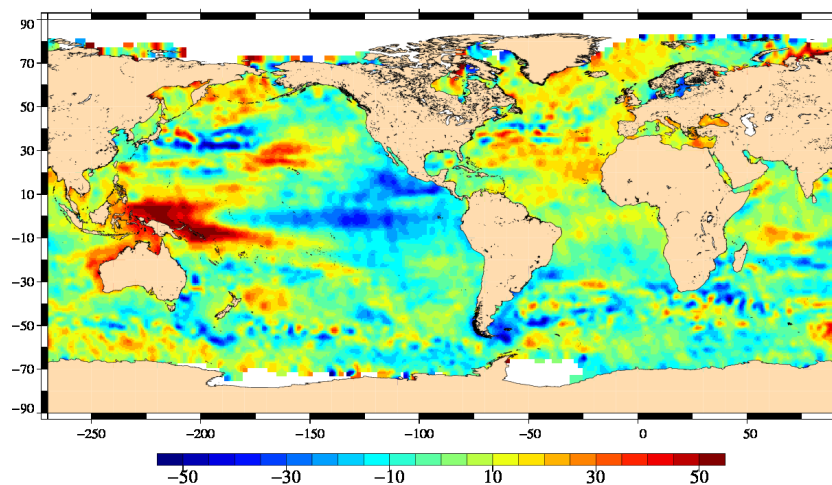
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with IONO NIC09+GIM : trends, odd pass numbers  
Mission e1, cycles 16 to 52



Trends (mm/yr)  
SLA with IONO BENT+GIM : trends, odd pass numbers  
Mission e1, cycles 16 to 52



Trends (mm/yr)



## Diagnostic A203\_a (mission e2)

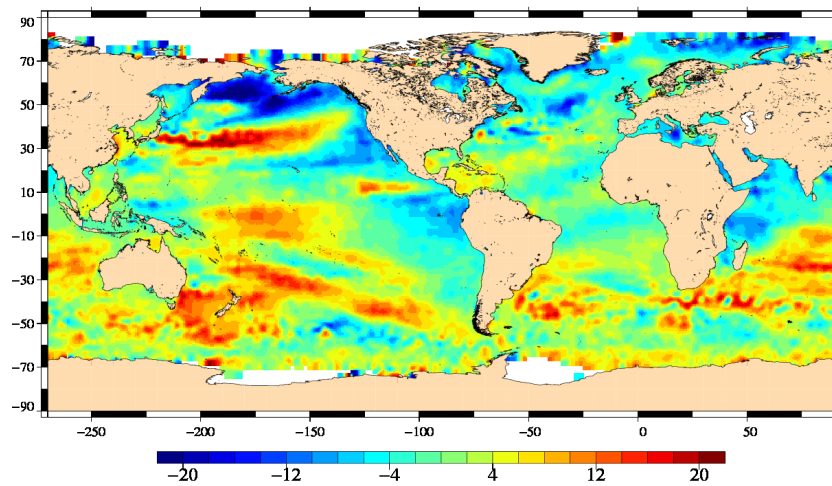
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA / SLA Grids combined between all missions

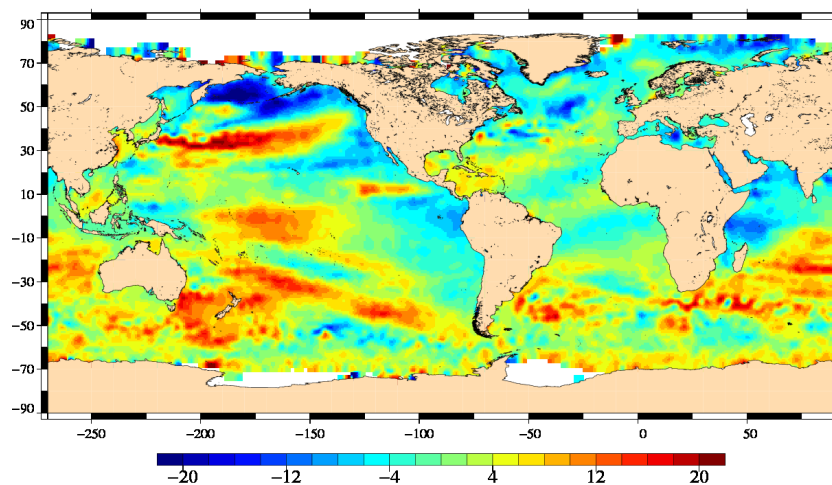
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with IONO NIC09+GIM : trends  
Mission e2, cycles 2 to 84



Trends (mm/yr)  
SLA with IONO BENT+GIM : trends  
Mission e2, cycles 2 to 84



Trends (mm/yr)

## Diagnostic A203\_b (mission e2)

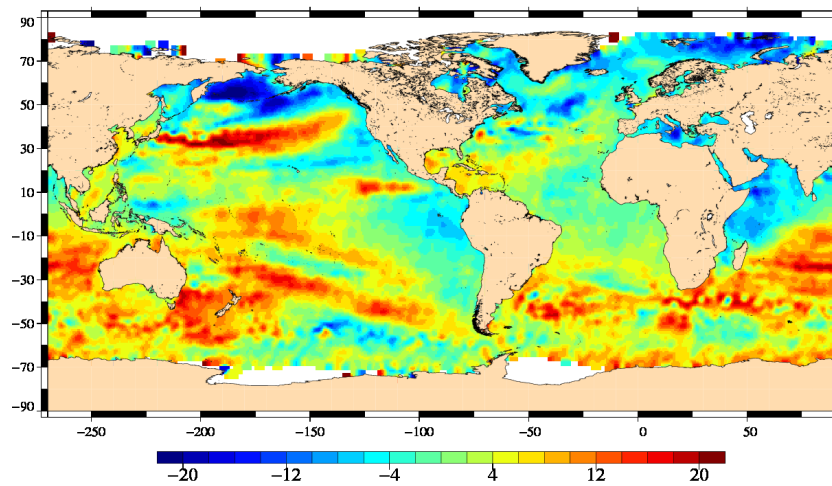
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA / SLA Grids combined between all missions

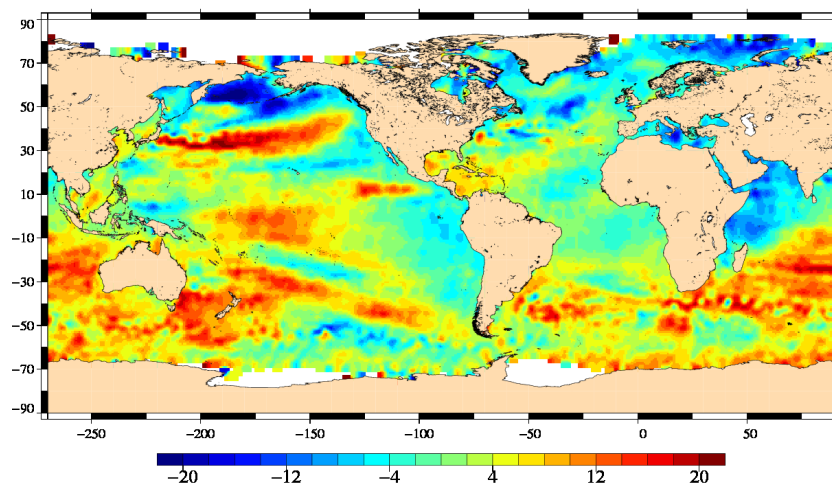
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with IONO NIC09+GIM : trends, even pass numbers  
Mission e2, cycles 2 to 84



Trends (mm/yr)  
SLA with IONO BENT+GIM : trends, even pass numbers  
Mission e2, cycles 2 to 84



Trends (mm/yr)

## Diagnostic A203\_c (mission e2)

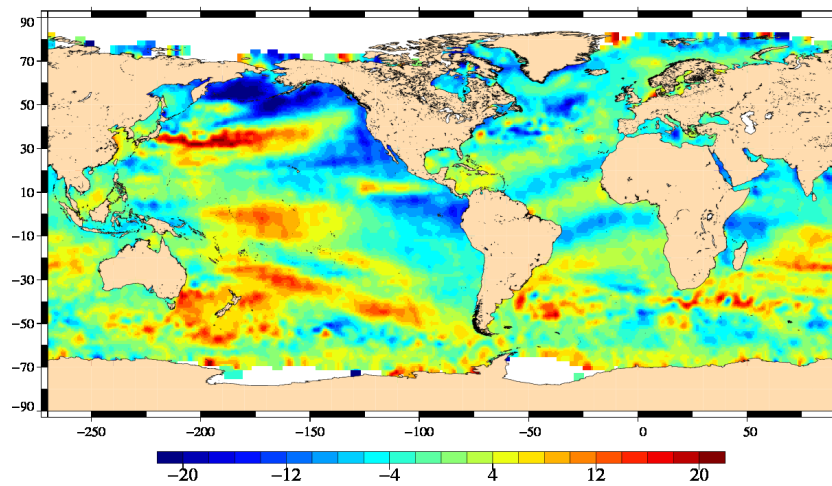
**Name :** Map of Sea Level Anomaly (SLA) over all the period

**Input data :** Along track SLA / SLA Grids combined between all missions

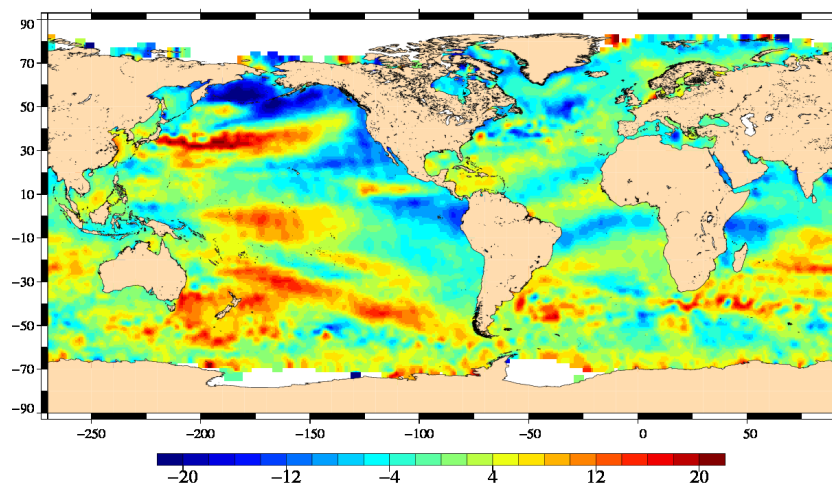
**Description :** The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

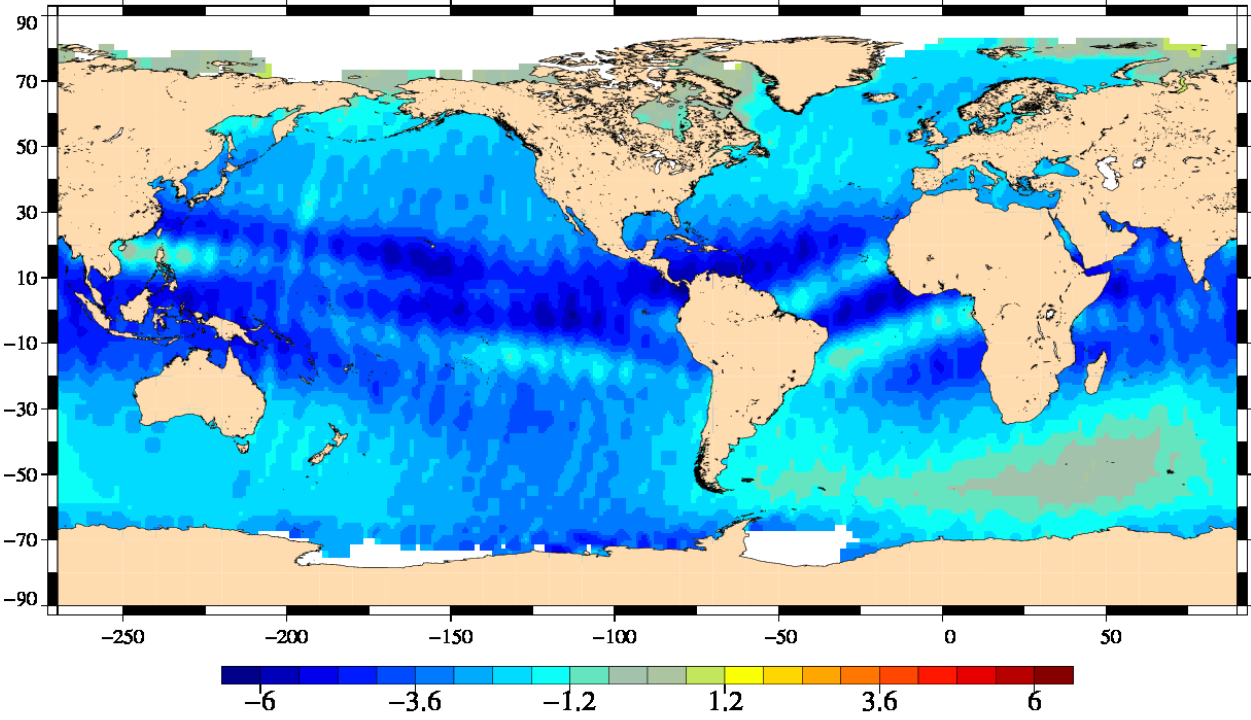
SLA with IONO NIC09+GIM : trends, odd pass numbers  
Mission e2, cycles 2 to 84



Trends (mm/yr)  
SLA with IONO BENT+GIM : trends, odd pass numbers  
Mission e2, cycles 2 to 84



Trends (mm/yr)

Diagnostic type : Global internal analyses	Diagnostic A204_a (mission e1)	
	Name : Differences between maps of SLA	
	Input data : Along track SLA / SLA Grids combined between all missions	
	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 IONO NIC09+GIM – SLA with IONO BENT+GIM : trends Mission e1, cycles 16 to 52</div>  <p>Trends (mm/yr)</p>	

## Diagnostic A204\_b (mission e1)

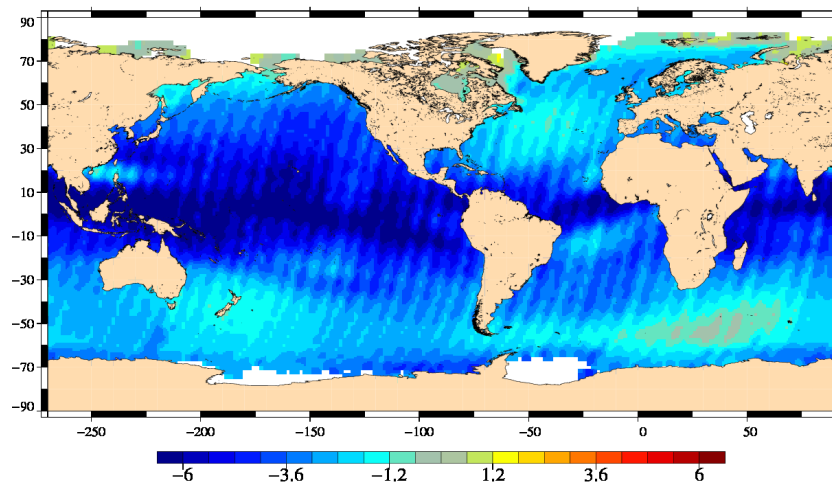
**Name :** Differences between maps of SLA

**Input data :** Along track SLA / SLA Grids combined between all missions

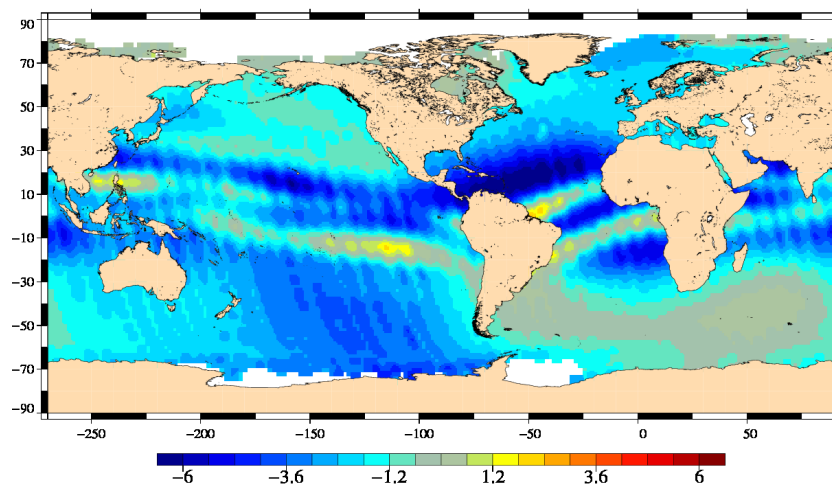
**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

SLA with IONO NIC09+GIM – SLA with IONO BENT+GIM : trends, even pass numbers  
Mission e1, cycles 16 to 52



Trends (mm/yr)  
SLA with IONO NIC09+GIM – SLA with IONO BENT+GIM : trends, odd pass numbers  
Mission e1, cycles 16 to 52



Trends (mm/yr)

## Diagnostic A204\_a (mission e2)

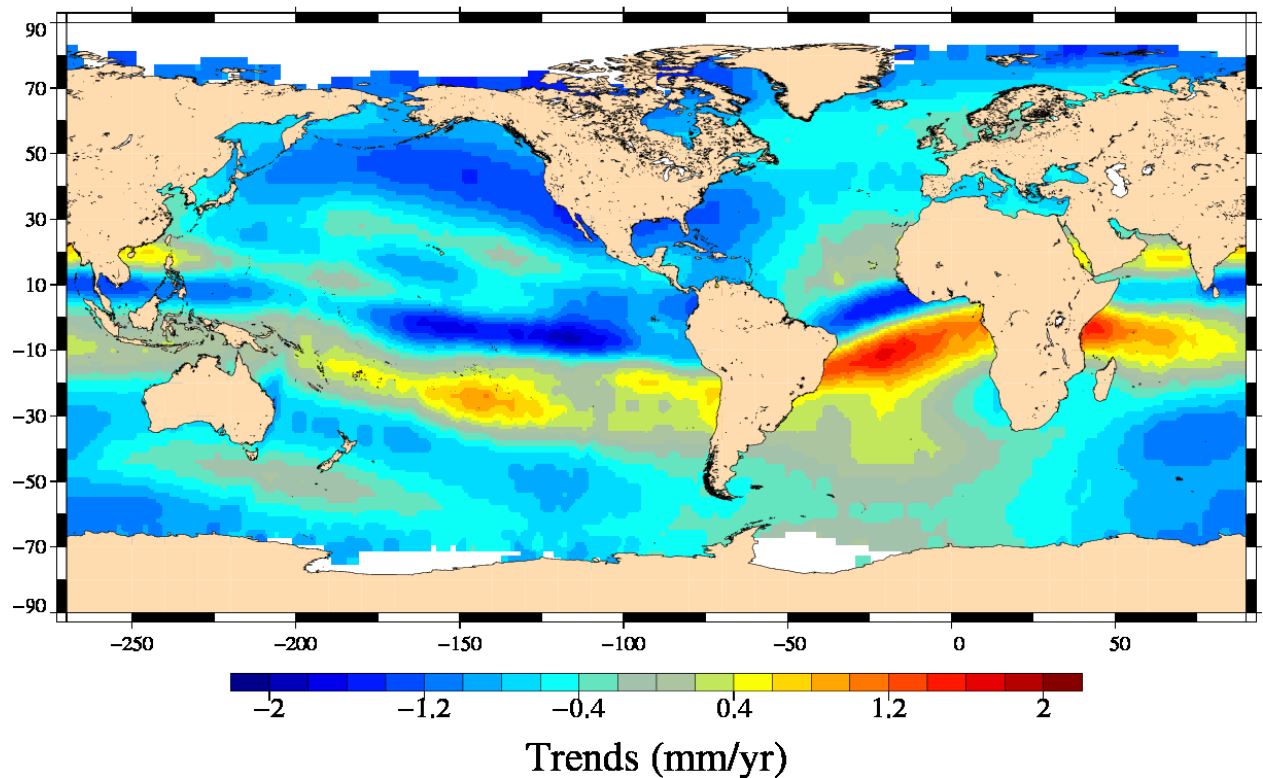
**Name :** Differences between maps of SLA

**Input data :** Along track SLA / SLA Grids combined between all missions

**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 IONO NIC09+GIM – SLA with IONO BENT+GIM : trends  
Mission e2, cycles 2 to 84





## Diagnostic A204\_b (mission e2)

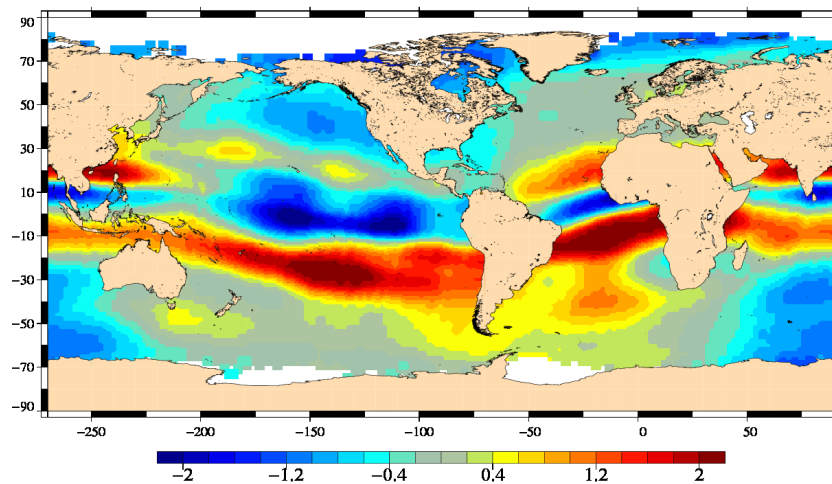
**Name :** Differences between maps of SLA

**Input data :** Along track SLA / SLA Grids combined between all missions

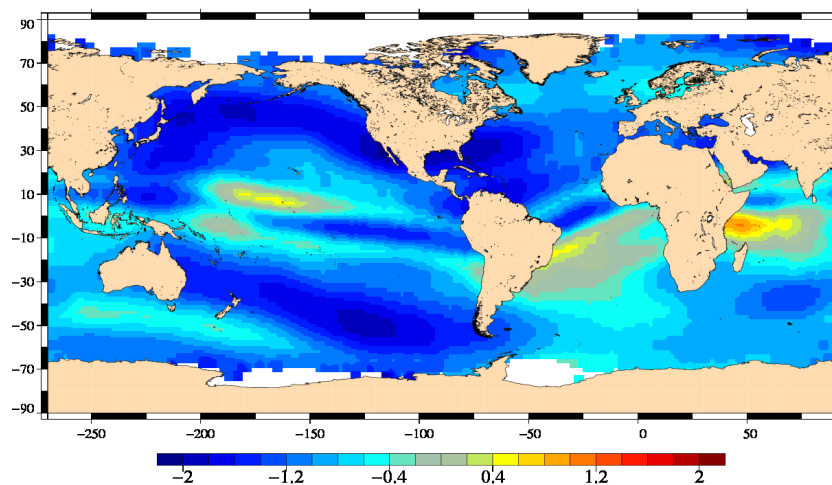
**Description :** The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

SLA with IONO NIC09+GIM – SLA with IONO BENT+GIM : trends, even pass numbers  
Mission e2, cycles 2 to 84



Trends (mm/yr)  
SLA with IONO NIC09+GIM – SLA with IONO BENT+GIM : trends, odd pass numbers  
Mission e2, cycles 2 to 84



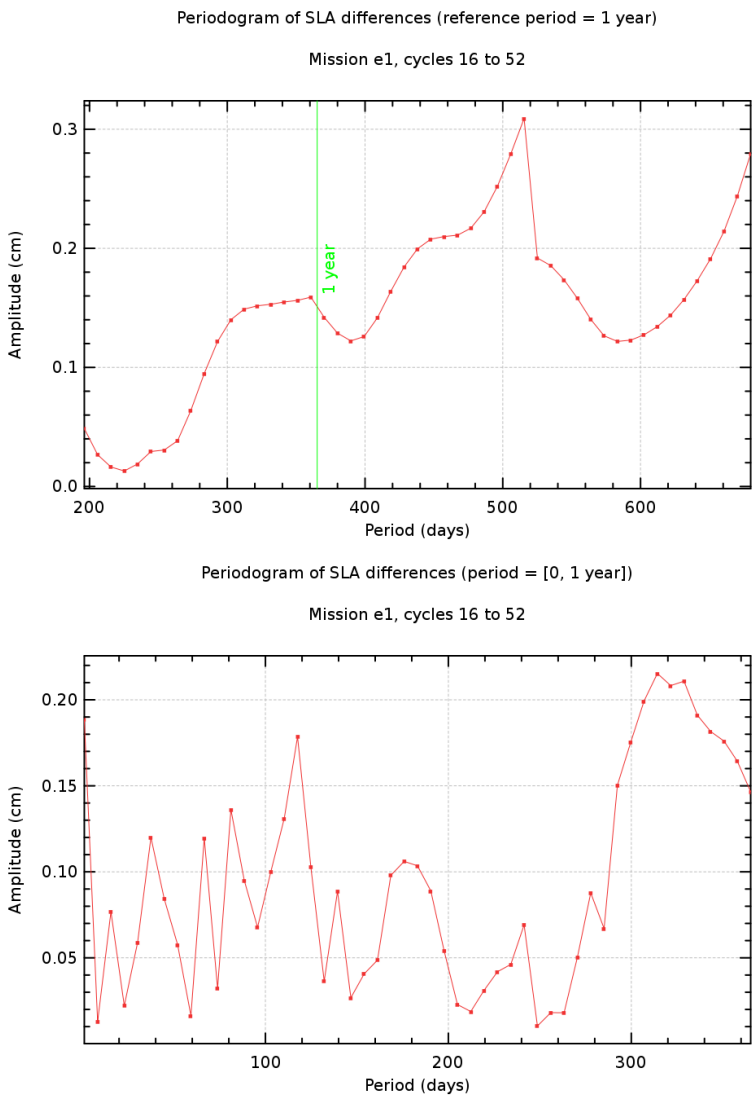
Trends (mm/yr)

Diagnostic A206\_a (mission e1)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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)

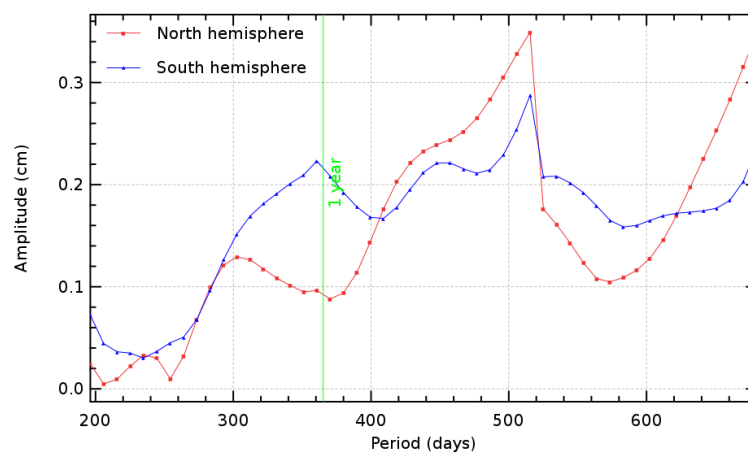
**Input data :** Along track SLA / SLA Grids combined between all missions

**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

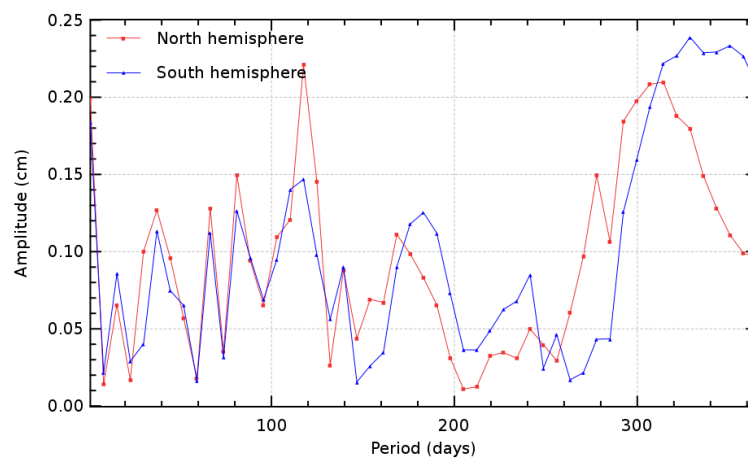
Periodogram of SLA differences, north and south hemispheres (reference period = 1 year)

Mission e1, cycles 16 to 52



Periodogram of SLA differences, north and south hemispheres (period = [0, 1 year])

Mission e1, cycles 16 to 52



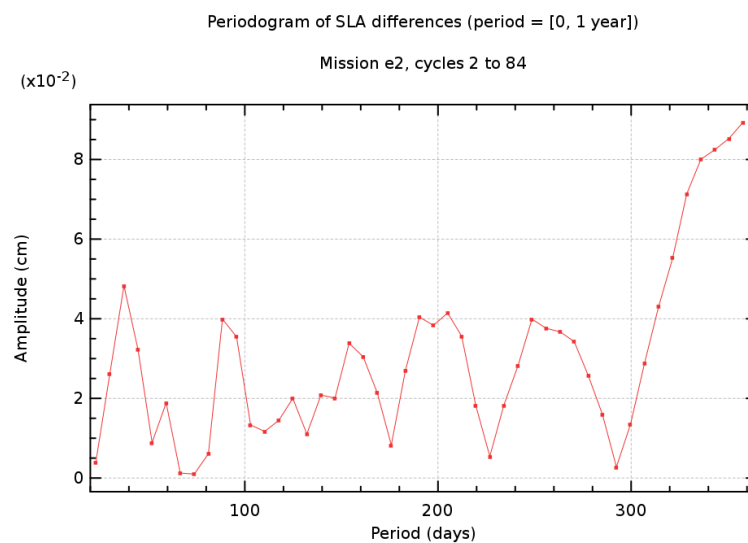
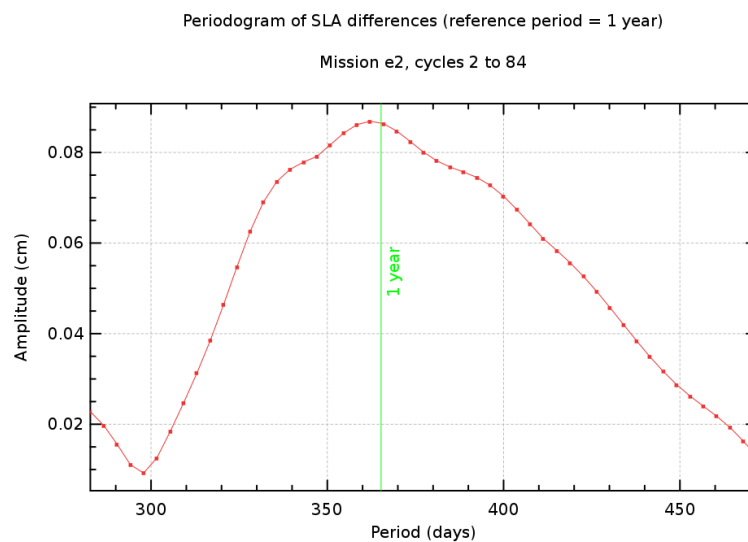
## Diagnostic A206\_a (mission e2)

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

**Input data :** Along track SLA / SLA Grids combined between all missions

**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)

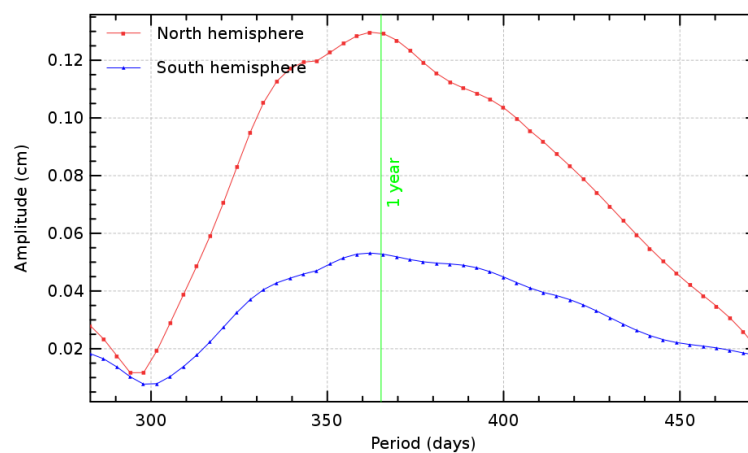
**Input data :** Along track SLA / SLA Grids combined between all missions

**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 SLA differences, north and south hemispheres (reference period = 1 year)

Mission e2, cycles 2 to 84



Periodogram of SLA differences, north and south hemispheres (period = [0, 1 year])

Mission e2, cycles 2 to 84

