

Comparison of CCI PTR time delay with and without IF filter

Study variable	PTR_DELAY_CCI_IF
Reference variable	PTR_DELAY_CCI
Missions	Envisat (<i>en</i>)
Period	[19265.898824964341, 22100.898711737245]

Creation date : 2011/09/06

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Study overview

In this study, the new PTR time delay with IF mask developed in the frame of sea-level CCI project has been compared to the CCI PTR time delay without IF mask to observe the impact of the IF mask on the ENVISAT sea surface height (SSH) in Ku-Band.

The impact of using these two PTR time delay on the SSH calculation has been analyzed for ENVISAT mission from October 2002 (cycle 10) to July 2010 (Cycle 90).

The PTR time delay is an instrumental correction computed in level 1b of ENVISAT ground segment. This correction allows, among other things, to take into account the ageing of the altimeter. The IF mask is applied to account for the influence of the altimeter on measurements. Both PTR time delay were provided by IsardSAT which is in charge of the ENVISAT Level 1b.

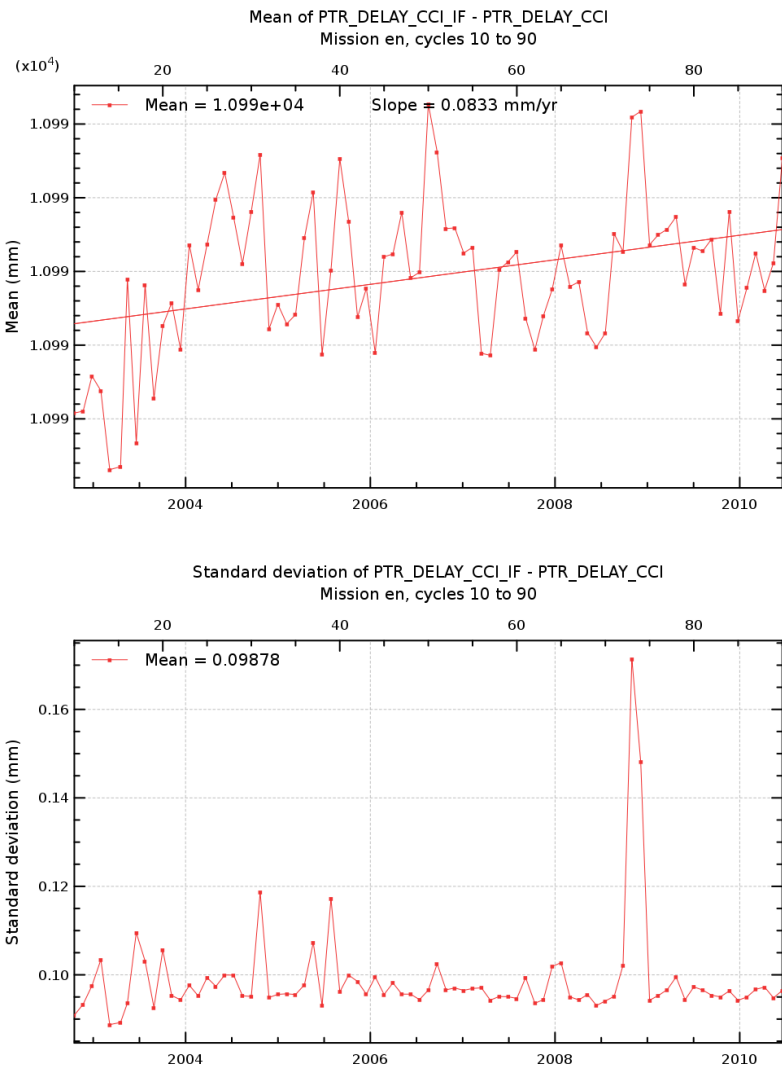
All the validation diagnostics displayed in this report have been performed in agreement with the Sea-Level CCI Product Validation Plan (PVP).

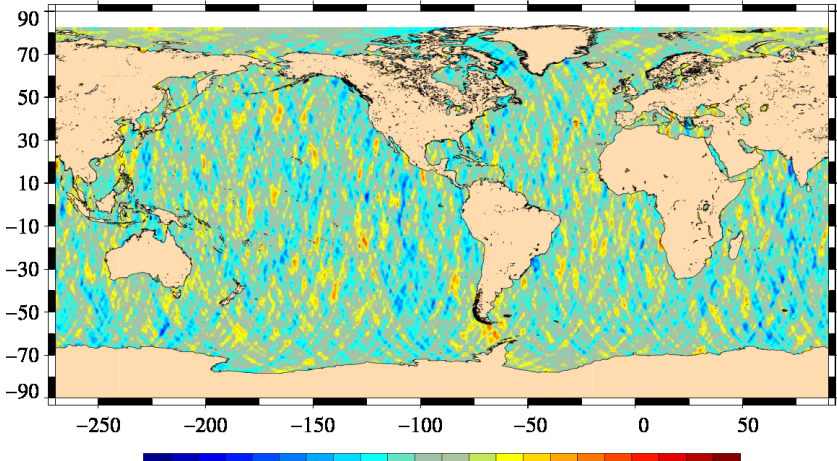
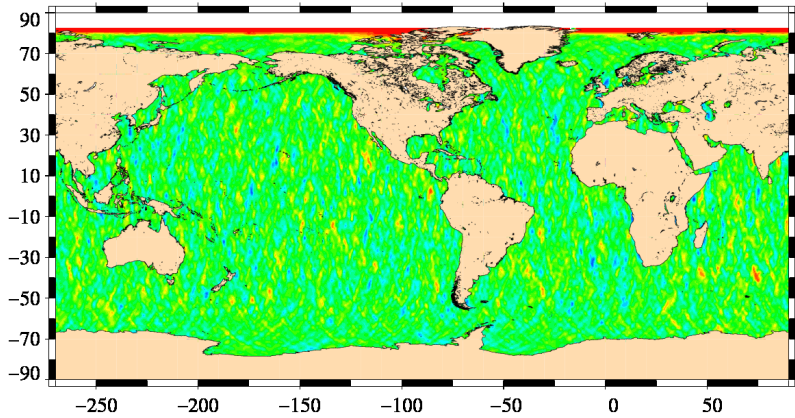
Diagnostic A001 (mission en)

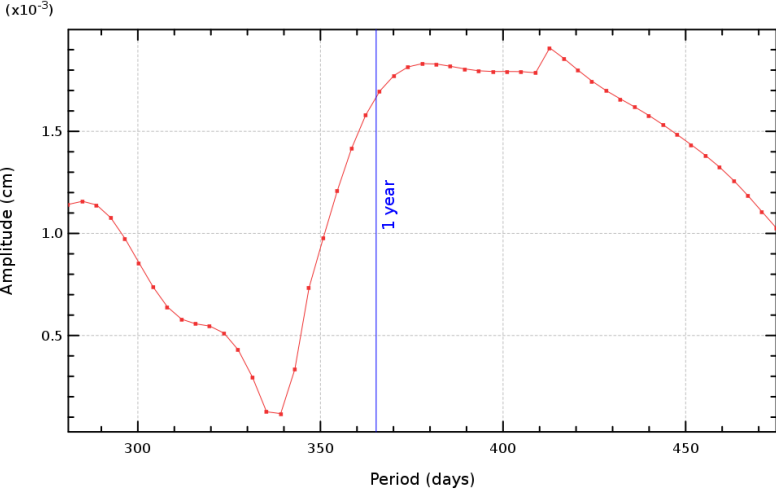
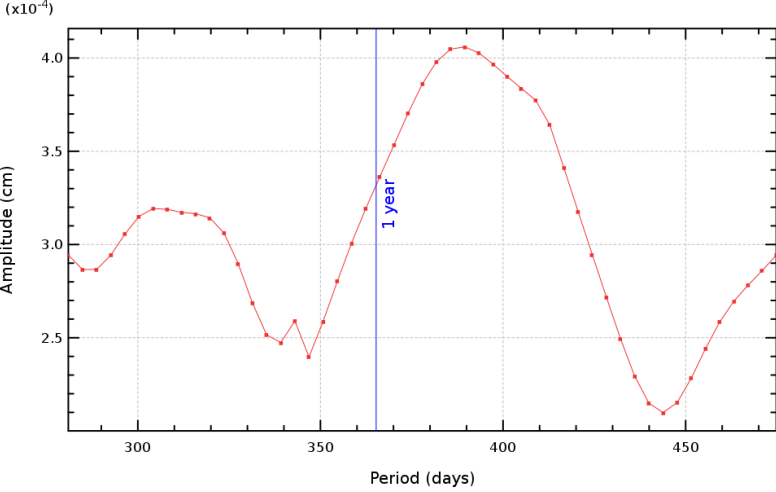
Name : Temporal evolution of differences between both altimetric components

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 en)	
	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.	
	<div>Mean of PTR_DELAY_CCI_IF – PTR_DELAY_CCI Mission en, cycles 10 to 90</div> <div><div>1099.11 1099.11 1099.11 1099.11</div><div>Mean (cm)</div><div>Standard deviation of PTR_DELAY_CCI_IF – PTR_DELAY_CCI Mission en, cycles 10 to 90</div><div><div>0.008 0.0092 0.0104 0.0116</div><div>Standard deviation (cm)</div></div></div>	

Diagnostic A003_a (mission en)	
Name : Periodogram derived from temporal evolution of altimetric component differences	
Input data : Along-track altimetric components	
<p>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.</p>	
<div><p>Periodogram of the mean of PTR_DELAY_CCI_IF - PTR_DELAY_CCI (reference period = 1 year) Mission en, cycles 10 to 90</p><p>Periodogram of the standard deviation of PTR_DELAY_CCI_IF - PTR_DELAY_CCI (reference period = 1 y) Mission en, cycles 10 to 90</p></div>	

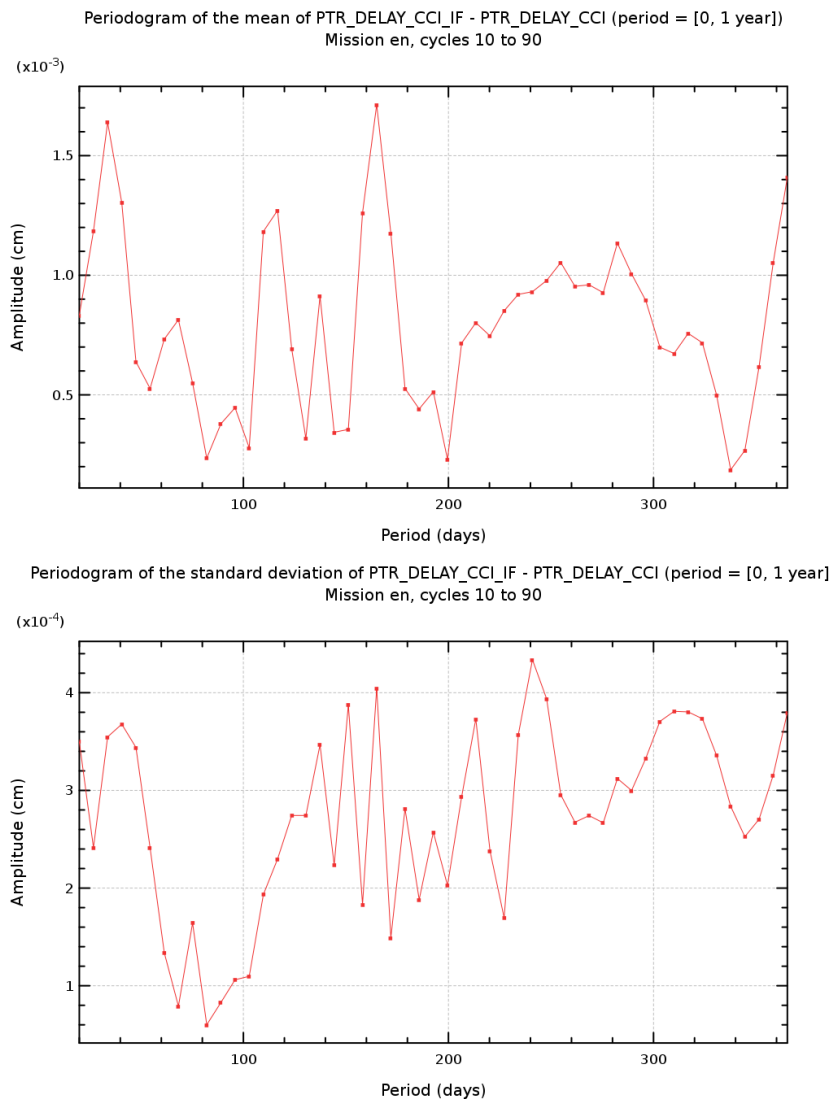
Diagnostic A003_b (mission en)

Name : Periodogram derived from temporal evolution of altimetric component differences

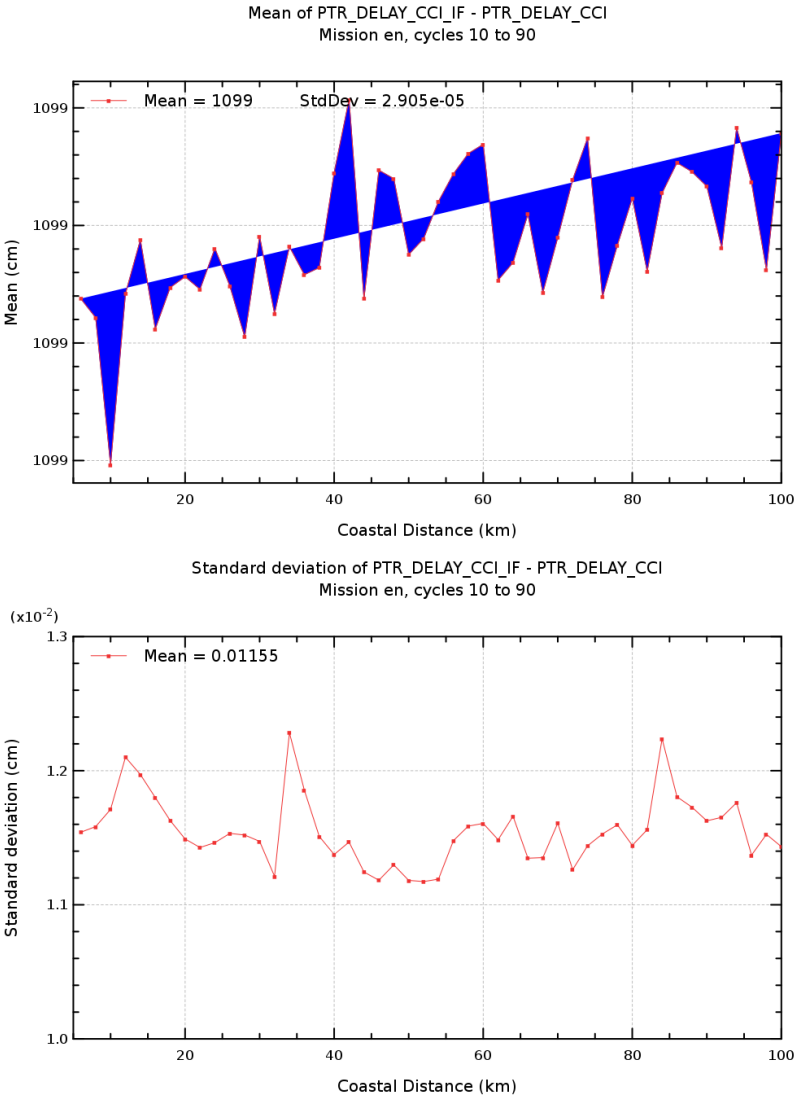
Input data : Along-track altimetric components

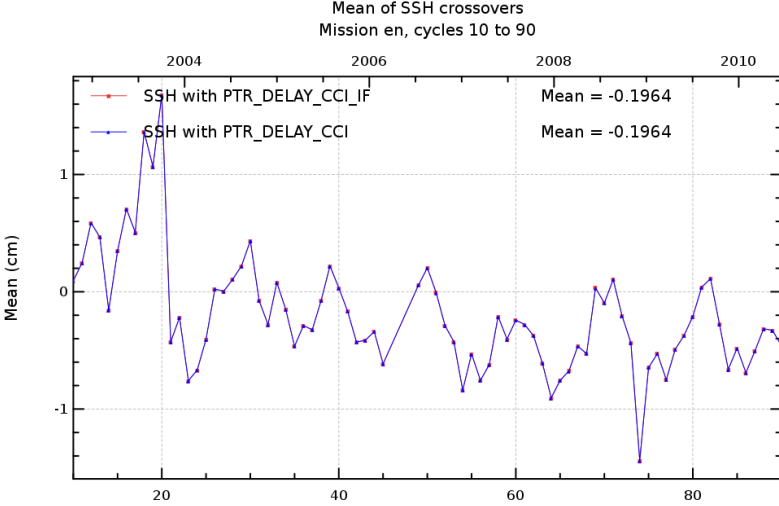
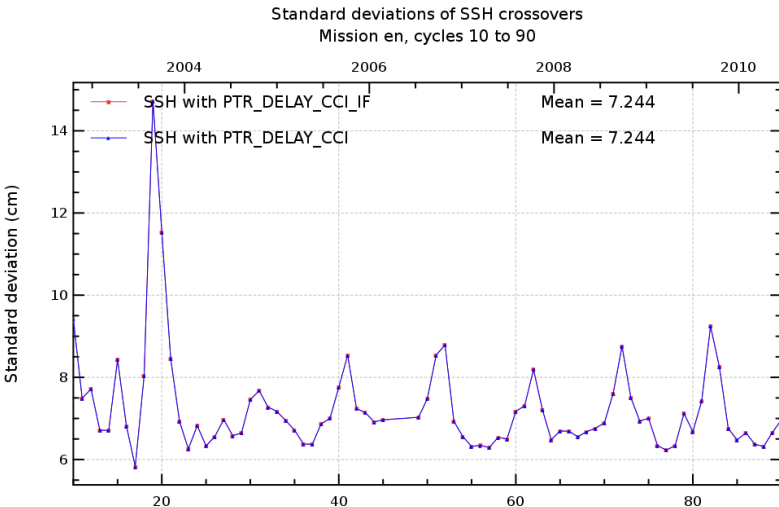
Description : The periodogram derived from temporal and global altimetric component differences is calculated from cycle by cycle monitoring of altimetric component differences (derived from diagnostic A001). It is calculated from the mean or the variance differences. The Periodogram can be calculated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

Diagnostic type : Global internal analyses



Diagnostic A004 (mission en)	
Name : Altimetric component differences versus coastal distances	
Input data : Along-track altimetric components	
Description : Mean and standard deviation of the differences between 2 different standards of a same altimetric component (sea surface height correction, altimeter parameter, orbit) are computed and plotted in function of coastal distances between 0 and 100 km.	



Diagnostic A101 (mission en)	
Name : Temporal evolution of SSH crossovers	
Input data : Sea Surface Height (SSH) crossovers	
<p>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).</p>	
<div><div><div>Mean of SSH crossovers Mission en, cycles 10 to 90</div><div></div></div><div><div>Standard deviations of SSH crossovers Mission en, cycles 10 to 90</div><div></div></div></div>	

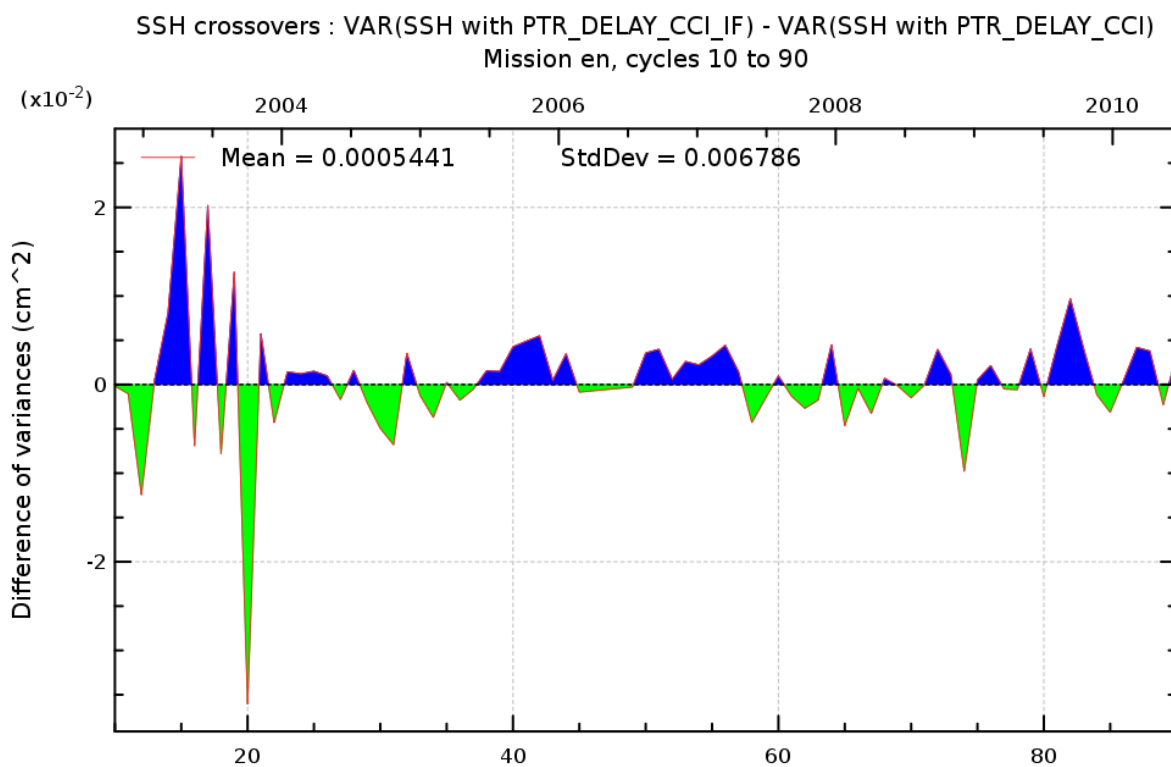
Diagnostic A102 (mission en)

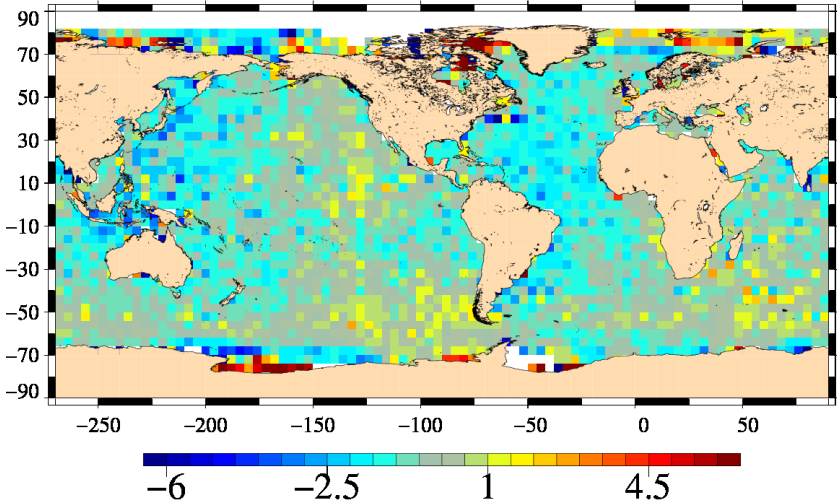
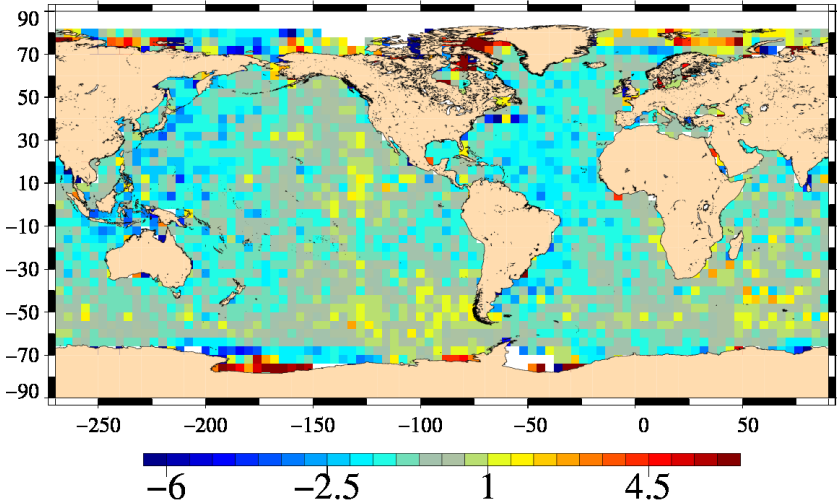
Name : Differences between temporal evolution of SSH crossovers

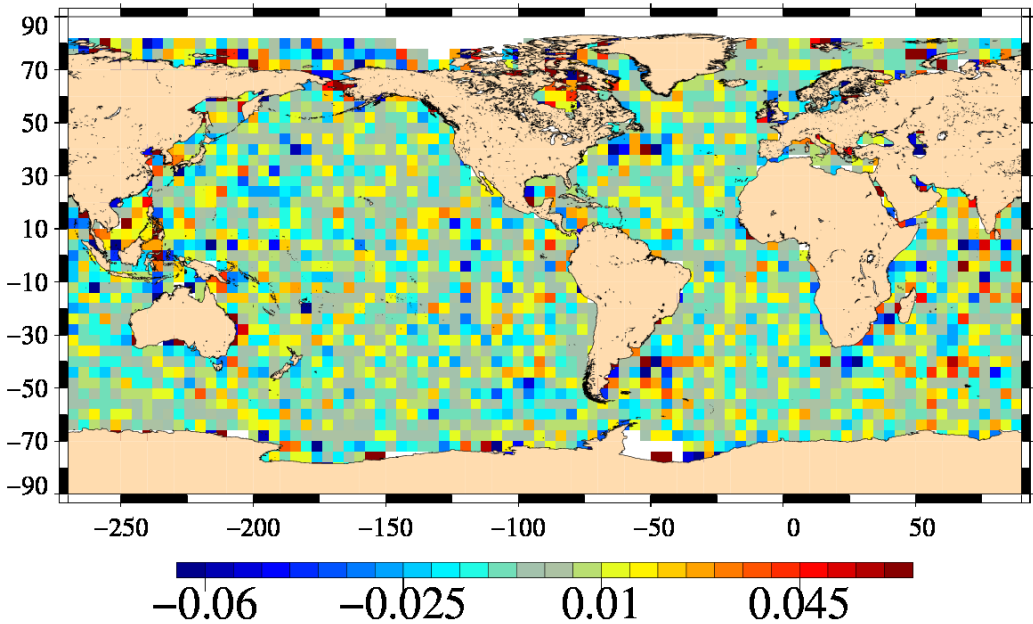
Input data : Sea Surface Height (SSH) crossovers

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 en)	
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).	
<div>Mean of SSH with PTR_DELAY_CCI_IF Mission en, cycles 10 to 90</div>  <div>Mean (cm)</div> <div>Mean of SSH with PTR_DELAY_CCI Mission en, cycles 10 to 90</div>  <div>Mean (cm)</div>	

Diagnostic type : Global internal analyses	Diagnostic A104 (mission en)	
	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>$\text{VAR}(\text{SSH with PTR_DELAY_CCI_IF}) - \text{VAR}(\text{SSH with PTR_DELAY_CCI})$ Mission en, cycles 10 to 90</p>  <p>SSH crossovers : difference of variances (cm²)</p>	

Diagnostic type : Global internal analyses	Diagnostic A201_a (mission en)	
	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><div>Global MSL</div><div>Mission en, cycles 10 to 90</div><div><div>20</div><div>40</div><div>60</div><div>80</div></div><div><div>SLA with PTR_DELAY_CCI_IF</div><div>SLA with PTR_DELAY_CCI</div></div><div>Slope = 2.66 mm/yr [L.S.R. =</div><div>Slope = 2.65 mm/yr [L.S.R. =</div><div>50</div><div>49</div><div>48</div></div> <div><div>Mean (cm)</div><div>2004</div><div>2006</div><div>2008</div><div>2010</div></div>	

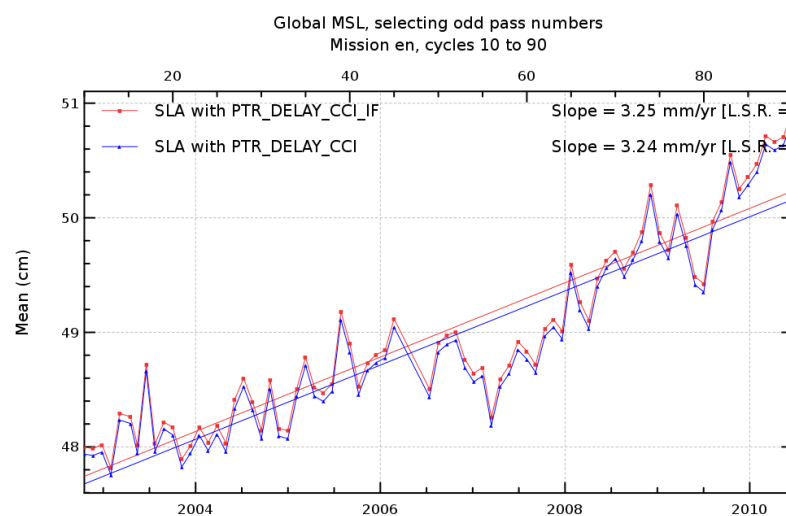
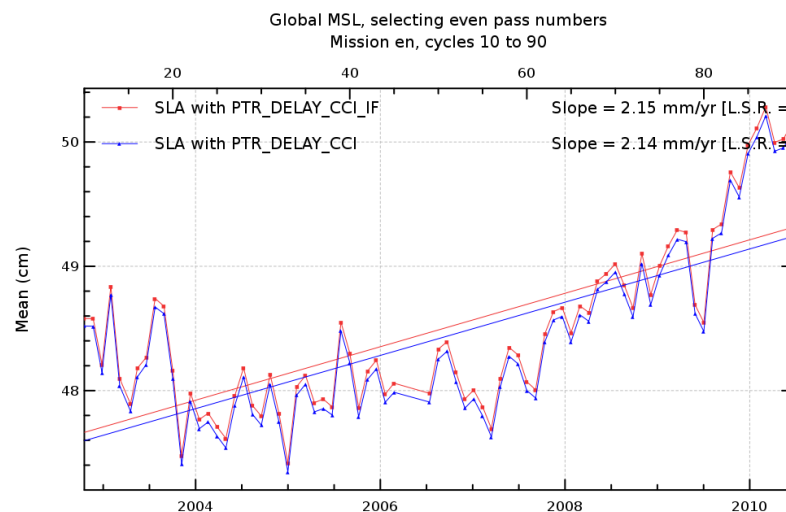
Diagnostic A201_b (mission en)

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



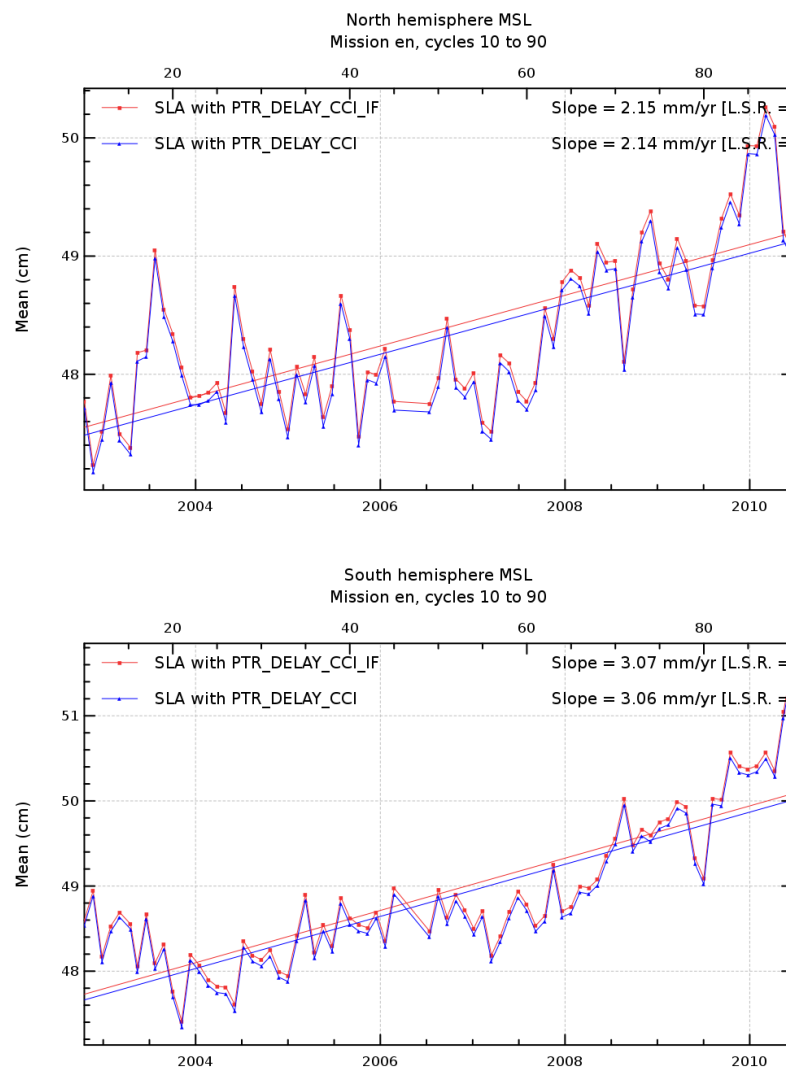
Diagnostic A201_c (mission en)

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 en)

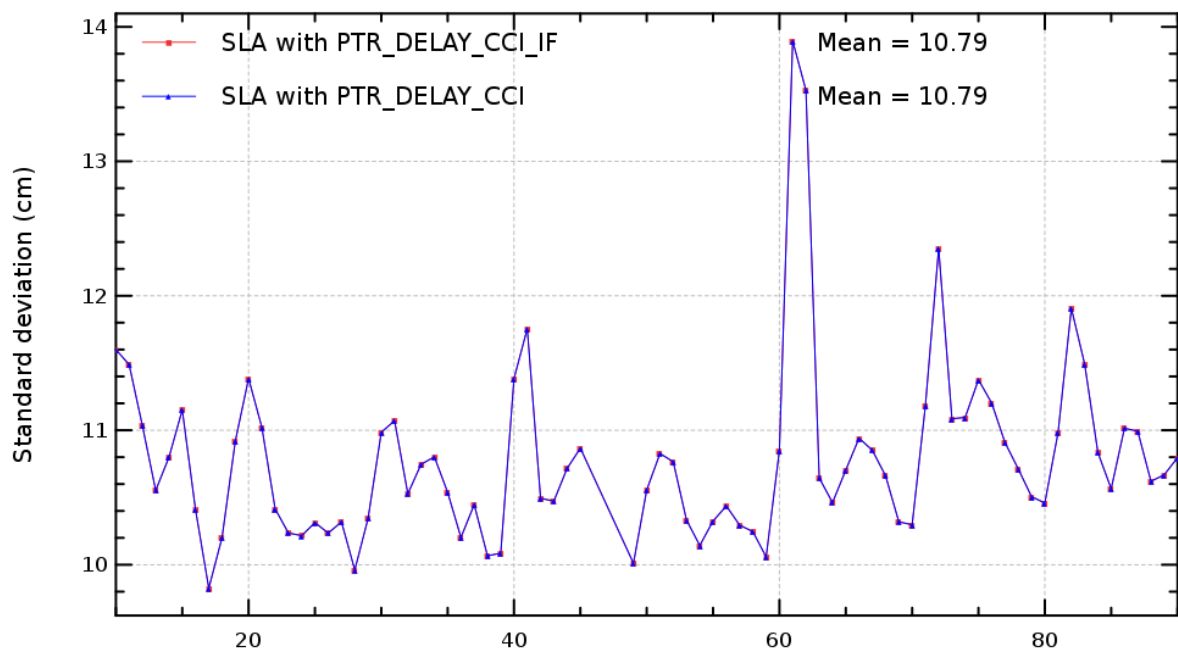
Name : Temporal evolution of Sea Level Anomaly (SLA)

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 en, cycles 10 to 90



Diagnostic A201_e (mission en)

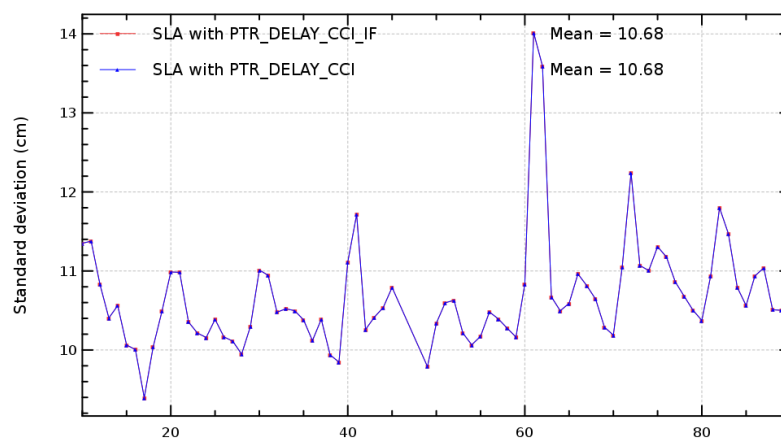
Name : Temporal evolution of Sea Level Anomaly (SLA)

Input data : Along track SLA

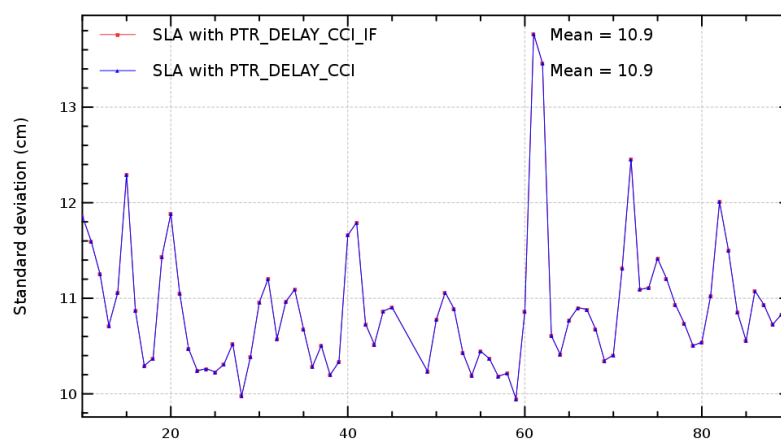
Description : The temporal evolution of SLA statistics (mean, standard deviation) are calculated from a cyclic way (altimeter repetivity, daily, weekly, monthly) using successively both altimetric components in the SLA calculation. These statistics are calculated from 1 Hz altimetric measurements after 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 en, cycles 10 to 90



Global MSL, selecting odd pass numbers
Mission en, cycles 10 to 90



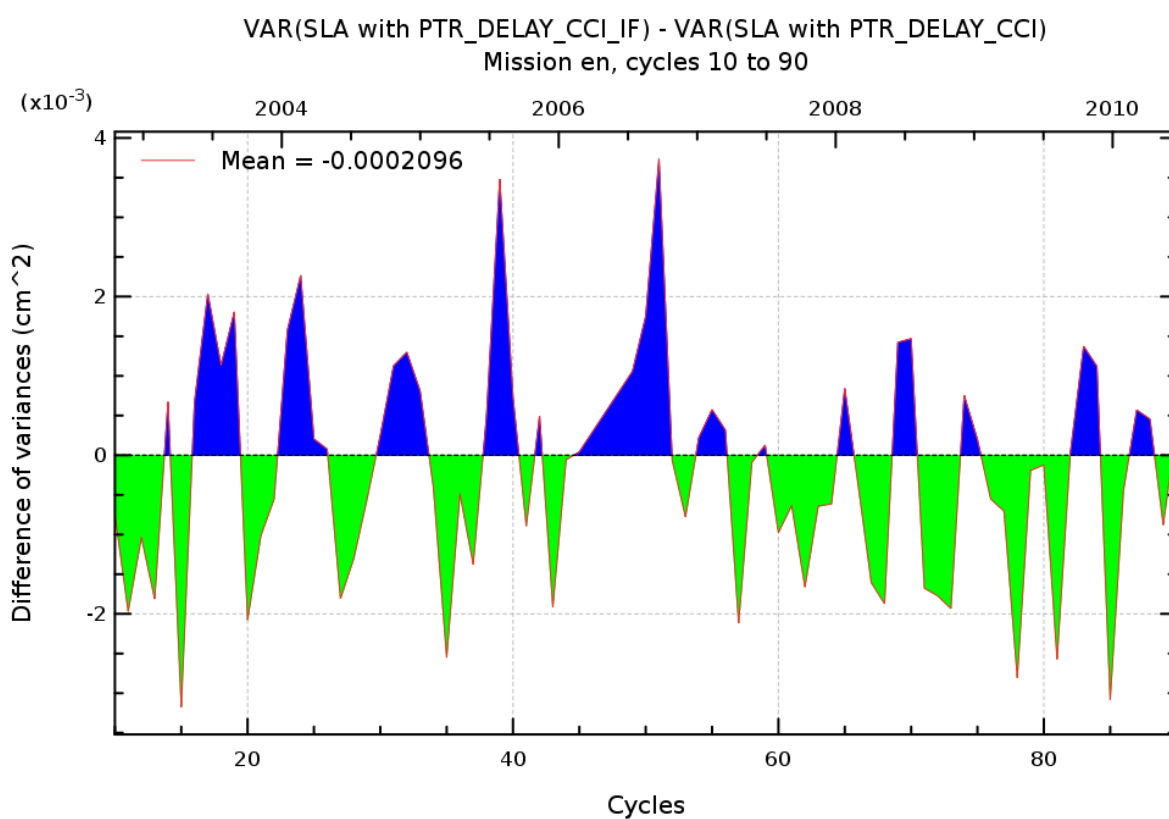
Diagnostic A202_a (mission en)

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



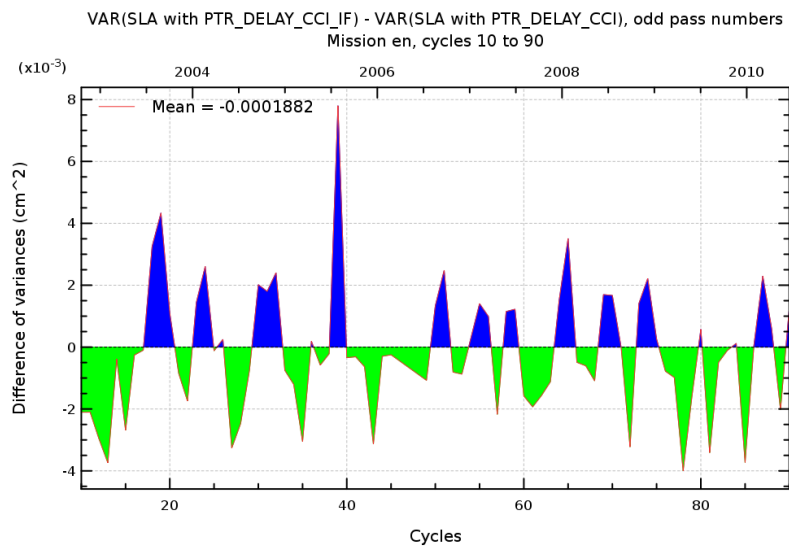
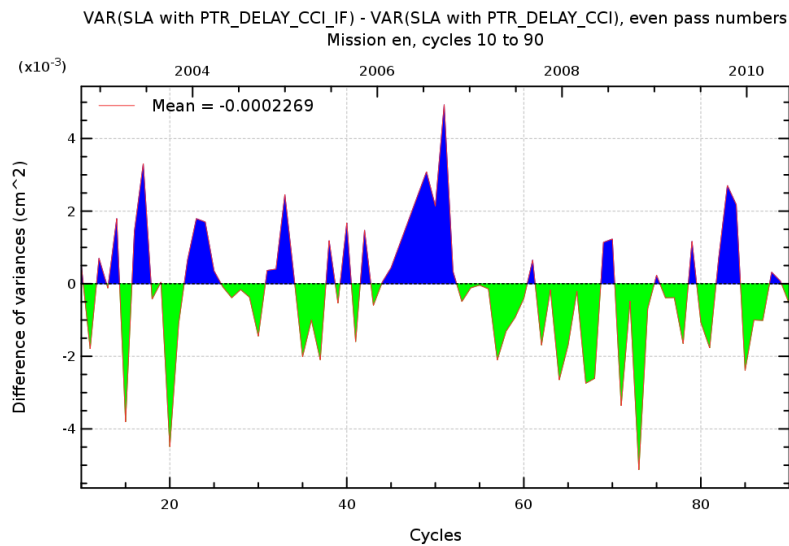
Diagnostic A202_b (mission en)

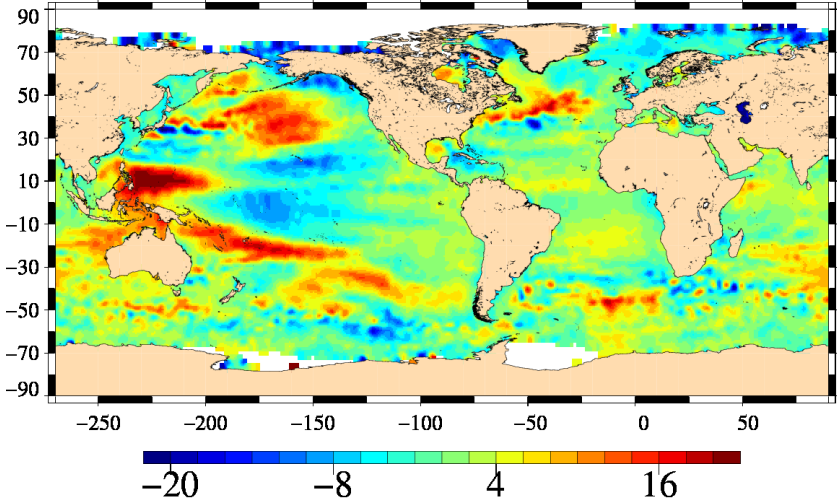
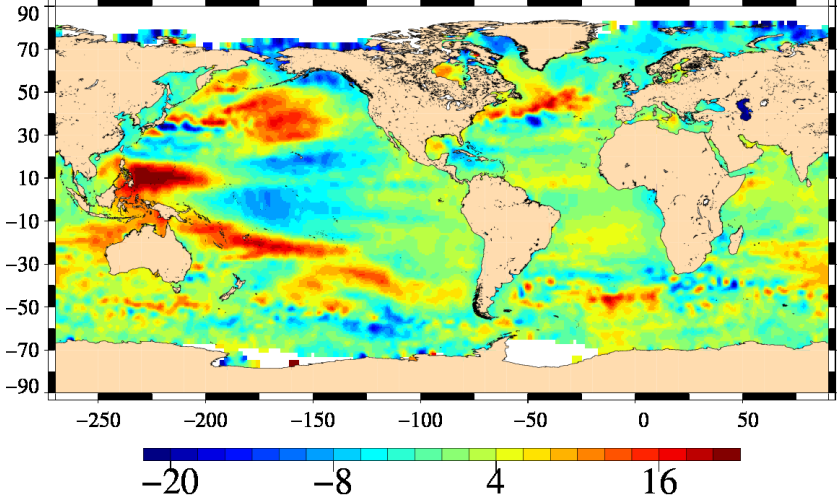
Name : Differences between temporal evolution of Sea Level Anomaly (SLA)

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 en)	
	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 PTR_DELAY_CCI_IF trends Mission en, cycles 10 to 90</div>  <div>Trends (mm/yr)</div> <div>SLA with PTR_DELAY_CCI trends Mission en, cycles 10 to 90</div>  <div>Trends (mm/yr)</div>	

Diagnostic A203_b (mission en)

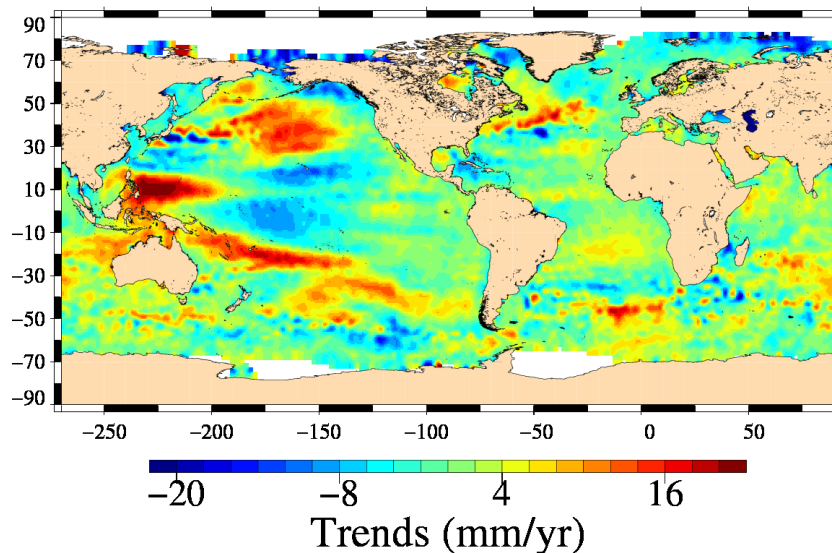
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

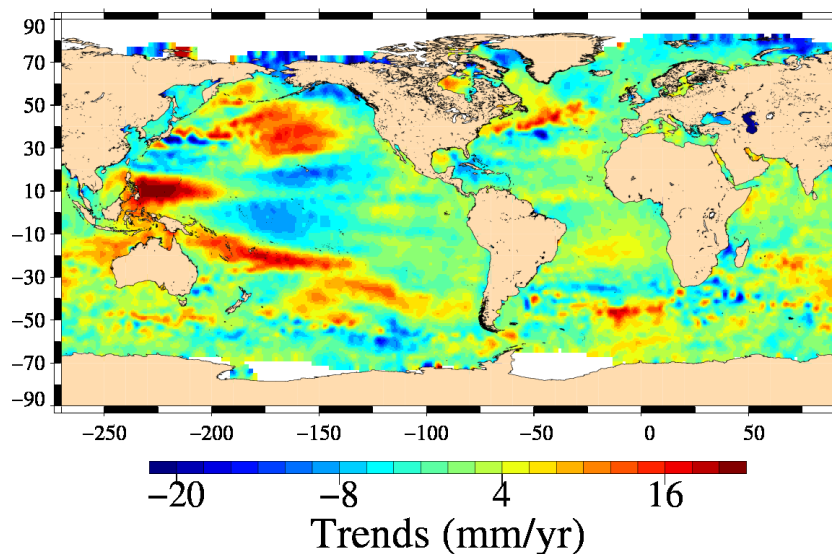
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

Diagnostic type : Global internal analyses

SLA with PTR_DELAY_CCI_IF trends : even pass numbers
Mission en, cycles 10 to 90



SLA with PTR_DELAY_CCI trends : even pass numbers
Mission en, cycles 10 to 90



Diagnostic A203_c (mission en)

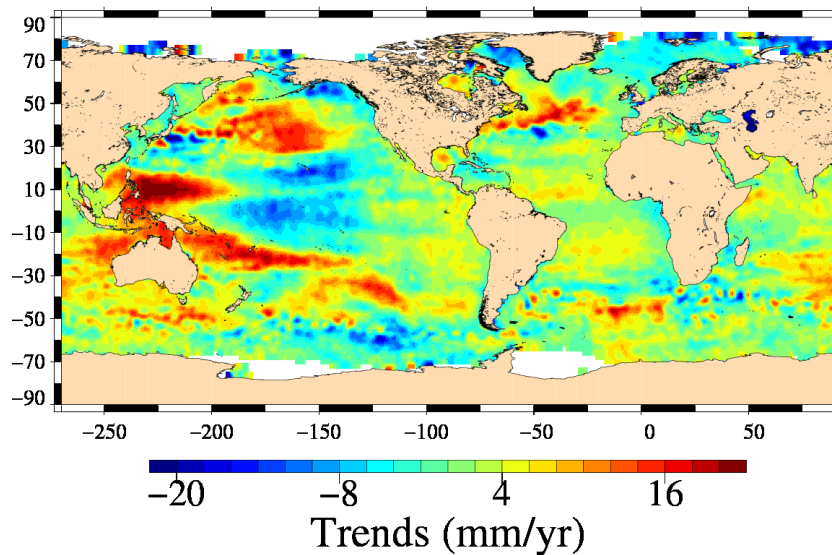
Name : Map of Sea Level Anomaly (SLA) over all the period

Input data : Along track SLA

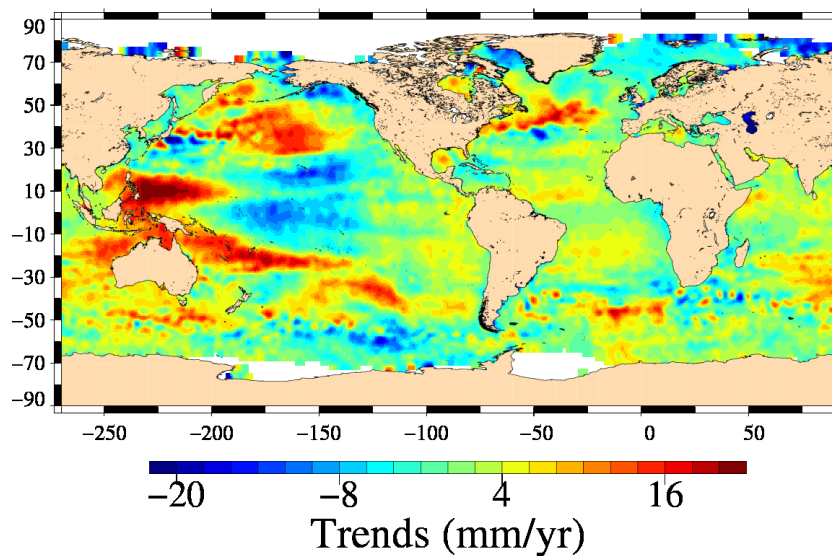
Description : The map of global statistics (mean, standard deviation) of SLA are calculated using successively both altimetric components in the SLA calculation over a large period. These statistics are calculated from 1 Hz altimetric measurements after removing spurious sea level measurements.

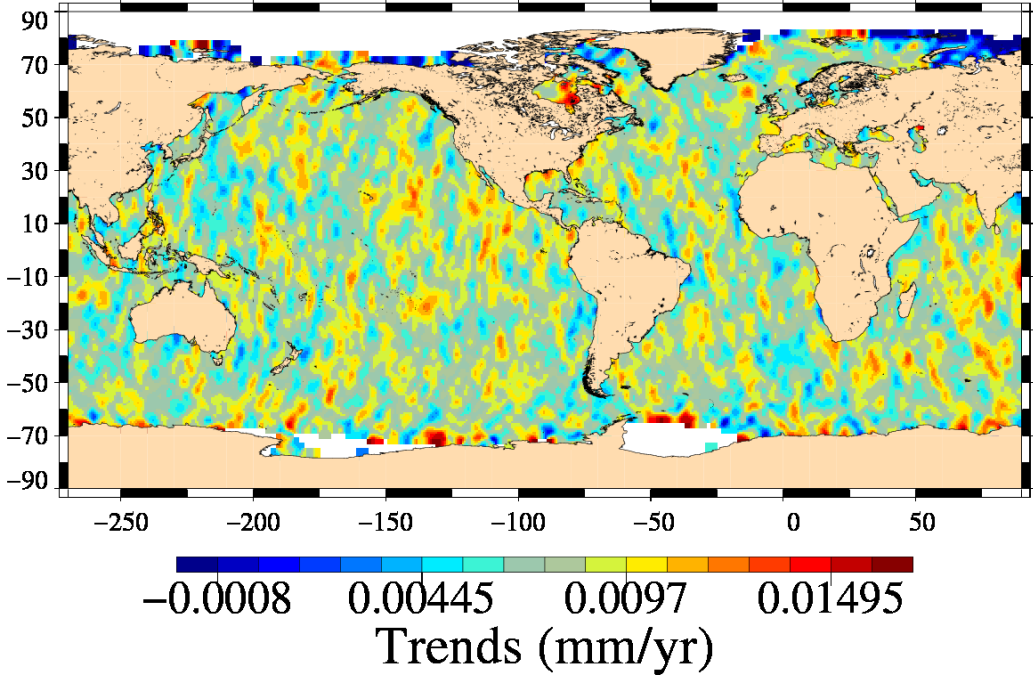
Diagnostic type : Global internal analyses

SLA with PTR_DELAY_CCI_IF trends : odd pass numbers
Mission en, cycles 10 to 90



SLA with PTR_DELAY_CCI trends : odd pass numbers
Mission en, cycles 10 to 90



Diagnostic type : Global internal analyses	Diagnostic A204_a (mission en)	
	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).	
	<p>SLA with PTR_DELAY_CCI_IF trends – SLA with PTR_DELAY_CCI trend Mission en, cycles 10 to 90</p> 	

Diagnostic A204_b (mission en)

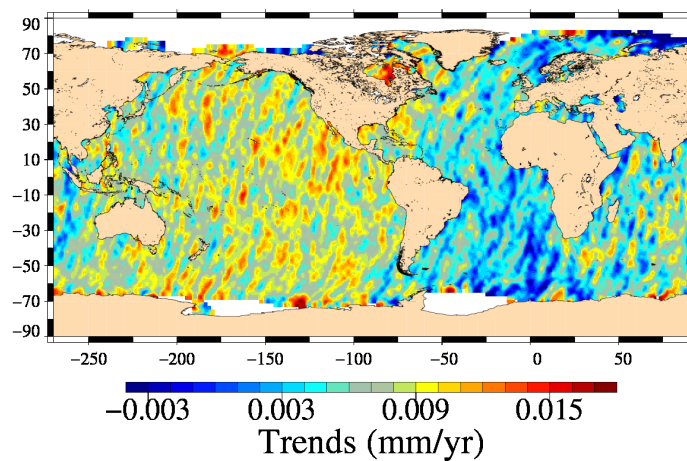
Name : Differences between maps of SLA

Input data : Along track SLA

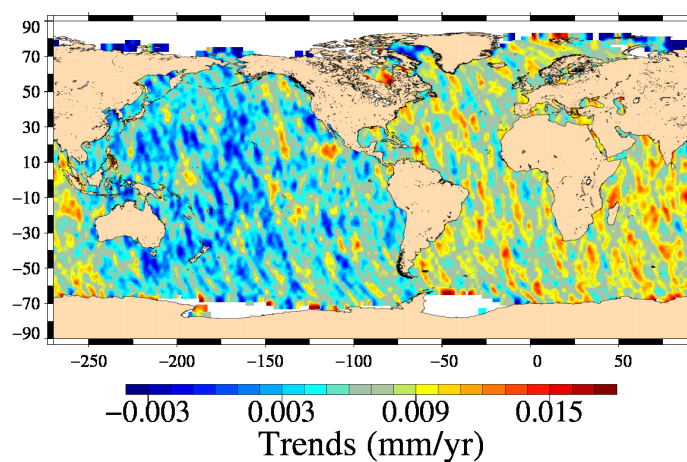
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

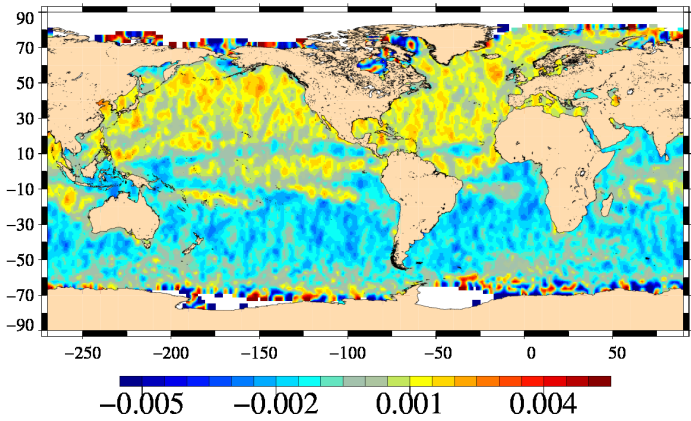
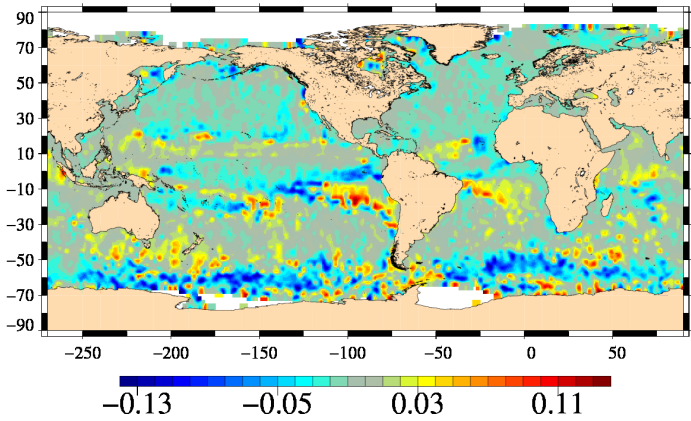
Diagnostic type : Global internal analyses

'PTR_DELAY_CCI_IF trends – SLA with PTR_DELAY_CCI trends : even pa
Mission en, cycles 10 to 90



PTR_DELAY_CCI_IF trends – SLA with PTR_DELAY_CCI trends : odd pa
Mission en, cycles 10 to 90



Diagnostic type : Global internal analyses	Diagnostic A205_a (mission en)	
	Name : Differences between maps of SLA (2)	
	Input data : Along track SLA	
	Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except for SLA Grids).	
	<p>TR_DELAY_CCI_IF amplitude – SLA with PTR_DELAY_CCI amplitude : a Mission en, cycles 10 to 90</p>  <p>Amplitude (cm)</p> <p>h PTR_DELAY_CCI_IF phase – SLA with PTR_DELAY_CCI phase : annu Mission en, cycles 10 to 90</p> 	

Diagnostic A205_b (mission en)

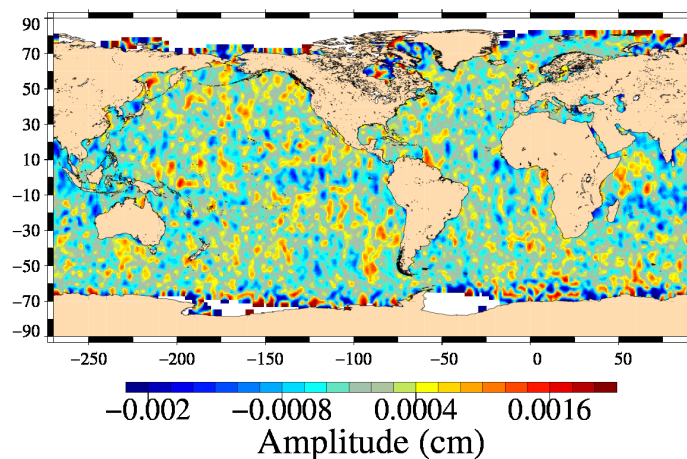
Name : Differences between maps of SLA (2)

Input data : Along track SLA

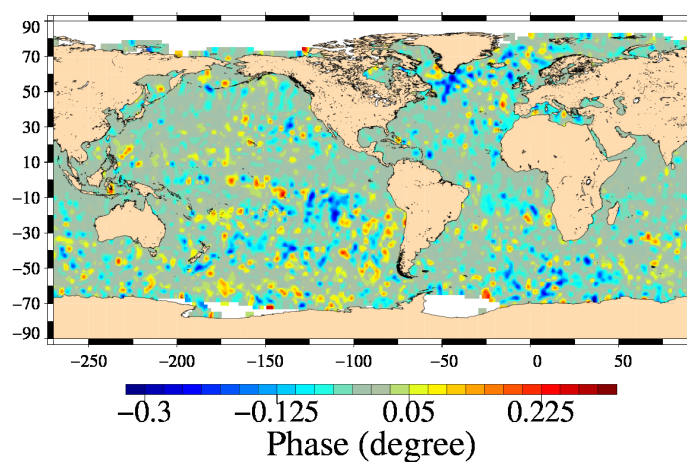
Description : The difference of SLA maps (mean, standard deviation, slope) is calculated from maps derived from diagnostic A203 using successively both altimetric components in the SLA calculation over a given period. This can be done globally, or separating in ascending and descending passes (except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

Diagnostic type : Global internal analyses

_DELAY_CCI_IF amplitude – SLA with PTR_DELAY_CCI amplitude : sem
Mission en, cycles 10 to 90



PTR_DELAY_CCI_IF phase – SLA with PTR_DELAY_CCI phase : semi-ar
Mission en, cycles 10 to 90



Diagnostic A206_a (mission en)	
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.	
<div>Periodogram of SLA (reference period = 1 year) Mission en, cycles 10 to 90</div> <p>This plot shows the amplitude of SLA in centimeters versus the period in days. The x-axis ranges from 300 to 450 days, and the y-axis ranges from 0.0 to 0.6 cm. Two data series are plotted: 'SLA with PTR_DELAY_CCI_IF' (red line with '+' markers) and 'SLA with PTR_DELAY_CCI' (blue line with '+' markers). Both series show a prominent peak at approximately 365 days, which is marked by a vertical green line labeled '1 year'. The amplitude at this peak is approximately 0.7 cm. There are smaller peaks at approximately 300 days and 450 days.</p> <div>Periodogram of SLA (period = [0, 1 year]) Mission en, cycles 10 to 90</div> <p>This plot shows the amplitude of SLA in centimeters versus the period in days. The x-axis ranges from 0 to 350 days, and the y-axis ranges from 0.0 to 0.6 cm. Two data series are plotted: 'SLA with PTR_DELAY_CCI_IF' (red line with '+' markers) and 'SLA with PTR_DELAY_CCI' (blue line with '+' markers). The plot shows several smaller peaks, with the most significant one at approximately 350 days, reaching an amplitude of about 0.7 cm. Other notable peaks occur at approximately 150, 200, and 300 days.</p>	

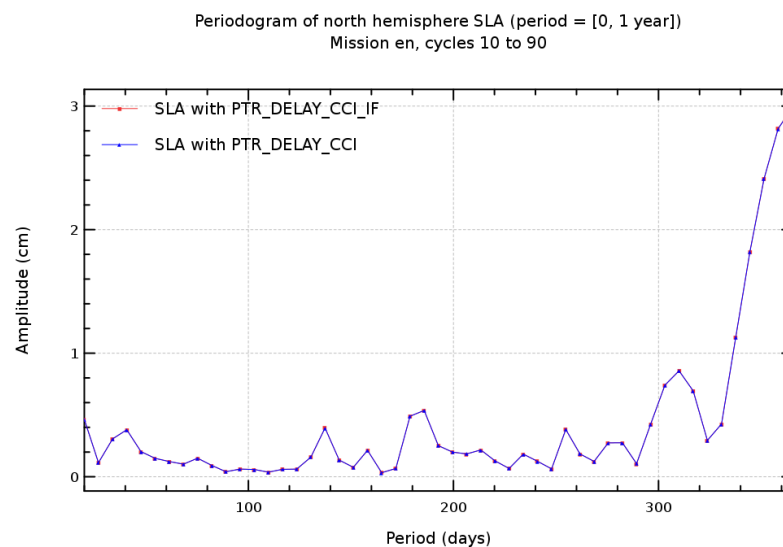
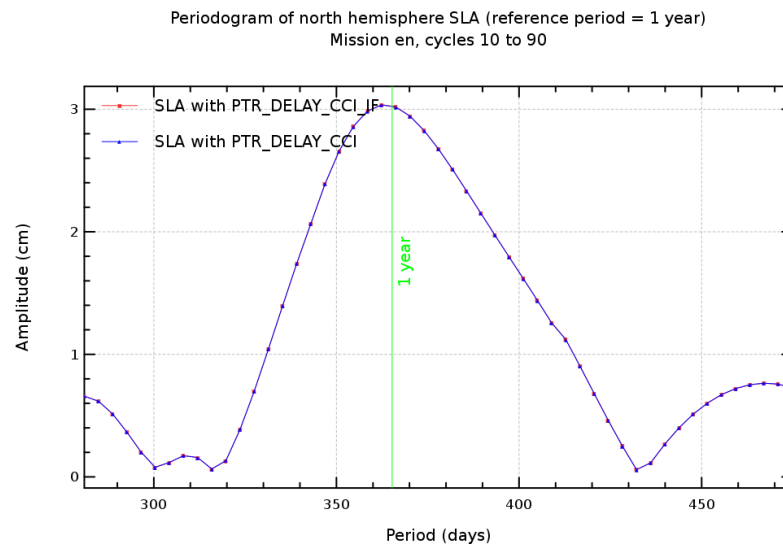
Diagnostic A206_b (mission en)

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



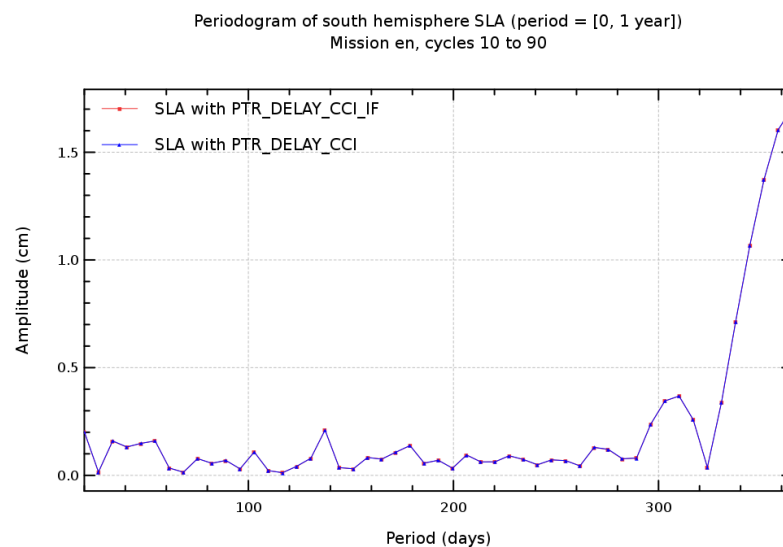
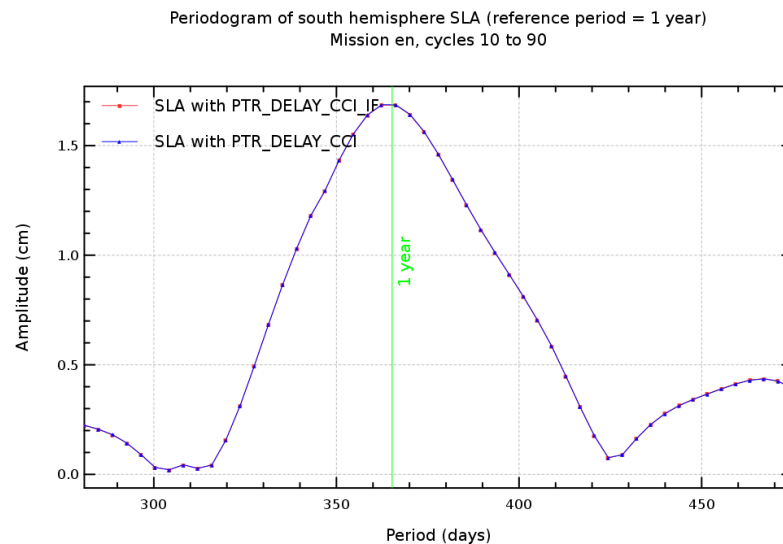
Diagnostic A206_c (mission en)

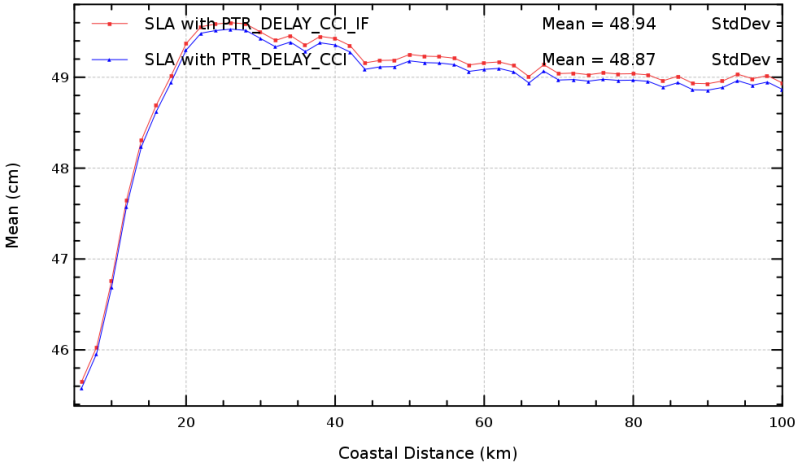
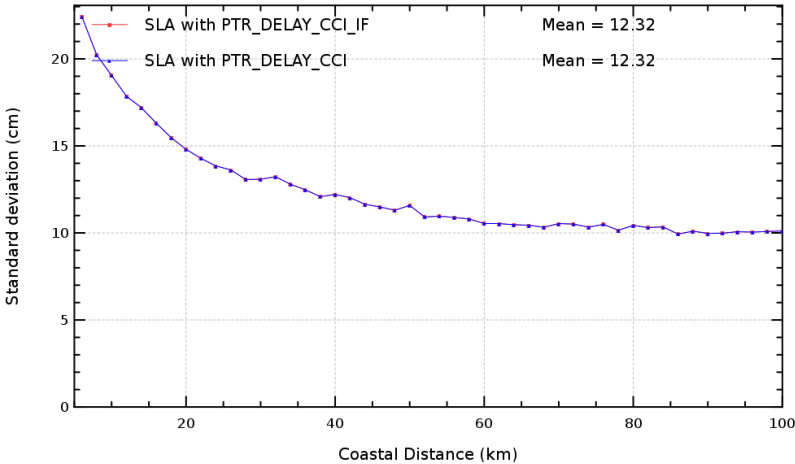
Name : Periodogram derived from temporal evolution of Sea Level Anomaly (SLA)

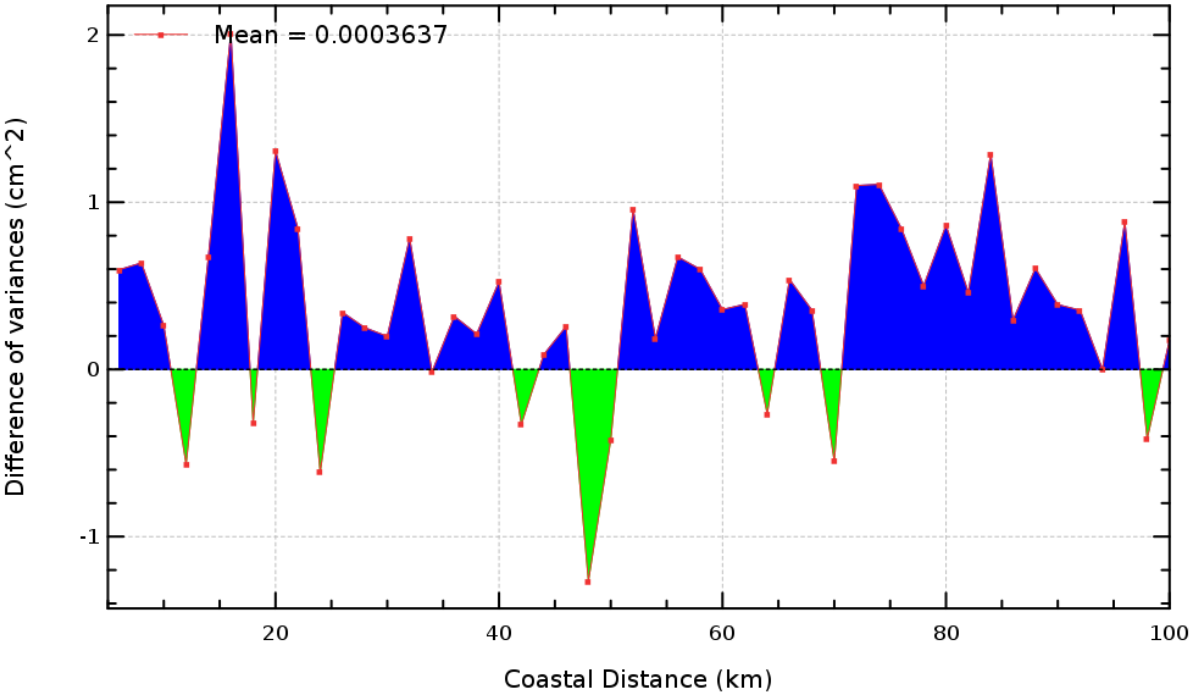
Input data : Along track SLA

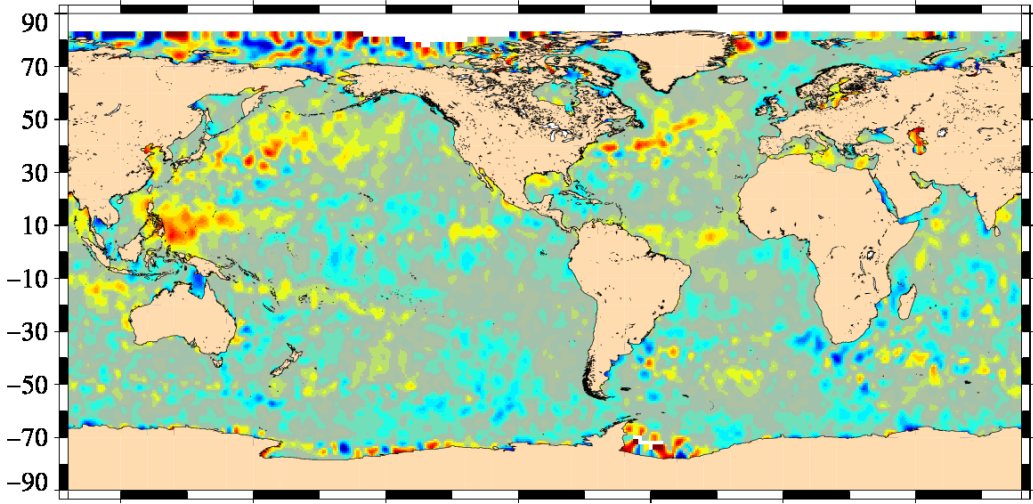
Description : The periodogram derived from temporal evolution of SLA (global, northern or southern hemisphere) can be done over all periods or focusing on particular periods, such as annual, semi annual or 60 day signal. Therefore mean of SLA differences are computed (every day or cycle), and time data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

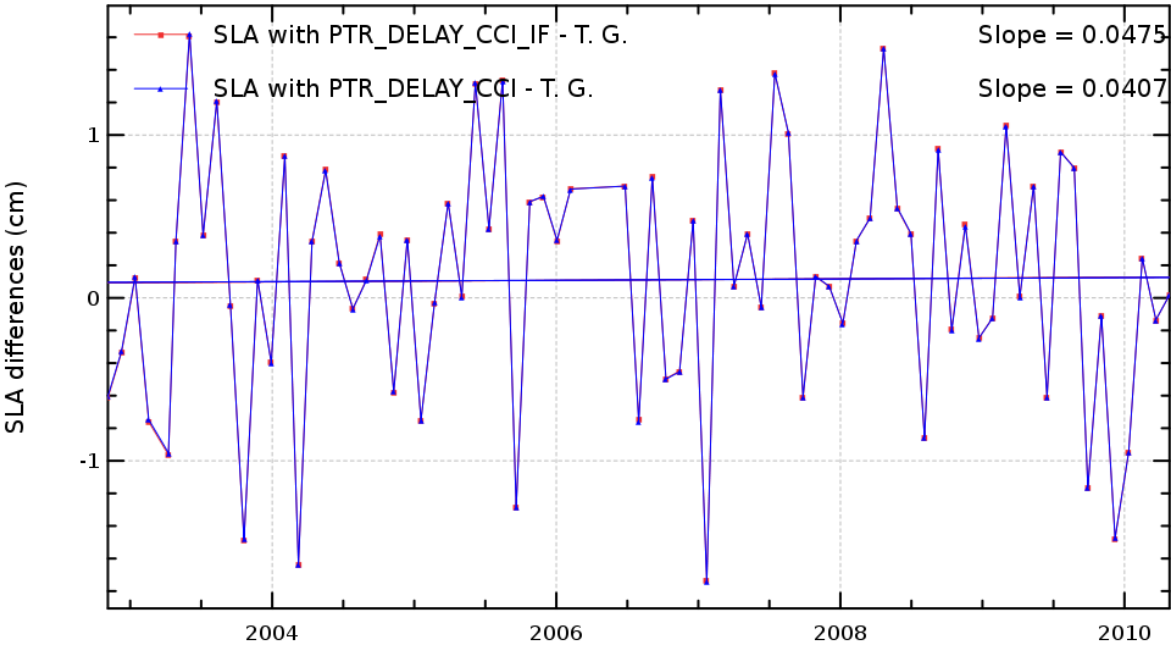
Diagnostic type : Global internal analyses



Diagnostic type : Global internal analyses	Diagnostic A207 (mission en)	
	Name : Sea Level Anomaly (SLA) versus coastal distance	
	Input data : Along track SLA	
	Description : Mean and standard deviation of SLA - computed by using successively both altimetric components - are plotted in function of coastal distances between 0 and 100 km.	
	<div><p>Global MSL Mission en, cycles 10 to 90</p><p>Mean (cm)</p><p>Coastal Distance (km)</p><p>SLA with PTR_DELAY_CCI_IF Mean = 48.94 StdDev =</p><p>SLA with PTR_DELAY_CCI Mean = 48.87 StdDev =</p></div> <div><p>Global MSL Mission en, cycles 10 to 90</p><p>Standard deviation (cm)</p><p>Coastal Distance (km)</p><p>SLA with PTR_DELAY_CCI_IF Mean = 12.32</p><p>SLA with PTR_DELAY_CCI Mean = 12.32</p></div>	

Diagnostic type : Global internal analyses	Diagnostic A208 (mission en)
	Name : Sea Level Anomaly (SLA) differences versus coastal distance
	Input data : Along track SLA
	Description : The differences of SLA variances - computed by using successively both altimetric components - are plotted in function of coastal distances between 0 and 100 km.
	<div><p>VAR(SLA with PTR_DELAY_CCI_IF) - VAR(SLA with PTR_DELAY_CCI) Mission en, cycles 10 to 90</p><p>(x10⁻³)</p><p>Mean = 0.0003637</p><p>Difference of variances (cm²)</p><p>Coastal Distance (km)</p></div>

Diagnostic type : Global internal analyses	Diagnostic A209 (mission en)	
	Name : Differences between maps of SLA (3)	
	Input data : Along track SLA	
	Description : The differences between maps of SLA are calculated from the SLA differences (mean, standard deviation) using successively both altimetric components in the SLA calculation.	
	<div>VAR(SLA with PTR_DELAY_CCI_IF) – VAR(SLA with PTR_DELAY_CC)</div> <div>Mission en, cycles 10 to 90</div> <div></div> <div>-0.06 -0.025 0.01 0.045</div> <div>Difference of variances (cm^2)</div>	

Diagnostic type : Altimetry and in-situ data comparison	Diagnostic C001 (mission en)	
	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 Mission en, cycles 10 to 90</div> 	

Diagnostic C002 (mission en)

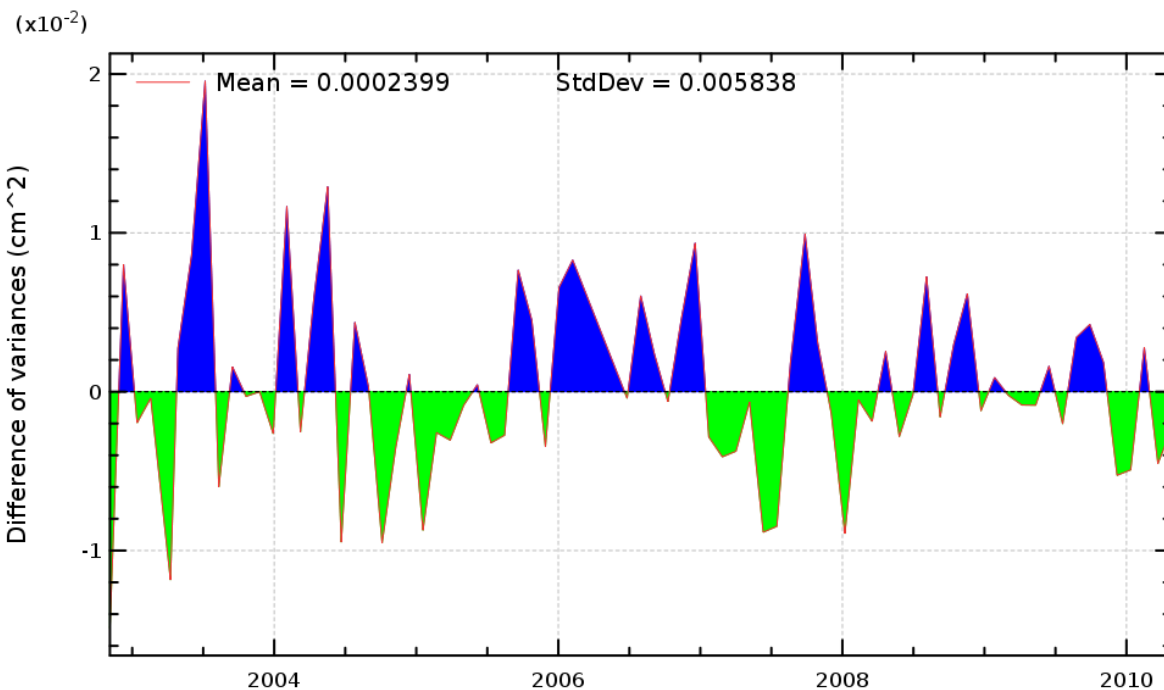
Name : Differences of temporal evolution of SSH differences between tide gauges and altimetry measurements

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 : $\text{VAR}(\text{SLA with PTR_DELAY_CCI_IF} - \text{T. G.}) - \text{VAR}(\text{SLA with PTR_DELAY_CCI} - \text{T. G.})$
Mission en, cycles 10 to 90



Diagnostic C003 (mission en)	
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	
<div>Periodogram of SLA differences : altimetry measurements - tide gauges (ref. period = 1 year) Mission en, cycles 10 to 90</div> <div></div> <div>Periodogram of SLA differences : altimetry measurements - tide gauges (period = [0, 1 year]) Mission en, cycles 10 to 90</div> <div></div>	

Diagnostic C004 (mission en)

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

ram of the difference of variances : $\text{VAR}(\text{SLA with PTR_DELAY_CCI_IF} - \text{T. G.}) - \text{VAR}(\text{SLA with PTR_DELAY})$
Mission en, cycles 10 to 90

