## Orbit comparison: ESOC-2011 (v7) versus CNES GDR-C

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Version 1: 2011/08/26

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Study overview

In this study, the orbit solution derived from ESOC center has been compared to the CNES orbit provided in level-2 GDR products to calculate the Jason-1 and ENVISAT sea-level height (SSH).

The impact of using these orbits on the SSH calculation have been analyzed for ENVISAT and Jason-1:

- for Jason-1: from January 2002 (cycle 1) to January 2009 (Cycle 259)
- for Envisat: from September 2002 (cycle 9) to December 2010 (Cycle 95)

The ESOC orbits have been uploaded from the following ftp site where their standards are described:

- for Jason-1 [ftp://dgn6.esoc.esa.int/jason1/](ftp://dgn6.esoc.esa.int/jason1/).
- for Envisat [ftp://dgn6.esoc.esa.int/envisat/sol7/](ftp://dgn6.esoc.esa.int/envisat/sol7/).

The CNES orbit used in Jason-1 and Envisat products corresponds to the GDR-C standards for both missions. All the validation diagnostics displayed in this report has been performed in agreement with the Sea-Level CCI Product Validation Plan (PVP).
**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 j1)

**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.
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 j1)

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.

![Mean of ESOC v7 Orbit – CNES GDR–C Orbit](image)

Mission j1, cycles 1 to 251

![Standard deviation of ESOC v7 Orbit – CNES GDR–C Orbit](image)

Mission j1, cycles 1 to 251
**Diagnostic A003.a (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.

![Periodogram of the mean of ESOC v7 Orbit - CNES GDR-C Orbit](image1)

![Periodogram of the standard deviation of ESOC v7 Orbit - CNES GDR-C Orbit](image2)
**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 j1)**

**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.

[Graph of periodogram of the mean of ESOC v7 Orbit - CNES GDR-C Orbit (reference period = 1 year), Mission j1, cycles 1 to 251]

[Graph of periodogram of the standard deviation of ESOC v7 Orbit - CNES GDR-C Orbit (reference period = 1 yr), Mission j1, cycles 1 to 251]
**Diagnostic A003_b (mission j1)**

**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.
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).
**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).
**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).

![SSH crossovers graph](image)
Diagnostic A102 (mission j1)

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).
Name: Map of SSH crossovers

Input data: Sea Surface Height (SSH) crossovers

Description: The differences between maps of SSH crossovers differences (mean, variance) are calculated using successively both altimetric components in the SSH calculation. SSH crossovers are the differences between ascending and descending passes for time differences between both passes lower than 10 days (in order to reduce the effect of the oceanic variability).
Diagnostic A103 (mission j1)

**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 A104 (mission en)

**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).

VAR(SSH with ESOC v7 Orbit) – VAR(SSH with CNES GDR–C Orbit)
Mission en, cycles 10 to 94

SSH crossovers : difference of variances (cm^2)
### Diagnostic A104 (mission j1)

**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).

**VAR(SSH with ESOC v7 Orbit) – VAR(SSH with CNES GDR–C Orbit)**

**Mission j1, cycles 1 to 251**

![SSH crossovers difference of variances (cm^2)](image-url)

SSH crossovers: difference of variances (cm^2)
**Diagnostic A201_a (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.

![Graph showing the temporal evolution of Global MSL](image)
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.
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 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.

![Graph showing the comparison between SLA with ESOC v7 Orbit and SLA with CNES GDR-C Orbit for Global MSL Mission en, cycles 10 to 94. The mean for SLA with ESOC v7 Orbit is 10.69 cm, and for SLA with CNES GDR-C Orbit is 10.66 cm.](image-url)
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 A201_a (mission j1)**

**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.
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 repetitivity, 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.
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.
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.
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 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.

![Graph showing variance differences between orbits](image-url)

VAR(SLA with ESOC v7 Orbit) - VAR(SLA with CNES GDR-C Orbit)

Mission en, cycles 10 to 94

Mean = 0.6385
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 A202_a (mission j1)

**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.

![Graph showing differences in SLA variances](image-url)
Diagnostic A202_b (mission j1)

**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 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.

SLA with ESOC v7 Orbit trends
Mission en, cycles 10 to 94

Trends (mm/yr)

SLA with CNES GDR-C Orbit trends
Mission en, cycles 10 to 94

Trends (mm/yr)
**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.

![Map of Sea Level Anomaly](image)

**Trends (mm/yr):**
- SLA with ESOC v7 Orbit trends: even pass numbers
  - Mission en, cycles 10 to 94
  - Trends: -22.56205 to 4.7996
- SLA with CNES GDR–C Orbit trends: even pass numbers
  - Mission en, cycles 10 to 94
  - Trends: -21.43396 to 17.59931
**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.
**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.

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**SLA with ESOC v7 Orbit trends**
Mission j1, cycles 1 to 251

Trends (mm/yr)

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**SLA with CNES GDR–C Orbit trends**
Mission j1, cycles 1 to 251

Trends (mm/yr)
**Diagnostic A203_b (mission j1)**

**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.

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**SLA with ESOC v7 Orbit trends: even pass numbers**

Mission j1, cycles 1 to 251

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**SLA with CNES GDR–C Orbit trends: even pass numbers**

Mission j1, cycles 1 to 251
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 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).

SLA with ESOC v7 Orbit trends – SLA with CNES GDR–C Orbit trends
Mission en, cycles 10 to 94
**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 A204_a (mission j1)

Name: Differences between maps of SLA

Input data: Along track SLA

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

SLA with ESOC v7 Orbit trends – SLA with CNES GDR–C Orbit trends
Mission j1, cycles 1 to 251

Trends (mm/yr)
**Diagnostic A204.b (mission j1)**

**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).

- **th ESOC v7 Orbit trends – SLA with CNES GDR–C Orbit trends : even pass**
  - Mission j1, cycles 1 to 251

- **th ESOC v7 Orbit trends – SLA with CNES GDR–C Orbit trends : odd pass**
  - Mission j1, cycles 1 to 251
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).
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 A205_a (mission j1)**

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

**Input data:** Along track SLA

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

![SLA Map](image1)

Amplitude differences of SLA with ESOC v7 and with GDR–C orbits: Annual sig
Mission j1, cycles 1 to 251

![SLA Map](image2)

Phase differences of SLA with ESOC v7 and with GDR–C orbits: Annual sig
Mission j1, cycles 1 to 251
**Diagnostic A205.b (mission j1)**

**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).

![Image 1](image1.png)

![Image 2](image2.png)
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 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 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.
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 j1)

**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_c (mission j1)**

**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.
Name: Temporal evolution of Sea level Anomaly (SLA) for 2 missions over the same period

Input data: Along track SLA

Description: Temporal evolution of SLA statistics (mean, standard deviation) of 2 or more missions are computed over the same period as long as possible using successively both components in the SLA calculation. This can be done globally, or separating in ascending and descending or in northern and southern hemisphere. In order to assure comparability, statistics are computed using sea level standard calculation (mean per box of 2x2 and weighted by cosine of latitude for the global mean) limited to 66 latitude.
**Name**: Temporal evolution of Sea level Anomaly (SLA) for 2 missions over the same period

**Input data**: Along track SLA

**Description**: Temporal evolution of SLA statistics (mean, standard deviation) of 2 or more missions are computed over the same period as longest as possible using successively both components in the SLA calculation. This can be done globally, or separating in ascending and descending or in northern and southern hemisphere. In order to assure comparability, statistics are computed using sea level standard calculation (mean per box of 2x2 and weighted by cosine of latitude for the global mean) limited to 66 latitude.

![Graph 1](image1.png)

**Global MSL, selecting even pass numbers**
Missions j1 (cycles 28 to 251) and en (cycles 10 to 72)

- SLA with ESOC v7 Orbit : j1
  - Slope = 2.25 mm/yr

- SLA with ESOC v7 Orbit : en
  - Slope = 0.24 mm/yr

![Graph 2](image2.png)

**Global MSL, selecting even pass numbers**
Missions j1 (cycles 28 to 251) and en (cycles 10 to 72)

- SLA with CNES GDR-C Orbit : j1
  - Slope = 1.15 mm/yr

- SLA with CNES GDR-C Orbit : en
  - Slope = 0.34 mm/yr
Name: Temporal evolution of Sea level Anomaly (SLA) for 2 missions over the same period

Input data: Along track SLA

Description: Temporal evolution of SLA statistics (mean, standard deviation) of 2 or more missions are computed over the same period as longest as possible using successively both components in the SLA calculation. This can be done globally, or separating in ascending and descending or in northern and southern hemisphere. In order to assure comparability, statistics are computed using sea level standard calculation (mean per box of 2x2 and weighted by cosine of latitude for the global mean) limited to 66 latitude.
**Name:** Temporal evolution of Sea level Anomaly (SLA) for 2 missions over the same period

**Input data:** Along track SLA

**Description:** Temporal evolution of SLA statistics (mean, standard deviation) of 2 or more missions are computed over the same period as long as possible using successively both components in the SLA calculation. This can be done globally, or separating in ascending and descending or in northern and southern hemisphere. In order to assure comparability, statistics are computed using sea level standard calculation (mean per box of 2x2 and weighted by cosine of latitude for the global mean) limited to 66 latitude.
**Name**: Temporal evolution of Sea level Anomaly (SLA) for 2 missions over the same period

**Input data**: Along track SLA

**Description**: Temporal evolution of SLA statistics (mean, standard deviation) of 2 or more missions are computed over the same period as long as possible using successively both components in the SLA calculation. This can be done globally, or separating in ascending and descending or in northern and southern hemisphere. In order to assure comparability, statistics are computed using sea level standard calculation (mean per box of 2x2 and weighted by cosine of latitude for the global mean) limited to 66 latitude.

![Graph](image_url)
Name: Differences between maps of Sea Level Anomaly (SLA) for 2 missions over the same period

Input data: Along track SLA

Description: The differences between maps of SLA (mean, variance or slope) derived from 2 altimetric missions are computed over the same period (as long as possible) using successively both altimetric components in the SLA calculation. Maps are calculated globally, they can be also calculated separating ascending and descending passes.
Name: Differences between maps of Sea Level Anomaly (SLA) for 2 missions over the same period

Input data: Along track SLA

Description: The differences between maps of SLA (mean, variance or slope) derived from 2 altimetric missions are computed over the same period (as long as possible) using successively both altimetric components in the SLA calculation. Maps are calculated globally, they can be also calculated separating ascending and descending passes.
**Name**: Differences between maps of Sea Level Anomaly (SLA) for 2 missions over the same period

**Input data**: Along track SLA

**Description**: The differences between maps of SLA (mean, variance or slope) derived from 2 altimetric missions are computed over the same period (as long as possible) using successively both altimetric components in the SLA calculation. Maps are calculated globally, they can be also calculated separating ascending and descending passes.

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**SLA with ESOC v7 Orbit differences**: j1 – en, odd pass numbers
**Missions j1 (cycles 28 to 251) and en (cycles 10 to 72)**

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**SLA with CNES GDR-C Orbit differences**: j1 – en, odd pass numbers
**Missions j1 (cycles 28 to 251) and en (cycles 10 to 72)**
**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 colocated with criteria of maximum of correlation, and tide gauges used are derived from global networks (GLOSS/CLIVAR, REFMAR).
Diagnostic C001 (mission j1)

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 colocated with criteria of maximum of correlation, and tide gauges used are derived from global networks (GLOSS/CLIVAR, REFMAR).
**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**: VAR(SLA with ESOC v7 Orbit - T. G.) - VAR(SLA with CNES GDR-C Orbit - T. G.)

Mission en, cycles 10 to 94

![Graph showing difference of variances](image)
## Diagnostic C002 (mission j1)

**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.

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**Difference of variances**: VAR(SLA with ESOC v7 Orbit - T. G.) - VAR(SLA with CNES GDR-C Orbit - T. G.)

### Mission j1, cycles 1 to 251

![Graph showing difference of variances](image-url)

**Mean** = -0.05104  
**StdDev** = 1.682
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.

![Diagram of periodogram of SLA differences between altimetric and tide gauge measurements](image)

![Diagram of periodogram of SLA differences between altimetric and tide gauge measurements](image)
Diagnostic C003 (mission j1)

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 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.

![Histogram of the difference of variances](image)

- Nbr = 40
- Mean = 0.08453
- StdDev = 6.055
Diagnostic C004 (mission j1)

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 differences of variances: VAR(SLA with ESOC v7 Orbit - T. G.) - VAR(SLA with CNES GDR-C C Mission j1, cycles 1 to 251

- Nbr = 93
- Mean = 0.2261
- StdDev = 3.274

Differences of variances (cm^2)

Number of tide gauges