



CENTRE NATIONAL D'ÉTUDES SPATIALES

Scale Factor for ENVISAT SRP model

Introduction

- **CLS analysis (Y. Faugere) has shown that MSL trend estimate computed using Envisat orbits from various groups is different**
- **In particular, a difference is observed between MSL rates calculated from either ascending or descending tracks (on both CNES/ESOC orbits)**
- **This fact triggered a discussion between CNES/ESOC/DEOS regarding Envisat SRP modeling issues...**
 - ◆ Existing models for Envisat
 - ◆ Scale factor, either fixed (to which value ?) or solved-for with constraints
 - ◆ Analyze the signature of 1/rev forces

Existing models for ENVISAT

■ CNES Box & Wing

- ◆ Used by CNES for GDR orbits
- ◆ Proposed scale factor = 1.045 (currently used in GDR-C standards, see following slides)
- ◆ P. Willis finds 0.97

■ ANGARA model

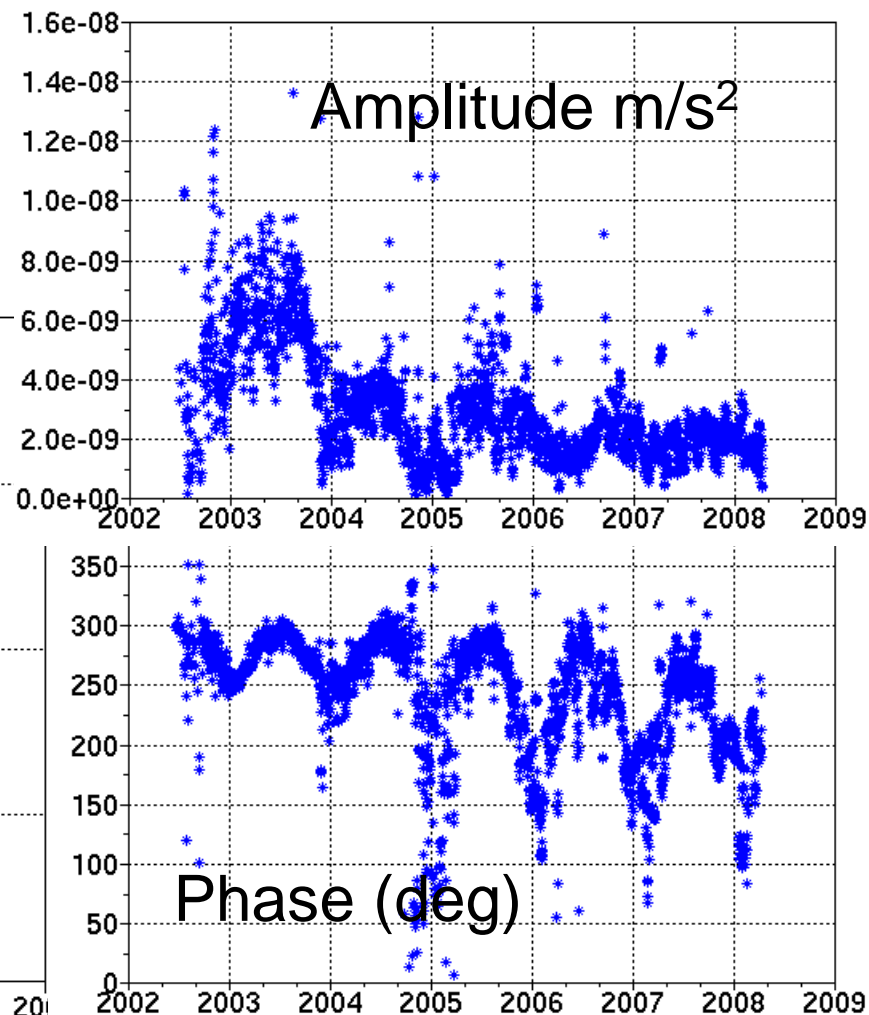
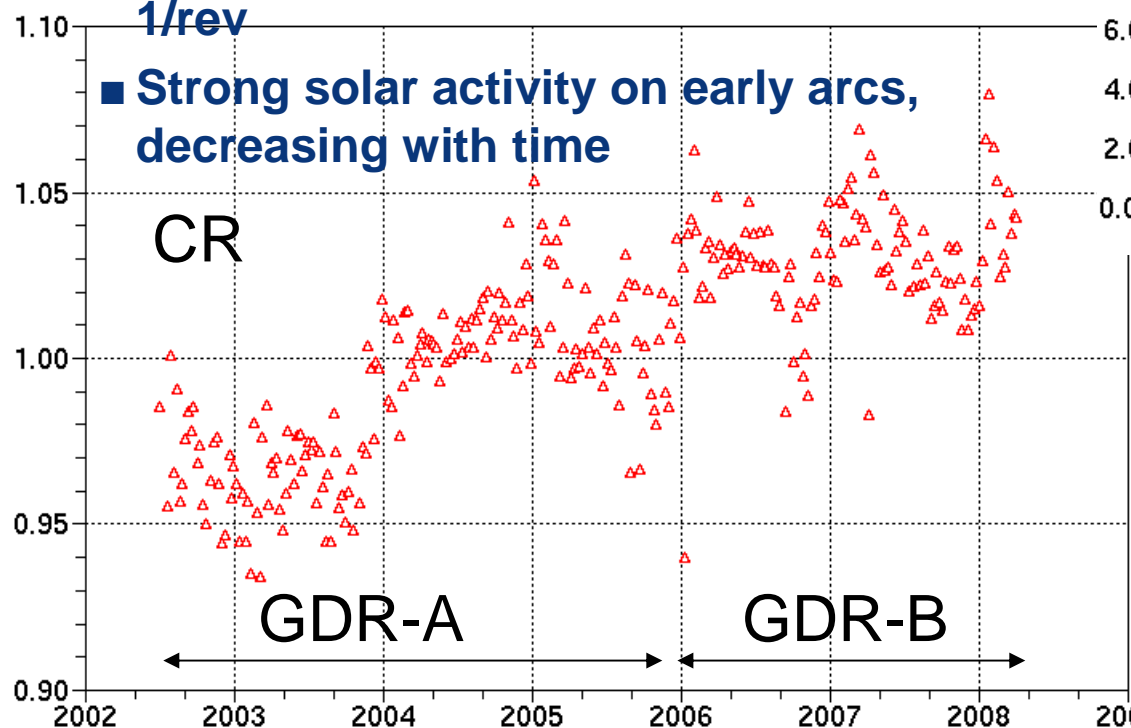
- ◆ Used by ESOC and DEOS
- ◆ Scale factor (if any) to be defined

■ UCL model

- ◆ Not tested yet

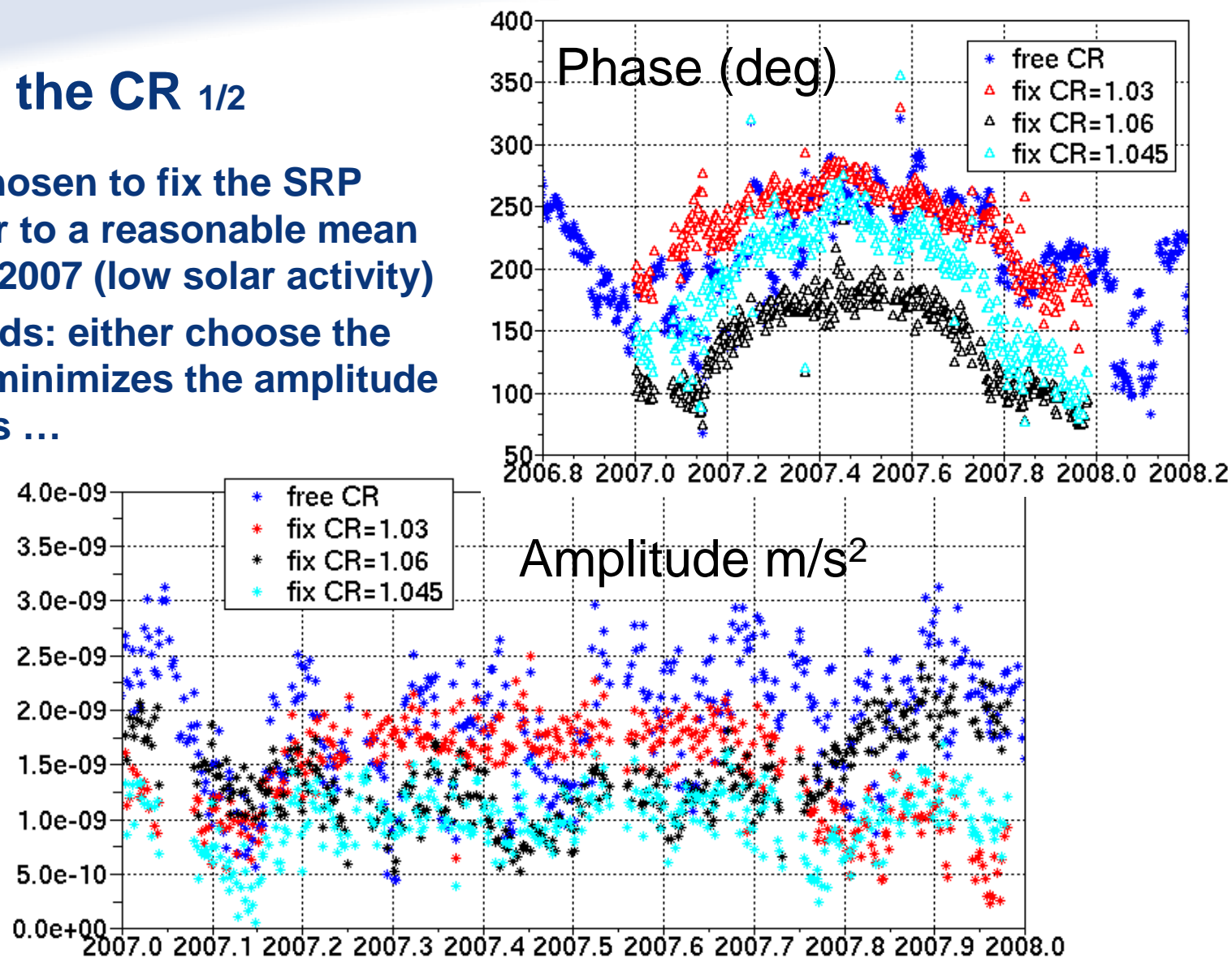
Correlation between 1/rev and SRP scale factor

- Previous CNES solution (GDR-A/B): box & wing, SRP scale factor estimated but constrained to 1
- Strong correlation with Along-Track 1/rev



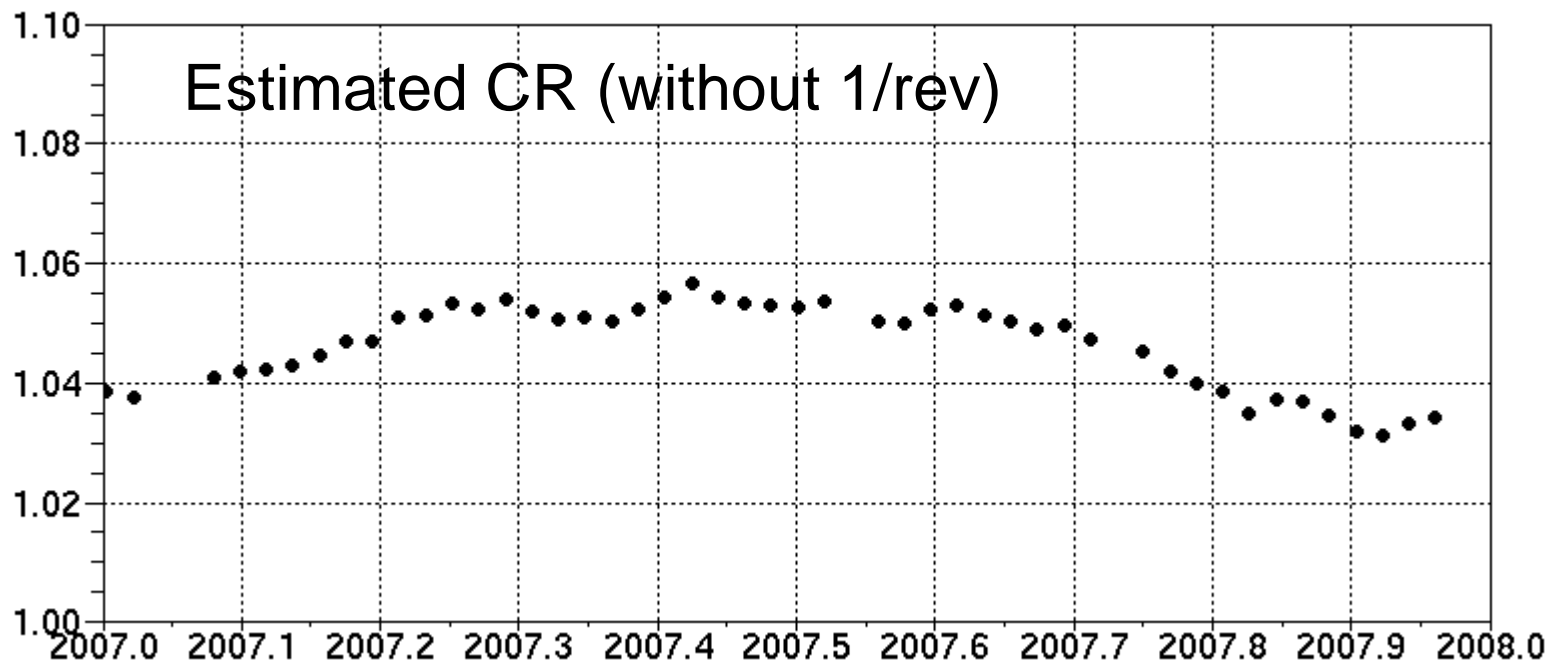
Choosing the CR $1/2$

- We have chosen to fix the SRP scale factor to a reasonable mean value over 2007 (low solar activity)
- Two methods: either choose the value that minimizes the amplitude 1/rev forces ...



Choosing the CR $2/2$

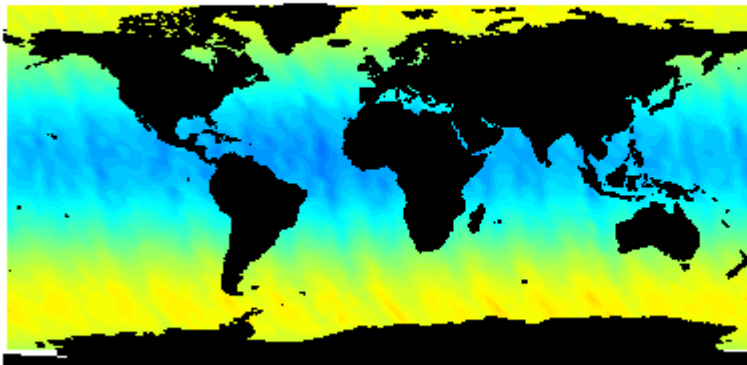
- ... or solve for the scale factor without the $1/\text{rev}$
- In both cases, $\text{CR}=1.045$ seems to be a good choice
- But a clear annual signature in the Envisat CR indicates a problem in CNES box & wing model



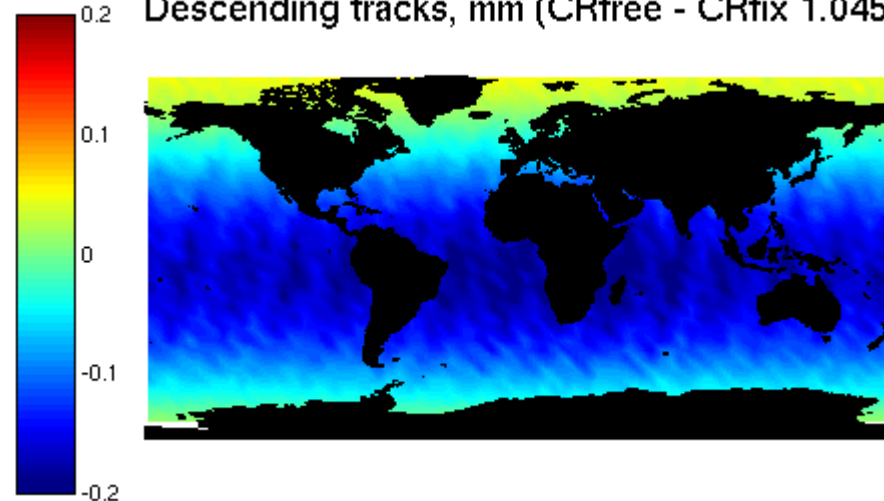
Impact of fixing the CR

- Radial differences between orbits with solved-for CR and fix CR remain negligible ($< 1\text{mm RMS}$), but
 - ◆ the effect is not symmetric between ascending/descending tracks (eclipse)

Ascending tracks, mm (CRfree - CRfix 1.045)



Descending tracks, mm (CRfree - CRfix 1.045)



Work in progress

- **ESOC comparison between free CR / fixed CR orbits over 2003-2007 period shows similar results as CNES in 2007; a higher difference is shown in 2003/2004 (higher solar activity?)**
 - ◆ Using ESOC long series, check if fixing the CR contributes in solving the ascending/descending tracks problem on MSL
- **Confirm a scale factor for the ANGARA model (test without 1/rev on ESOC side in progress)**
- **Still to be investigated ...**
 - ◆ Understand annual signatures in the empiricals, try to correct the CNES model
 - ◆ Jump of the estimated CR at end 2003
 - ◆ Analysis of UCL model