Federal Agency for
Cartography and Geodesy

Further Studies on the Influence of Range Biases

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Background

- ILRS Pilot Project

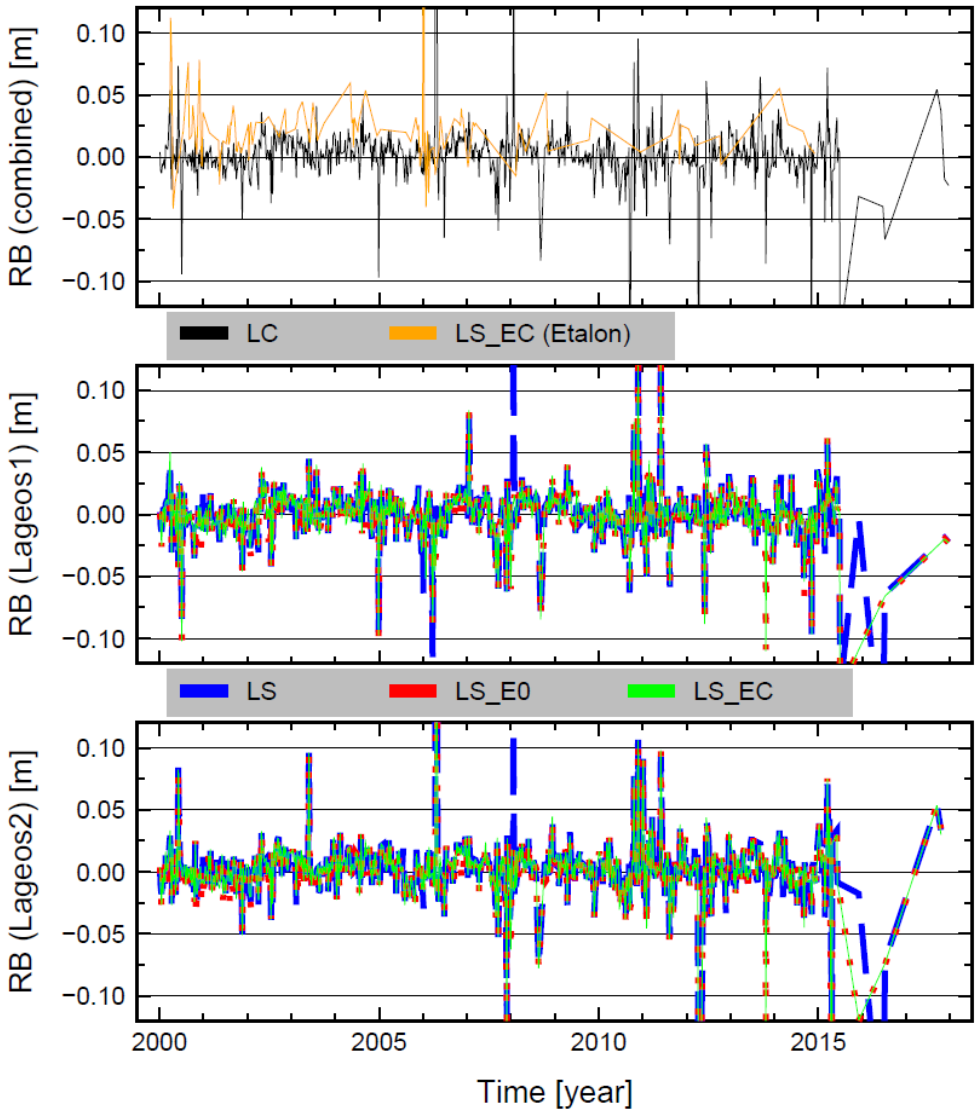
  „Station Systematic Error Monitoring“ (SSEM)
- Influence of additional Range Biases (RB) to be tested
- Idea:
  - absorbing systematic errors of laser device
  - improving TRF parameters

Characteristics of Test Cases

Test Case	LC	LS	LS_E0	LS_EC
Time span	2000-2017			
Satellites	LAGEOS		LAGEOS+Etalon	
Range Biases				
• LAGEOS	combined	per satellite	per satellite	per satellite
• Etalon	-	-	-	combined
Datum	NNR/core stations			
A priori TRF	ITRF2014			
A priori EOP	C04_14			

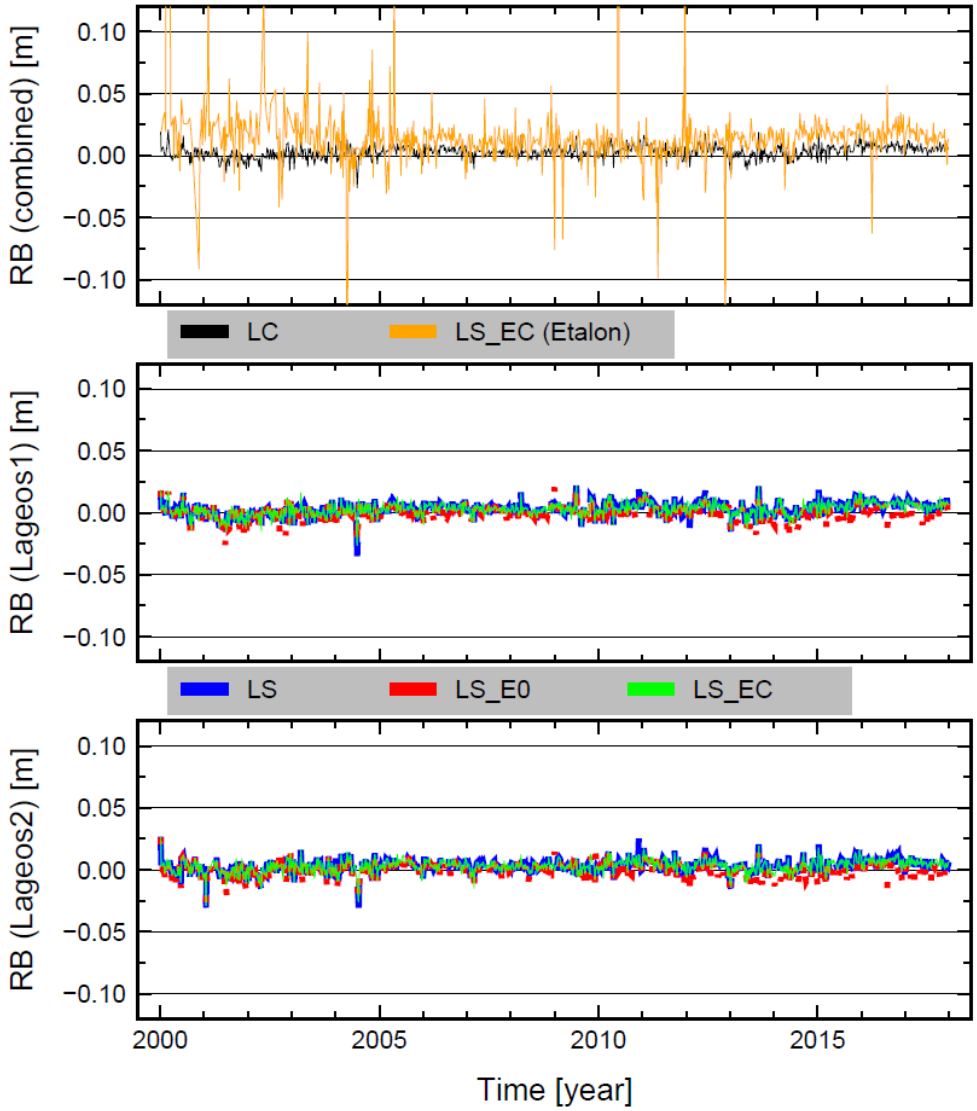
Range Biases: Time Series

7080 McDonald



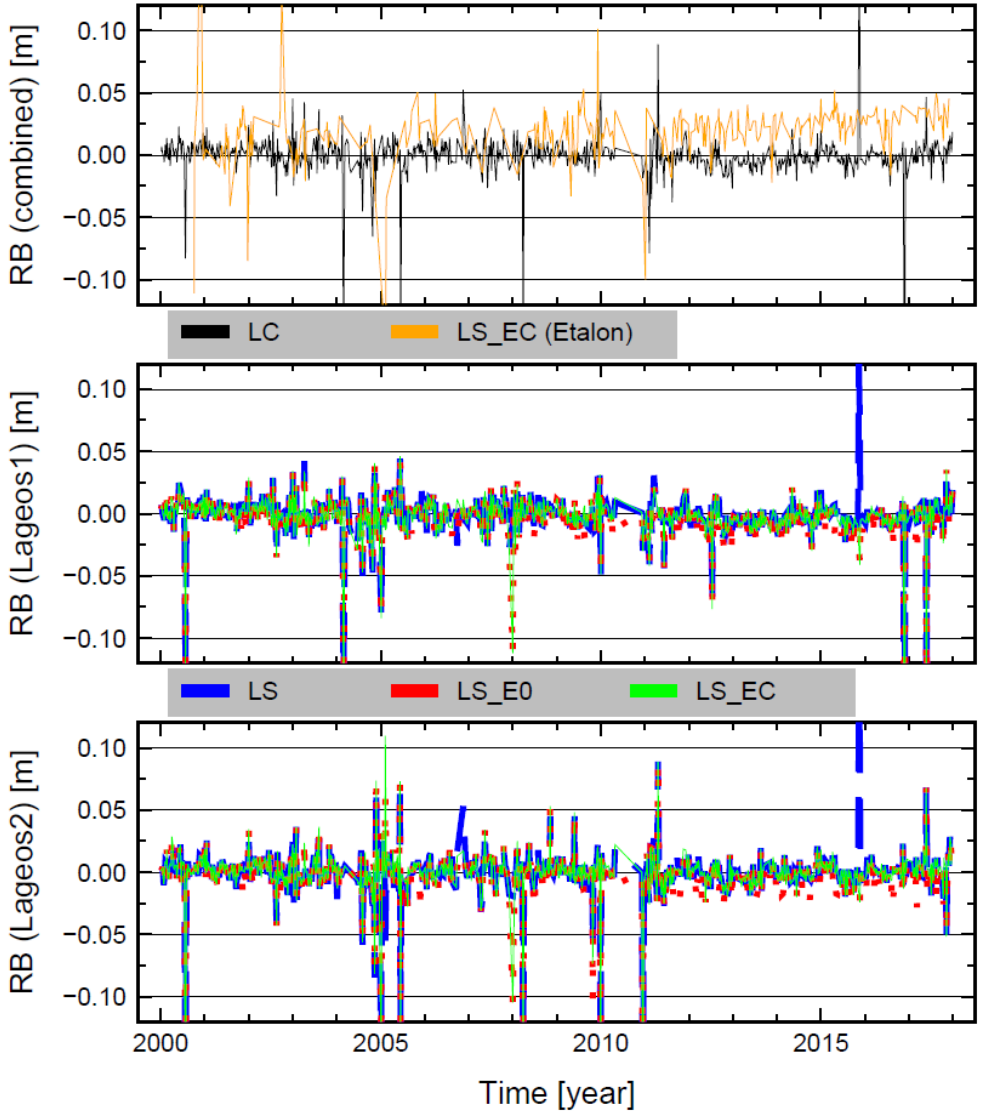
Range Biases: Times Series

7090 Yarragadee



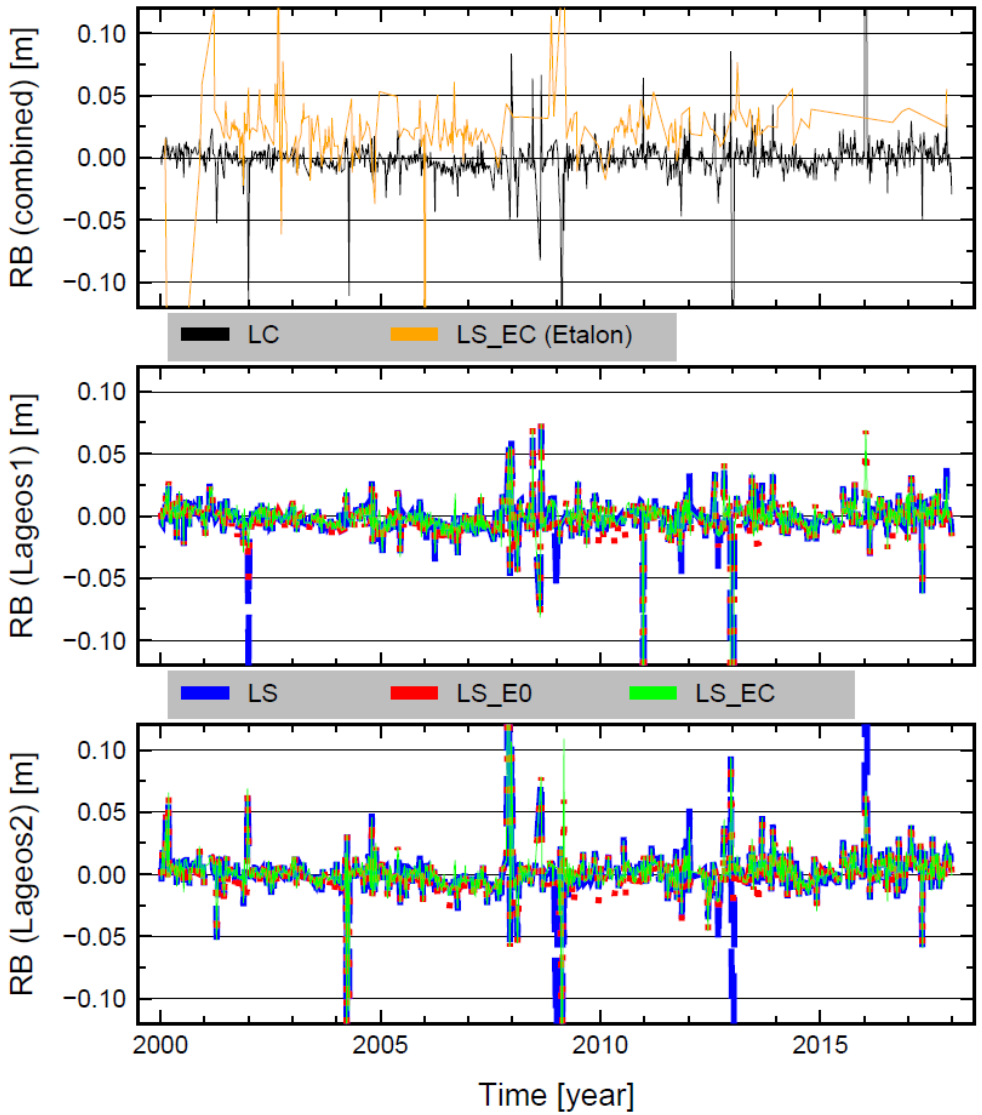
Range Biases: Time Series

7105 Greenbelt

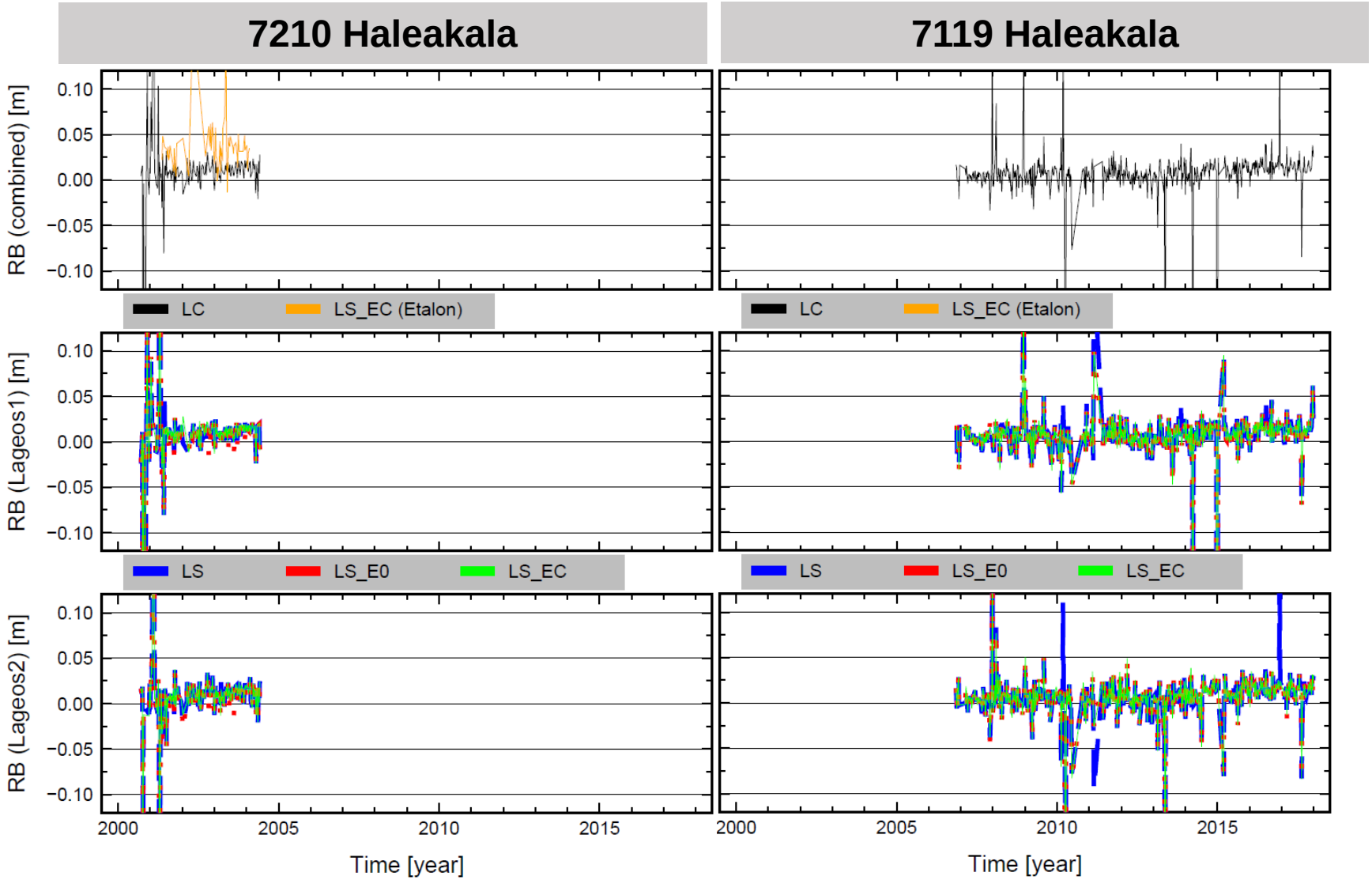


Range Biases: Time Series

7110 Monument Peak

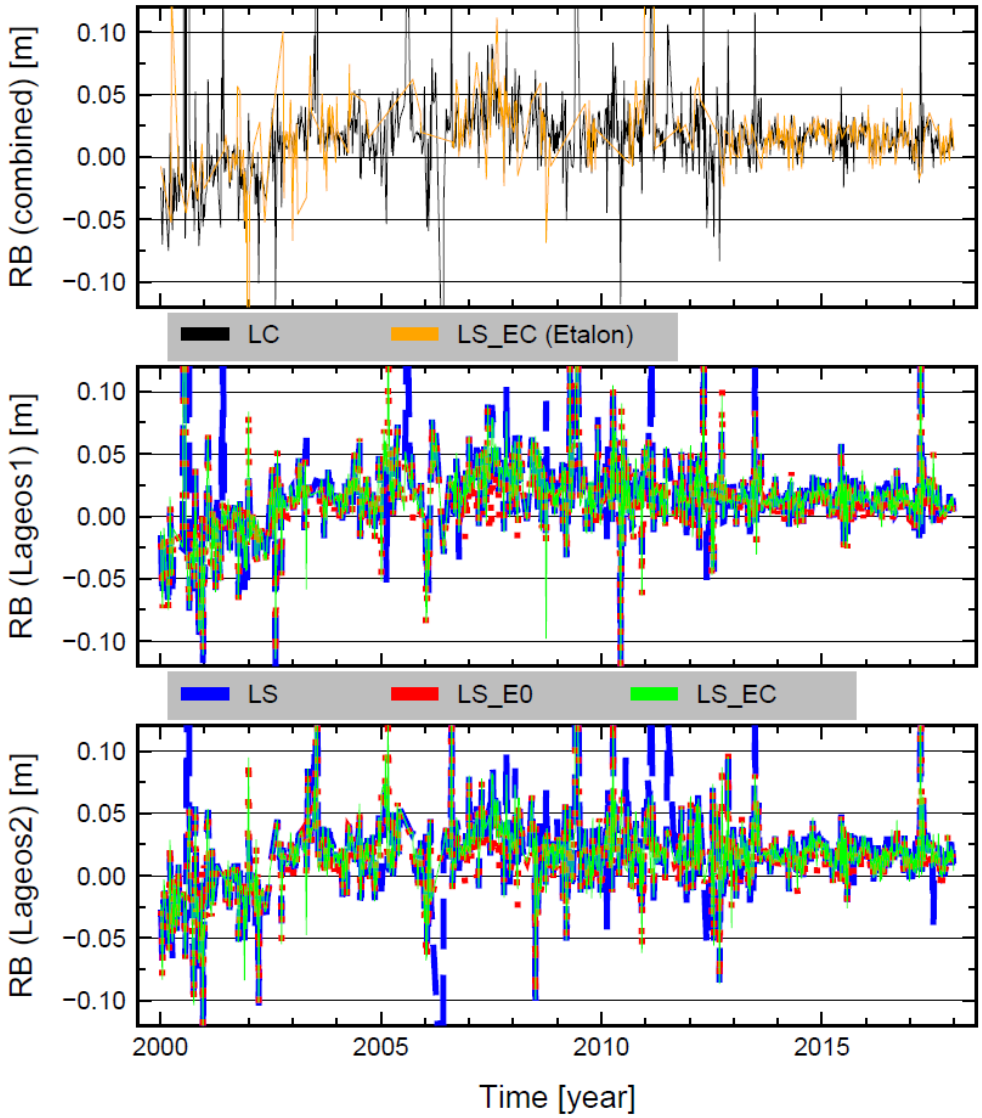


Range Biases: Time Series



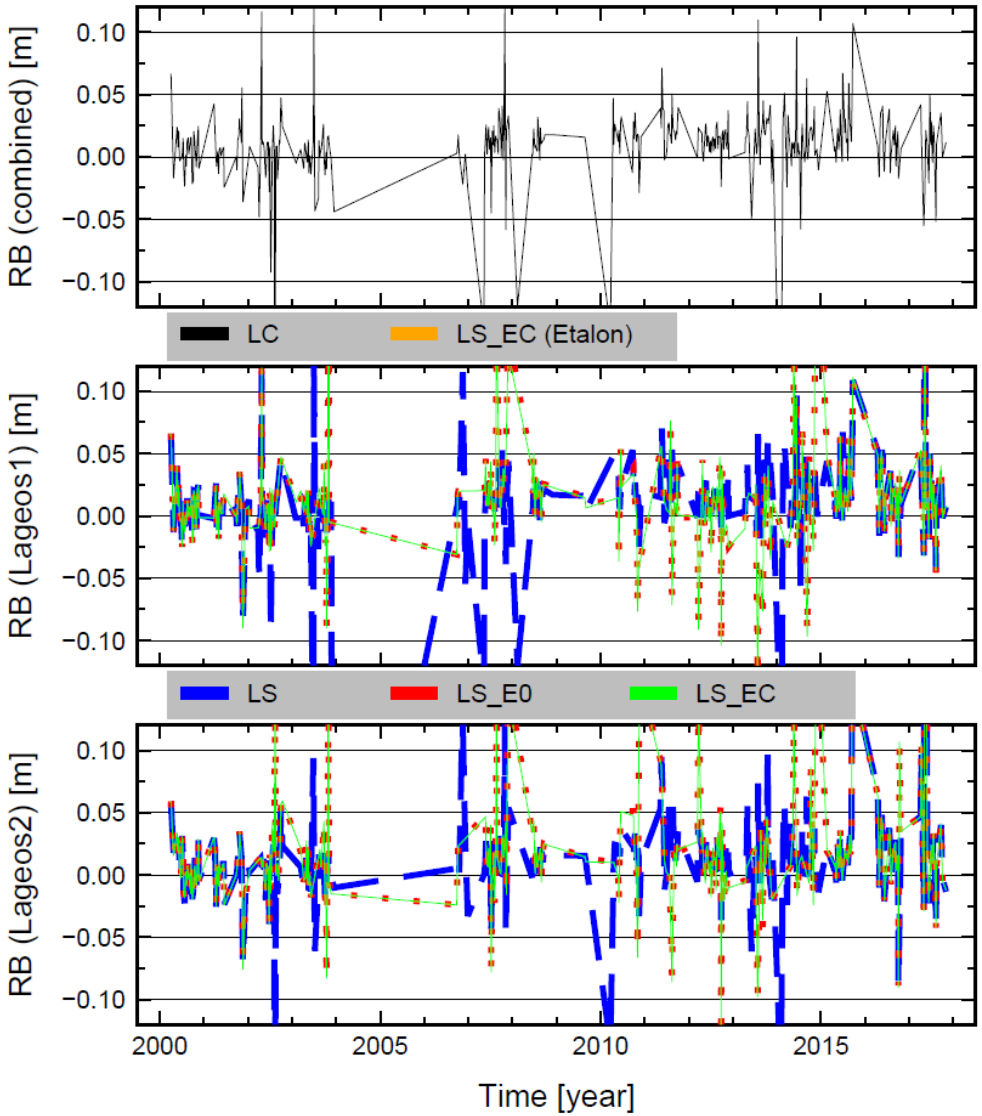
Range Biases: Time Series

7237 Changchun



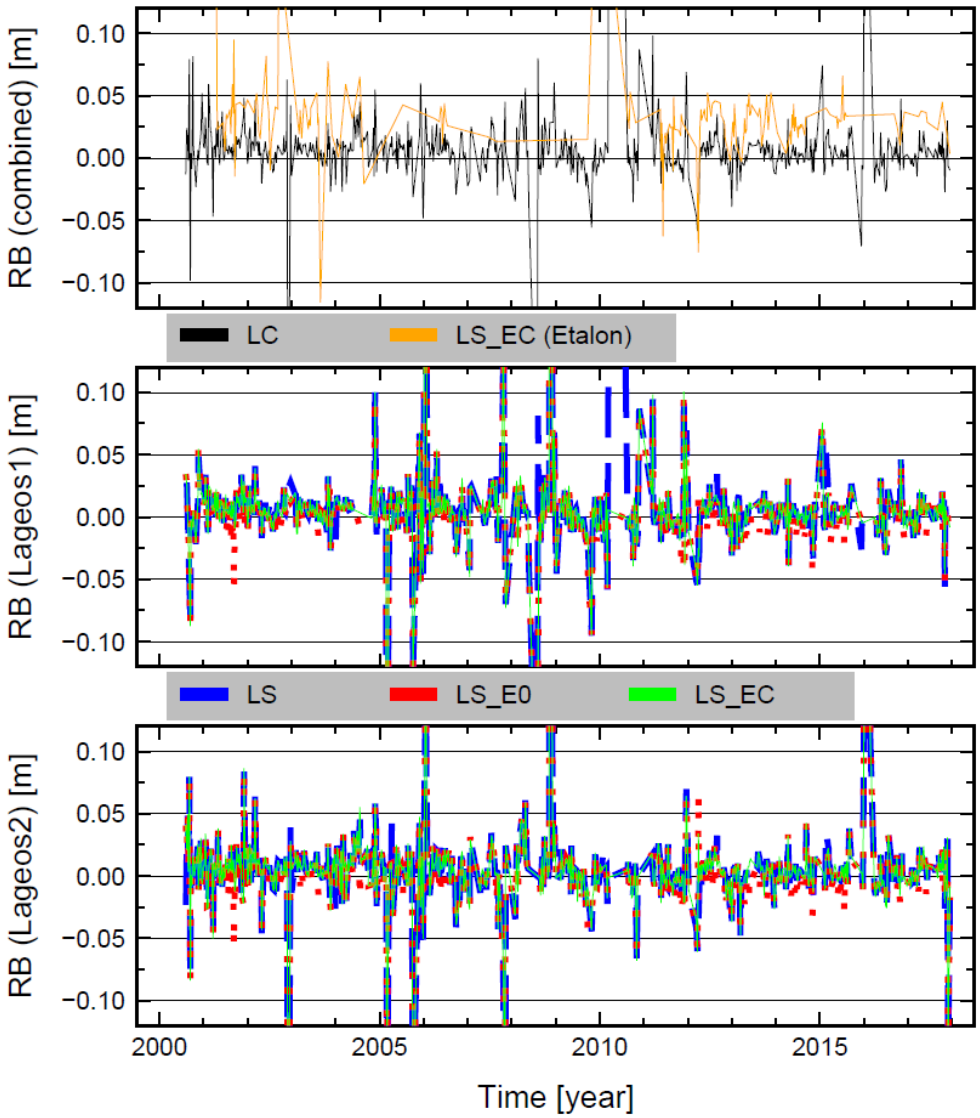
Range Biases: Time Series

7403 Arequipa



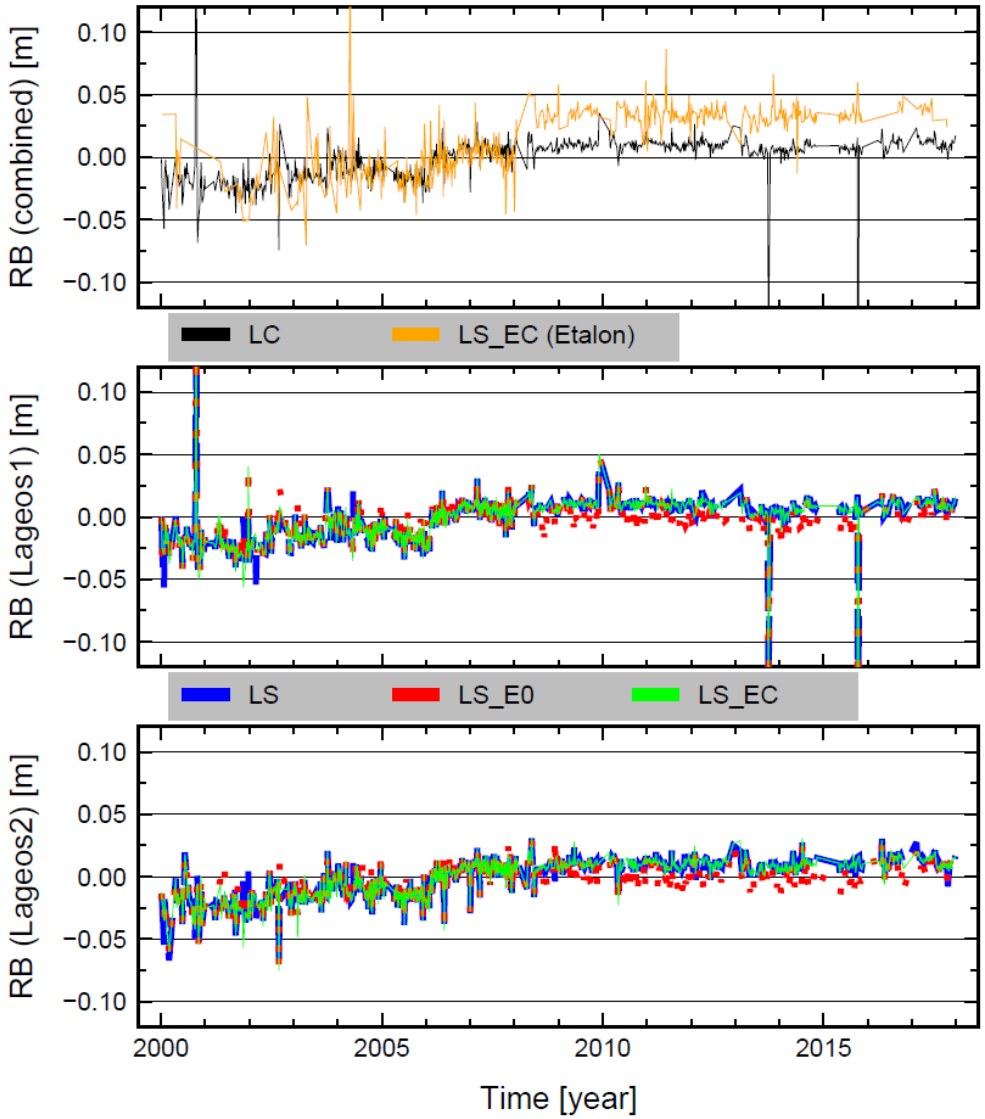
Range Biases: Time Series

7501 Hartebeesthoek

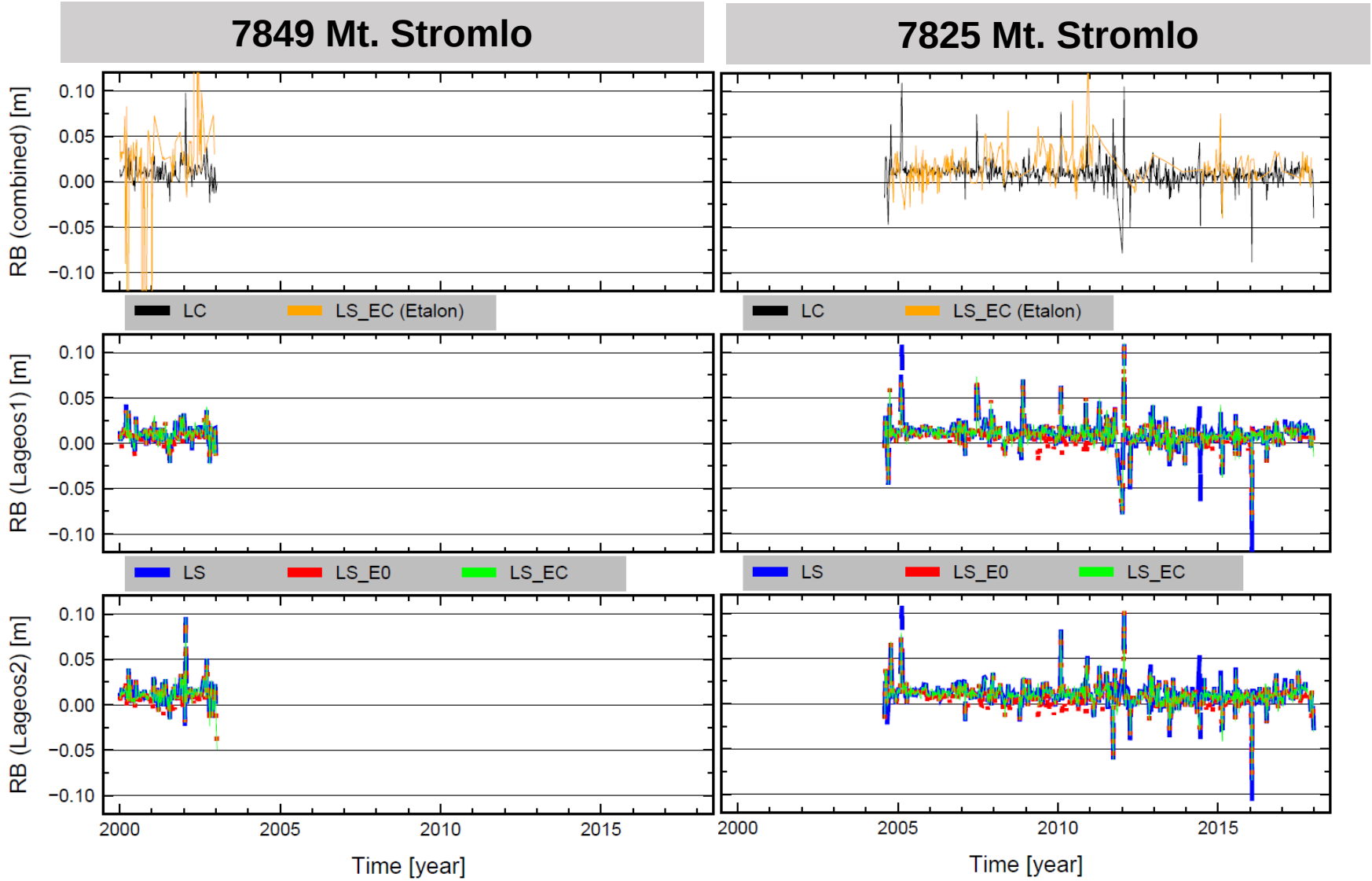


Range Biases: Time Series

7810 Zimmerwald

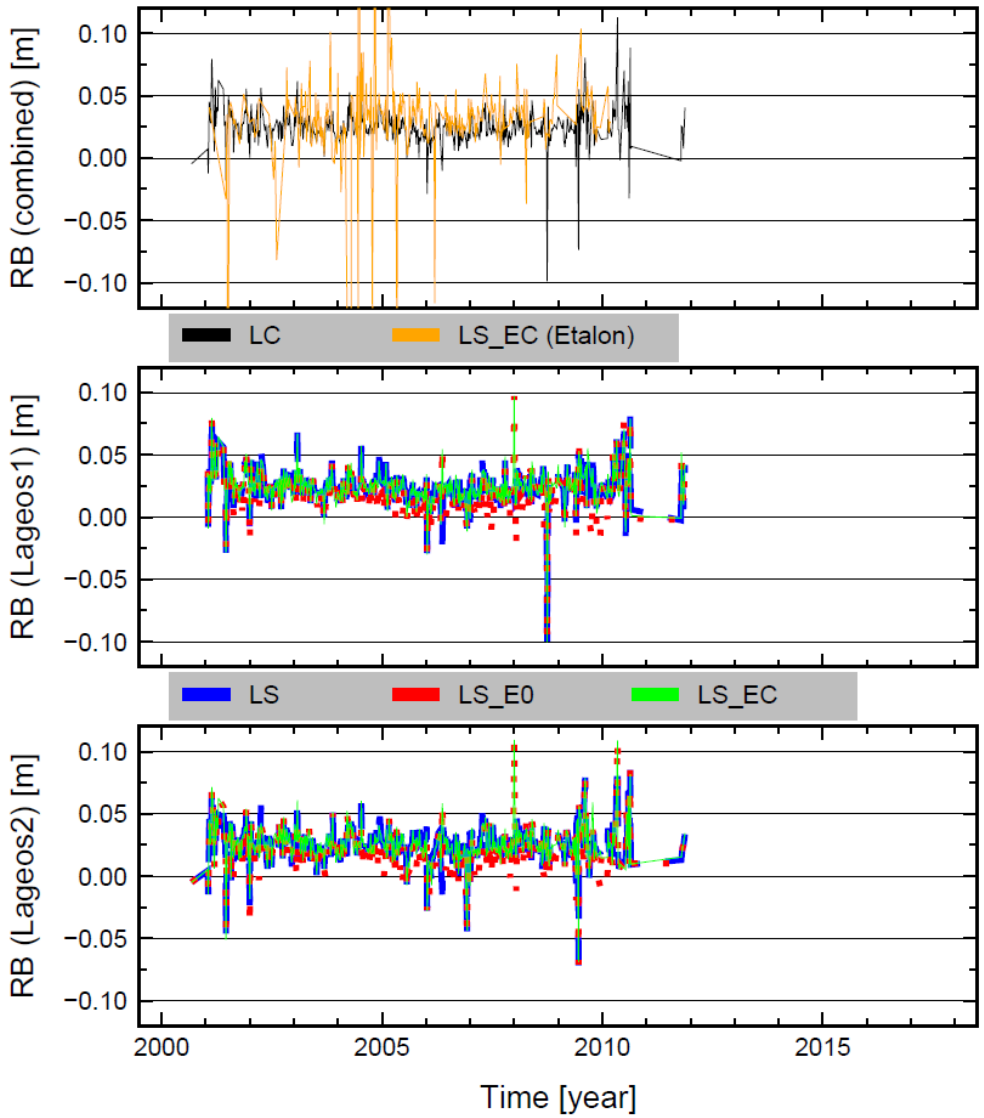


Range Biases: Time Series



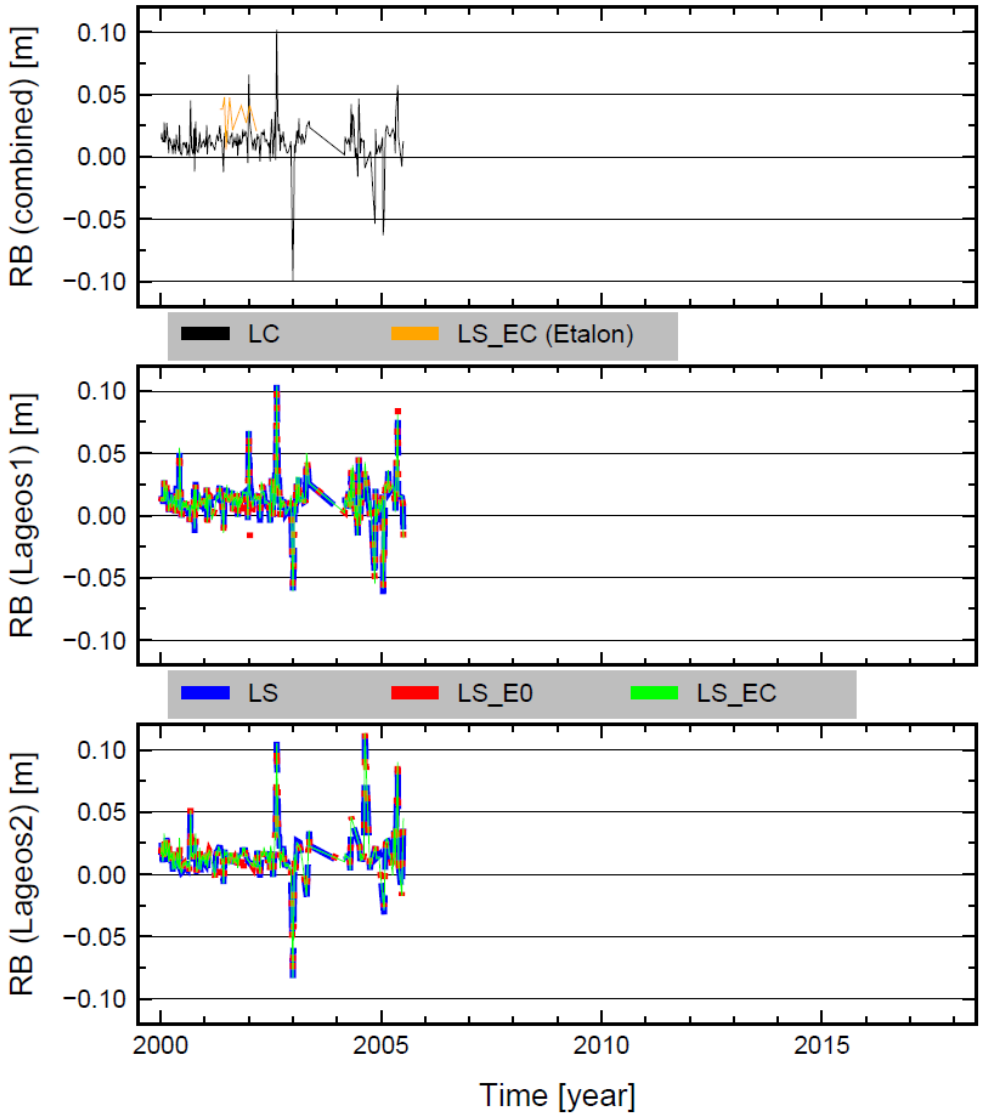
Range Biases: Time Series

7832 Riyadh

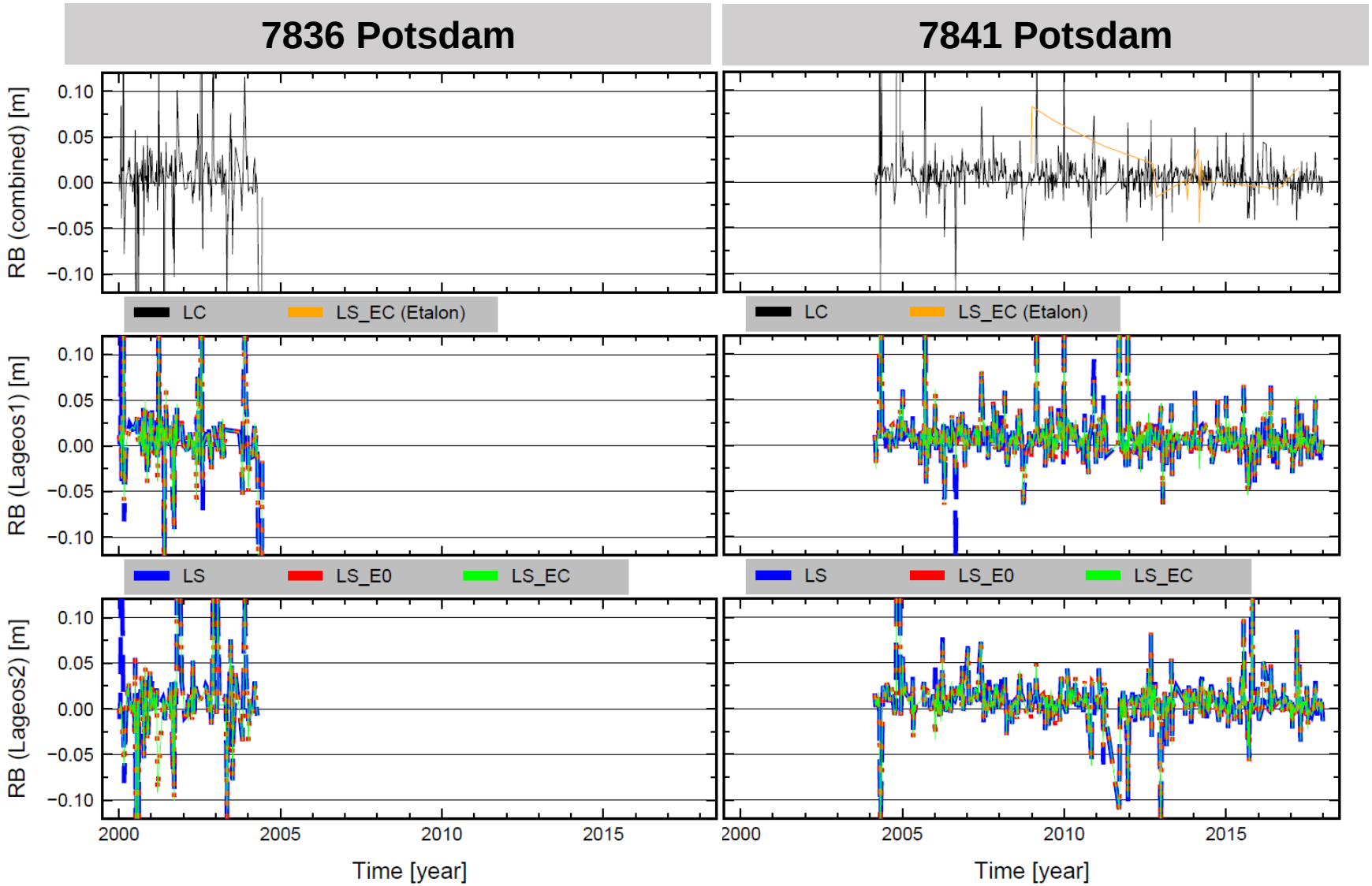


Range Biases: Time Series

7835 Grasse

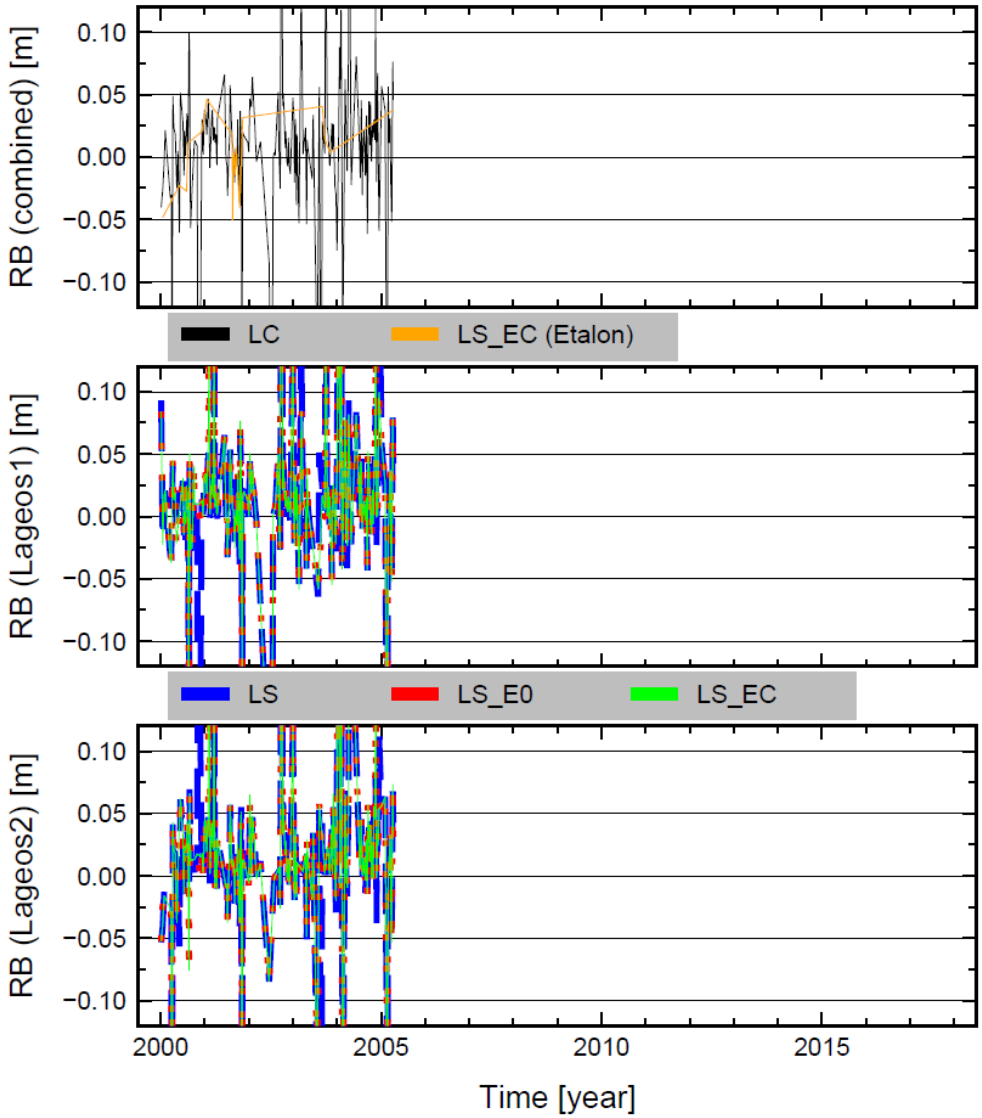


Range Biases: Time Series



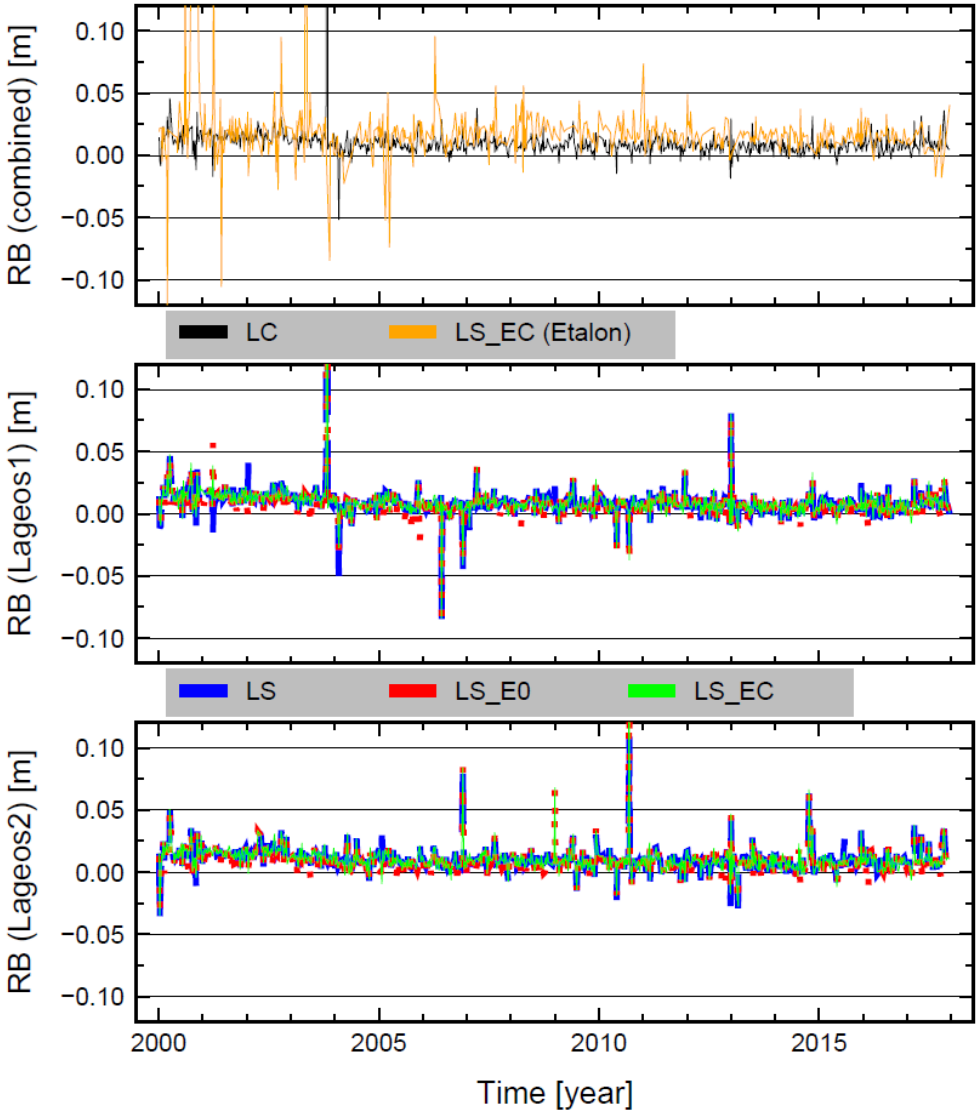
Range Biases: Time Series

7837 Shanghai



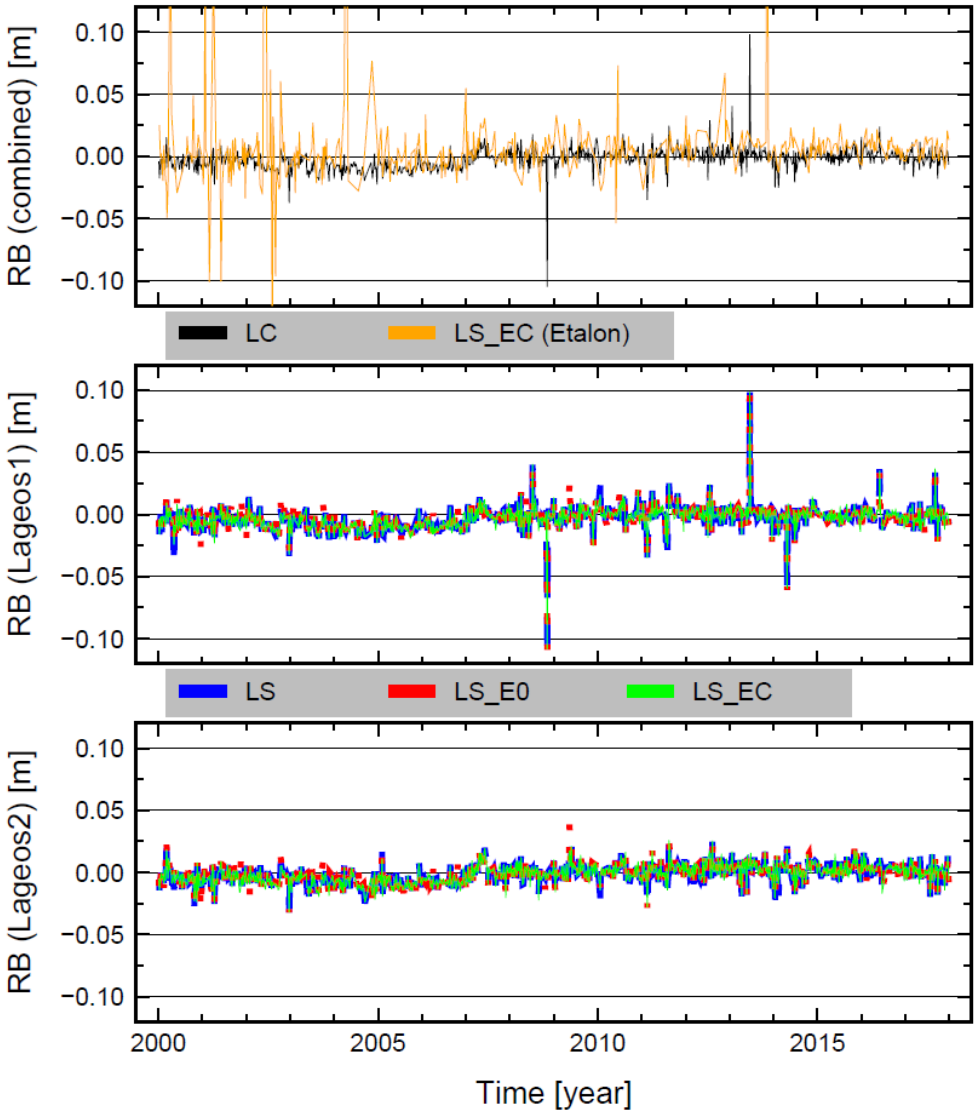
Range Biases: Time Series

7839 Graz

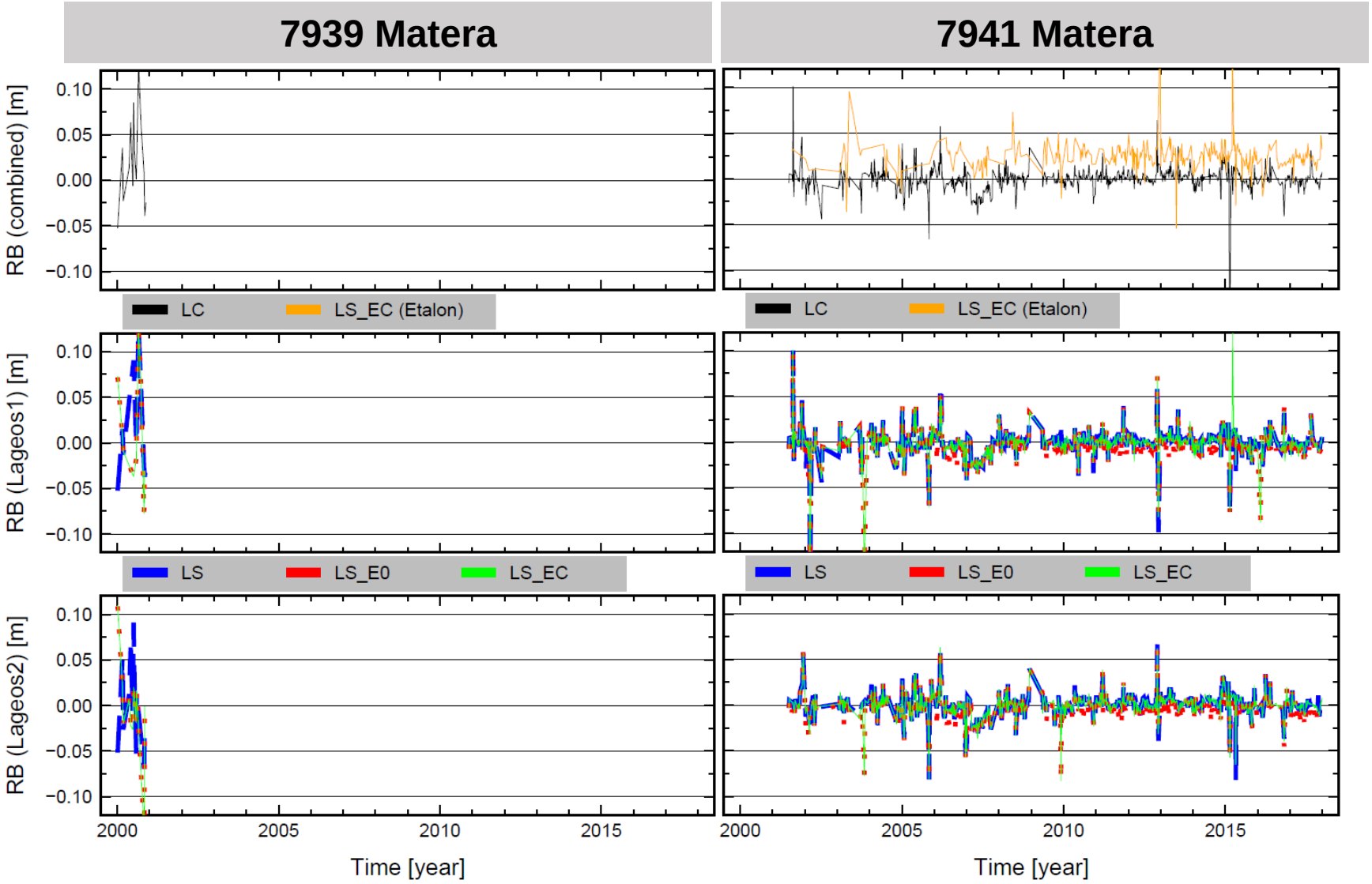


Range Biases: Time Series

7840 Herstmonceux

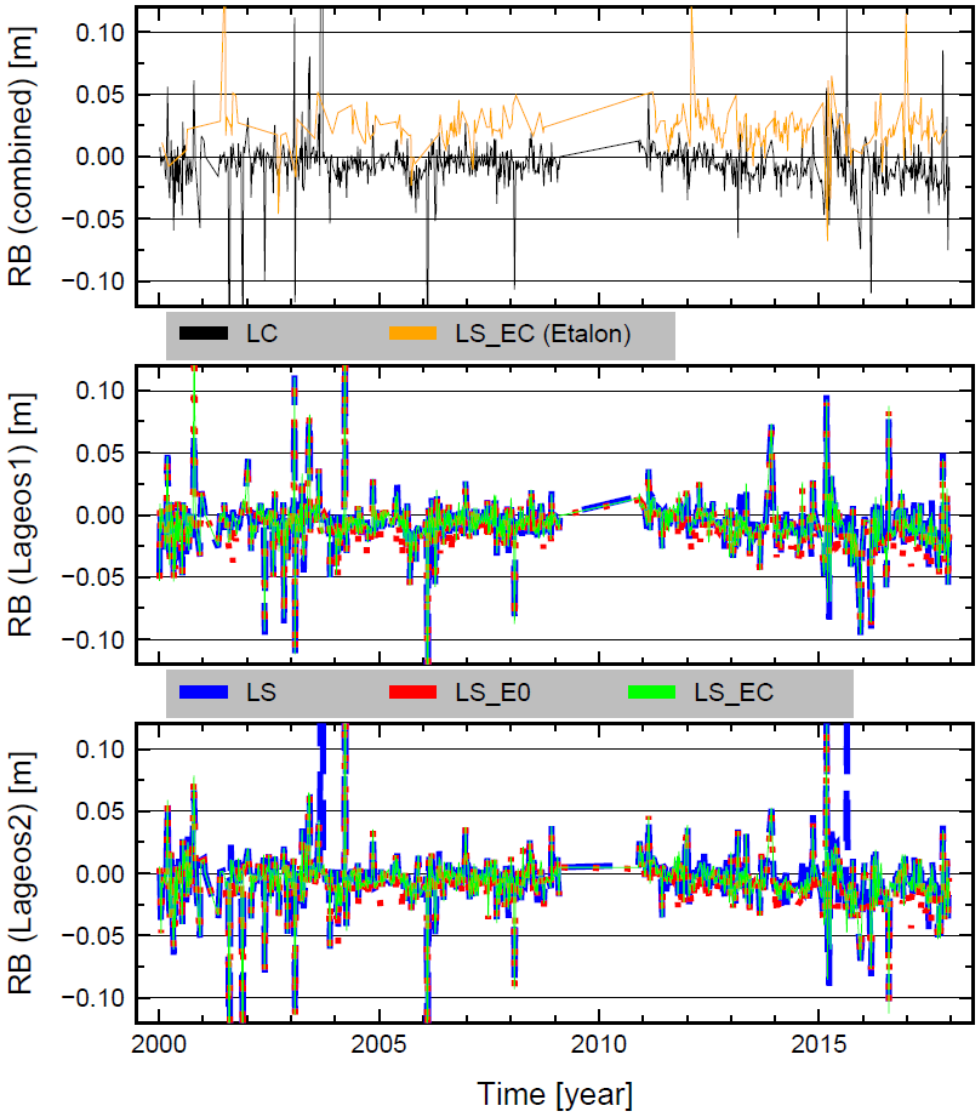


Range Biases: Time Series



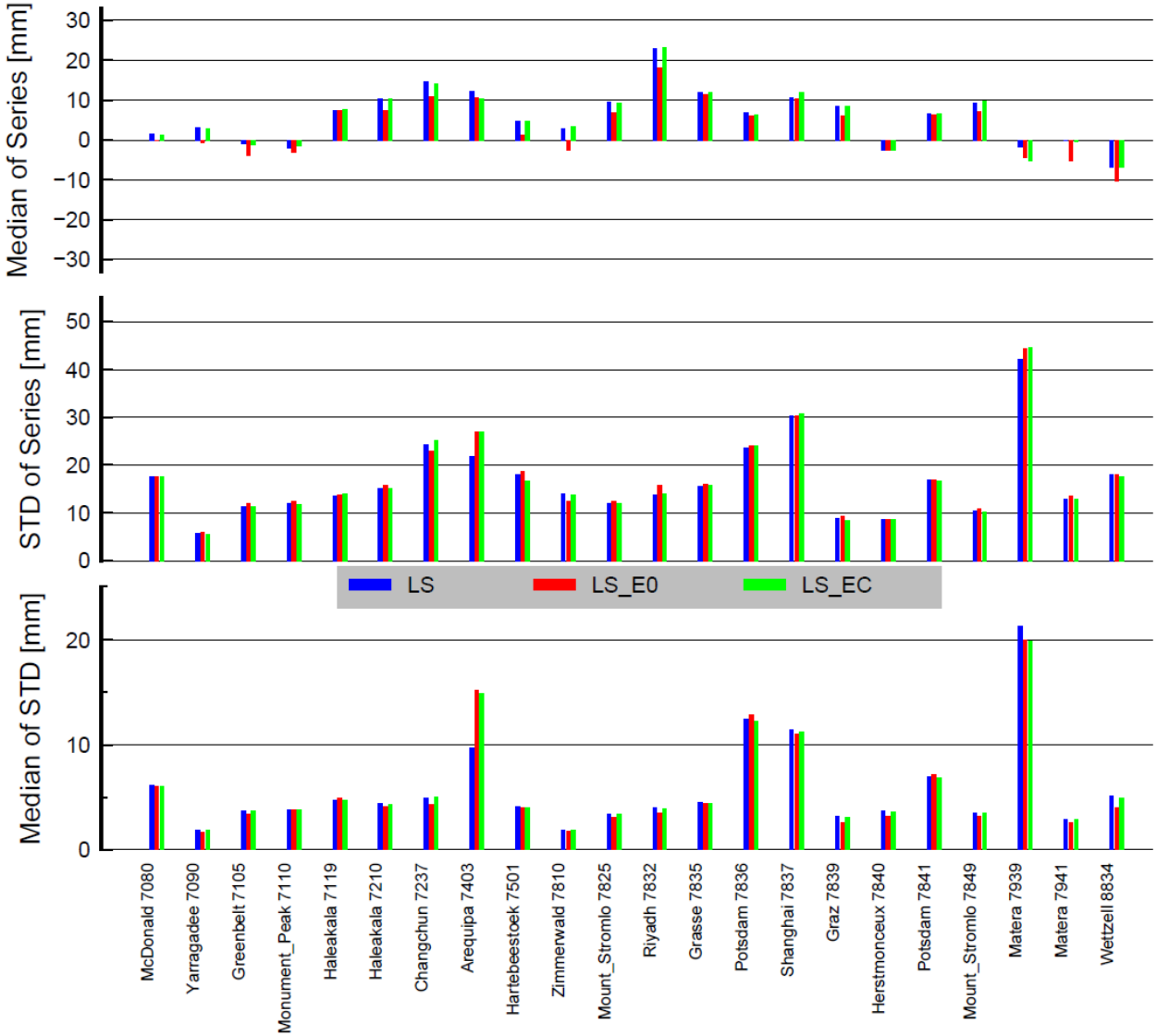
Range Biases: Time Series

8834 Wettzell



Range Biases: Statistics

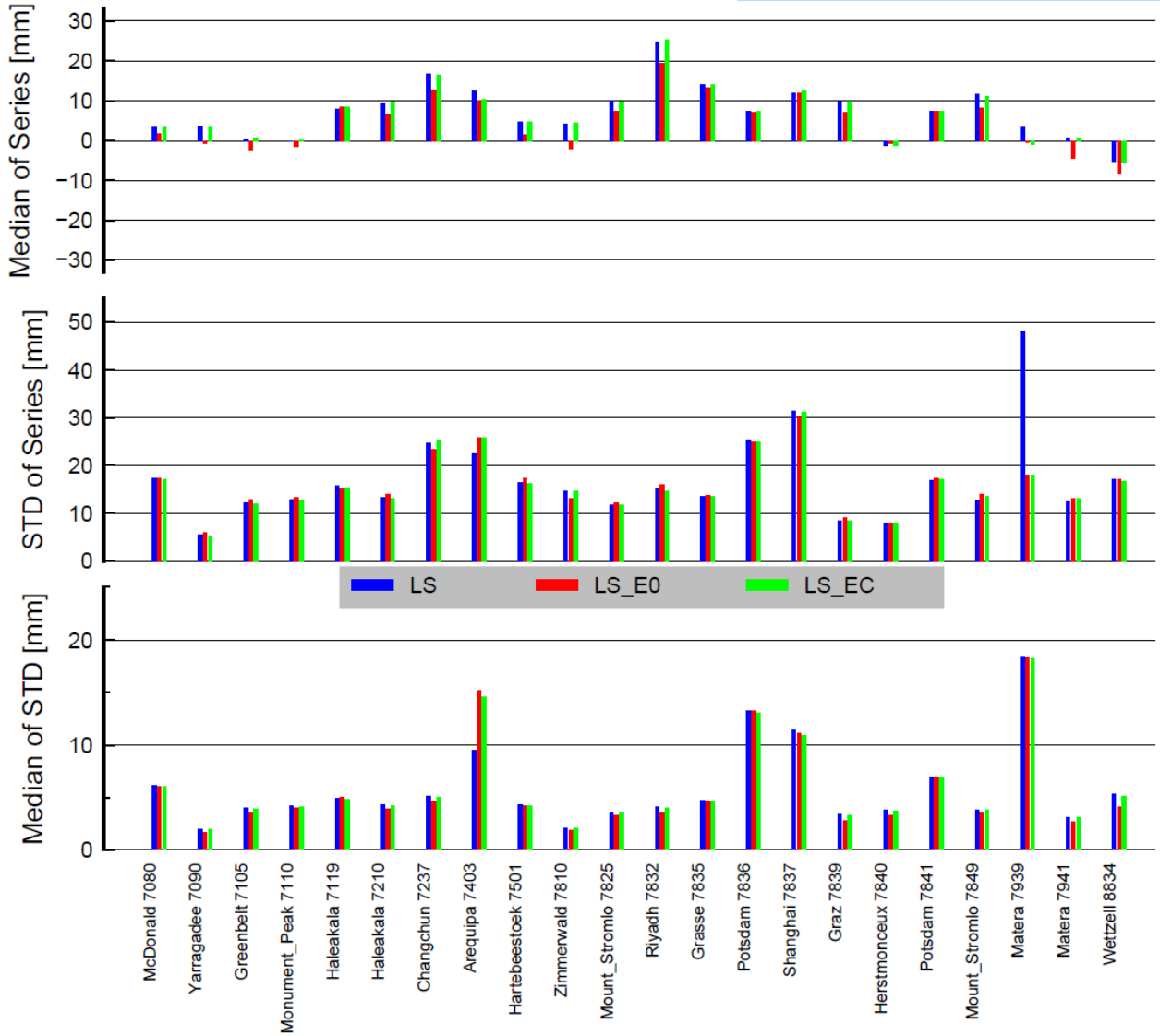
LAGEOS-1



STD of Series:
Values outside
±100 mm removed

Range Biases: Statistics

LAGEOS-2

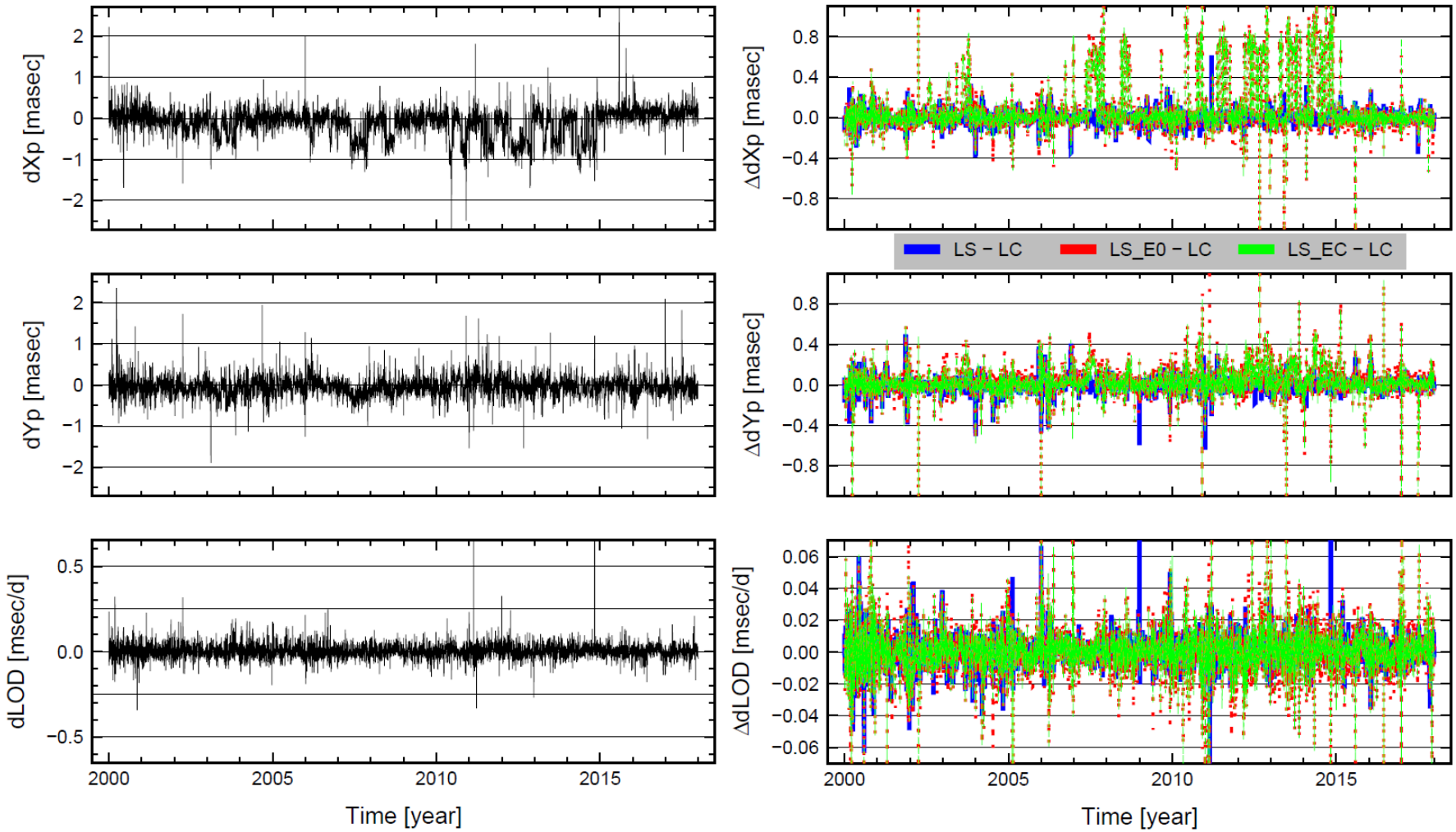


STD of Series:
Values outside
±100 mm removed

ERP: Time Series

LC: Estimates

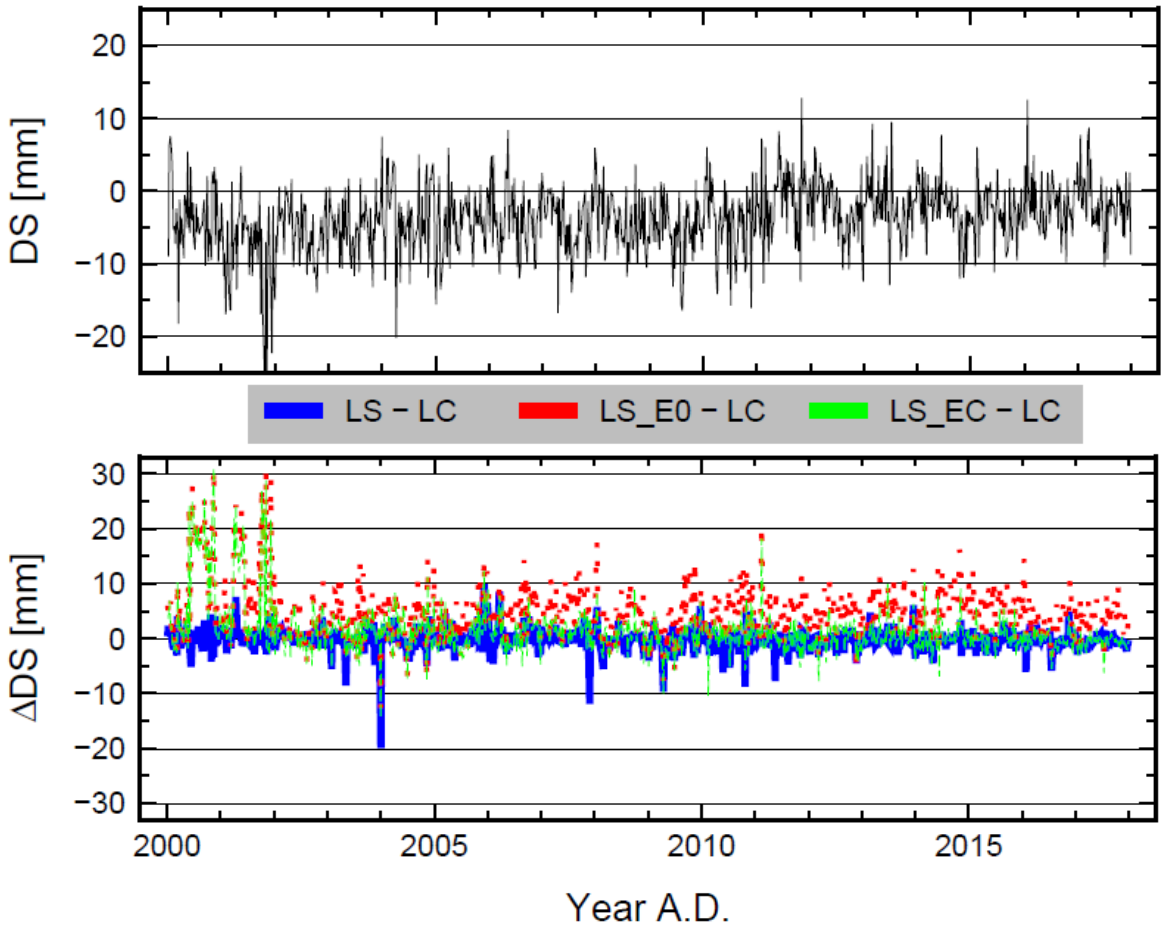
Differences w.r.t. LC



ERP: Statistics

Test Case	LC	LS	LS_E0	LS_EC
X_P				
Median of Series [µas]	-27	-30	**+7**	**+12**
STD of Series [µas]	358	365	**255**	**255**
Median of STD [µas]	**59.7**	**61.2**	**61.3**	**60.4**
Y_P				
Median of Series [µas]	-50	-49	**-14**	**-21**
STD of Series [µas]	245	254	**237**	**239**
Median of STD [µas]	**63.0**	**64.5**	**64.1**	**63.5**
LOD				
Median of Series [µs/d]	**+0.36**	**+0.48**	+0.67	+0.58
STD of Series [µs/d]	46.0	47.1	**42.1**	**42.1**
Median of STD [µs/d]	**8.2**	**8.2**	**8.3**	**8.1**

Differential Scale w.r.t ITRF2014



LC: Estimates

Differences w.r.t. LC

Differential Scale w.r.t ITRF2014

Test Case	LC	LS	LS_E0	LS_EC
DS				
Median of Series [mm]	-3.64	-3.76	**+0.89**	**-2.62**
STD of Series [mm]	**4.80**	**4.87**	5.95	5.62
Median of STD [mm]	**3.38**	3.44	3.57	3.44

Conclusions

- Various RB test cases processed
- Covering 18 years (2000-2017)
- A priori EOP: C04_14
- Range Biases (core stations):
  - few very well calibrated stations
  - most stations with peculiar patterns
- ERP:
  - artefacts in X_P,Y_P (LC)
  - improvement by adding Etalon (lower median/STD of time series)
  - negligible change in median of STD
  - negligible influence of RB
- Scale:
  - adding Etalon:
    reducing artefacts in late 2001
    new artefacts in 2000-2001
  - LS_E0 (LAGEOS+Etalon/no Etalon-RB): lowest median of time series!
  - LC (LAGEOS-only/ combined RB): lowest median of STD!

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