

# DGFI's SLR contributions to the COL-WG

***Mathis Bloßfeld, Horst Müller***

*Deutsches Geodätisches Forschungsinstitut, DGFI  
Centrum für Geodätische Erdsystemforschung, CGE*

# COL-WG requests

## Test period:

CONT08 (2008-08-10/30)  
CONT11 (2011-09-11/10-01)

## Data set:

LAGEOS 1 & LAGEOS 2  
28 stations, defined by COL-WG

## A priori models to be implemented acc. to last COL-WG meeting:

Station coordinates: ITRF2008  
EOP: IERS 08 C04 (new theory) @ 0h

# COL-WG requests & DGFI solution

| Test period:                                                   |                                                                             |
|----------------------------------------------------------------|-----------------------------------------------------------------------------|
| CONT08 (2008-08-10/30)<br>CONT11 (2011-09-11/10-01)            | OK                                                                          |
| Data set:                                                      |                                                                             |
| LAGEOS 1 & LAGEOS 2                                            | OK                                                                          |
| 28 stations, defined by COL-WG                                 | OK                                                                          |
| A priori models to be implemented acc. to last COL-WG meeting: |                                                                             |
| Station coordinates: ITRF2008                                  | OK                                                                          |
| EOP: IERS 08 C04 (new theory) @ 0h                             | <b>Solutions computed with old software version. New version available!</b> |

# COL-WG requests

| A priori models to be implemented acc. to last COL-WG meeting:                                                  |  |
|-----------------------------------------------------------------------------------------------------------------|--|
| Gravity field: EIGEN-GRGS RL02 (mean atmospheric gravitational effect and oceanic circulation effect are added) |  |
| Atmospheric tide model: Ray-Ponte                                                                               |  |
| Ocean tide loading model: FES2004                                                                               |  |
| Optical tropospheric propagation delay: Mendes-Pavlis                                                           |  |

# COL-WG requests & DGFI solution

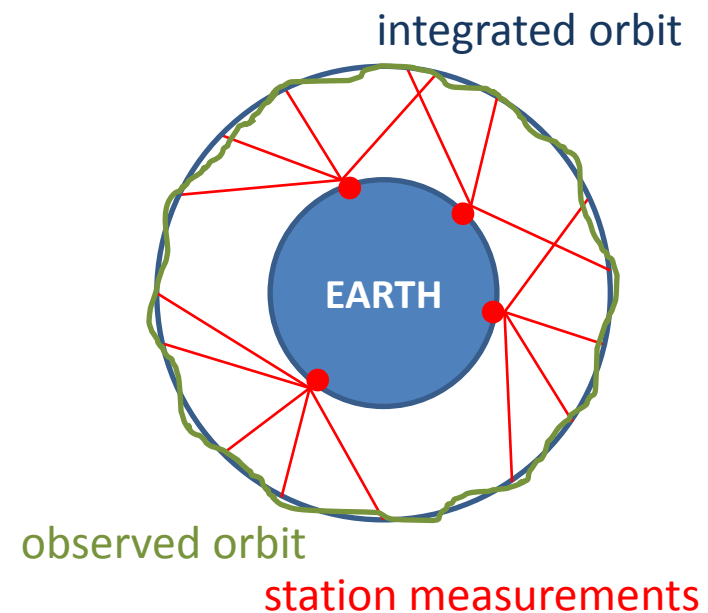
| A priori models to be implemented acc. to last COL-WG meeting:                                                  |                                  |
|-----------------------------------------------------------------------------------------------------------------|----------------------------------|
| Gravity field: EIGEN-GRGS RL02 (mean atmospheric gravitational effect and oceanic circulation effect are added) | OK                               |
| Atmospheric tide model: Ray-Ponte                                                                               | Implementation not yet finished. |
| Ocean tide loading model: FES2004                                                                               | OK                               |
| Optical tropospheric propagation delay: Mendes-Pavlis                                                           | OK                               |

| Reduced parameters in DGFI solution:                 |  |
|------------------------------------------------------|--|
| Osculating Keplerian Elements                        |  |
| Emp. Acc. T-, N-direction (opr) / T-direction (@ 0h) |  |
| Multiplier for solar radiation pressure (@ mid-arc)  |  |
| Station biases                                       |  |

# Validation of DGFI solution (internal)

- Orbit fit (mean RMS of difference between integrated and ,observed' orbit):

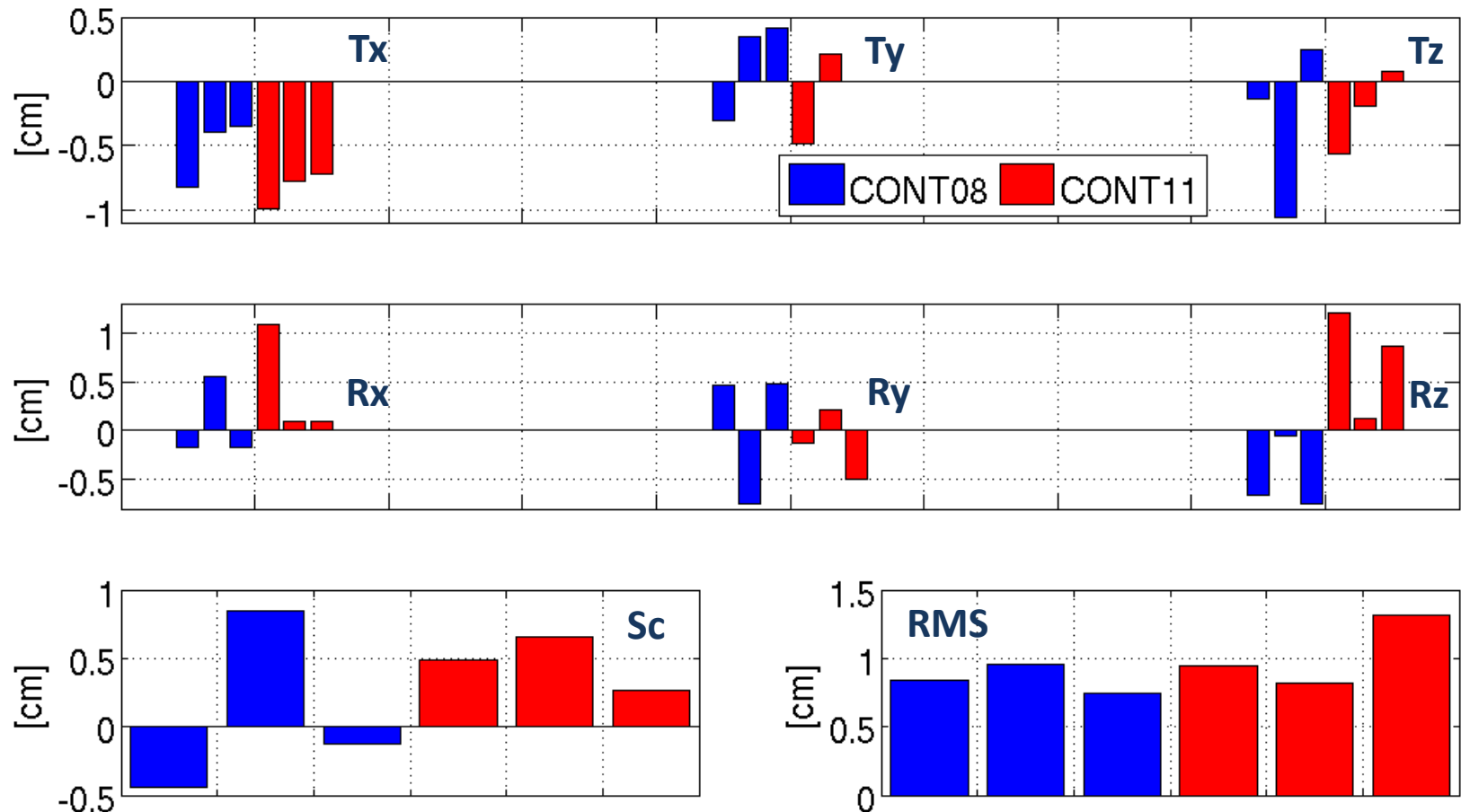
| GPS week | LAGEOS 1 [cm] | LAGEOS 2 [cm] |
|----------|---------------|---------------|
| 1492     | 0.98          | 1.01          |
| 1493     | 1.36          | 1.06          |
| 1494     | 1.30          | 1.15          |
| 1653     | 1.17          | 1.28          |
| 1654     | 0.98          | 1.11          |
| 1655     | 1.34          | 1.36          |



→ Acceptable level of orbit fits.  
Could be improved, if only ,good' stations are considered.

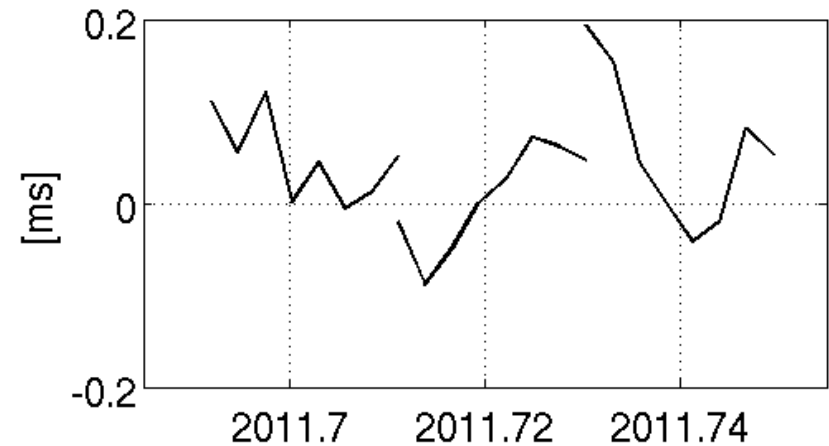
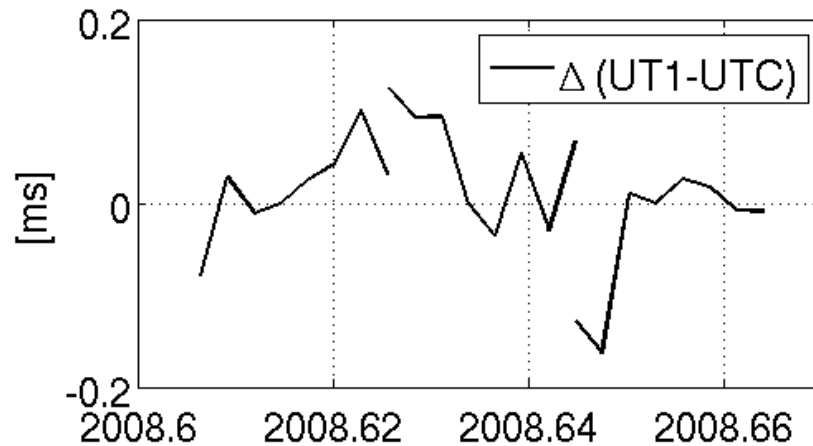
# Validation of DGFI solution (external)

- 7 parameter similarity transformation on ITRF2008:

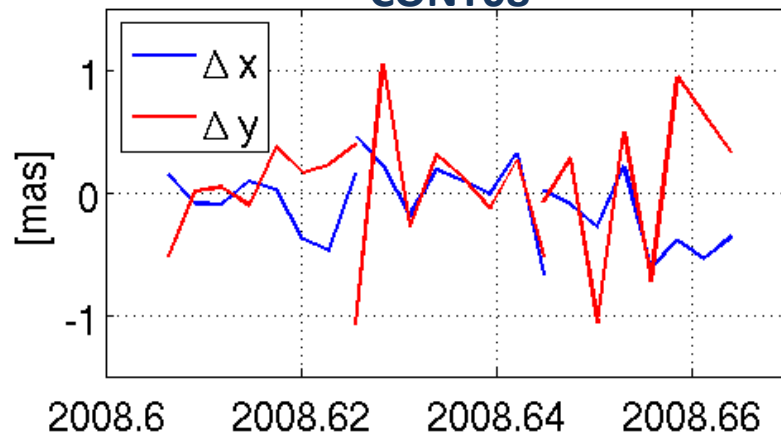


# Validation of DGFI solution (external)

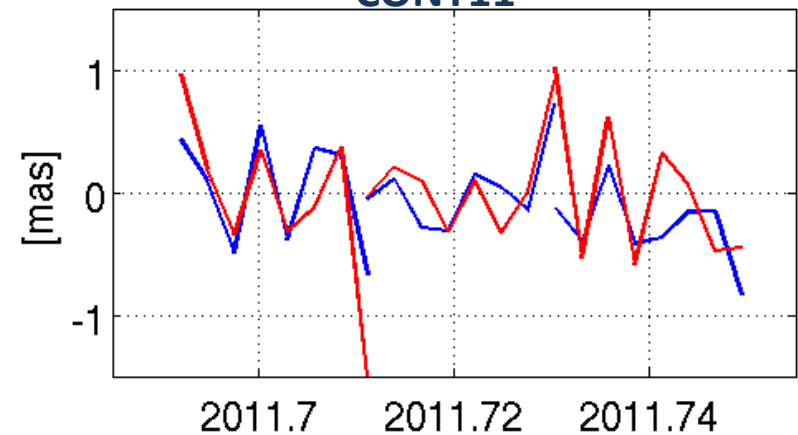
## ■ ERP w.r.t. IERS 08 C04:



**CONT08**



**CONT11**



# Conclusion

- DGFI SLR solution not yet achieving totally the Col-WG requests
  - Release of DOGS-OC 5.2 already done
    - New rotation theory implemented
    - Implementation of corrections for atmospheric tides in progress
  - Orbit fits are around 1 cm for all solutions
  - Transformation parameters w.r.t. ITRF2008 are around 1 cm
  - Offsets w.r.t. IERS 08 C04 are around  $\pm 0.15$  ms for UT1-UTC and  $\pm 1$  mas for the pole coordinates
  - Should the list of neglected observations also be aligned as the list of used stations?
- DGFI VLBI solution
  - Implementation of new nutation theory not yet finished