

# Contribution to ITRF2008

Philip Moore

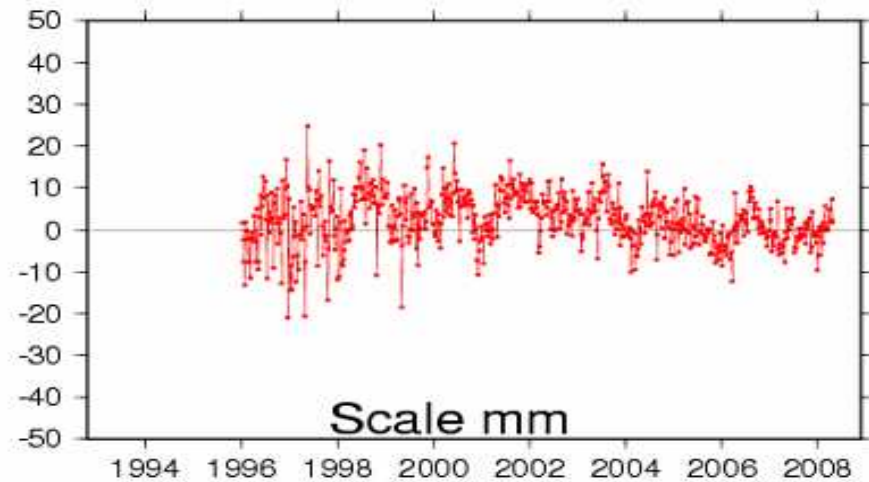
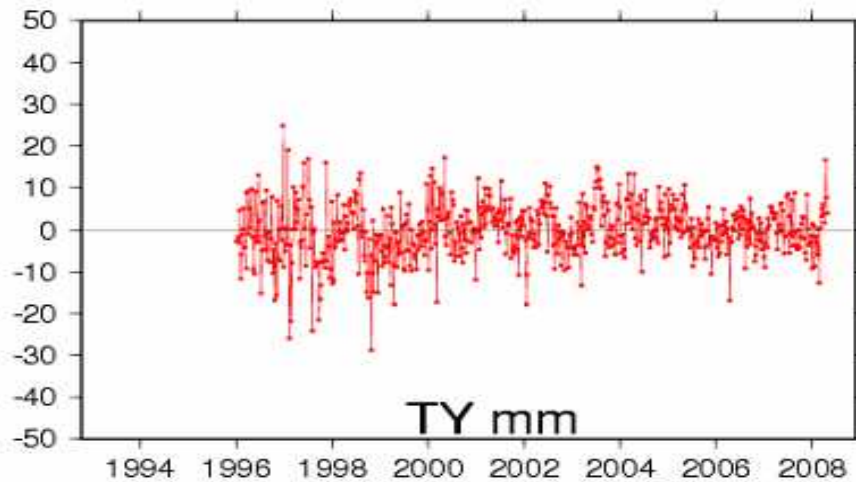
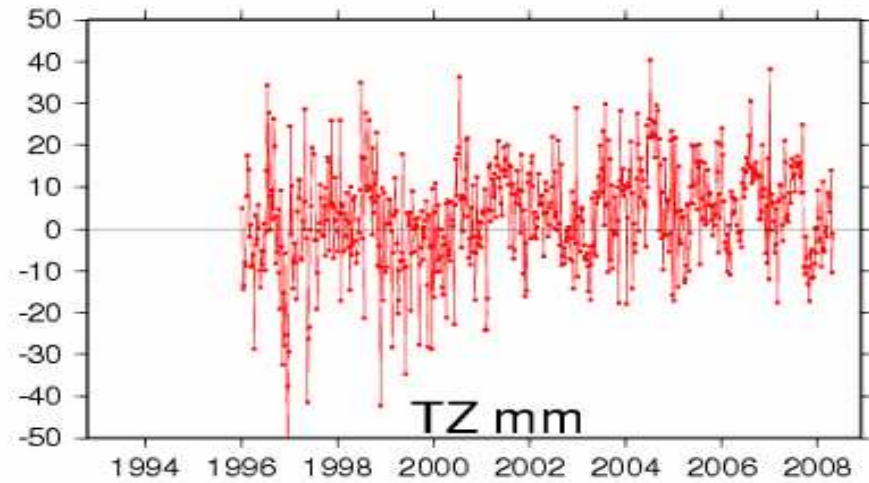
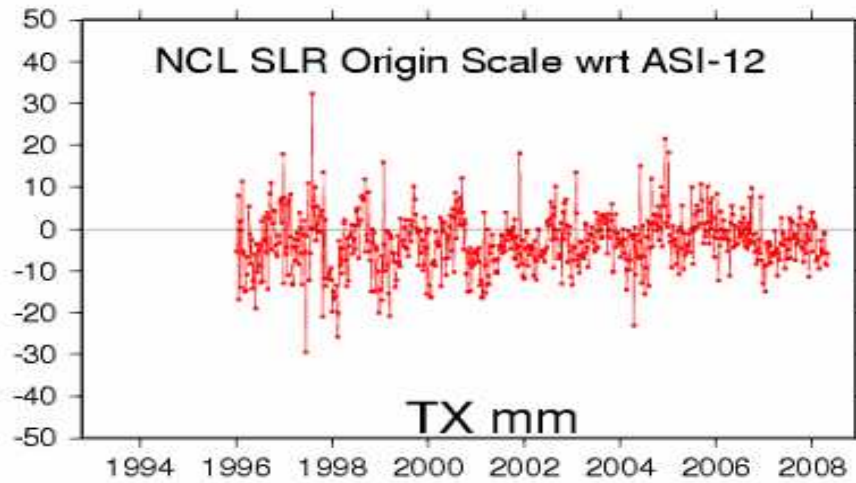
School of Civil Engineering  
and Geosciences  
Newcastle University

# Faust

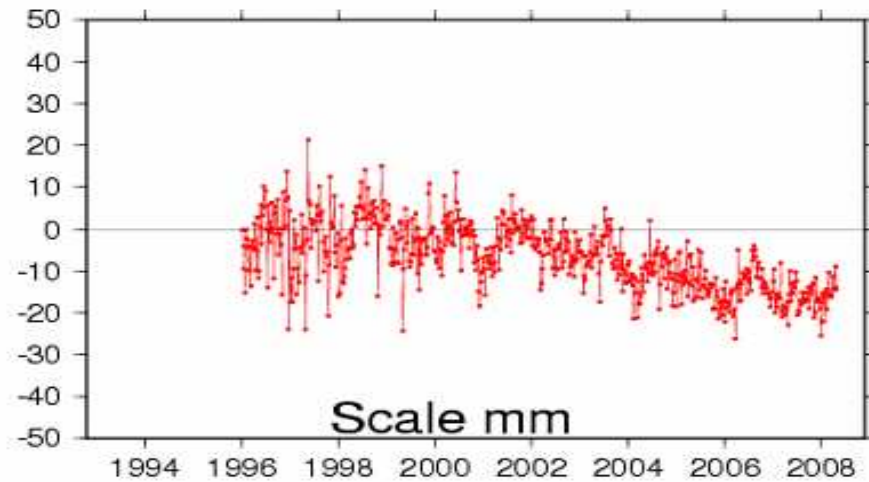
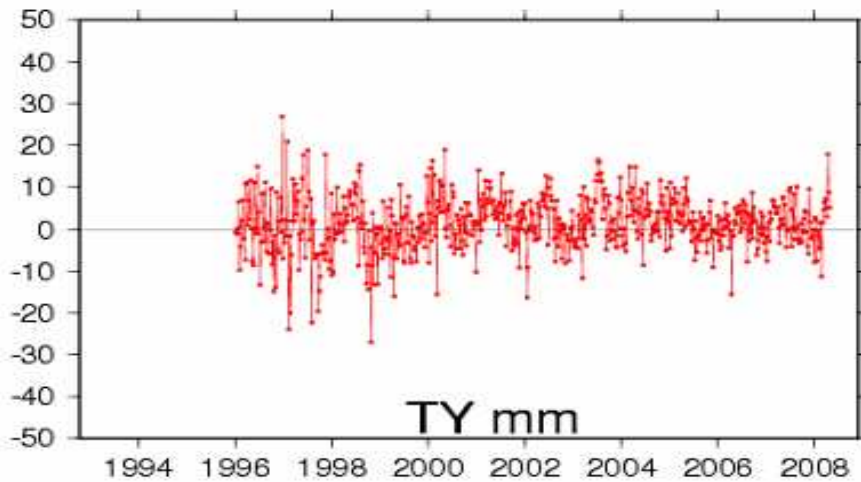
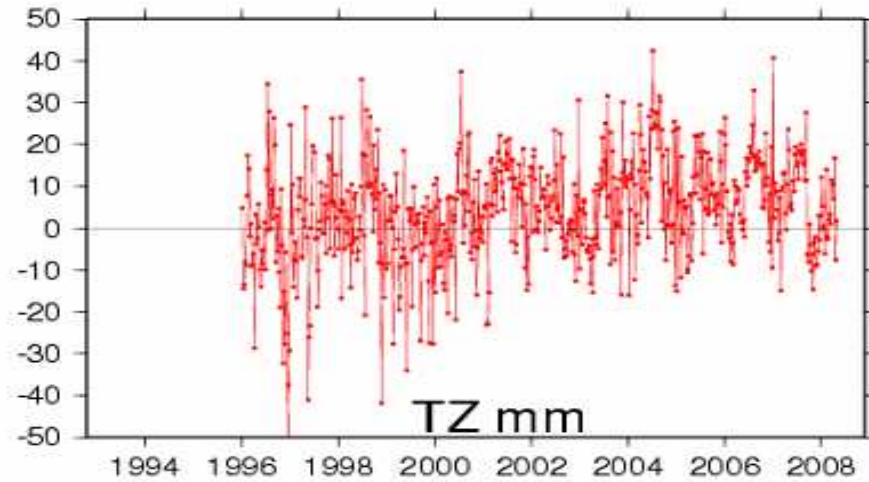
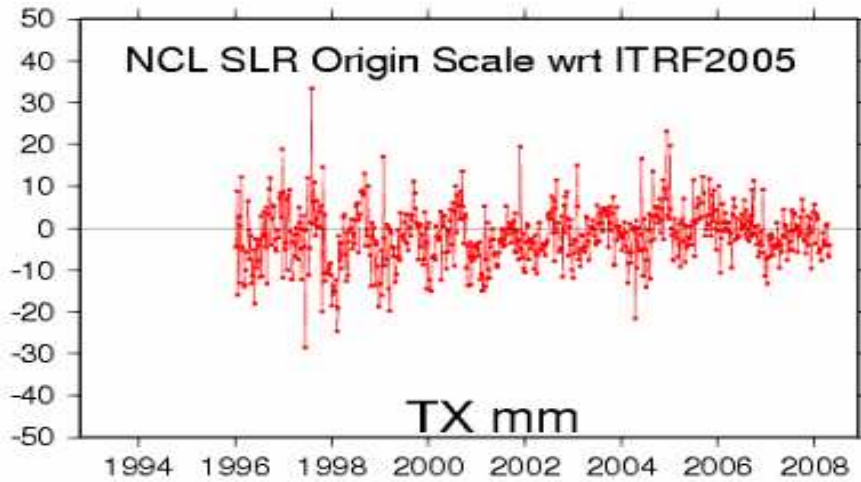
## Newcastle University in-house precise orbit determination software

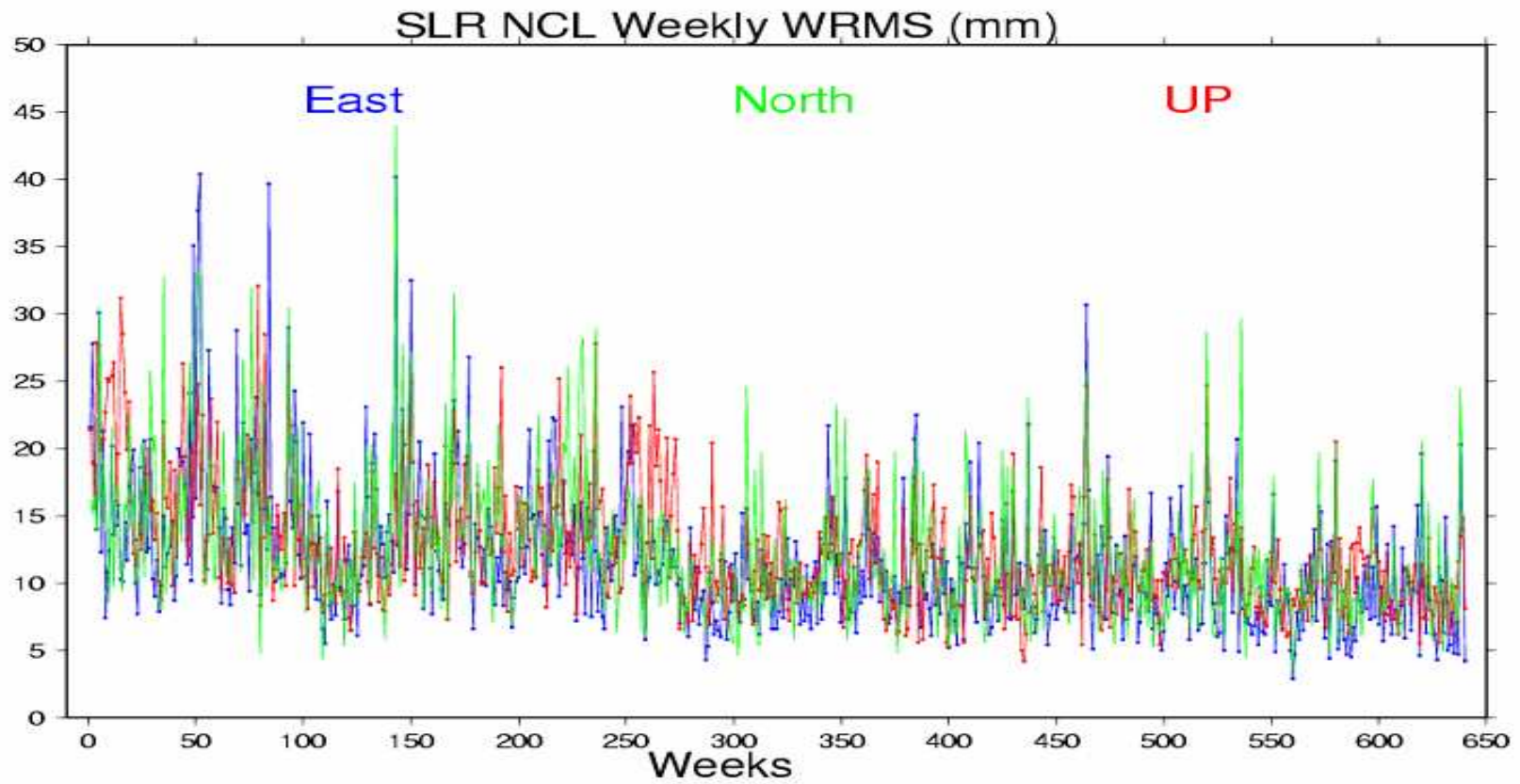
- Multi-satellite multi-arc
  - Dynamic and reduced dynamic modes
- Tracking data
  - SLR
  - microwave (DORIS, PRARE, Tranet)
  - Altimetry (heights, SXO,DXO)
  - Cartesian positioning from GPS

# SLR: NCL v ASI Lageos 1/2 coordinates



# SLR: NCL v ITRF2005 Lageos 1/2 coordinates





# FAUST: DORIS

## Heritage

Capability from launch of T/P  
ENVISAT precise orbit calibration (reduced dynamic mode)

## Force Model:

IERS 2003 Convention

## Results here used

### Gravity field

GGM02C – deg/order 70

### Neutral air density

MSIS83

Satellite area : macro model (ENVISAT, SPOT)

### Ocean Tides

CSR4.0

### Polar Motion

C04 Daily values

## Measurement Model

### Station coordinates

DPOD2005

### Ocean tidal loading

GOT00

COM correction : DORIS data record

## DORIS Data

ENVISAT, Spot2, Spot4, Spot5

1 Jan 2003 – 31 Dec 2007

Arcs

7 day arcs corresponding to GPS weeks

Arcs stopped/restarted before/after manoeuvre

Arcs less than 24hr not used

## Estimated parameters

Satellite position/velocity

6hr drag scale factors

Daily once rev along track and cross track empirical accelerations

(SRP coefficient fixed at  $C_{SRP} = 1.0$ )

Frequency offset per DORIS pass

Tropospheric scaling factor per DORIS pass (scaling of correction on DORIS data record)

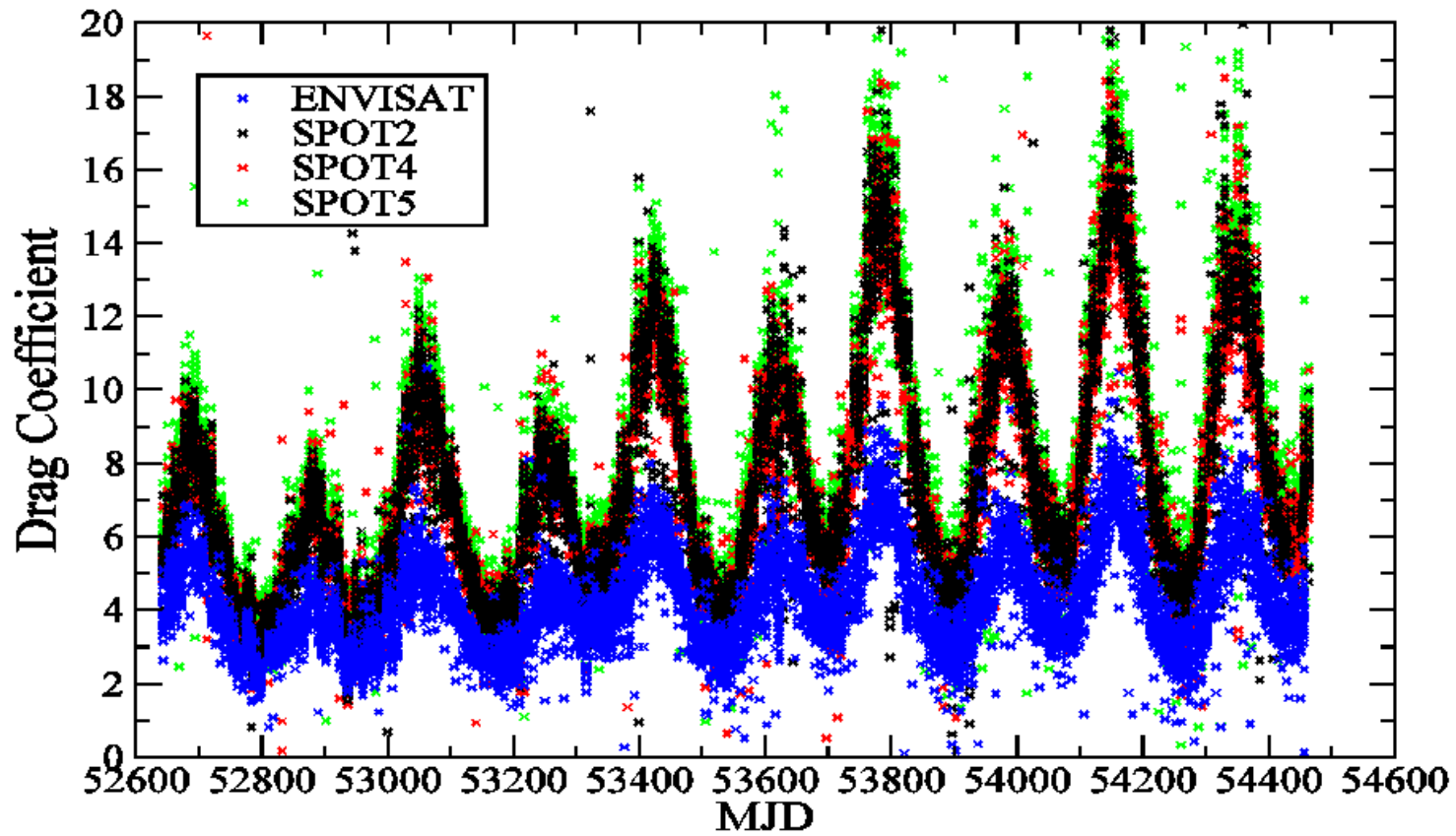
## DORIS Rejection Criterion

5.0 mm/s

No elevation cutoff

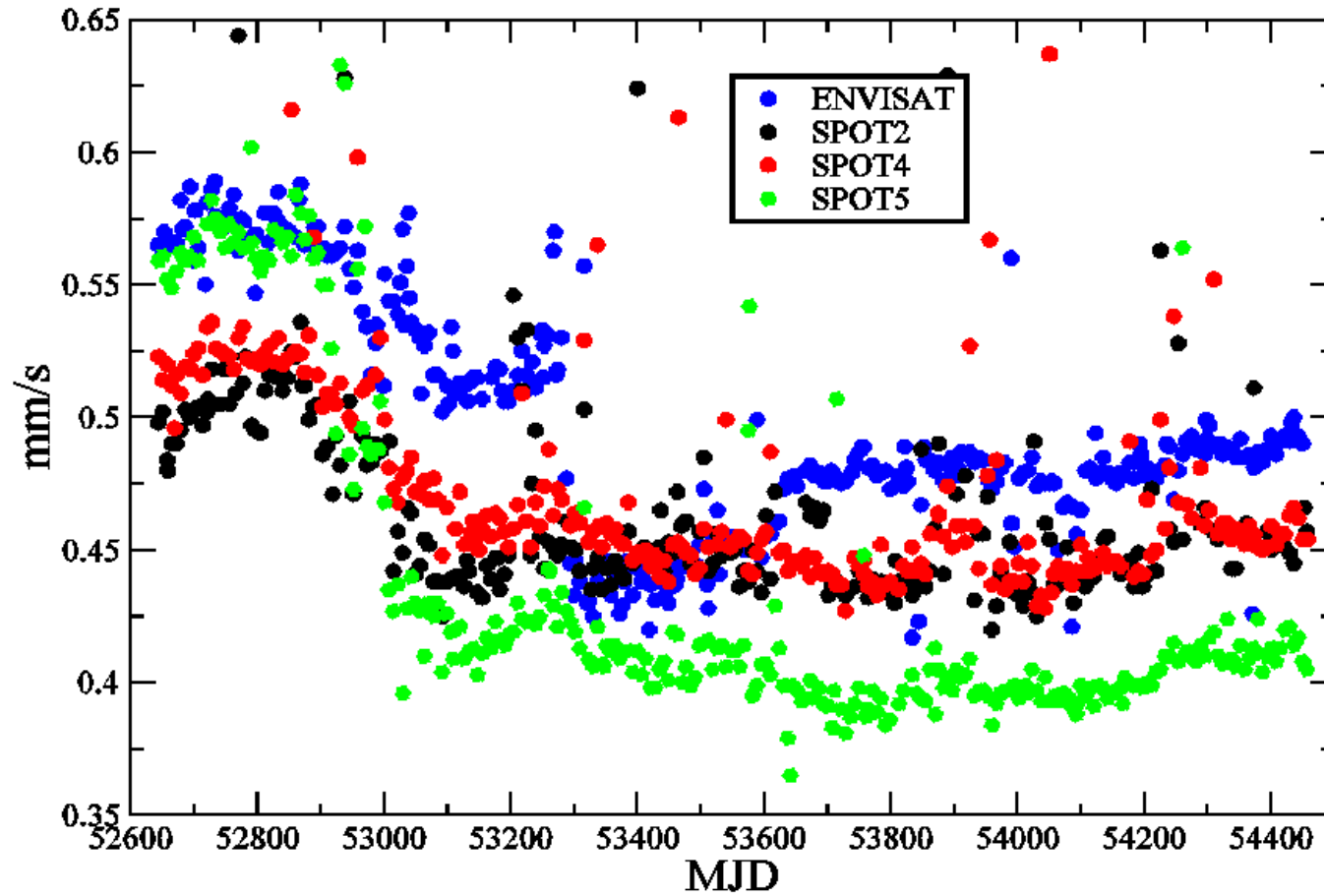


# Drag scale coefficients

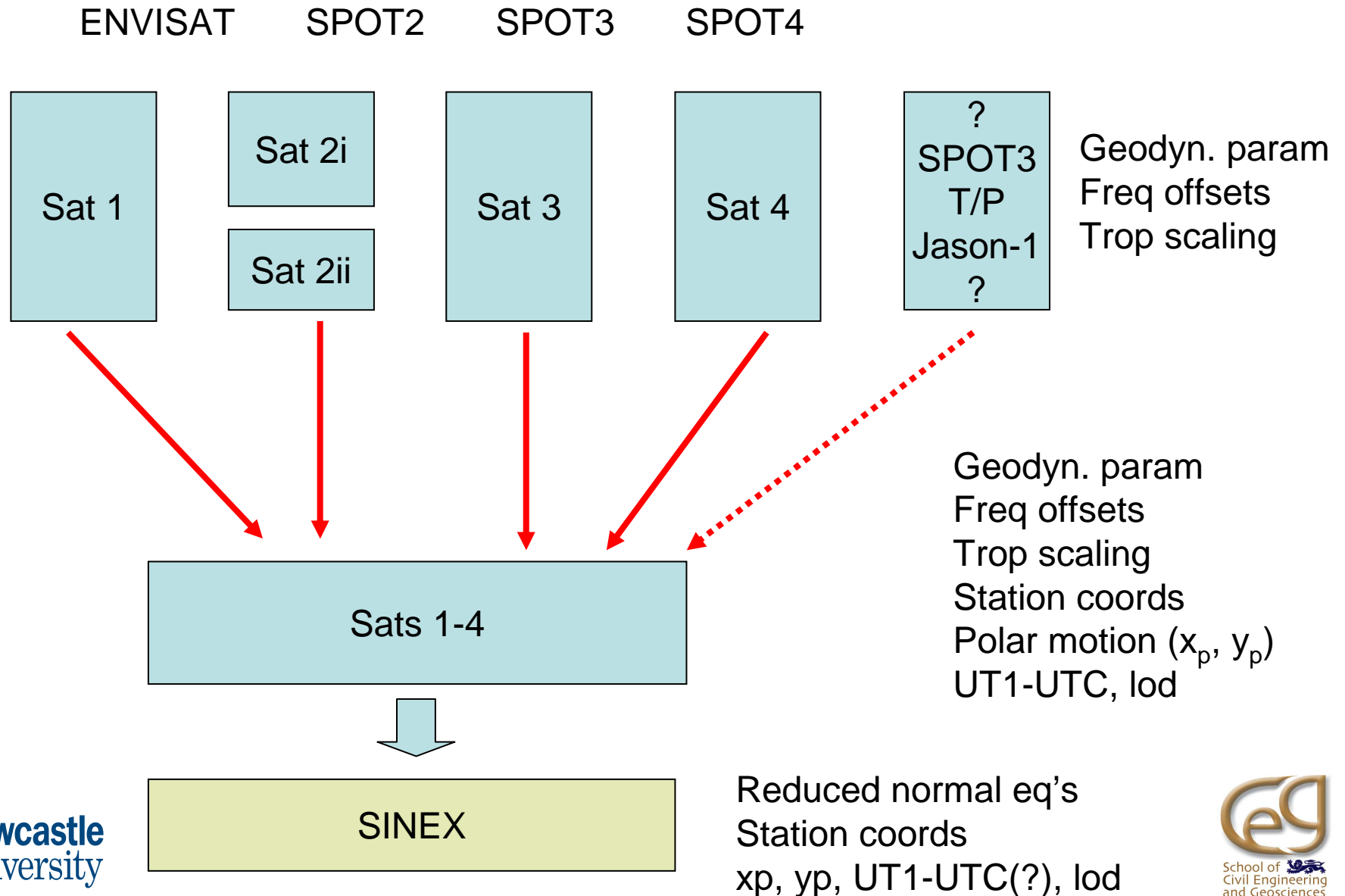




# DORIS tracking residuals



# ITRF2008 (SLR, DORIS)



# Example

MJD 52644-52651 (5/1/03 – 12/1/03)

		orbital param.	+station coords	+ ERP's
Combined solution	{ ENVISAT	0.564	0.551	0.551
	{ SPOT2	0.498	0.470	0.470
	{ SPOT4	0.523	0.494	0.494
	{ SPOT5	0.559	0.507	0.507

rms tracking residuals mm/s

35 stations, daily ERP's,

# Conclusions: Towards ITRF2008

- **DORIS**
  - Software/scripts ready for DORIS run
  - Preliminary orbits computed 2003-2007
  - About to process multi-satellite/multi-arc 2003-2008 inclusive for ENVISAT, SPOT2, SPOT4, SPOT5
  - Additional sats/years as time permits!!
- **SINEX** – reduced normal equations for ITRF2008 (station coords,  $x_p$ ,  $y_p$ , lod)