



# ITRF2008: ILRS Support for Optimal SLR POD



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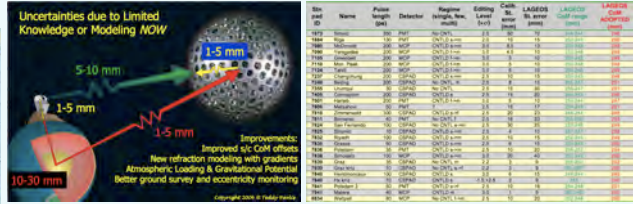
### Abstract

With the recent release of the ITRF2008 the ILRS AWG put in operational mode a number of additional products that will contribute to the optimal use of ITRF2008 for Precision Orbit Determination (POD). The ILRS AWG contribution to ITRF2008 was based strictly on the current IERS Conventions 2003 and our internal standards. The main areas of improvement in our ITRF2008 contribution were careful evaluation and remedy of tracking station systematic errors, extending the data span used in the analysis by an additional ten years of LAGEOS data, and the careful consideration of target characteristics. The new re-analysis extends from 1983 to 2009, covering a 25-year period, the longest for any of the contributing techniques; although the network and data quality for the 1983-1993 period are significantly poorer than for the latter years, the overall SLR contribution reinforced the stability of the datum definition, especially in terms of origin and scale. An evaluation of the commission error from the past and present ITRF on the mean sea level rate indicates a very significant improvement, although we are still far from reaching the accuracy levels required by GGOS. As a companion to the release of the new TRF, a number of online live documents keep track of each station's systematic errors, in order to achieve the highest accuracy possible. ILRS requires that all stations track the two LAGEOS satellites in order to be able to precisely calibrate them over time at the few millimeter level. The systematic errors that are thus obtained should be applied to all tracking data from each site for the specified period, unless stated otherwise in the data base. The AWG ACs that contribute to the daily quality control (QC) of all SLR data, are issuing reports which are delivered electronically and should be consulted for very detailed characterization of each station's performance. The new TRF and the accompanying ancillary data will contribute significantly towards the improved POD for missions with very stringent accuracy requirements such as those monitoring long-term sea-level change.

## The ILRS Network

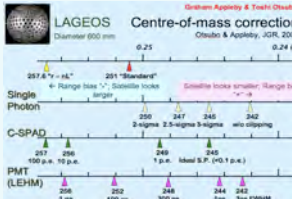


## SLR MEASUREMENT ERROR BUDGET ESTIMATES



Site ID	Name	Range Length (km)	Detector	Region (Single, Two, multi)	Estim. Level (m)	Coll. Sta. (m)	LAGEOS Sta. Error (mm)	LAGEOS Coll. Error (mm)	STATUS (C or A)
1832	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1833	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1834	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1835	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1836	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1837	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1838	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1839	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1840	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1841	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1842	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1843	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1844	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1845	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1846	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1847	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1848	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1849	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1850	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1851	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1852	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1853	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1854	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
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1858	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1859	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1860	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1861	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1862	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
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1870	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
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1875	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1876	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
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1890	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1891	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1892	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1893	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1894	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1895	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1896	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1897	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1898	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1899	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C
1900	Alcala	350	TRF	Two	5	0.3	0.1	0.1	C

### SLR's EQUIVALENT TO GNSS' ANTENNA PHASE CENTER



Site ID	Name	Phase Length (km)	Detector	Region (Single, Two, multi)	Estim. Level (m)	Coll. Sta. (m)	STATUS (C or A)
1914	Alcala	350	TRF	Two	5	0.3	C
1915	Alcala	350	TRF	Two	5	0.3	C
1916	Alcala	350	TRF	Two	5	0.3	C
1917	Alcala	350	TRF	Two	5	0.3	C
1918	Alcala	350	TRF	Two	5	0.3	C
1919	Alcala	350	TRF	Two	5	0.3	C
1920	Alcala	350	TRF	Two	5	0.3	C
1921	Alcala	350	TRF	Two	5	0.3	C
1922	Alcala	350	TRF	Two	5	0.3	C
1923	Alcala	350	TRF	Two	5	0.3	C
1924	Alcala	350	TRF	Two	5	0.3	C
1925	Alcala	350	TRF	Two	5	0.3	C
1926	Alcala	350	TRF	Two	5	0.3	C
1927	Alcala	350	TRF	Two	5	0.3	C
1928	Alcala	350	TRF	Two	5	0.3	C
1929	Alcala	350	TRF	Two	5	0.3	C
1930	Alcala	350	TRF	Two	5	0.3	C
1931	Alcala	350	TRF	Two	5	0.3	C
1932	Alcala	350	TRF	Two	5	0.3	C
1933	Alcala	350	TRF	Two	5	0.3	C
1934	Alcala	350	TRF	Two	5	0.3	C
1935	Alcala	350	TRF	Two	5	0.3	C
1936	Alcala	350	TRF	Two	5	0.3	C
1937	Alcala	350	TRF	Two	5	0.3	C
1938	Alcala	350	TRF	Two	5	0.3	C
1939	Alcala	350	TRF	Two	5	0.3	C
1940	Alcala	350	TRF	Two	5	0.3	C
1941	Alcala	350	TRF	Two	5	0.3	C
1942	Alcala	350	TRF	Two	5	0.3	C
1943	Alcala	350	TRF	Two	5	0.3	C
1944	Alcala	350	TRF	Two	5	0.3	C
1945	Alcala	350	TRF	Two	5	0.3	C
1946	Alcala	350	TRF	Two	5	0.3	C
1947	Alcala	350	TRF	Two	5	0.3	C
1948	Alcala	350	TRF	Two	5	0.3	C
1949	Alcala	350	TRF	Two	5	0.3	C
1950	Alcala	350	TRF	Two	5	0.3	C

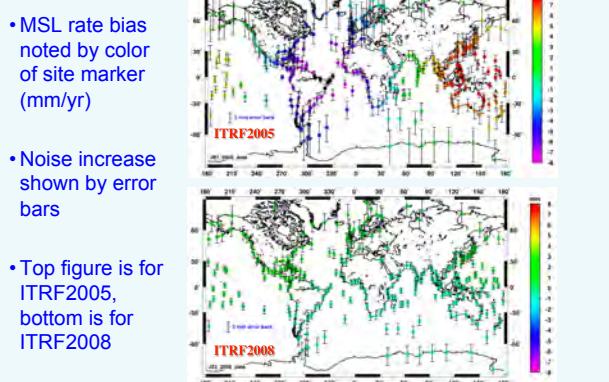
### TARGET ARRAYS FOR OTHER SATELLITES THAN LAGEOS EXHIBIT SIMILAR VARIATIONS THAT SHOULD BE ACCOUNTED FOR HIGHEST QUALITY POD!

### THE ILRS MAINTAINS AN ONLINE DOCUMENT THAT LISTS ALL KNOWN SYSTEMATIC CORRECTIONS FOR ALL SITES (PART OF THIS FILE IS SHOWN BELOW)

Table with multiple columns containing systematic corrections for various sites, including site ID, name, and correction values.

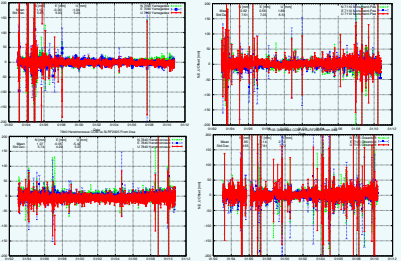
CONSULT THIS FILE OFTEN AT:  
[http://www.dgfi.badw.de/typo3\\_ilrs/fileadmin/data\\_handling/ILRS\\_Data\\_Handling\\_File.sux](http://www.dgfi.badw.de/typo3_ilrs/fileadmin/data_handling/ILRS_Data_Handling_File.sux)

### Geocenter Error Effect on GLOSS Network

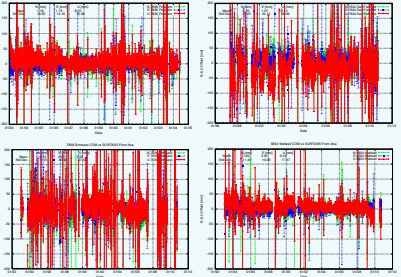


- MSL rate bias noted by color of site marker (mm/yr)
- Noise increase shown by error bars
- Top figure is for ITRF2005, bottom is for ITRF2008

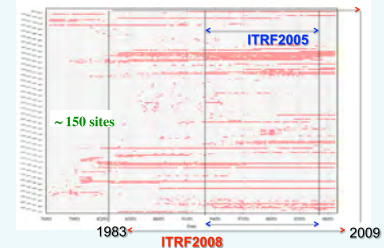
### QUALITY AND STABILITY VARIES ...



### ... OVER THE NETWORK AND OVER TIME!

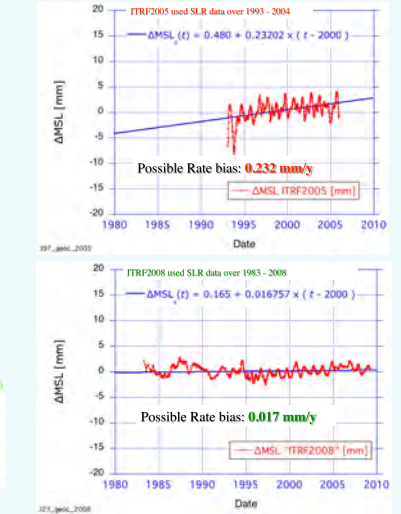
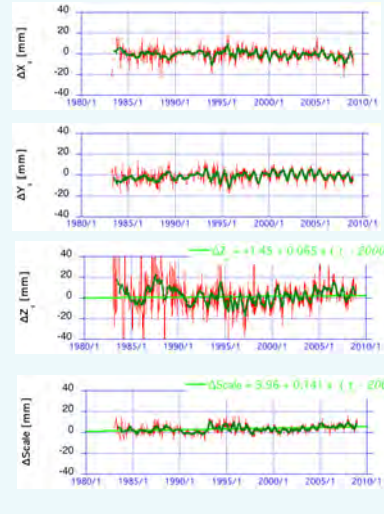


### ITRF2008 IS BASED ON A MUCH LONGER SLR DATA SET, INCLUDING THE HISTORICAL LAGEOS 1 DATA SINCE 1983



THE NEW ITRF2008 HAS AN IMPROVED AND MORE STABLE DEFINITION OF THE ORIGIN AND SCALE IN BETTER AGREEMENT WITH SLR

THE MORE STABLE ORIGIN WILL INCUR SIGNIFICANTLY SMALLER ERROR ON MSL RATE ESTIMATES FROM ALTIMETRY AND TIDE GAUGES



ALTIMETRY FOR OCEANS AND HYDROLOGY  
18-22 October 2010 - Lisbon - PORTUGAL

Logos for IERS, International Laser Ranging Service, CNES, OST-ST Meeting, Ocean and hydrology applications workshop, IDS workshop, and ESA.

