J. Robbins
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BASELINE ESTIMATION FROM SIMULTANEOUS TRACKING (BEST):

RECENT SLR RESULTS FROM QUINCY-TO-MONUMENT PEAK

by

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BEST:
Baseline Estimation from Simultaneous Tracking

- **Solution requires minimum of four passes; typical arc is 5 days long: permits monitoring of inter-station motion with high temporal resolution**

- **Minimize the propagation of errors in estimated baseline distance**

- **Utilization of strictly simultaneous passes between pair of sites**

- **Stations are "navigated" in common by modeling errors thusly canceling errors in baseline estimates**

EMPLOYED AS A VERIFICATION OF MORE GENERAL GSFC SOLUTIONS

RECIPE
for BEST Solutions

For Orbit Definition:

Three-to-five global stations with "good" performance histories are selected along with simultaneous data from 2 adjusted stations of interest.

Data from adjusted stations matched so number of points/pass is equal.

Minimum of 4 simultaneous passes are required; arc lengths from 5 to 30 days are employed.

For Earth Orientation:

Five-day values of polar motion and ΔLOD are estimated

For Quality Control on Solution:

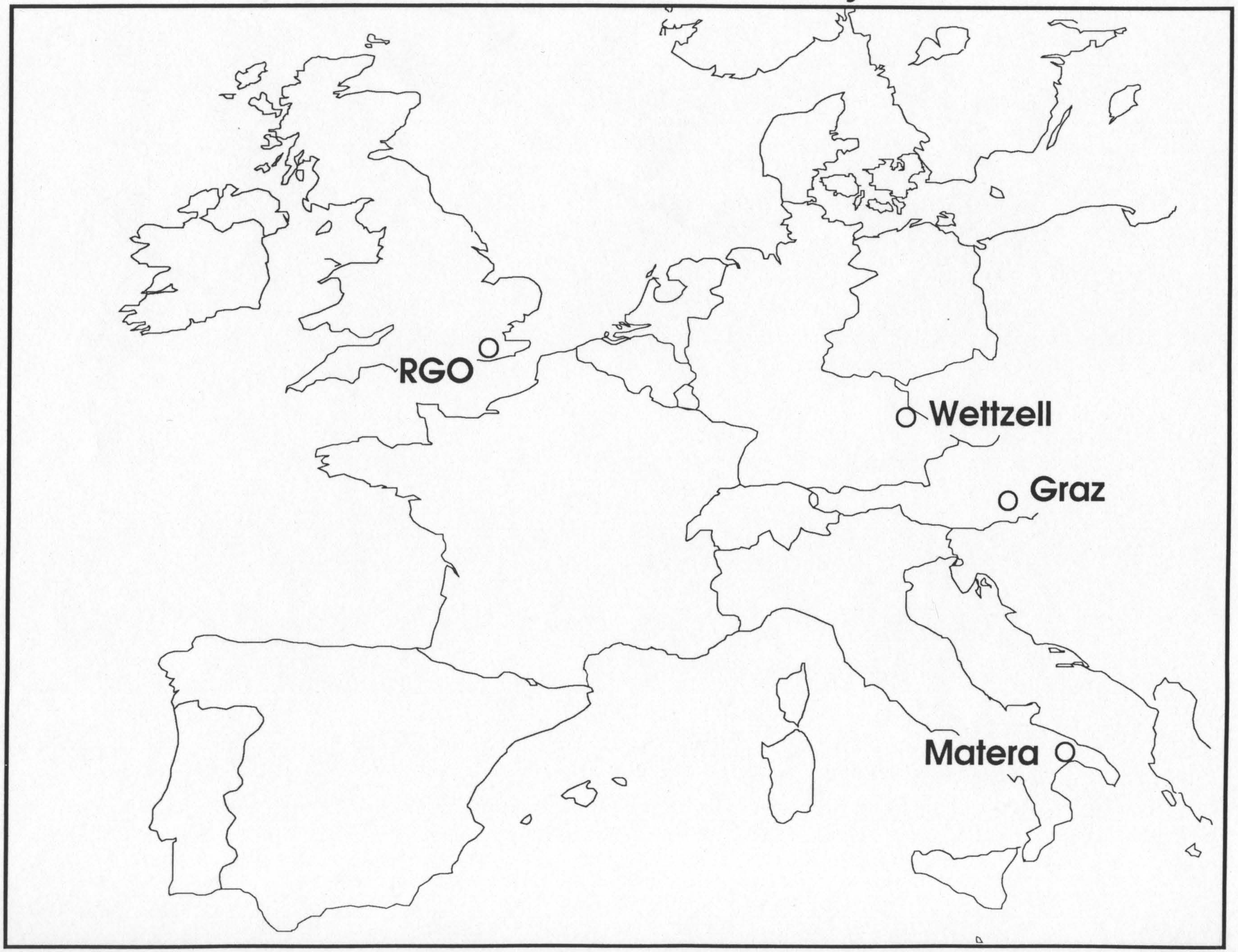
Laser residuals from adjusting stations are analyzed to detect local data anomalies

EXAMPLE OF POST-SOLUTION LASER DATA RESIDUAL ANALYSIS

(*Monument Peak/Quincy*)

date ymd hh mm	no. pts.	RMS of fit (cm) to orbit	bias	trend	quad.	estimated orbit error represented as bias (cm)	ΔT (μsec)
860109 809	28	4.1/4.0	0.6/1.8	0.6/1.5	0.4/0.4	4/3	- 1/- 8
860110 650	32	3.2/3.7	3.0/3.4	1.1/1.2	0.3/0.2	1/1	-23/-25
860110 1012	26	2.9/3.0	3.9/3.0	0.9/1.3	0.2/0.4	-1/-3	-21/-25
860111 852	44	5.3/5.3	4.4/4.7	2.3/2.8	0.5/0.5	-4/-2	-20/-20
860111 1230	32	4.1/4.2	4.0/3.6	0.6/0.7	0.4/0.3	2/1	-40/-36

Sites Used in "BEST" Analysis



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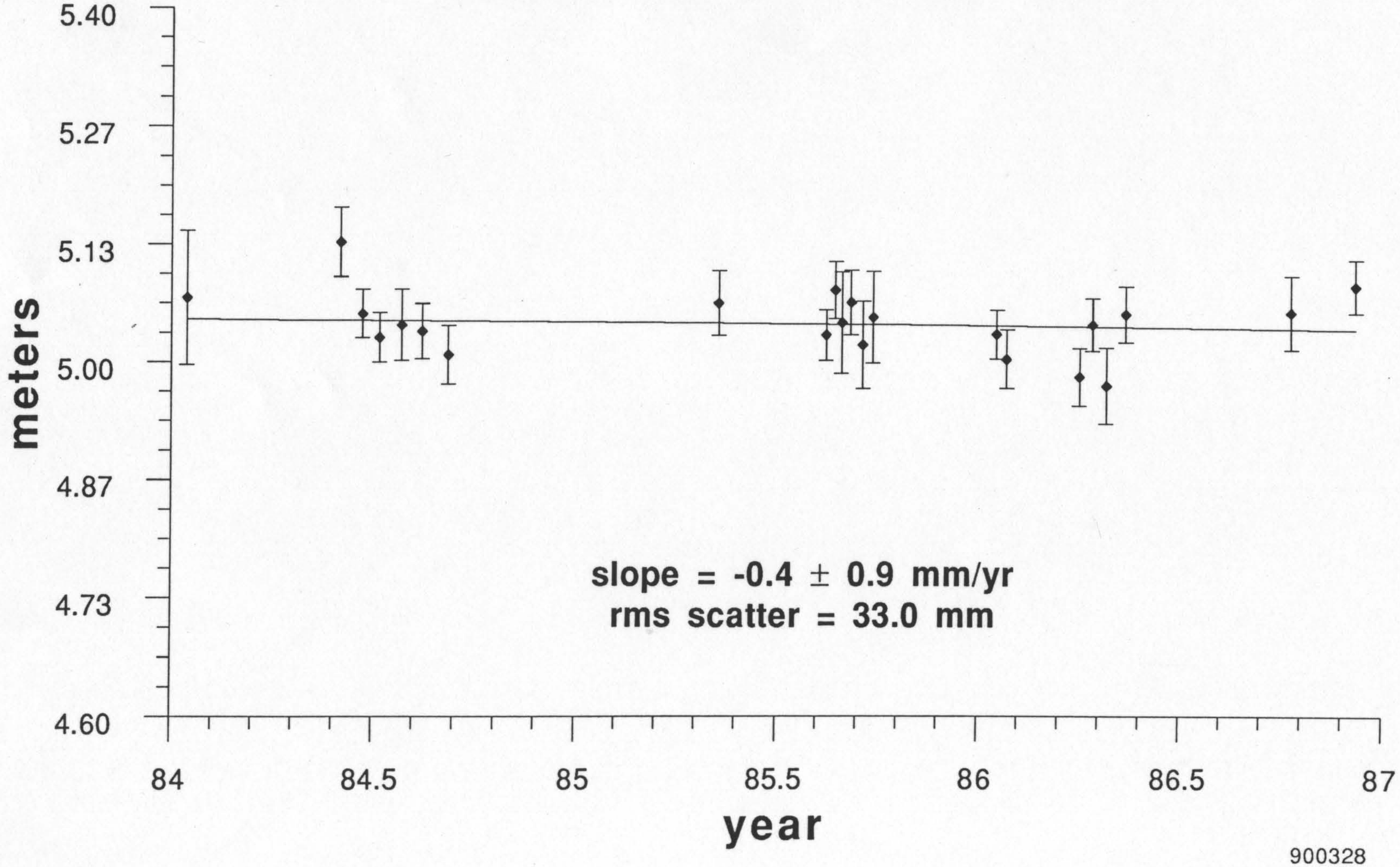
SAMPLE EUROPEAN BASELINES FOR PERMANENT STATIONS

Baseline	**Length (km)**	**No. of Values/ years/ RMS (cm)**	**Baseline Rate (mm/y)** **BEST**	**SL7.1**
Wetz - Graz	302	(12) 1984-6 2.9	- 3 ± 15	3 ± 2
Graz - Matera	719	(22) 1984-6 3.3	- 4 ± 9	- 4 ± 3
Wetz - RGO	917	(30) 1984-7 3.1	- 2 ± 5	- 3 ± 2
Wetz - Matera	990	(46) 1984-7 2.9	- 15 ± 4	- 6 ± 3
RGO - Matera	1694	(34) 1984-6 3.5	3 ± 9	- 8 ± 2

Graz to Matera

baseline distances from "BEST"



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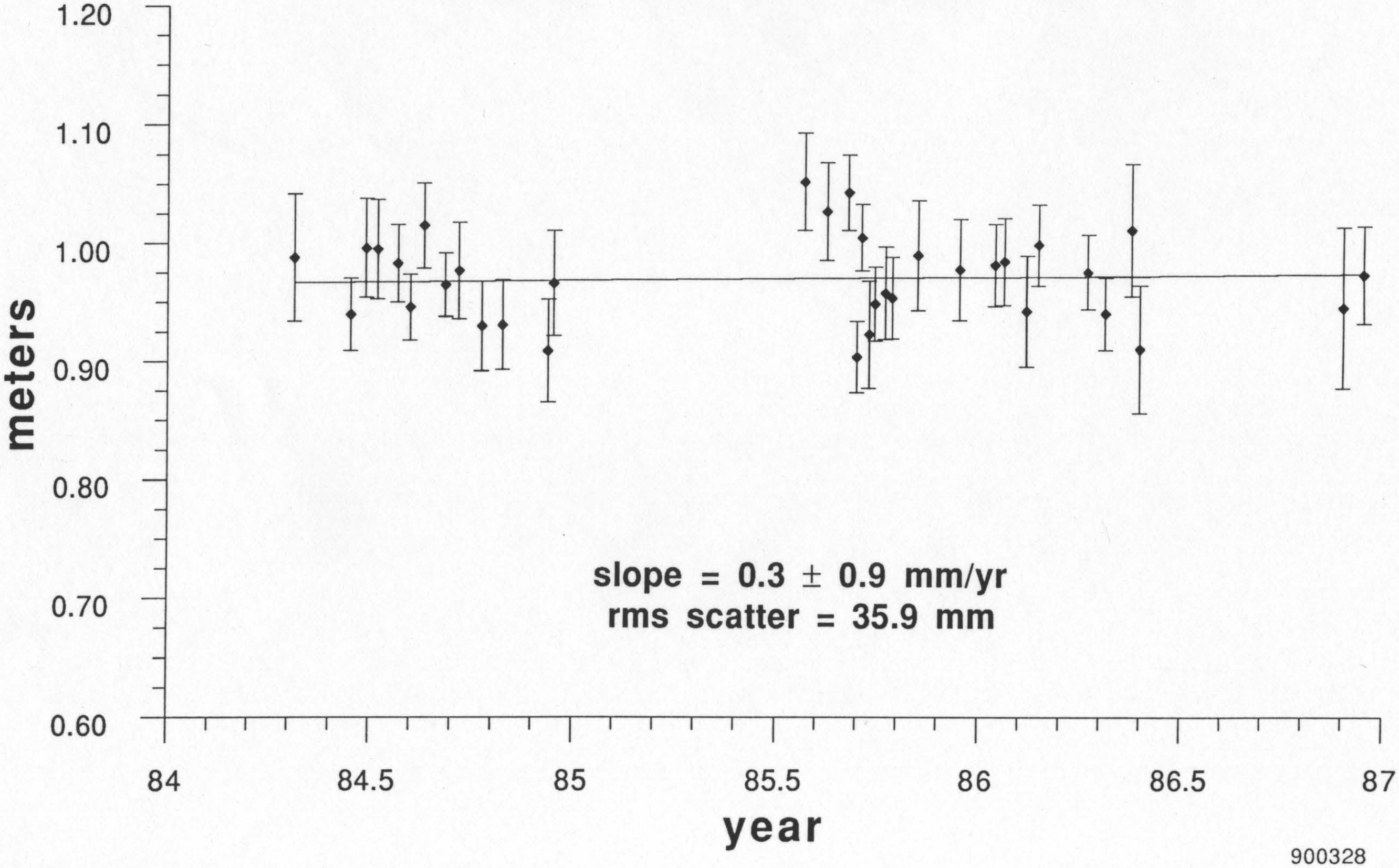
RGO to Matera

baseline distances from "BEST"



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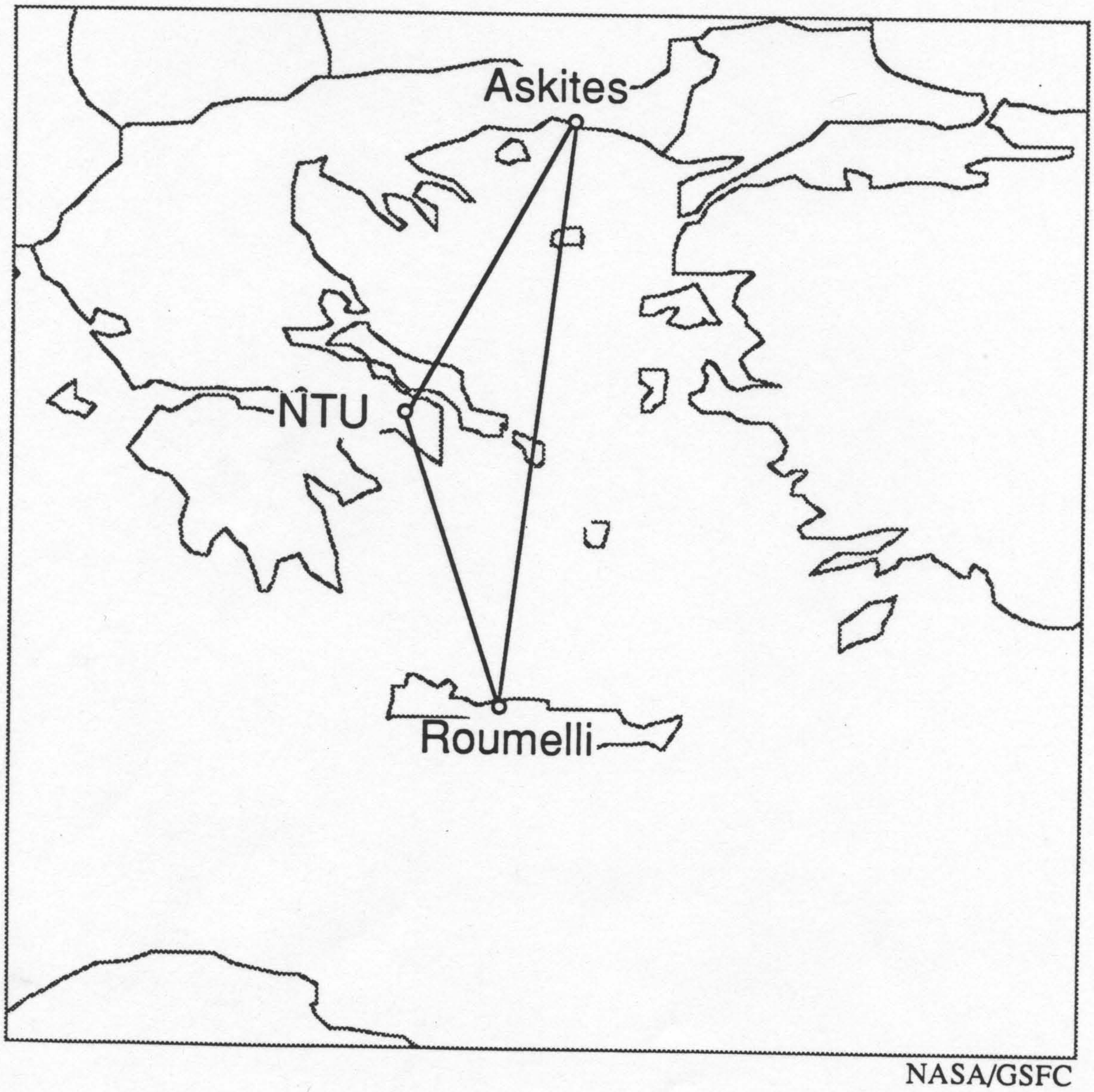
Baseline Estimation from Simultaneous Tracking



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BEST: Roumelli to NTU

Date	Arc Length	Simult. Passes	Simult. Points	Range Fit	Baseline
86-8-4	16days	7	63	55mm	304,459, 598 ± 32mm
86-8-19	10	6	70	55	304,459, 500 ± 23*
86-8-28	4	6	64	41	304,459, 591 ± 19
87-7-27	5	6	62	51	304,459, 578 ± 21
87-7-31	6	4	34	65	304,459, 563 ± 36
87-9-9	18	5	36	92	304,459, 588 ± 53 Range: 35 mm

BEST: Askites to Roumelli

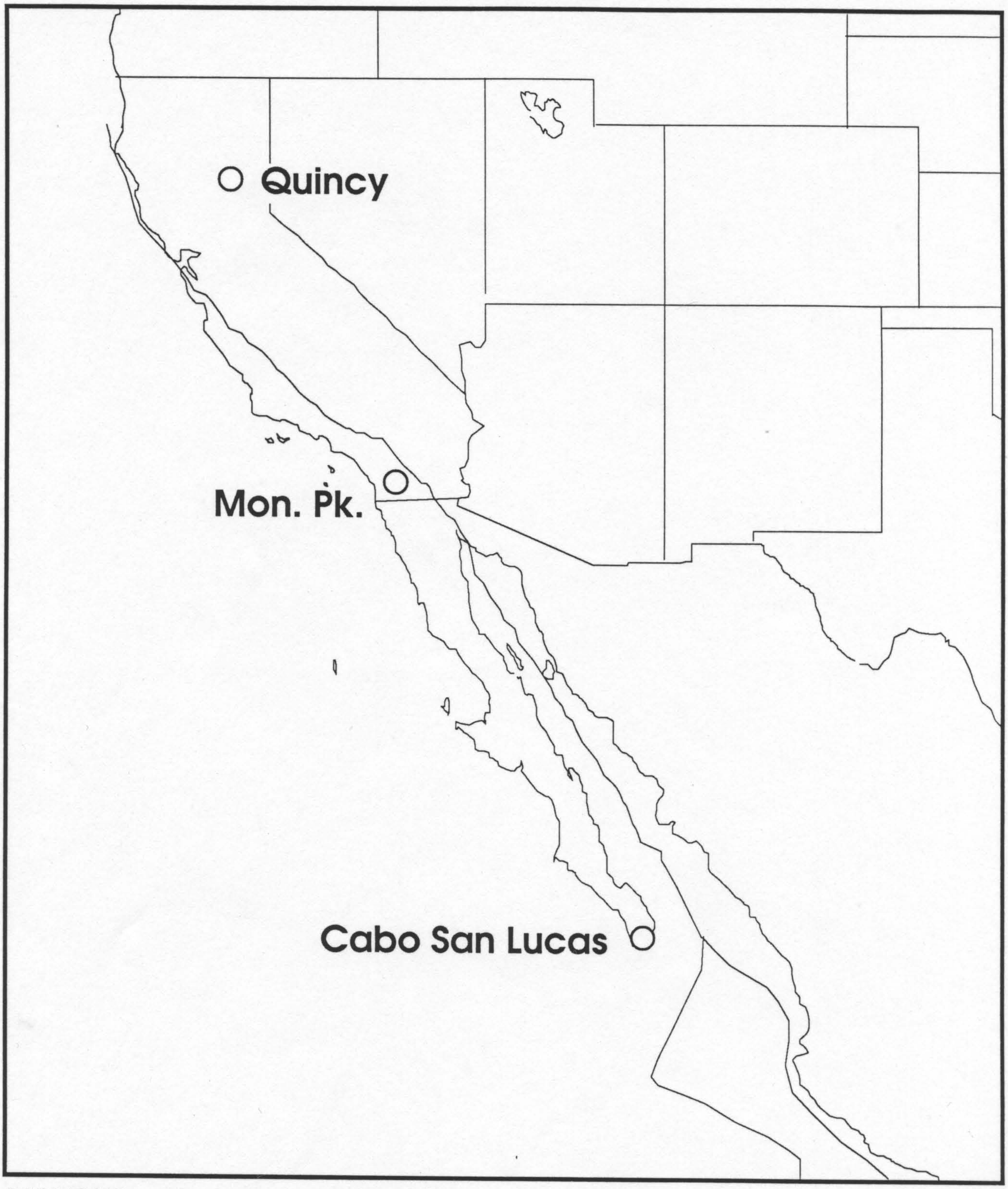
Date	Arc Length	Simult. Passes	Simult. Points	Range Fit	Baseline
86-6-1	29days	4	62	123mm	617,642, 808 ± 46 mm
86-6-29	24	4	19	99	617,642, 866 ± 179
87-7-19	5	6	62	63	617,642, 821 ± 25
87-7-23	8	6	39	106	617,642, 806 ± 52
87-8-4	3	4	38	75	617,642, 823 ± 39
87-8-14	13	5	43	101	617,642, 843 ± 44 Range: 35 mm

BEST: Askites to NTU

Date	Arc Length	Simult. Passes	Simult. Points	Range Fit	Baseline
87-7-31	6 days	6	45	56mm	346,119, 099 ± 26 mm
87-7-27	3	4	35	48	346,119, 089 ± 41
87-8-4	4	5	57	73	346,119, 122 ± 29
87-8-9	10	6	47	55	346,119, 131 ± 46
87-8-23	6	7	82	56	346,119, 125 ± 22

Range: 42 mm

Sites Used in "BEST" Analysis



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BEST:
BASELINE RESULTS FROM THE 1988 *TLRS OCCUPATION OF CABO SAN LUCAS, BAJA, MEXICO*

Cabo San Lucas -to- Monument Peak (1277 km line)

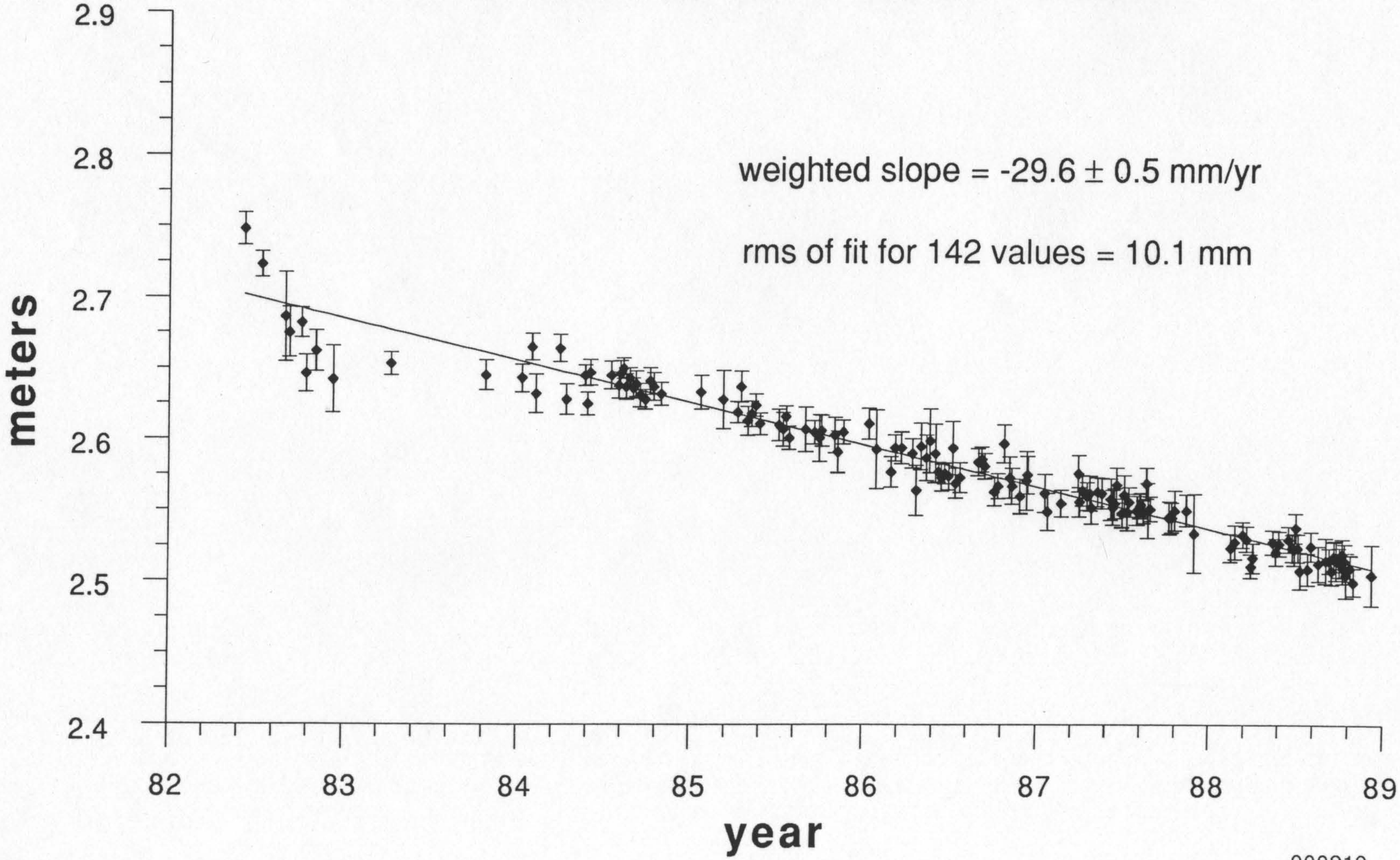
Interval (month/day)	No. Simultaneous Passes	Baseline (m)
5/19-31	8	1277332.498
6/06-11	5	2.510
6/13-18	5	2.501
6/20-25	6	2.484
6/27-29	4	2.490
6/30-7/3	4	2.491

Cabo San Lucas -to- Quincy Peak (2150 km line)

5/19-28	5	2150415.152
6/13-22	4	5.182
6/21-29	6	5.171
6/28-7/3	5	5.166

Monument Peak to Quincy

baseline distances from "BEST"



weighted slope = -29.6 ± 0.5 mm/yr

rms of fit for 142 values = 10.1 mm

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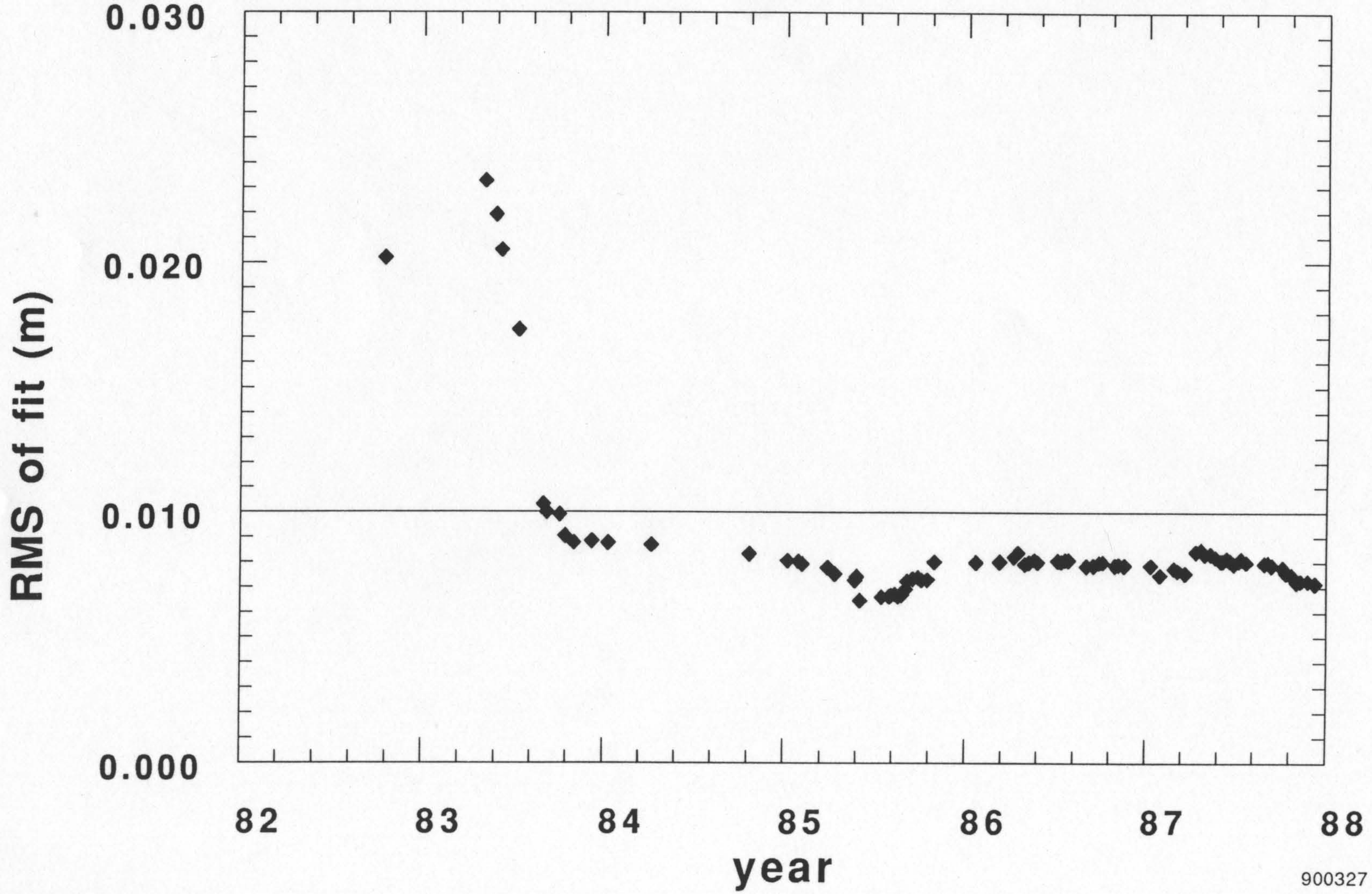
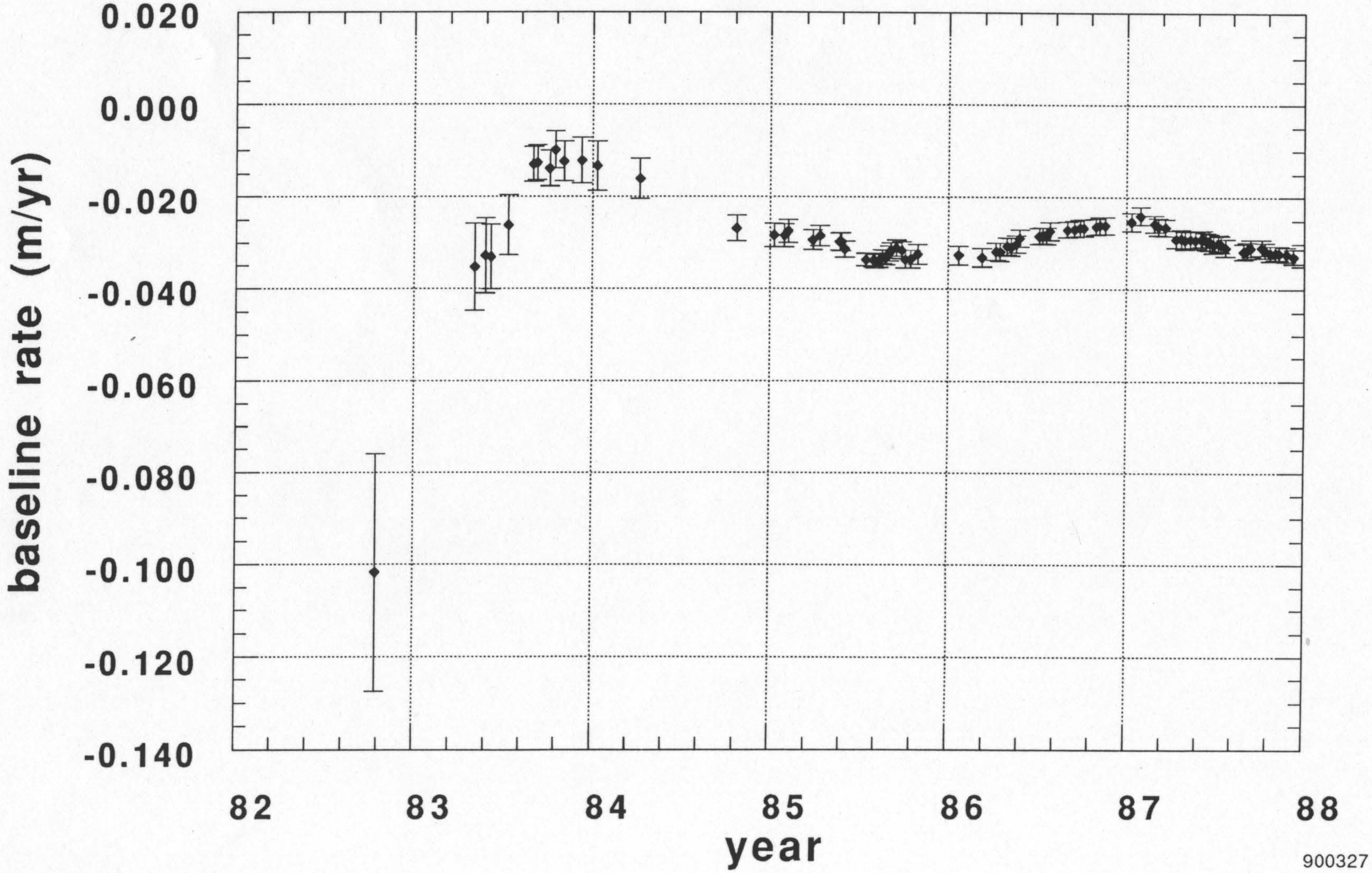
RMS OF FIT FOR THE SAFE BASELINE RATE FROM POINT - BY - POINT 2 YEAR MOVING WINDOW



SAFE BASELINE RATE FROM POINT - BY - POINT 2 YEAR MOVING WINDOW



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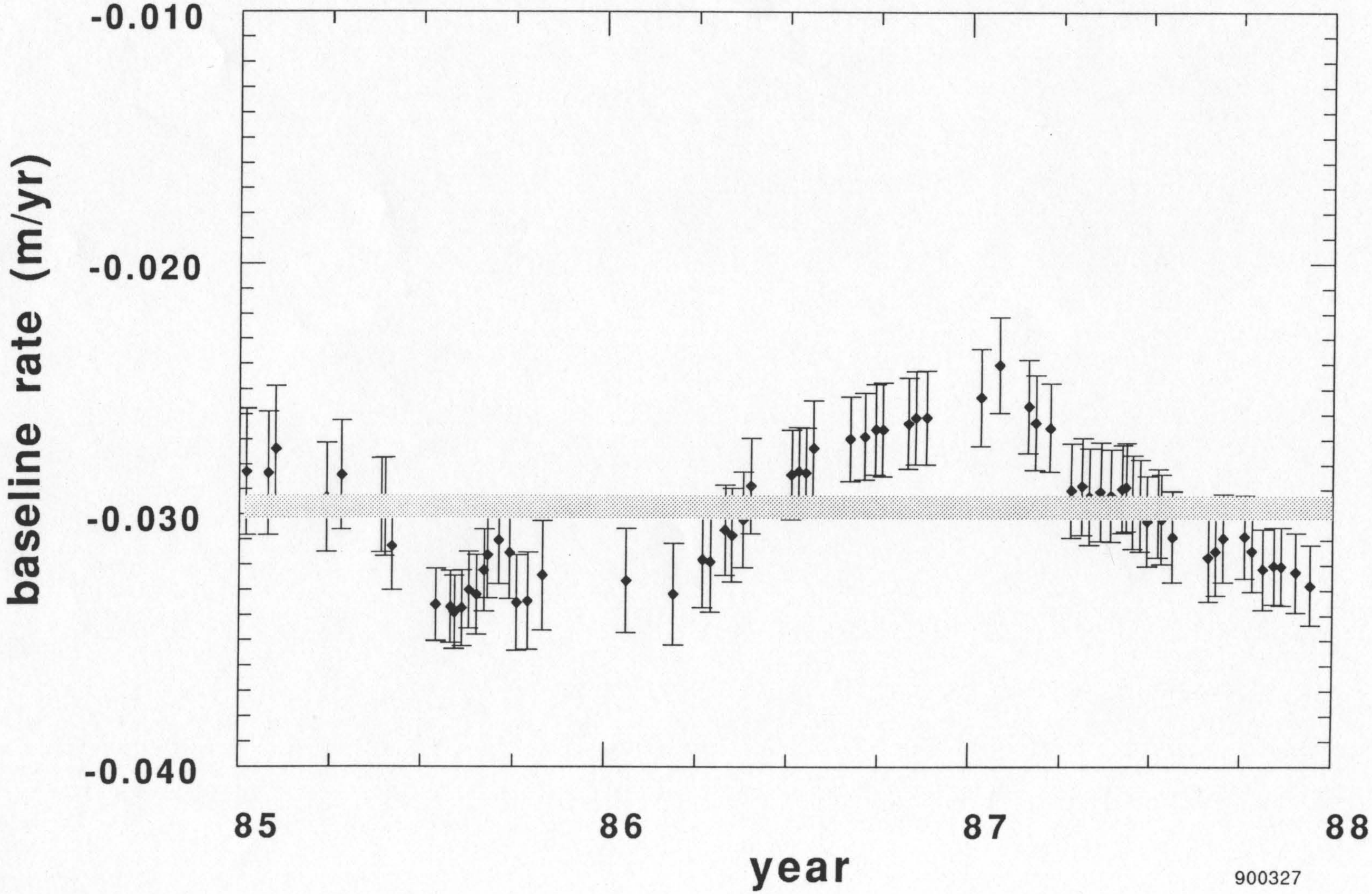
SAFE BASELINE RATE FROM POINT - BY - POINT 2 YEAR MOVING WINDOW



SUMMARY

- **EVALUATION OF SIMULTANEOUS OBSERVATIONS PERMITS DETAILED INVESTIGATION OF INDIVIDUAL BASELINE**

  SAFE BASELINE SHOWS NO SIGNIFICANT EVIDENCE OF NON-LINEAR INTERSTATION MOTION BEWTEEN 1984-88 WHICH EXCEEDS THE ± 1-2 mm/y LEVEL.

  THE SAFE BASELINE RATE IS -29.6 ± 0.5 mm/y BASED ON 142 INDIVIDUAL BASELINE DETERMINATIONS

  BASELINE RECOVERY PRECISION FROM BEST METHOD IS BETTER THAN ± 10 mm WITH 2-YEAR HISTORIES HAVING AN RMS SCATTER OF LESS THAN 8 mm RMS

- **TECHNIQUE REQUIRES REASONABLY SMALL AMOUNTS OF SUPPORTING GLOBAL DATA**

- **SHORT ARC ORBITAL COMPUTATIONS ARE UTILIZED MAKING THE TECHNIQUE APPLICABLE TO MICRO-COMPUTING ENVIRONMENTS**

- **RESULTS ARE USEFUL FOR VERIFYING DATA CONSISTENCY**