Comparison and cut off angle tests for observed and simulated CONT05 sessions

Kamil Teke[1,2]

Joerg Wresnik[1]

Johannes Boehm[1]

Harald Schuh[1]

(1) IGG, Vienna University of Technology, Austria

(2) Dept. of Geodesy and Photogrammetry Engineering, Karadeniz Technical University, Turkey

Regression Function and Curve Fitting

$$y = a^2 + b^2 ppb^2 L^2$$

Regression function for baseline length repeatabilities

LSM Application

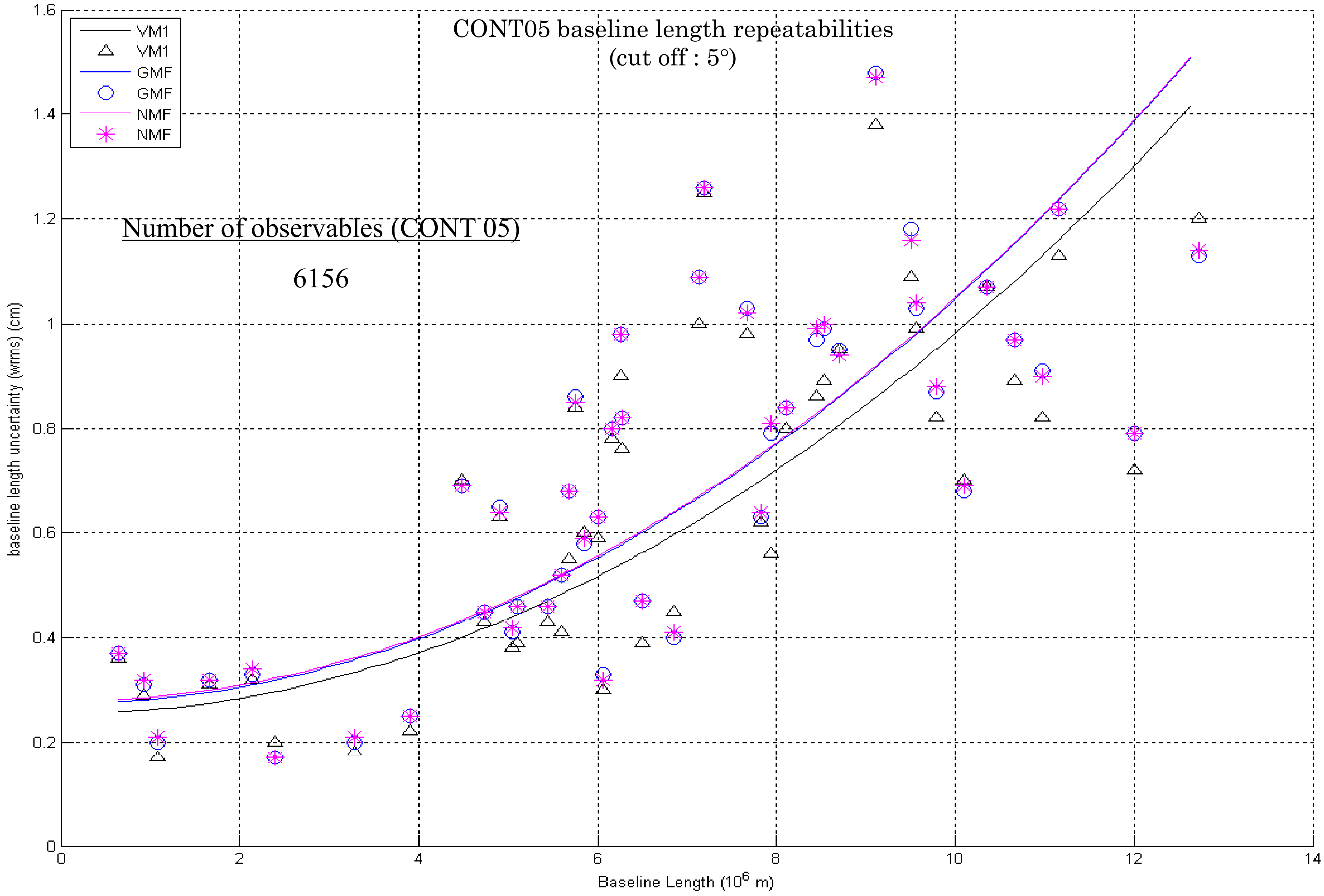
$$y = \begin{bmatrix} rms_1^2 \\ rms_2^2 \\ \vdots \\ rms_n^2 \end{bmatrix}; \quad A = \begin{bmatrix} 1 & ppb^2 L_1^2 \\ 1 & ppb^2 L_2^2 \\ \vdots & \vdots \\ 1 & ppb^2 L_n^2 \end{bmatrix}; \quad x = \begin{bmatrix} a^2 \\ b^2 \end{bmatrix}; \quad W = \begin{bmatrix} 1/s_1^2 & & & \\ & 1/s_2^2 & & \underline{0} \\ & & \ddots & \\ & \underline{0} & & \\ & & & 1/s_n^2 \end{bmatrix}$$

$$x = (A^T W A)^- A^T W \, y$$

Values of the estimated parameters by LSM

Mapping Functions	*Parameters of the function for different cut off angles*									
	5° (6156)		*6°(6028)*		*7°(5907)*		*8°(5818)*		*9°(5646)*	
	a (cm)	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*
VM1	0.505	0.853	0,515	0,817	0,517	0,801	0,523	0,796	0,510	0,836
GMF	0,524	0,879	0,521	0,844	0,521	0,823	0,522	0,806	0,512	0,844
NMF	0,528	0,879	0,520	0,844	0,521	0,826	0,522	0,808	0,512	0,845
Mapping Functions	*10°(5502)*		*12°(5207)*		*15°(4730)*		*20°(3906)*		*30°(2491)*	
	a (cm)	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*
VM1	0,501	0,859	0,489	0,927	0,428	1,078	0,404	1,229	0,657	1,542
GMF	0,500	0,866	0,488	0,931	0,426	1,081	0,403	1,229	0,656	1,542
IMF	0,500	0,867	0,489	0,931	0,428	1,081	0,404	1,228	0,655	1,543

Comparison and cut off angle tests for observed and simulated CONT05 sessions



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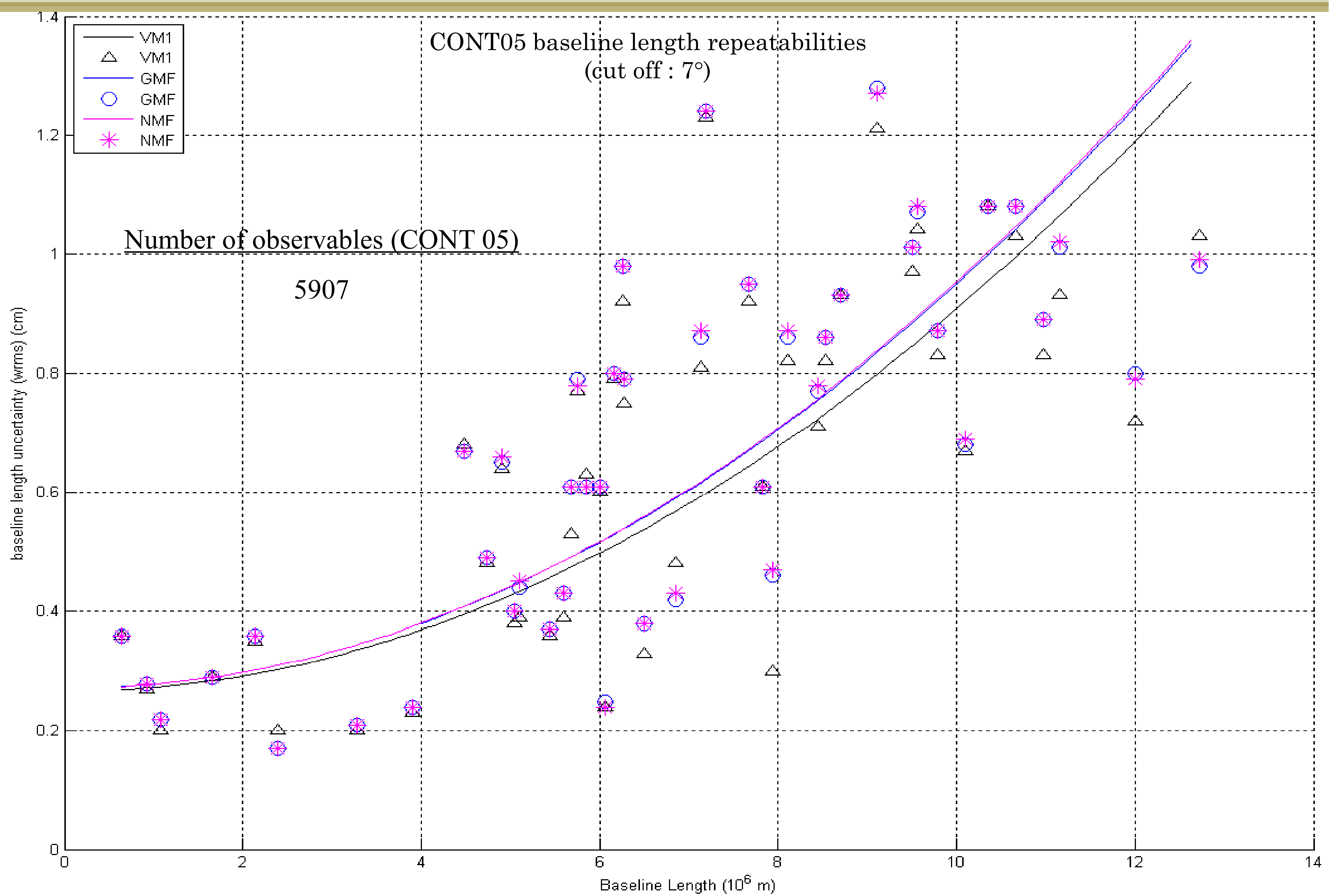

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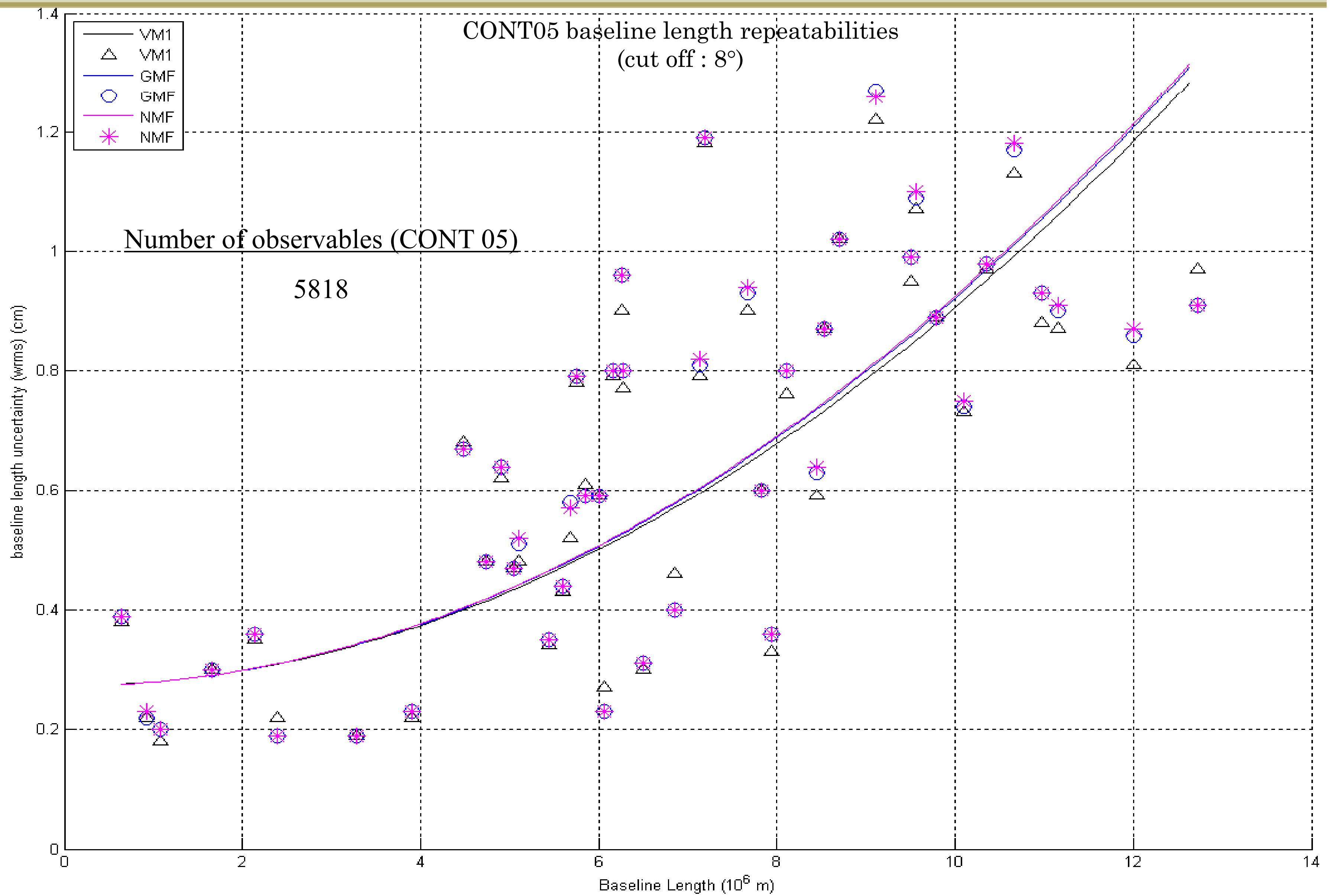

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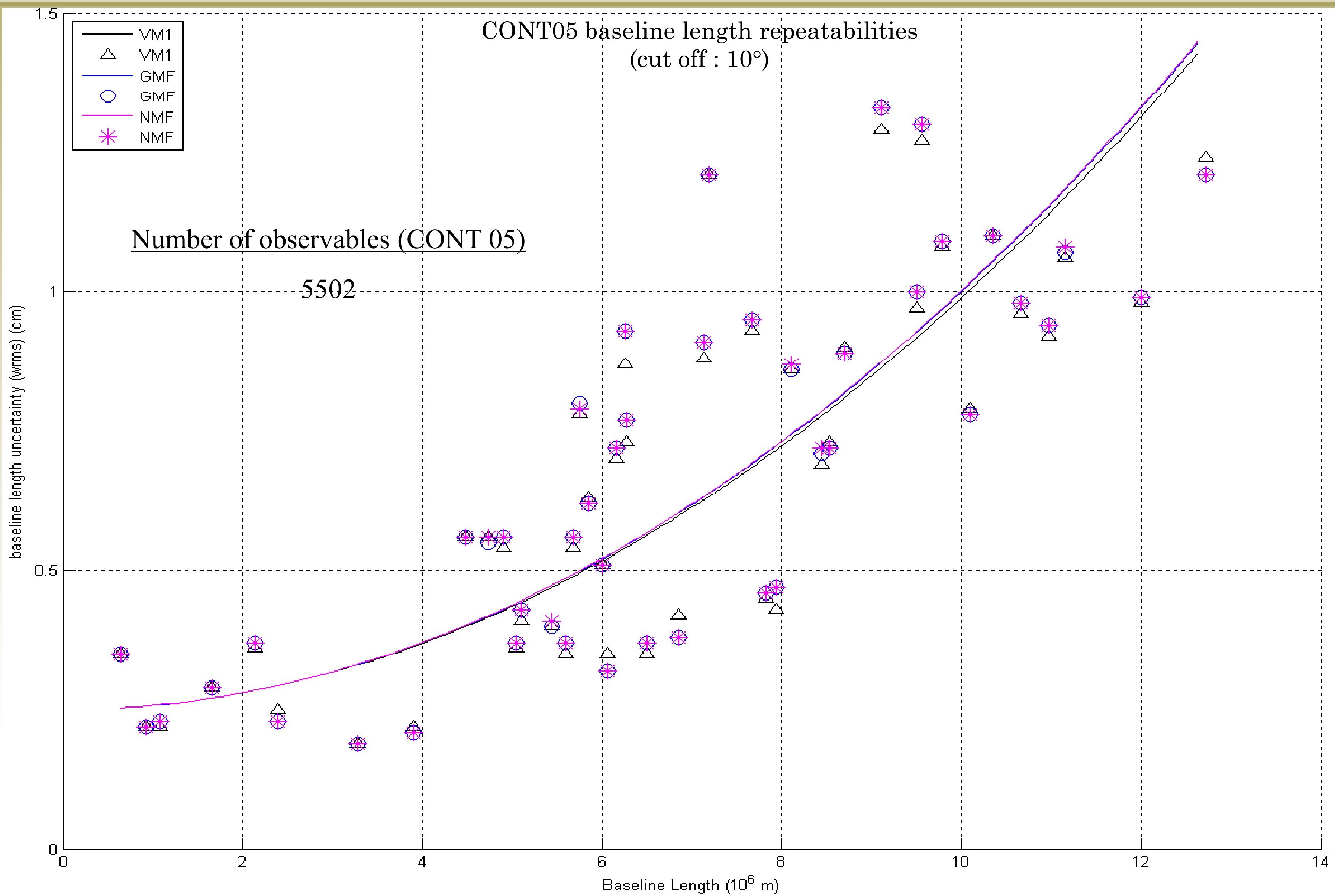

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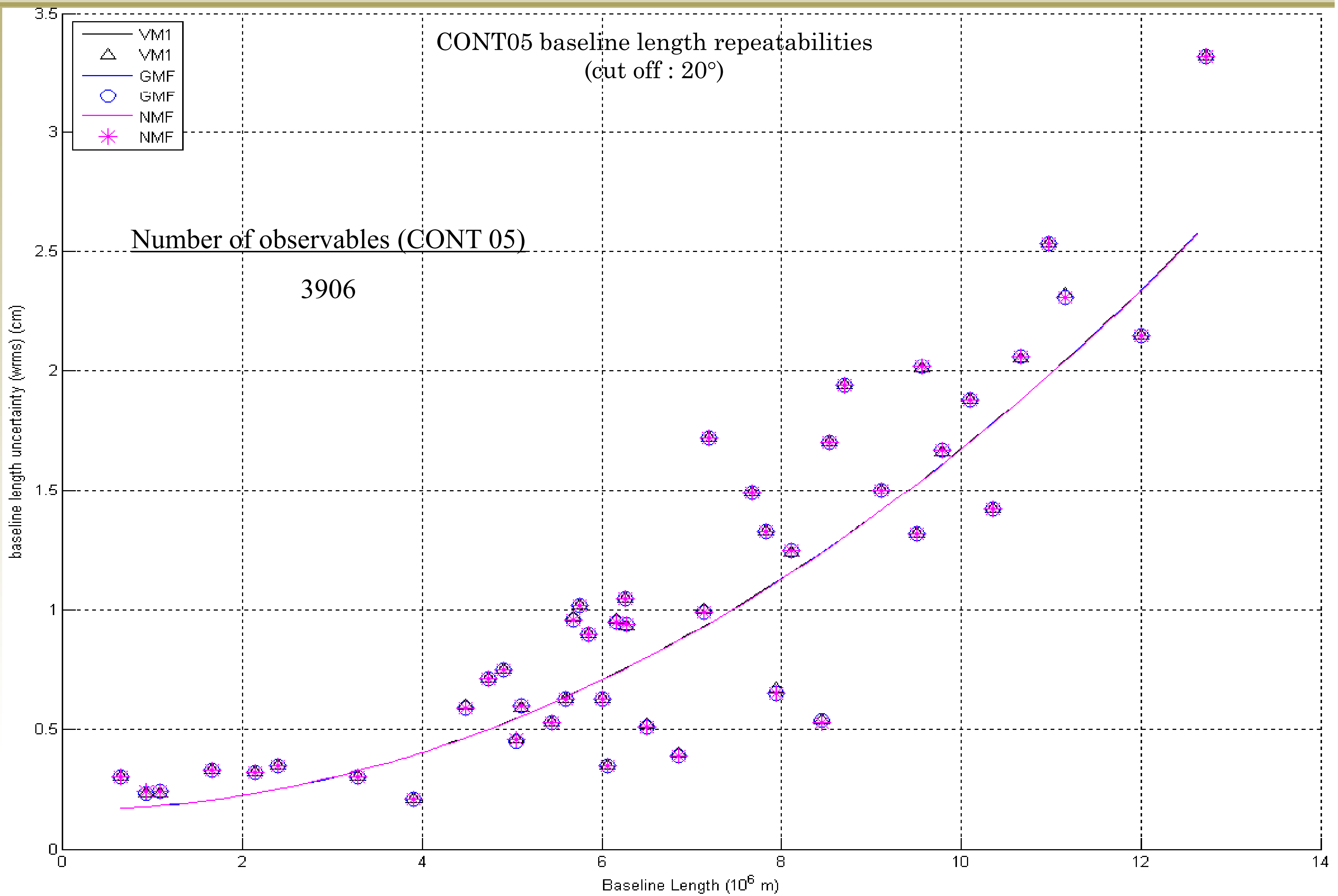

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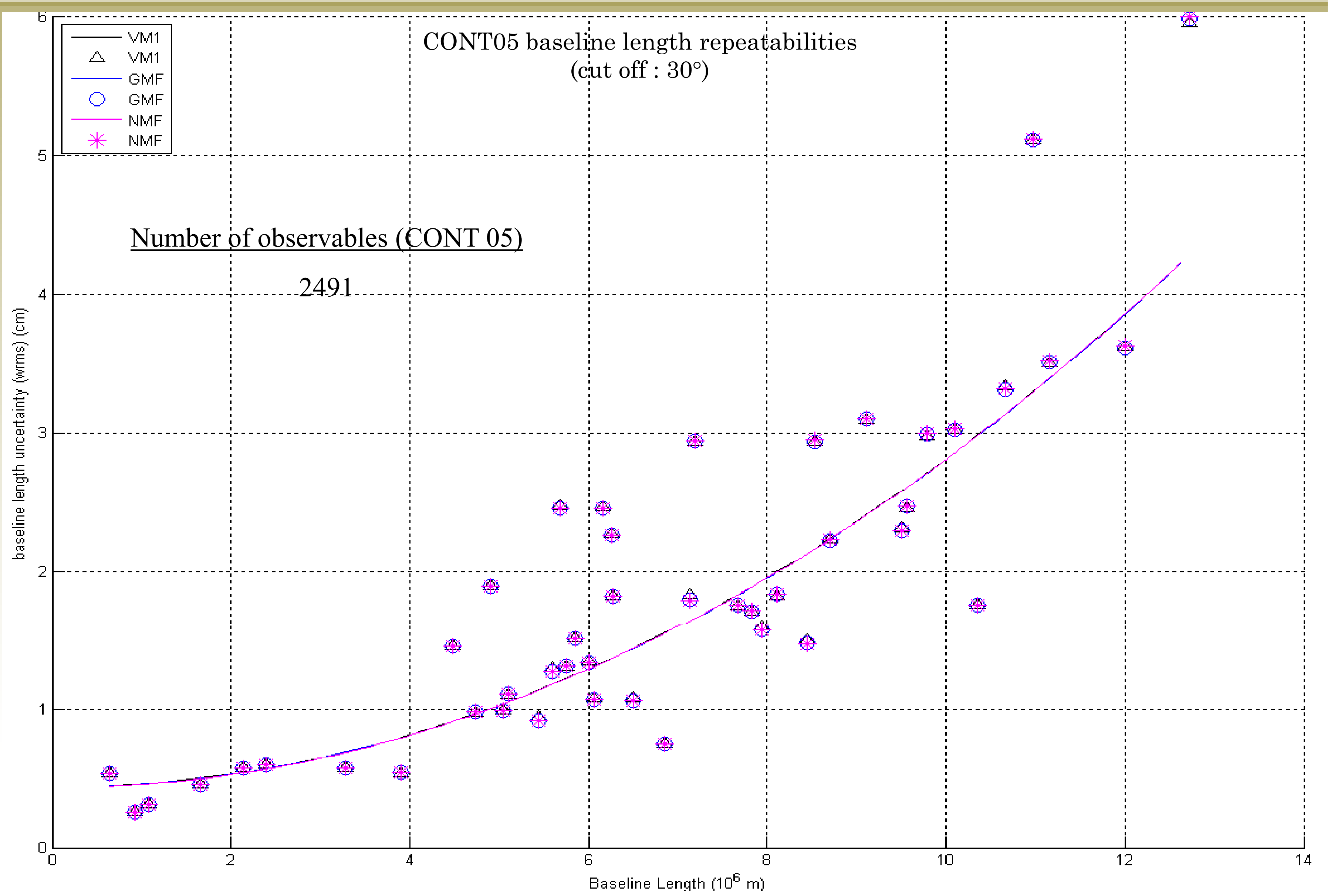
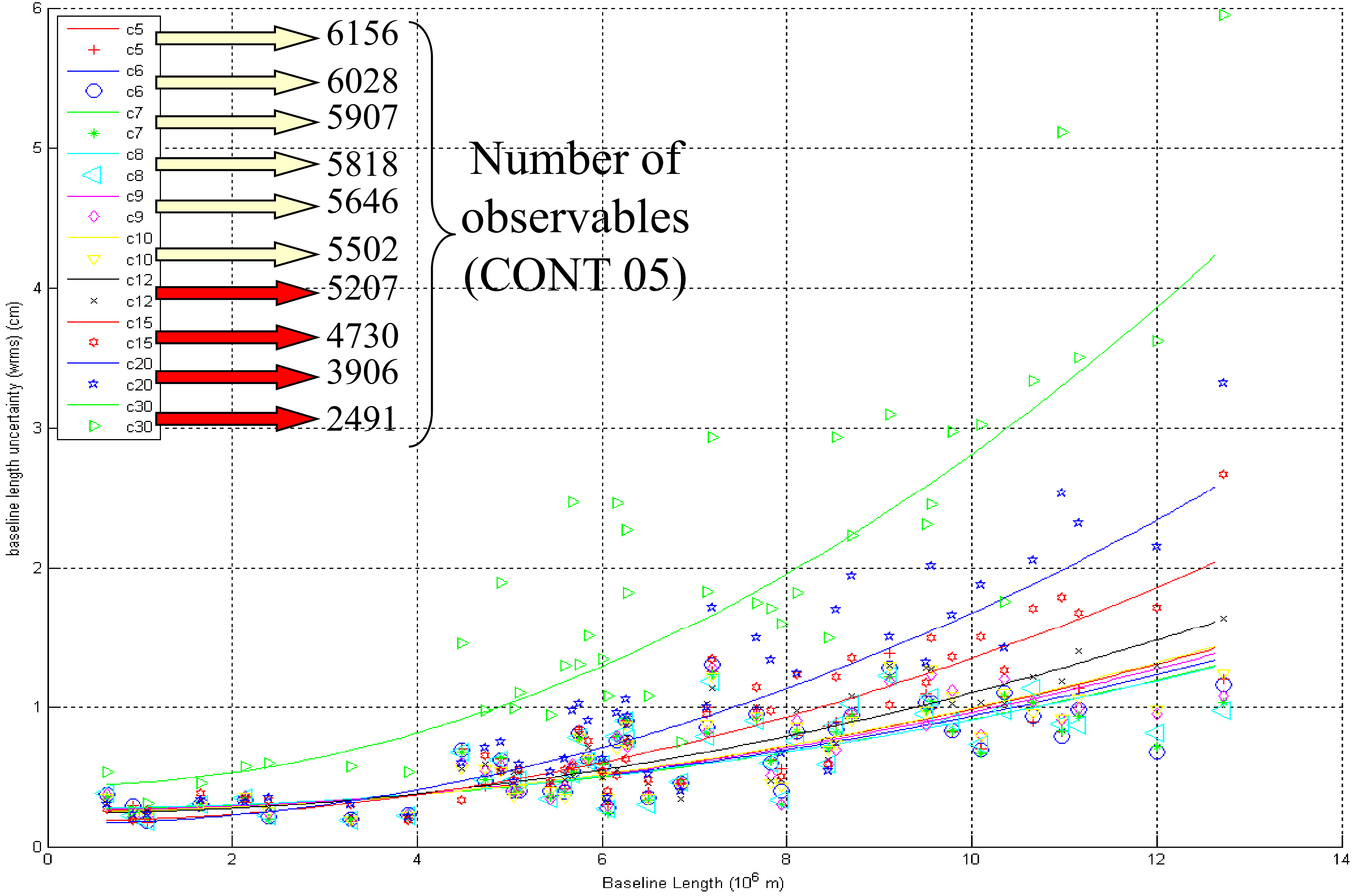


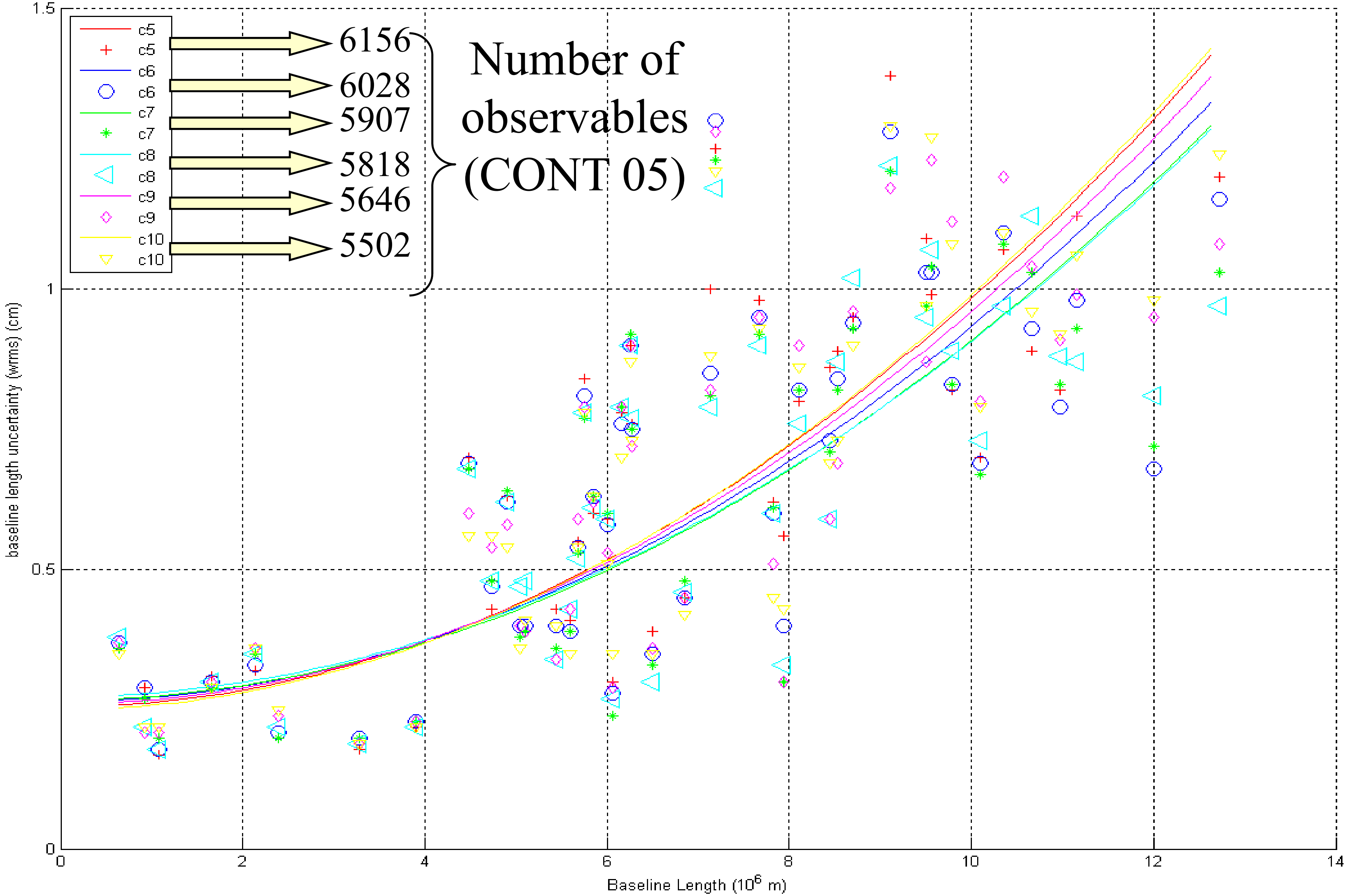
Comparison and cut off angle tests for observed and simulated CONT05 sessions

CONT05 baseline length repeatabilities (VM1)



Comparison and cut off angle tests for observed and simulated CONT05 sessions

CONT05 baseline length repeatabilities (VM1)

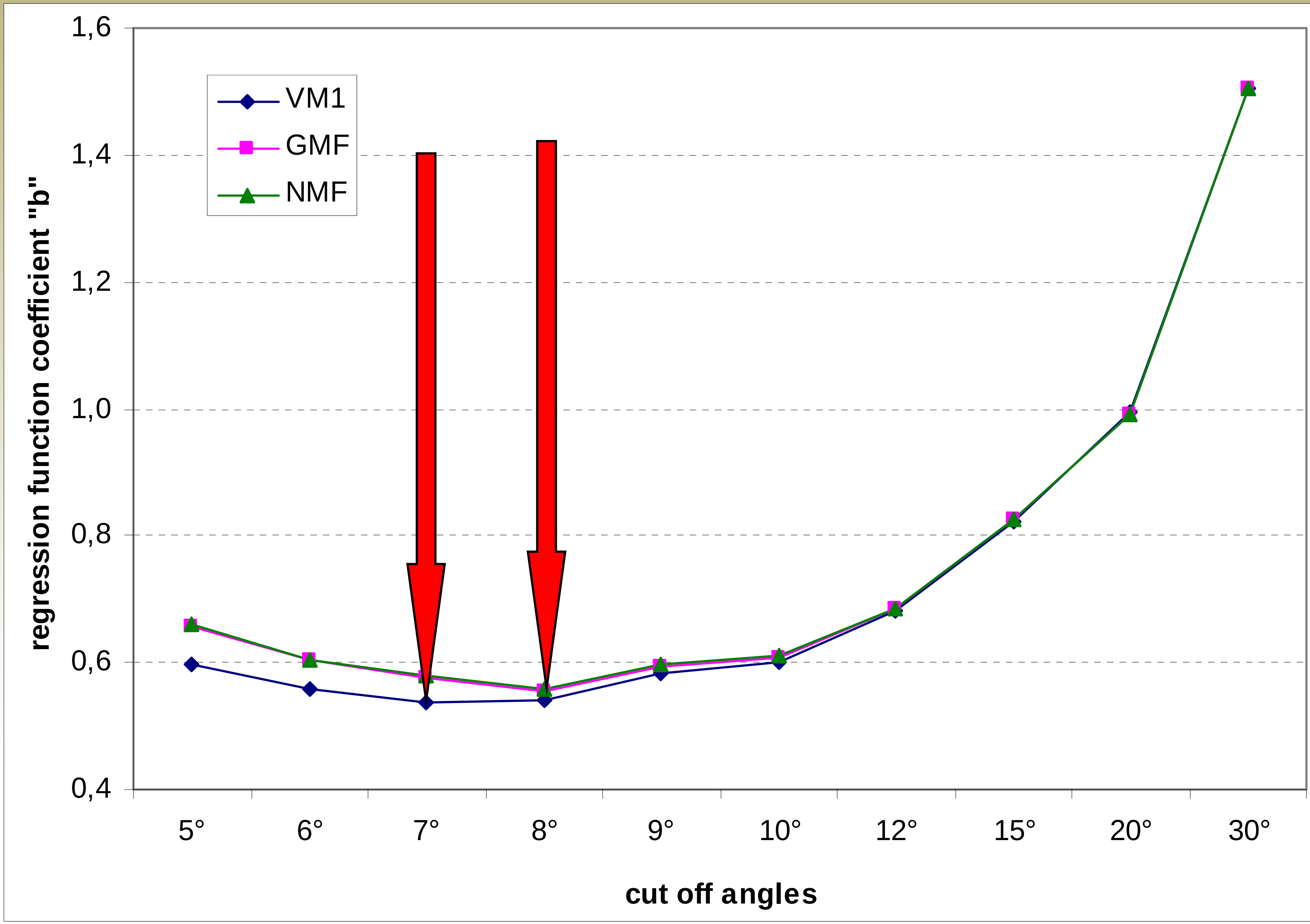


Values of the estimated parameters by LSM

Parameter “a“ fixed to 0.5 cm

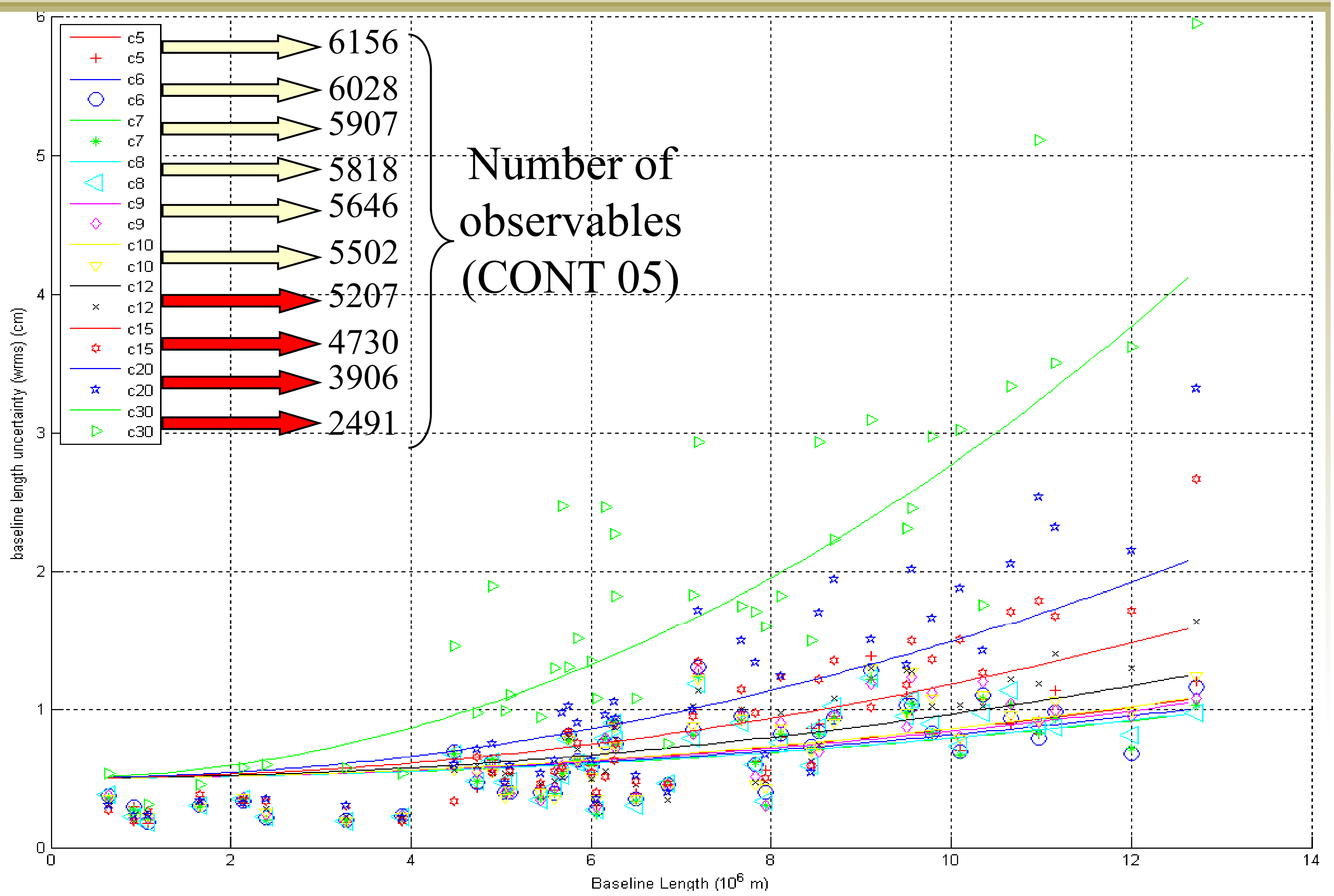
Mapping Functions	*Parameters of the function for different cut off angles*									
	5 *5°(6156)*		3 *6°(6028)*		1 *7°(5907)*		2 *8°(5818)*		4 *9°(5646)*	
	a (cm)	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*
VM1	0,5	0,597	0,5	0,559	0,5	0,537	0,5	0,540	0,5	0,582
GMF	0,5	0,657	0,5	0,605	0,5	0,577	0,5	0,554	0,5	0,595
NMF	0,5	0,660	0,5	0,605	0,5	0,580	0,5	0,558	0,5	0,597
Mapping Functions	6 *10°(5502)*		*12°(5207)*		*15°(4730)*		*20°(3906)*		*30°(2491)*	
	a (cm)	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*	*a (cm)*	*b*
VM1	0,5	0,600	0,5	0,680	0,5	0,823	0,5	0,994	0,5	1,506
GMF	0,5	0,610	0,5	0,685	0,5	0,824	0,5	0,993	0,5	1,505
IMF	0,5	0,611	0,5	0,686	0,5	0,826	0,5	0,992	0,5	1,506

Comparison of the parameter “b“



Comparison and cut off angle tests for observed and simulated CONT05 sessions

CONT05 baseline length repeatabilities (VM1)
Parameter “a“ fixed to 0.5 cm



Objective function for the optimization

SIMULATED MEASUREMENT

$\Delta\tau$: Observed group delay is simulated

$$\Delta\tau = \Delta\tau_{\text{computed}} + (WZD_2\ mfw_2(e) + cl_2) - (WZD_1\ mfw_1(e) + cl_1) + wn_{bsl(1\text{-}2)}$$

OBJECTIVE FUNCTION FOR THE OPTIMIZATION

$$\sum_{j=1}^{m} (rep_{real(j)} - rep_{simulated(j)})^2 \Rightarrow \min$$

Simulation

Simulated clocks : ASD 2.10^{-15}@15

wn : 12 psec

Troposphere : PSD : 0.5 ps^2/sec

<u>except:</u>

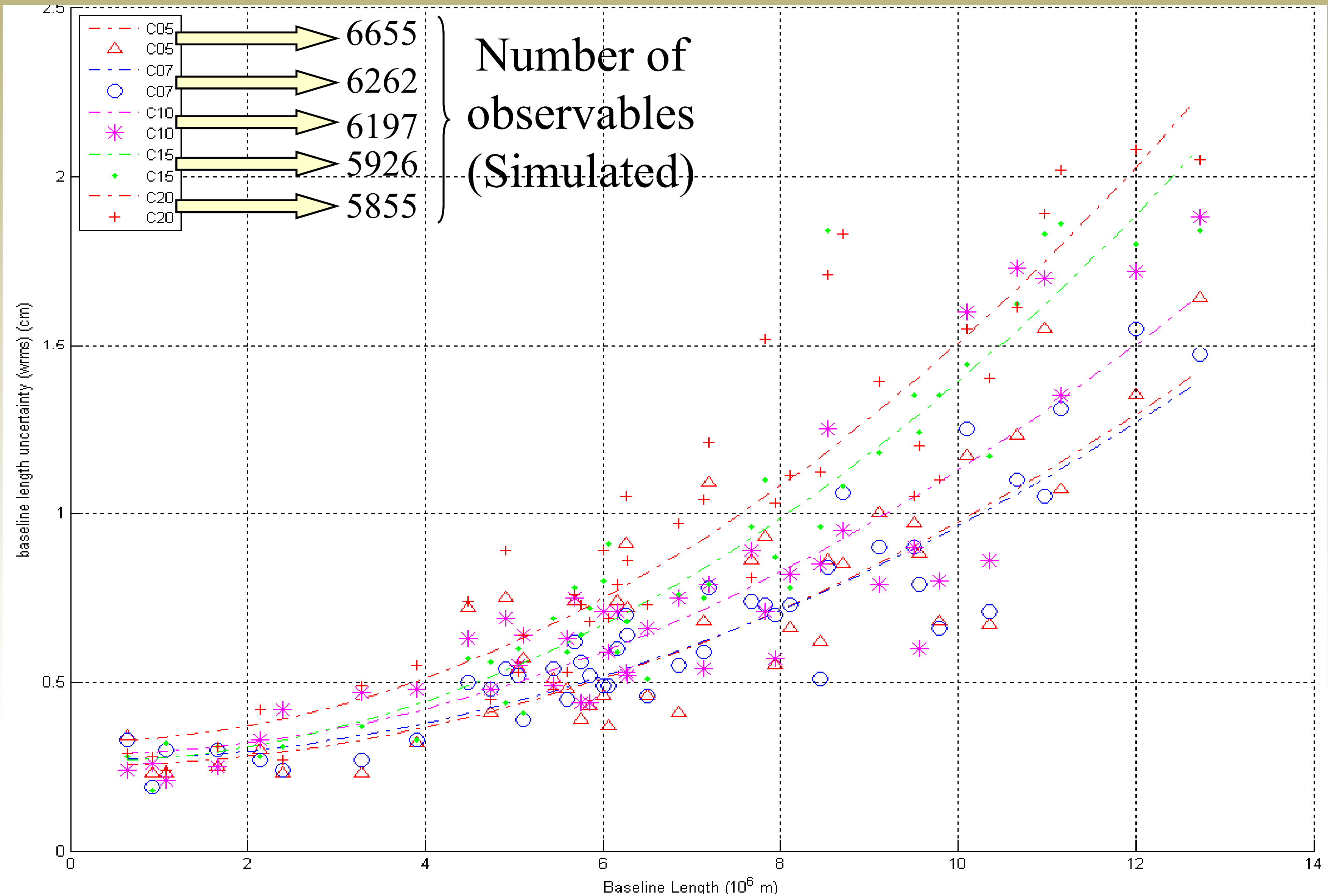
Kokee : 0.8 ps^2/sec

Hartrao: 0.1 ps2/sec

Tsukub32: 0.6 ps2/sec

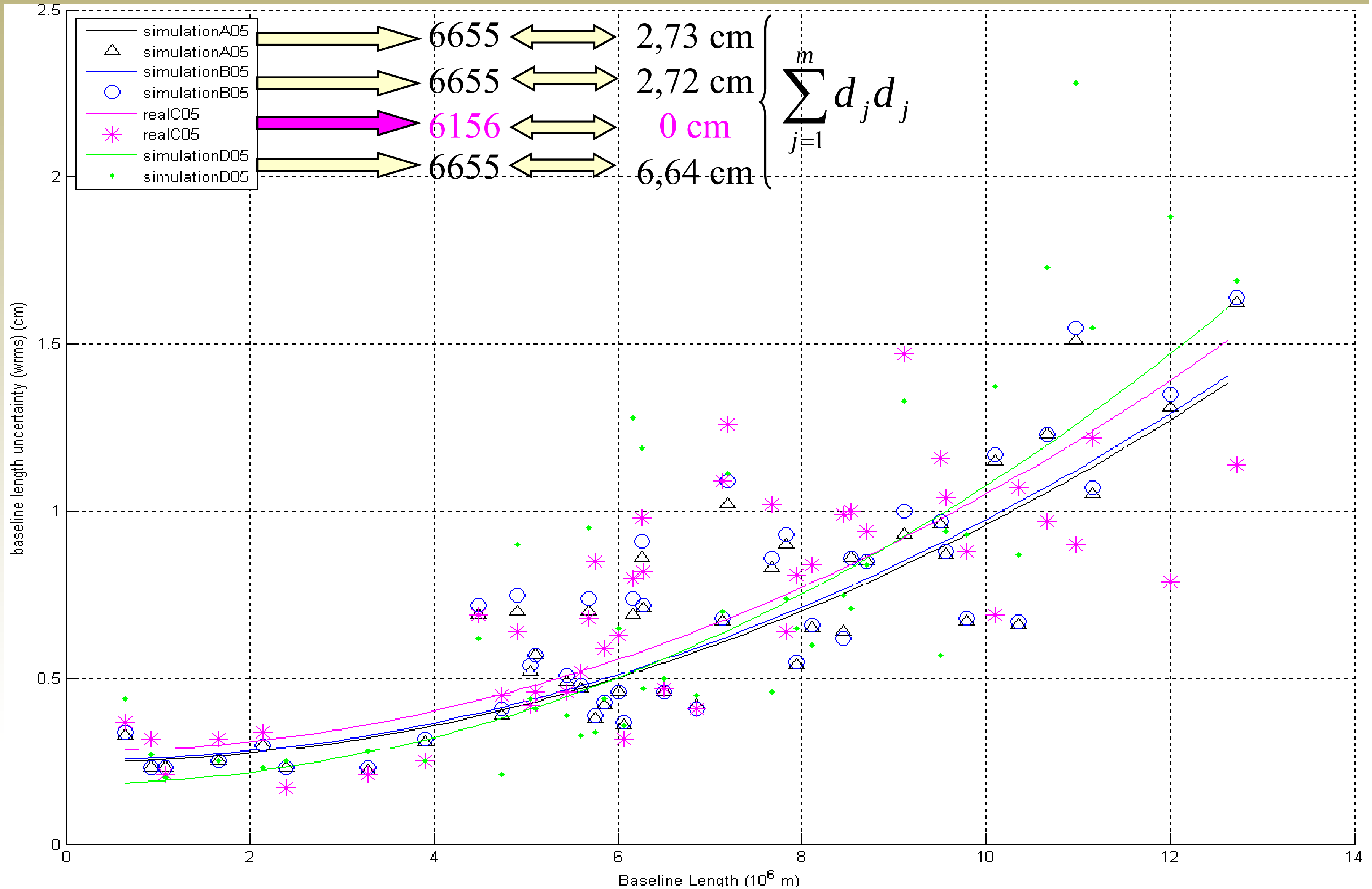
Comparison and cut off angle tests for observed and simulated CONT05 sessions

Baseline length repeatabilities derived from simulated CONT05 NGS files



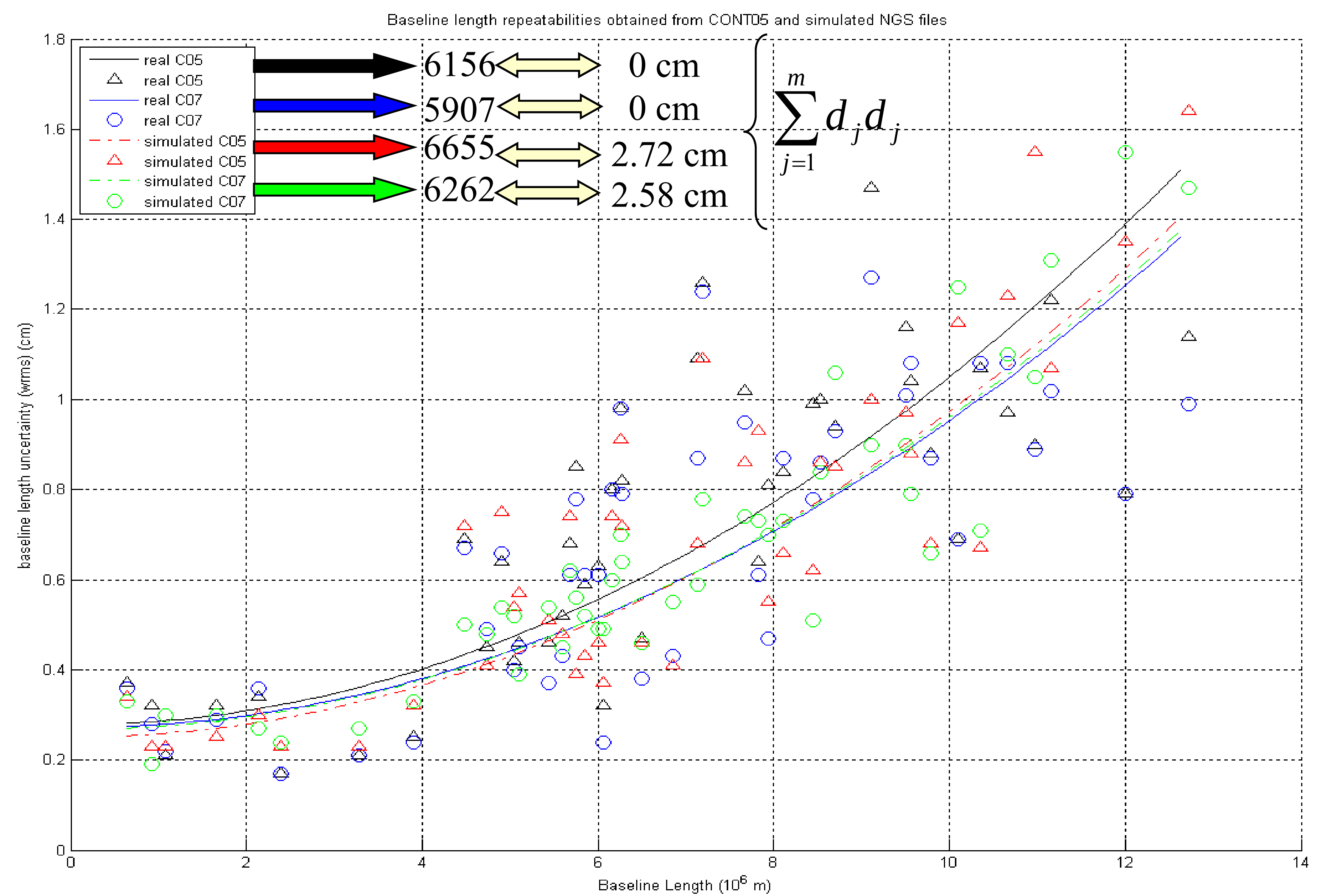
Comparison and cut off angle tests for observed and simulated CONT05 sessions

Comparison of baseline length repeatabilities derived from simulated and real CONT05 NGS files



Comparison and cut off angle tests for observed and simulated CONT05 sessions

Comparison of baseline length repeatabilities derived from simulated and real CONT05 Sessions



Conclusions and outlook

- **Similar baseline uncertainty values for cut off angles 5 to 10 degrees but not for 12 to 30 degrees.**
- **Inspite of the small differences, VM1 gives always the best results.**
- **In the simulation the white noise effect is reduced to some extent.**
- **the same amount of observables for simulations with the real ones, cut off angle 7 gives approximately the best outcomes.**
- **It has been succeeded to create overlapped simulation outcomes with the real ones for cut off angle 7 degree.**
- **No need to observe quasars below the cut off angle 7 unless the wet zenith delay parameters will be measured accurately and the related models will be improved.**

Comparison and cutoff-angle tests for observed and simulated CONT05 sessions

- Thank you ...