(2005/11/24   2005/6/25   )

.

.

.

.

Implications and Influences of Length Variations of the Forward Filter Using the Convolution Approach

Marwan Mutib
Department of Geology
College of Science
Mosul University

ABSTRACT

The research aims at the study of convolution implications for1-D forward filter length variation using different apparent resistivity patterns with sampling intervals depending upon number of filter coefficients . Three geoelectric models were obtained for each pattern by applying three filter frequencies. Each geoelectric model contains resistivity reflection coefficients, transversal resistance ratios, Longitudinal conductance ratios and Dar Zarrouk parameters.

It has been found that the reflectivity coefficients were the least affected with the changing of the filter length while there is an obvious contrast in other geoelectric parameters. The study has shown that variations in filter length has no relation with

variations in maximum penetration depth or with the length and dip of the field curve branches. However, it is possible to exploit multi-sampling technique of the field curve for diagnosing the length of the forward filter which determine the upper value of the maximum depth of penetration.

.(O'Neill and Merrick, 1984; Buttkus, 2000)

(Zhdanov and Keller ,1994 ; Reynold,

.   1997)

) www.sis.slb.com.(

( )   .(Geotomo, 2004)

.

.(   )

.

. (   )

.   (6.0096,5.3758,4.6052)   (- .   ,-2.1076,-1.5351)

(Mutib, 2000)

.

(Busokur, 1998)   (Koefoed, 1979)   :

* −									
.			.	.	.	.	.	100	
.			.	.	.	.	.	.	
.			.	.	.	.	.	.	
.			.	.	.	.	.	.	
.			.	.	.	.	.	.	
.			.	.	.	.	.	.	
.			.	.	.	.	.	.	
.			.	.	.	.	.	.	
.		-723	.	.	.	.	.	.	
.			.	.		.	.		
.	-3224		.	.		.	.		
.			.	.		.	.		
.	-1099		.	.		.	.		
.			.	.		.	.		
.			.			.			
			.			.			
			.			.			
			.			.			

(Busokur, 1998)   (Koefoed, 1979)

			.			.			
.			.			.			
-1235			.			.			
.			.			.			
-87.9			.			.			
.			.			.			
-2.766			.			.			

S = 12	S = 8	S = 6	(S)	
.	.	.	10 1/S=(F)	
.	.	.	10 2/S= (AB/2) (I1)	
.	.	.	F -1 =(E)	
.	.	.	lnI1=©	
.	.	.	1/(E-lnF)=(T1)	
.	.	.	T1*EX=®	
			* =	
			(X)	
			← c=(Ab)	
-3.194	-1.82	-1.4767	Ln{R*arc(Ab)}=	

(Hi)   (-)

(RTi)   (SLi)   (ρi)

.(Ki)   (Resistivity contrast ratio; ρi +1/ρi= Ji)

, (Coefficient of anisotropy; λ)   , (ρT)   , (ρι)

.(SLi+ /SL;ψi)   (RTi+1/ RTi ; φi)

Σ ψi Σ φi

.(   ) (Hi+1/Hi)

QH

ρι, ρT , λ , ΣHi   .

Hi, RTi, SLi   ψ, φ

(0.6%)   (Error criterion, Ec)

(   )   (   )

(   )   .   156.9   ΣHi

(HKHK,QHAK)

. (QHKH)

Patterns	ΣHi	ΣSLi	Σ RTi	ρι	ρτ	λ	Σψi	Σφi	EC
1 Mod1	.	.		.	.	.	.	.	.006
Mod2	.	.		.	.	.	.	.	.01
Mod3	.	.		.	.	.	.	.	.01
2 Mod1	.	.		.	.	.	.	.	.02
Mod2	.	.		.	.	.	.	.	0.006
Mod3		.		.	.	.	.	.	0.01
3 Mod1		.		.	.	.	.	.	0.008
Mod2	.	.		.	.	.	.	.	0.02
Mod3	.	.		.	.	.	.		0.01
4 Mod1	.	.		.	.	.	.	.	.
Mod2	.	.		.	.	.	.	.	0.01
Mod3		.		.	.	.	.	.	.
5 Mod1	.	.		.	.	.	.	.	.
Mod2	.	.		.	.	.	.		.
Mod3	.	.		.	.	.	.		.

6 Mod1	.	.		.	.	.	.	.	.
Mod2	.	.		.	.	.	.	.	.
Mod3	.	.		.	.	.	.		.

418)

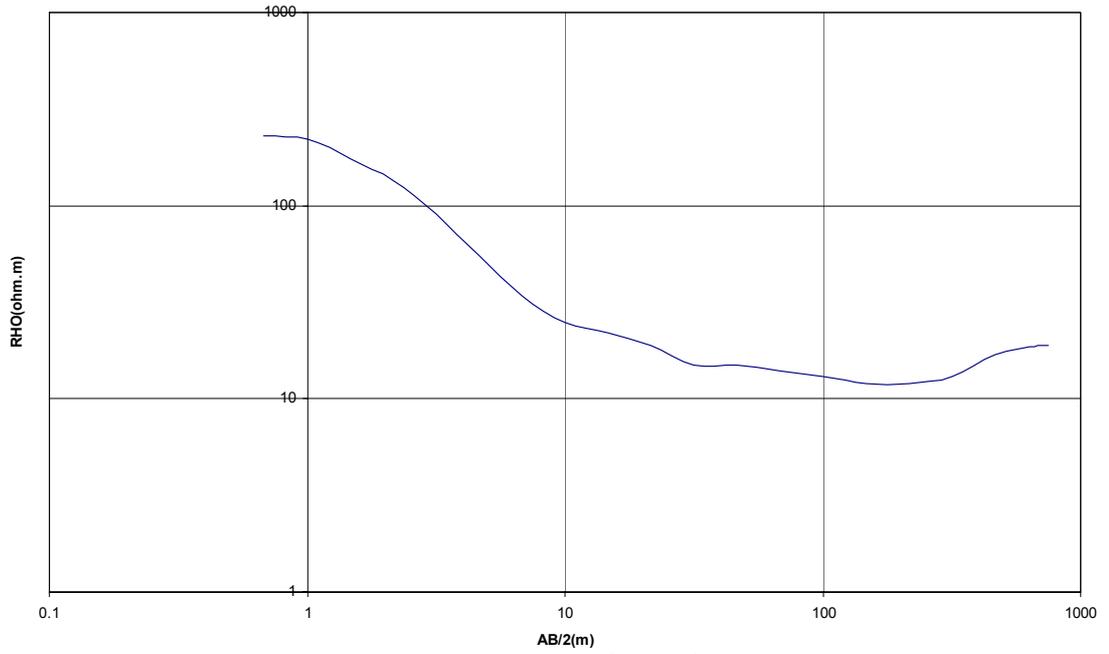. 0.6%   Ec   (

(   )

(HKHK)   (   )
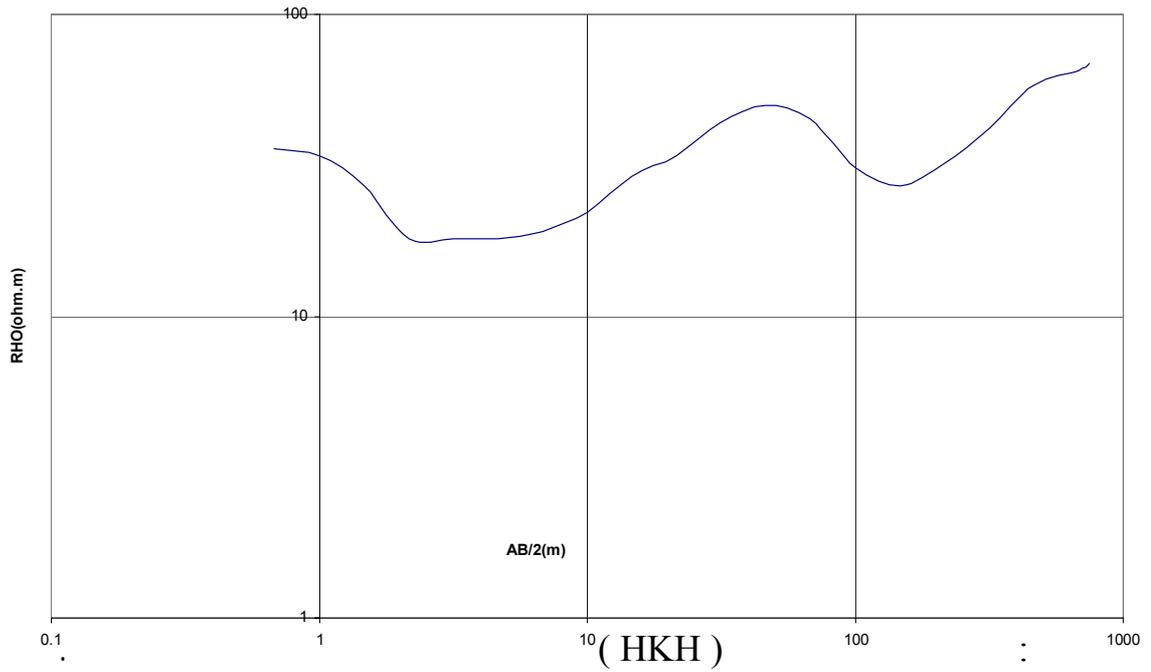
)   (HKH)

.(HAA

(QH)

Model - 1   Model - 2   Model - 3

Pi	ꜧ	Sꞇi	Rꞇi	κ	Ji	ρi	ꜧ	Sꞇi	Rꞇi	κ	Ji	ρi	ꜧ	Sꞇi	Rꞇi	κ	Ji
230	0.9	0.0039	207	-0.83	0.096	230	1.2	0.0052	276	-0.8	0.114	230	1	0.0043	230	-0.78	0.125
22.1	10	0.4525	221	-0.32	0.52	26.3	10.7	0.4068	281.4	-0.36	0.47	28.7	7.3	0.2544	209.5	-0.38	0.44
11.5	89	7.7391	1023	0.26	1.7	12.3	145	11.7886	1783.5	0.24	1.63	12.7	147	11.5748	1867	0.25	1.69
19.5						20.1						21.5					
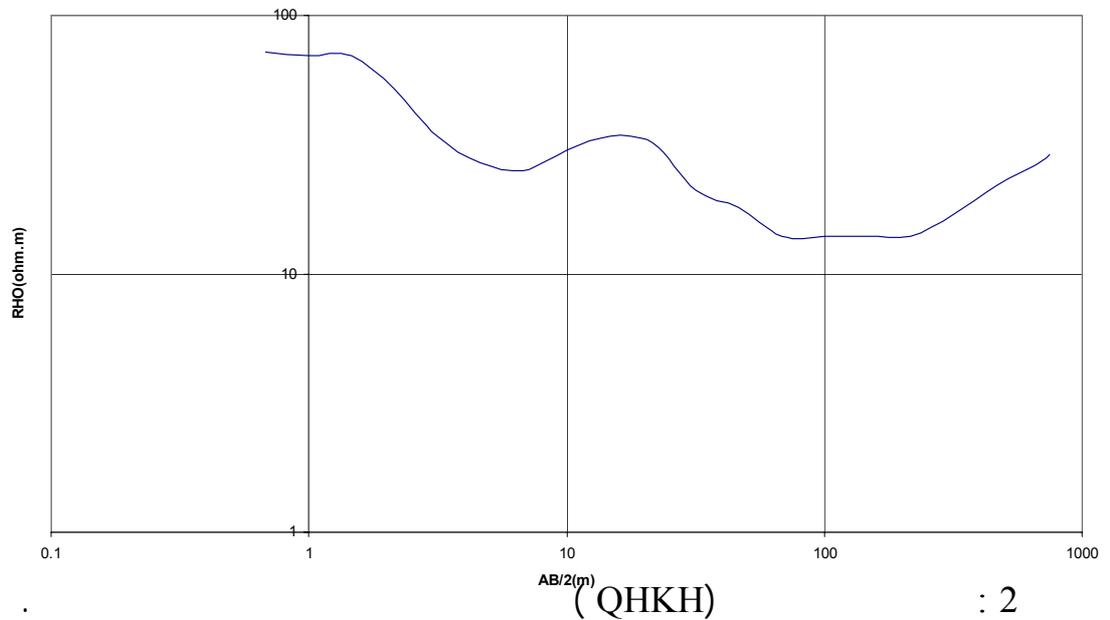
(QHKH)   : 2

Model - 1   Model - 2   Model - 3

ρi	ꜧ	Sꞇi	Rꞇi	κ	Ji	ρi	ꜧ	Sꞇi	Rꞇi	κ	Ji	ρi	ꜧ	Sꞇi	Rꞇi	κ	Ji
72	0.3	0.0042	21.6	-0.37	0.45	72	1.2	0.0166	86	-0.6	0.014	72	0.9	0.0125	65	-0.57	0.27
32.7	14.6	0.4485	477	-7.4	0.15	17.8	2.1	0.11797	37	0.37	2.16	19.6	3.3	0.1684	64	0.63	4.41
4.9	9.7	1.9796	47	0.5	2.94	38.5	11.4	0.2961	439	-0.58	0.265	36.5	3.7	0.0428	320	-0.78	0.12
14.4	71	4.931	1022	0.38	2.22	10.2	130.3	12.7745	1329	0.74	6.65	10.4	121.7	11.7	1266	0.72	6.19
31.9	322.7	10.116	10294	-0.09	0.84	68.1	156.7	2.301	10671	-0.61	0.23	64.4	270.4	4.2	17414	-0.69	0.18
26.9						16.2						11.8					

(HAA)

Model – 1   Model - 2   Model - 3

ρi	Hᵢ	Sℓi	Rᴛi	κ	Ji	ρi	Hᵢ	Sℓi	Rᴛi	κ	Ji	ρi	Hᵢ	Sℓi	Rᴛi	κ	Ji
100	0.6	0.006	60	-0.76	0.14	100	0.9	0.009	90	-0.76	0.14	100	0.8	0.008	80	-0.77	0.13
13.9	7.8	0.561	110	0.88	16	13.8	11.8	0.855	163	0.95	35.69	13	9.3	0.72	121	0.94	31.4
223	12.5	0.056	2787	-0.64	0.22	492.5	10.8	0.02193	5319	-0.87	0.072	408.3	14.8	0.036	6043	-0.98	0.01
49.7	74.1	1.49	3683	0.14	1.33	35.7	69.7	1.952	2488	0.36	2.147	4.1	15.9	3.88	65.2	0.98	99
66.2						76.5						405.9	137.9	0.34	55974	-94	0.033
												13.3					

(HK)

Model - 1   Model - 2   Model - 3

ρi	Hᵢ	Sℓi	Rᴛi	κ	Ji	ρi	Hᵢ	Sℓi	Rᴛi	κ	Ji	ρi	Hᵢ	Sℓi	Rᴛi	κ	Ji
100	0.6	0.906	60	-0.76	0.14	100	0.9	0.009	90	-0.74	0.15	100	0.8	0.008	80	-0.74	0.15
13.9	7.8	0.56	108	0.88	16	14.9	13.2	0.866	97	0.97	72.9	14.9	11.4	0.765	170	0.98	99
223	14.2	0.064	3167	-0.66	0.21	1086.1	5.4	0.005	5865	-0.93	0.036	1475	3.4	0.0023	5015	-0.95	0.025
46.5	99.9	2.15	4645	-0.28	0.56	38.9	185.4	4.77	7212	-0.23	0.63	37.1	159.4	4.3	5914	-0.16	0.72
26.2	157.8	5.871	4030	-0.28	1.11	24.6						26.7					
29																	

RHO(ohm.m)

AB/2(m)

0.1　　1　　10 (HKH)　　100　　1000

Model – 1　　　　Model – 2　　　　Model – 3

ρi	Hi	Sℓi	Rτi	κ	Ji	ρi	Hi	Sℓi	Rτi	κ	Ji	ρi	Hi	Sℓi	Rτi	κ	Ji
36	0.2	0.0056	7	-0.31	0.53	36	0.5	0.0139	18	-0.37	0.46	36	0.5	0.014	18	-0.38	0.45
19.1	5.4	0.283	103	0.67	5.11	16.4	6.3	0.384	103	0.69	5.56	16.2	5.8	0.36	94	0.85	12.4
97.6	12.4	0.13	1210	-0.68	0.19	91.1	25.6	0.281	2332	-0.81	0.11	200.9	10.2	0.051	2049	-0.98	0.01
18.8	68.4	3.64	1286	0.79		8.54	9.7	6.39	601	0.97	62	2	9.9	4.95	20	0.98	99
160.5	155	0.97	24877	-0.49	0.35	581.4	138.6	0.236	81413	-0.98	0.0099	198	289.7	1.46	57360	-0.89	0.1
55.5						5.8						11.5					

RHO(ohm.m)

AB/2(m)

0.1　　1　　10 (AKH)　　100　　1000
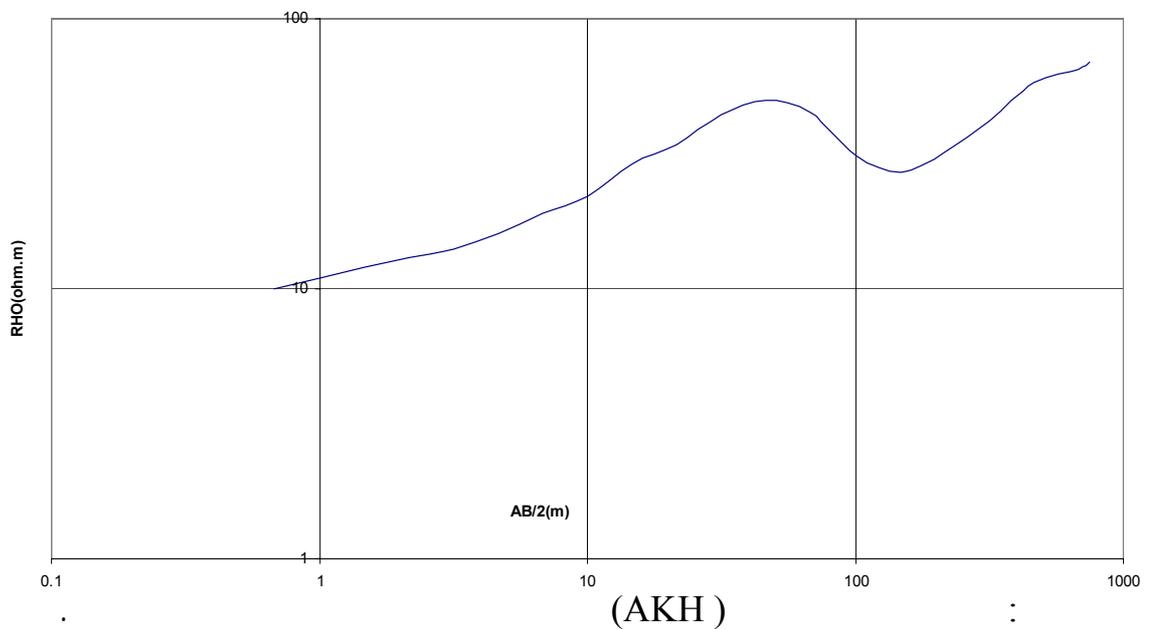
Model - 1　　　　Model – 2　　　　Model – 3

ρi	Hi	Sℓi	Rτi	κ	Ji	ρi	Hi	Sℓi	Rτi	κ	Ji	ρi	Hi	Sℓi	Rτi	κ	Ji
10	1.3	0.13	13	0.57	3.6	10	1.1	0.11	11	0.33	1.97	10	1	0.1	10	0.34	2.04
36	2.2	0.061	79.3	0.21	1.5	19.7	6.4	0.325	126	0.69	5.4	20.4	6.2	0.3	126	0.88	15.86
54.8	19.7	0.359	1079	-0.43	0.4	107	22.1	0.21	2364	-0.85	0.079	323.9	6.4	0.019	2006	-0.98	0.0099
22.1	75.6	3.52	1671	0.74	6.77	8.4	55.2	6.57	464	0.98	97.7	16.8	3.2	5.25	54	0.98	99
149.7	160.4	1.0715	24012	-0.45	0.38	820.7	98.9	0.121	81167	-0.98	0.099	316.9	193.3	0.61	61237	-0.98	0.0097
56.2						8.2						3.1					

.

Ec 198 910 ψ, φ

(   ) . (0.8%)

(Resolution analysis)

φ (0.8%) EC 276.3 HKQH

(HK) (1957) ψ (33.5)

HKH (   )

(310)

. (1%) Ec (125,2926) ψ, φ

259.2 (   )

223.5 . φ ψ

. (%) Ec 279.4,1166 φ ψ

-: .

.

.

.

ΣRT, λ , ρT , .

(Keller and Frischnecht,1982)

.

(Reynold, 1997)

(Koefoed, 1979)

.

(Systematic relationship) .

Σφ

. (Reynold,1997)

.

(Enhancement power)

$\Sigma\psi$

.

.(Inversion Technique)

Buttkus, B., 2000. Spectral Analysis and Filter Theory in Applied Geophysics. 667p.

Busokur, A.T., 1998. Digital Filter Design using the Hyperbolic Tangent Functions. Balkan journ., geophys. Soc., Vol.1, pp.14-18.

Geotomo, 2004. Rapid Two Dimensional Resistivity and IP Inversions Using least Square Method.Gelugor 11700, Penamy, Malaysia.

Keller, G.V. and Frischknecht, F.C., 1982. Electrical Methods in Geophysical Prospecting. Pergamon press, NewYork, USA, 519p.

Koefoed, O., 1979. Geosounding Principles,1, Resistivity Sounding Measurements Elsevier Scientific Publishing Company, Amsterdam, Netherland, 276p.

Mutib, M., 2000. New Contributions to the Geology of Mosul Area from Geoelectric. Investigations. Unpub.Ph.D.Thesis, Geol. Dept., Mosul Univers.,167p.

O'Neill, D.J. and Merrick, N.P., 1984. A Digital Linear Filter for Resistivity. sounding.. Geophys.Prosp.,Vol 32, pp.105-123.

Reynold, J.M., 1997. An Introduction to Applied and Environmental. Geophysics. Wiley and Sons Publish., England, 796p.

Zhdanov, M.S. and Keller, G.V., 1994. The Geoelectric Methods in Geophysical Exploration, Elsevier, Amsterdam, Netherland.

WWW.sis.slb.com/about/news. 1-D Convolution Filter for all Tools,1998.