Convergence Tests IntegralforwardModel

In the following tests we have run the processing application usingthe Conjugate Gradient as an inversion method and the Integral Forward Model. The goal is to determine the impact on the calculated cost when changing one of the input parameters and try to find if a modification of the input parameters can make the calculated cost with IntegralForwardModel converge to zero.

Name	Parameter	Default value	New value	Relative variation(%)	Default cost	New cost	Relative cost variation(%)
LowerFreq	GEN:Freq:min	10	1	90	48,74E-3	48,96E-3	43,74E-2
HigherFreq	GEN:Freq:max	40	50	25	48,74E-3	70,98E-3	45,61
MoreFreq	GEN:Freq:nTotal	15	25	66,66	48,74E-3	48,98E-3	48,52E-2
MoreReceivers	GEN:nReceivers	17	27	58,82	48,74E-3	53,18E-3	9,10
MoreSourcesAndReceivers	GEN:nSources and GEN:nReceivers	17	27	58,82	48,74E-3	51,01E-3	4,65
CalculateAlpha	IFM:Iter2:calcAlpha	FALSE	TRUE	100	48,74E-3	48,74E-3	0,00
MoreIterationsForwardModel	IFM:Iter2:n	15	25	66,66	48,74E-3	49,02E-3	55,73E-2

Column definitions

Default value: default value for a parameter
New value: new value for a parameter
Relative variation: abs(Default value - New value)*100/Default value
Default cost: calculated cost when using the default value for the parameter
New cost: calculated cost when using the new value for the parameter
Relative cost variation: abs(Default cost- New cost)*100/Default cost

Color definitions

worst result
best result

Based on the previous results we can see that the best result is obtained using the default parameters (since they produce the smallest cost for the same number of iterations). We now test what happens to the cost using the default parameters but increasing the number of iterations.

Iterations	Cost
20	48,74E-3
40	44,08E-3
60	43,06E-3
100	41,96E-3
200	41,67E-3

Conclusion:

None of the previous variations makes the cost converge to zero. Changing the number of iterations has some effect but in the last step we double the number of iterations and we obtain a negligible effect, so it is recommended to start an investigation regarding why a reconstruction using the Integral Forward Model can’t converge to zero.