Numerical Results for Comparison

SPE1A

spe1a

```
--------------------------------------------------
OCP_IMPEC_1

.\OpenCAEPoro.exe ..\..\examples\spe1a\spe1a.data  method=IMPEC  dtInit=0.1 dtMax=1 dtMin=0.1

Final time:          3655.500 Days
Total time steps:    4633
Total Newton steps:  4633 (+47 wasted steps)
Total linear steps:  7748 (+91 wasted steps)
Linear solve time:   0.772s (56.857%)
Simulation time:     1.357s


--------------------------------------------------
OCP_FIM_10

.\OpenCAEPoro.exe ..\..\examples\spe1a\spe1a.data  method=FIM  dtInit=1 dtMax=100 dtMin=0.1

precond_type            = 69

Final time:          3655.500 Days
Total time steps:    64
Total Newton steps:  147 (+2 wasted steps)
Total linear steps:  2274 (+34 wasted steps)
Linear solve time:   0.162s (52.650%)
Simulation time:     0.308s
```

SPE1B

spe1b

```
--------------------------------------------------
OCP_IMPEC_1

.\OpenCAEPoro.exe ..\..\examples\spe1b\spe1b.data  method=IMPEC  dtInit=0.1 dtMax=1 dtMin=0.1

Final time:          3655.500 Days
Total time steps:    3852
Total Newton steps:  3852 (+8 wasted steps)
Total linear steps:  7209 (+14 wasted steps)
Linear solve time:   0.659s (58.432%)
Simulation time:     1.127s


--------------------------------------------------
OCP_FIM_10

.\OpenCAEPoro.exe ..\..\examples\spe1b\spe1b.data  method=FIM  dtInit=1 dtMax=100 dtMin=0.1

precond_type            = 69

Final time:          3655.500 Days
Total time steps:    75
Total Newton steps:  175 (+2 wasted steps)
Total linear steps:  2599 (+37 wasted steps)
Linear solve time:   0.189s (53.695%)
Simulation time:     0.352s
```

SPE9

```
--------------------------------------------------
OCP_IMPEC_1

.\OpenCAEPoro.exe ..\..\examples\spe9\spe9_IMPEC.data

Final time:          900.000 Days
Total time steps:    7486
Total Newton steps:  7486 (+42 wasted steps)
Total linear steps:  9900 (+96 wasted steps)
Linear solve time:   55.246s (62.154%)
Simulation time:     88.885s


--------------------------------------------------
OCP_FIM_10

.\OpenCAEPoro.exe ..\..\examples\spe9\spe9_FIM.data

precond_type           = 69

Final time:          900.000 Days
Total time steps:    140
Total Newton steps:  185 (+67 wasted steps)
Total linear steps:  2751 (+852 wasted steps)
Linear solve time:   7.817s (52.918%)
Simulation time:     14.771s
```

SPE10

```
--------------------------------------------------
PS_FIM


Final time:          2000 Days
Total time steps:    53
Total Newton steps:  215
Wasted Newton steps: 5
Total linear steps:  1305
Linear solver time:  1413.86s
Simulation time:     2905.24s


--------------------------------------------------
OCP_FIM


.\OpenCAEPoro.exe ..\..\examples\spe10\spe10.data


Final time:          2000.000 Days
Total time steps:    53
Total Newton steps:  215 (+5 wasted steps)
Total linear steps:  1278 (+40 wasted steps)
Linear solve time:   1343.855s (73.547%)
Simulation time:     1827.200s
```

CP

CP

```
--------------------------------------------------
OCP_IMPEC_1

.\OpenCAEPoro.exe ..\..\examples\cornerpoint\CP.data  method=IMPEC  dtInit=0.1 dtMax=1 dtMin=0.1

Final time:          1000.000 Days
Total time steps:    1999
Total Newton steps:  1999 (+3 wasted steps)
Total linear steps:  13542 (+35 wasted steps)
Linear solve time:   0.044s (29.720%)
Simulation time:     0.148s


--------------------------------------------------
OCP_FIM_10

.\OpenCAEPoro.exe ..\..\examples\cornerpoint\CP.data  method=FIM  dtInit=1 dtMax=100 dtMin=0.1

precond_type             = 69

Final time:          1000.000 Days
Total time steps:    66
Total Newton steps:  154 (+3 wasted steps)
Total linear steps:  1582 (+24 wasted steps)
Linear solve time:   0.024s (25.256%)
Simulation time:     0.096s
```

SPE5

```
----------------------------------------------------
OCP_IMPEC

.\OpenCAEPoro.exe ..\..\examples\spe5\spe5.data  method=IMPEC  dtInit=0.1 dtMax=1 dtMin=0.1

SSMSTA:      6347464
NRSTA:       20264
SSMSP:       9455434
NRSP:        1665916
========================================
Final time:          7305.000 Days
Total time steps:    10791
Total Newton steps:  10791 (+25 wasted steps)
Total linear steps:  17352 (+49 wasted steps)
Linear solve time:   1.140s (8.054%)
Simulation time:     14.159s



----------------------------------------------------
OCP_FIM

.\OpenCAEPoro.exe ..\..\examples\spe5\spe5.data  method=FIM  dtInit=1 dtMax=50 dtMin=0.1

precond_type              = 64

SSMSTA:      549520
NRSTA:       2639
SSMSP:       769094
NRSP:        120125
========================================
Final time:          7305.000 Days
Total time steps:    311
Total Newton steps:  767 (+23 wasted steps)
Total linear steps:  2500 (+66 wasted steps)
Linear solve time:   6.473s (79.102%)
Simulation time:     8.183s



----------------------------------------------------
OCP_FIMn

.\OpenCAEPoro.exe ..\..\examples\spe5\spe5.data  method=FIMn  dtInit=1 dtMax=50 dtMin=0.1

precond_type              = 64

SSMSTA:      638384
NRSTA:       4939
SSMSP:       910204
NRSP:        128626
========================================
Final time:          7305.000 Days
```
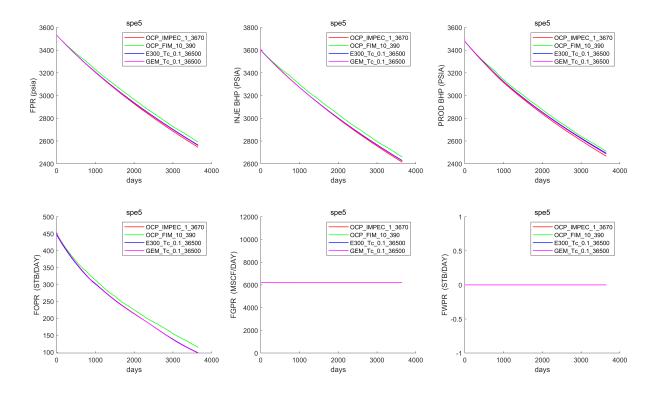
```
Total time steps:      304
Total Newton steps:    807 (+36 wasted steps)
Total linear steps:    2573 (+177 wasted steps)
Linear solve time:     6.819s (76.855%)
Simulation time:       8.873s
```

SPE3

```
-------------------------------------------------
OCP_IMPEC

.\OpenCAEPoro.exe ..\..\examples\spe3\spe3.data  method=IMPEC  dtInit=0.1 dtMax=1 dtMin=0.1

SSMSTA:      23725633
NRSTA:       19451
SSMSP:       23979137
NRSP:        1462997
========================================
Final time:          3650.000 Days
Total time steps:    3652
Total Newton steps:  3652 (+0 wasted steps)
Total linear steps:  7307 (+0 wasted steps)
Linear solve time:   1.042s (2.698%)
Simulation time:     38.641s


-------------------------------------------------
OCP_FIM

.\OpenCAEPoro.exe ..\..\examples\spe3\spe3.data  method=FIM  dtInit=1 dtMax=100 dtMin=0.1

precond_type            = 64

SSMSTA:      750655
NRSTA:       4772
SSMSP:       884275
NRSP:        38973
========================================
Final time:          3650.000 Days
Total time steps:    46
Total Newton steps:  80 (+0 wasted steps)
Total linear steps:  121 (+0 wasted steps)
Linear solve time:   0.668s (29.790%)
Simulation time:     2.243s



-------------------------------------------------
OCP_FIMn

.\OpenCAEPoro.exe ..\..\examples\spe3\spe3.data  method=FIMn  dtInit=1 dtMax=100 dtMin=0.1

precond_type            = 64

SSMSTA:      777437
NRSTA:       4900
SSMSP:       874045
NRSP:        40469
========================================
Final time:          3650.000 Days
```
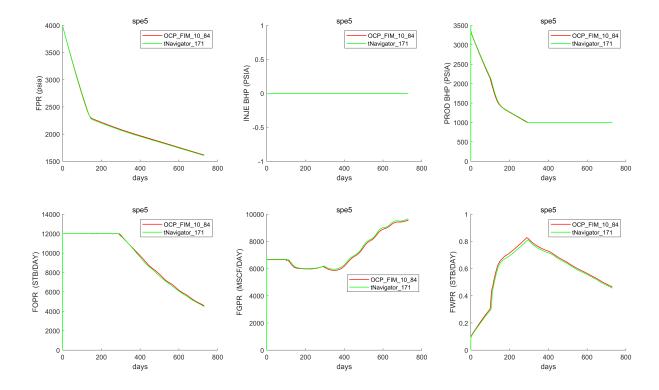
```
Total time steps:      46
Total Newton steps:    86 (+0 wasted steps)
Total linear steps:    132 (+0 wasted steps)
Linear solve time:     0.773s (30.430%)
Simulation time:       2.540s
```

SPE5r

```
--------------------------------------------------
OCP_FIM

.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data  method=FIM  dtInit=1 dtMax=10  dtMin=0.1  pl=1

precond_type   =   64

SSMSTA:     185640490
NRSTA:      76
SSMSP:      140723299
NRSP:       50135363
=======================================
Final time:         730.000 Days
Total time steps:   82
Total Newton steps: 260 (+27 wasted steps)
Total linear steps: 896 (+87 wasted steps)
Linear solve time:  542.995s (47.367%)
Simulation time:    1146.347s


.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data  method=FIM  dtInit=1 dtMax=20  dtMin=0.1  pl=1

precond_type   =   64

SSMSTA:     157185627
NRSTA:      81
SSMSP:      115716480
NRSP:       41758653
=======================================
Final time:         730.000 Days
Total time steps:   48
Total Newton steps: 213 (+24 wasted steps)
Total linear steps: 790 (+77 wasted steps)
Linear solve time:  465.497s (48.439%)
Simulation time:    961.001s



.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data  FIM  1  50  0.1

precond_type   =   64

SSMSTA:     190604401
NRSTA:      117
SSMSP:      149990315
NRSP:       56039151
=======================================
Final time:         730.000 Days
Total time steps:   47
Total Newton steps: 213 (+85 wasted steps)
Total linear steps: 781 (+442 wasted steps)
Linear solve time:  687.898s (48.709%)
```

```
Simulation time:      1412.269s


-------------------------------------------------
OCP_NEW_FIM


.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data  FIMn  1  10  0.1


precond_type   =  64


SSMSTA:      180930118
NRSTA:       80
SSMSP:       140805797
NRSP:        50478353
======================================
Final time:         730.000 Days
Total time steps:   80
Total Newton steps: 252 (+14 wasted steps)
Total linear steps: 864 (+24 wasted steps)
Linear solve time:  552.229s (42.005%)
Simulation time:    1314.664s


.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data  FIMn  1  20  0.1


precond_type   =  64


SSMSTA:      178769093
NRSTA:       72
SSMSP:       124291924
NRSP:        45607746
======================================
Final time:         730.000 Days
Total time steps:   50
Total Newton steps: 218 (+34 wasted steps)
Total linear steps: 807 (+112 wasted steps)
Linear solve time:  545.601s (43.609%)
Simulation time:    1251.113s


.\OpenCAEPoro.exe ..\..\examples\spe5refine\spe5-70x70x30-2y.data  FIMn  1  50  0.1


precond_type   =  64


SSMSTA:      193803346
NRSTA:       86
SSMSP:       160981671
NRSP:        60714439
======================================
Final time:         730.000 Days
Total time steps:   50
Total Newton steps: 210 (+93 wasted steps)
Total linear steps: 757 (+397 wasted steps)
Linear solve time:  665.262s (43.112%)
```

Simulation time: 1543.095s