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1  <?xml version="1.0" encoding="ISO-8859-1"?>
2  <OpenGeoSysProject>
3    <mesh>TaskB_mesh.vtu</mesh>
4    <geometry>TaskB.gml</geometry>
5    <processes>
6      <process>
7        <name>HM</name>
8        <type>HYDRO_MECHANICS_WITH_LIE</type>
9        <integration_order>3</integration_order>
10       <dimension>2</dimension>
11       <process_variables>
12         <process_variable>pressure</process_variable>
13         <process_variable>displacement</process_variable>
14         <process_variable>displacement_jump1</process_variable>
15       </process_variables>
16       <constitutive_relation>
17         <type>LinearElasticIsotropic</type>
18         <youngs_modulus>E</youngs_modulus>
19         <poissons_ratio>nu</poissons_ratio>
20       </constitutive_relation>
21       <intrinsic_permeability>k</intrinsic_permeability>
22       <specific_storage>S</specific_storage>
23       <fluid_viscosity>mu</fluid_viscosity>
24       <biot_coefficient>biot_m</biot_coefficient>
25       <porosity>phi</porosity>
26       <solid_density>rho_sr</solid_density>
27       <fluid_density>rho_fr</fluid_density>
28       <specific_body_force>0 0</specific_body_force>
29       <initial_effective_stress>effective_stress0</initial_effective_stress>
30
31       <initial_fracture_effective_stress>fracture_effective_stress0</initial_fractu
32       re_effective_stress>
33       <deactivate_matrix_in_flow>1</deactivate_matrix_in_flow>
34       <fracture_model>
35         <type>LinearElasticIsotropic</type>
36         <normal_stiffness>Kn</normal_stiffness>
37         <shear_stiffness>Ks</shear_stiffness>
38         <penalty_aperture_cutoff>10e-6</penalty_aperture_cutoff>
39         <tension_cutoff>1</tension_cutoff>
40       </fracture_model>
41       <fracture_properties>
42         <material_id>1</material_id>
43         <initial_aperture>aperture0</initial_aperture>
44         <specific_storage>S_f</specific_storage>
45         <biot_coefficient>biot_f</biot_coefficient>
46       </fracture_properties>
47       <secondary_variables>
48       </secondary_variables>
49     </process>
50   </processes>
51   <time_loop>
52     <processes>
53       <process ref="HM">
54         <nonlinear_solver>basic_newton</nonlinear_solver>
55         <convergence_criterion>
56           <type>PerComponentDeltaX</type>
57           <norm_type>NORM2</norm_type>
58           <reltols>1e-8 1e-8 1e-8 1e-8 1e-8</reltols>
59         </convergence_criterion>
60         <time_discretization>
61           <type>BackwardEuler</type>
62         </time_discretization>
63         <output>
64           <variables>
65             <variable>pressure</variable>
66             <variable>displacement</variable>
67             <variable>displacement_jump1</variable>

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66         </variables>
67     </output>
68     <time_stepping>
69         <type>FixedTimeStepping</type>
70         <t_initial>0</t_initial>
71         <t_end>18</t_end>
72         <timesteps>
73             <pair>
74                 <repeat>1</repeat>
75                 <delta_t>3.0</delta_t>
76             </pair>
77             <pair>
78                 <repeat>3</repeat>
79                 <delta_t>5.0</delta_t>
80             </pair>
81         </timesteps>
82     </time_stepping>
83 </process>
84 </processes>
85 <output>
86     <type>VTK</type>
87     <prefix>TaskB</prefix>
88     <output_iteration_results>0</output_iteration_results>
89     <timesteps>
90         <pair>
91             <repeat>1</repeat>
92             <each_steps>1</each_steps>
93         </pair>
94     </timesteps>
95 </output>
96 </time_loop>
97 <parameters>
98     <!-- Fluid phase properties -->
99     <parameter>
100         <name>rho_fr</name>
101         <type>Constant</type>
102         <value>1e3</value>
103     </parameter>
104     <!--
105     fluid compressibility 4.4e-10
106     -->
107     <parameter>
108         <name>mu</name>
109         <type>Constant</type>
110         <value>1e-3</value>
111     </parameter>
112     <!-- Solid phase properties -->
113     <parameter>
114         <name>rho_sr</name>
115         <type>Constant</type>
116         <value>2450</value>
117     </parameter>
118     <!-- Porous medium properties -->
119     <parameter>
120         <name>phi</name>
121         <type>Constant</type>
122         <value>0</value>
123     </parameter>
124     <parameter>
125         <name>k</name>
126         <type>Constant</type>
127         <value>1e-17</value>
128     </parameter>
129     <parameter>
130         <name>S</name>
131         <type>Constant</type>
132         <value>1e-10</value>

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133     </parameter>
134     <parameter>
135         <name>biot_m</name>
136         <type>Constant</type>
137         <value>0</value>
138     </parameter>
139     <parameter>
140         <name>E</name>
141         <type>Constant</type>
142         <value>6.1065e9</value>
143     </parameter>
144     <parameter>
145         <name>nu</name>
146         <type>Constant</type>
147         <value>0.3275</value>
148     </parameter>
149     <!--
150     K=5.9GPa, G=2.3GPa
151     -->
152     <!-- Fracture properties -->
153     <parameter>
154         <name>aperture0</name>
155         <type>Constant</type>
156         <value>10e-6</value>
157     </parameter>
158     <parameter>
159         <name>S_f</name>
160         <type>Constant</type>
161         <value>4.4e-10</value>
162     </parameter>
163     <parameter>
164         <name>biot_f</name>
165         <type>Constant</type>
166         <value>1</value>
167     </parameter>
168     <parameter>
169         <name>Kn</name>
170         <type>Constant</type>
171         <value>20e9</value>
172     </parameter>
173     <parameter>
174         <name>Ks</name>
175         <type>Constant</type>
176         <value>20e9</value>
177     </parameter>
178     <!-- Flow properties -->
179     <parameter>
180         <name>p0</name>
181         <type>Constant</type>
182         <values>0.5e6</values>
183     </parameter>
184     <parameter>
185         <name>p_in</name>
186         <type>Constant</type>
187         <values>1e6</values>
188     </parameter>
189     <parameter>
190         <name>p_in_transient</name>
191         <type>CurveScaled</type>
192         <curve>timeRamp_p_in</curve>
193         <parameter>p_in</parameter>
194     </parameter>
195     <!-- Mechancis properties -->
196     <parameter>
197         <name>displacement0</name>
198         <type>Constant</type>
199         <values>0 0</values>

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200     </parameter>
201     <parameter>
202         <name>effective_stress0</name>
203         <type>Constant</type>
204         <values>-5.3e6 -7.0e6 0 0</values>
205     </parameter>
206     <parameter>
207         <name>fracture_effective_stress0</name>
208         <type>Constant</type>
209         <!-- values: shear stress, normal stress -->
210         <values>-0.65113778e6 -5.10363053e6</values>
211     </parameter>
212     <parameter>
213         <name>zero_u</name>
214         <type>Constant</type>
215         <value>0</value>
216     </parameter>
217 </parameters>
218 <curves>
219     <curve>
220         <name>timeRamp_p_in</name>
221         <coords>0 22.9999      23 99.9999   100 156.9999  157 212.9999  213
222         266.99999 267 316.9999  317 419.9999  420 452.9999  453 807</coords>
223         <values>0.7446 0.7446  1.919 1.919  3.627 3.627  4.094 4.094  4.511
224         4.511  4.99 4.99  5.484 5.484  6.302 6.302  3.382 3.382</values>
225     </curve>
226 </curves>
227 <process_variables>
228     <process_variable>
229         <name>pressure</name>
230         <components>1</components>
231         <order>1</order>
232         <initial_condition>p0</initial_condition>
233         <boundary_conditions>
234             <boundary_condition>
235                 <geometrical_set>TaskB</geometrical_set>
236                 <geometry>INJECTION</geometry>
237                 <type>Dirichlet</type>
238                 <component>0</component>
239                 <parameter>p_in_transient</parameter>
240             </boundary_condition>
241             <boundary_condition>
242                 <geometrical_set>TaskB</geometrical_set>
243                 <geometry>PLY_TOP</geometry>
244                 <type>Dirichlet</type>
245                 <component>0</component>
246                 <parameter>p0</parameter>
247             </boundary_condition>
248             <boundary_condition>
249                 <geometrical_set>TaskB</geometrical_set>
250                 <geometry>PLY_BOTTOM</geometry>
251                 <type>Dirichlet</type>
252                 <component>0</component>
253                 <parameter>p0</parameter>
254             </boundary_condition>
255         </boundary_conditions>
256     </process_variable>
257     <process_variable>
258         <name>displacement</name>
259         <components>2</components>
260         <order>2</order>
261         <initial_condition>displacement0</initial_condition>
262         <boundary_conditions>
263             <boundary_condition>
264                 <geometrical_set>TaskB</geometrical_set>
265                 <geometry>PLY_TOP</geometry>
266                 <type>Dirichlet</type>

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265         <component>1</component>
266         <parameter>zero_u</parameter>
267     </boundary_condition>
268     <boundary_condition>
269         <geometrical_set>TaskB</geometrical_set>
270         <geometry>PLY_BOTTOM</geometry>
271         <type>Dirichlet</type>
272         <component>1</component>
273         <parameter>zero_u</parameter>
274     </boundary_condition>
275     <boundary_condition>
276         <geometrical_set>TaskB</geometrical_set>
277         <geometry>PLY_LEFT</geometry>
278         <type>Dirichlet</type>
279         <component>0</component>
280         <parameter>zero_u</parameter>
281     </boundary_condition>
282     <boundary_condition>
283         <geometrical_set>TaskB</geometrical_set>
284         <geometry>PLY_RIGHT</geometry>
285         <type>Dirichlet</type>
286         <component>0</component>
287         <parameter>zero_u</parameter>
288     </boundary_condition>
289 </boundary_conditions>
290 </process_variable>
291 <process_variable>
292     <name>displacement_jump1</name>
293     <components>2</components>
294     <order>2</order>
295     <initial_condition>displacement0</initial_condition>
296     <boundary_conditions>
297         <boundary_condition>
298             <geometrical_set>TaskB</geometrical_set>
299             <geometry>PLY_TOP</geometry>
300             <type>Dirichlet</type>
301             <component>1</component>
302             <parameter>zero_u</parameter>
303         </boundary_condition>
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305             <geometrical_set>TaskB</geometrical_set>
306             <geometry>PLY_BOTTOM</geometry>
307             <type>Dirichlet</type>
308             <component>1</component>
309             <parameter>zero_u</parameter>
310         </boundary_condition>
311     </boundary_conditions>
312 </process_variable>
313 </process_variables>
314 <nonlinear_solvers>
315     <nonlinear_solver>
316         <name>basic_newton</name>
317         <type>Newton</type>
318         <max_iter>15</max_iter>
319         <linear_solver>general_linear_solver</linear_solver>
320     </nonlinear_solver>
321 </nonlinear_solvers>
322 <linear_solvers>
323     <linear_solver>
324         <name>general_linear_solver</name>
325         <eigen>
326             <solver_type>BiCGSTAB</solver_type>
327             <precon_type>ILUT</precon_type>
328             <max_iteration_step>3000</max_iteration_step>
329             <error_tolerance>1e-12</error_tolerance>
330             <scaling>1</scaling>
331         </eigen>

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332         </linear_solver>
333     </linear_solvers>
334 </OpenGeoSysProject>
335
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