3D Geological modelling of the State of Vaud: first steps with the map of Nyon

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Why did we made the choice of modelling Nyon’s territory?

High complexity of Quaternary deposits on the Plateau and elaborated structure in Jura
Model made with geotypes:

1. Geotypes have been defined for their hydrogeological and/or geotechnical features.
2. Already in use by State of Vaud’s administration.

Challenge:
How to get through from limited data (geological maps, logs,...) to continuous data (3D model)?

Make the information denser.
Model Building: make the information denser in…

I. Quaternary deposits:
   I.1 with geological cross-sections
   I.2 lenses modelling

II. Tertiary and Mesozoic deposits
   II.1 A new picture of the Molasses’ top on the Plateau
   II.2 Jura’s folds modelling with structural maps
   II.3 Fault data extrapolation

III. 3D Model
   III.1 Stratigraphic column
   III.2 Results
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• 15 lenses underground within Quaternary deposits
• 7 geotypes on surface
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• Large and deep subglacial valley (from Gingins to Bursinel) featuring, at least, 4 glaciation periods

• Glacial erosion is sometimes lead by major strike-slip faults
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« Official » cross-section from Nyon’s geological map
Height of Reef Complex’s top (Kimmeridgian)

Purbeckian’s Top height between two major reverse faults
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AWK script (De Kemp, 1998) on Linux leading to extrapolations using main azimuth and dip (cossines)
## Stratigraphic column

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>90</th>
<th>120</th>
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<tr>
<td>Unit</td>
<td>20</td>
<td>40</td>
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<tr>
<td>Formation</td>
<td>66-60</td>
<td>25-40</td>
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<tr>
<td>Age</td>
<td>74</td>
<td>15</td>
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<tr>
<td>Age</td>
<td>30</td>
<td>35-45</td>
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<td>Calcaires de Voquins</td>
<td>Formation Pierre Chael + Vons</td>
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<tr>
<td>Formation</td>
<td>Marnes du Plateau</td>
<td>Marine de l'Haubry</td>
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<td>Formation</td>
<td>Calcaires</td>
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<tr>
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<td>Calcaires</td>
<td>Calcaires</td>
</tr>
</tbody>
</table>

**Legend:**
- **Calcaires:** limestone
- **Marnes:** mudstone
- **Formation Pierre Chael + Vons:** Pierre Chael + Vons Formation
- **Formation Calcaire de Voquins:** Calcaire de Voquins Formation
- **Formation Marnes du Plateau:** Marnes du Plateau Formation
- **Formation Marine de l'Haubry:** Marine de l'Haubry Formation
- **Formation Calcaires:** Calcaire Formation
- **Formation Marnes:** Marnes Formation

**Stratigraphic column used to establish a model of the Jura area covering Mesozoic era (down to Oxfordian age).**
All surface are obtained by isopach calculations (constant bed thickness – concentric folds) from reference surface
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Main features and Conclusions

• 43 reference surfaces with a 50m mesh

• Including main Quaternary formations (fluvio-glacial, glacio-lacustrine, ground morainnes or lateral morainnes, etc…) and Mesozoic formations (down to Oxfordian age)

• Including major strike-slip and reverse faults

• Developed for geothermal assessment purpose but can be used for other applications

• Overview of the present knowledge that can be deeply modified with any new geological information about this region
Thanks a lot