Integration of terrain, parent material and soil information in e-SOTER at scale 1:250,000

Michael Bock
content

I. Basic procedure

II. Case study 1: data rich environment Chemnitz (Germany/Czech Rep.)
   - landform
   - parent material
   - terrain
   - soil data situation
   - critical number of sample points
   - cluster analysis
   - e-SOTER Map

III. Case study 2: data poor environment Fes (Morocco)
   - landform
   - parent material
   - terrain
   - soil data situation
   - further processing and cluster analysis
   - eSOTER draft Map
   - validation trip

IV. Outlook
I. Basic procedure

- Landform units / GMK
- Parent material
- Terrain units
- Legacy point data
- Legacy polygon data
- Soil component
  - Cluster analysis
  - e-SOTER soil component
II. Case study: data rich environment Chemnitz - landform units: Geomorphographic map (GMK) -

zoomed in 1/6\textsuperscript{th} of total pilot
II. Case study: data rich environment Chemnitz
- parent material units: reclassified Geological map -
zoomed in 1/6th of total pilot
II. Case study: data rich environment Chemnitz
- terrain units: merging GMK with PM = 349 classes –
  (first 3 digits landform unit / last 2 parent material)

zoomed in 1/6\textsuperscript{th} of total pilot
• The system picks up on the idea that the combination of landform and parent material information dissects the landscape in a complex manner sufficiently to represent delineations conform with soil-landscape formation.

• The legend of the terrain units requires aggregation according to soil content.
Profile data with 10 main soil types in pilot Chemnitz (13480 samples)
Analyzing profile data:
Proportions of main soil types in Chemnitz [%]
Analyzing profile data:
Proportions of main soil types in bottom areas [%] | area 2 | USAS (34 samples)
Main soil types in Upper terraces 2 | SLXS (139 samples)
Analysing profile data within terrain units

**Reduction of the number of points**

Randomly reducing the points down to 15% of the points still leads to the same results. More reducing leads to accidently altering the proportions.

In Chemnitz 2,500 points would have been enough for more than 17,000 km², 

\[ \Delta 1 \text{ point} \sim 9 \text{km}^2. \]
Analyzing profile data:
Differences in main soil types in bottom areas,
data preparation for terrain unit aggregation

<table>
<thead>
<tr>
<th>RN</th>
<th>RQ</th>
<th>BB</th>
<th>LF</th>
<th>LL</th>
<th>PP</th>
<th>SS</th>
<th>YK</th>
<th>AB</th>
<th>GG</th>
<th>control sum</th>
<th>number of points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10153</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>43.5</td>
<td>-18.2</td>
<td>5</td>
</tr>
<tr>
<td>10211</td>
<td>-0.6</td>
<td>-2.6</td>
<td>15.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>33.5</td>
<td>-18.2</td>
<td>10</td>
</tr>
<tr>
<td>10212</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>43.5</td>
<td>-18.2</td>
<td>5</td>
</tr>
<tr>
<td>10215</td>
<td>-0.6</td>
<td>-2.6</td>
<td>15.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>28.2</td>
<td>-10.5</td>
<td>-16.5</td>
<td>-18.2</td>
<td>5</td>
</tr>
<tr>
<td>10217</td>
<td>-0.6</td>
<td>-2.6</td>
<td>14.4</td>
<td>-0.2</td>
<td>0.2</td>
<td>-1.9</td>
<td>-6.2</td>
<td>11.7</td>
<td>-11.0</td>
<td>-7.1</td>
<td>36</td>
</tr>
<tr>
<td>10220</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>11.8</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>13.5</td>
<td>11.8</td>
<td>10</td>
</tr>
<tr>
<td>10224</td>
<td>-0.6</td>
<td>4.5</td>
<td>11.3</td>
<td>-0.2</td>
<td>8.2</td>
<td>-1.9</td>
<td>-4.7</td>
<td>10.9</td>
<td>1.3</td>
<td>-11.1</td>
<td>28</td>
</tr>
<tr>
<td>10228</td>
<td>-0.6</td>
<td>-2.6</td>
<td>4.1</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>12.0</td>
<td>10.4</td>
<td>7</td>
</tr>
<tr>
<td>10230</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>6.4</td>
<td>7.7</td>
<td>-16.5</td>
<td>27.3</td>
<td>11</td>
</tr>
<tr>
<td>10231</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>33.5</td>
<td>-18.2</td>
<td>6</td>
</tr>
<tr>
<td>10253</td>
<td>-0.6</td>
<td>3.3</td>
<td>-9.8</td>
<td>-0.2</td>
<td>0.7</td>
<td>-1.9</td>
<td>-3.0</td>
<td>-10.5</td>
<td>15.8</td>
<td>8.3</td>
<td>34</td>
</tr>
<tr>
<td>10254</td>
<td>-0.6</td>
<td>-2.6</td>
<td>21.0</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>24.5</td>
<td>-10.5</td>
<td>-16.5</td>
<td>-18.2</td>
<td>11</td>
</tr>
<tr>
<td>10311</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-3.0</td>
<td>-0.2</td>
<td>-1.0</td>
<td>-1.9</td>
<td>13.2</td>
<td>0.2</td>
<td>-2.2</td>
<td>3.2</td>
<td>28</td>
</tr>
<tr>
<td>10312</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>11.8</td>
<td>-1.9</td>
<td>1.5</td>
<td>9.5</td>
<td>-16.5</td>
<td>15.1</td>
<td>15</td>
</tr>
<tr>
<td>10314</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>50.1</td>
<td>-18.2</td>
<td>3</td>
</tr>
<tr>
<td>10316</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-8.7</td>
<td>-0.2</td>
<td>-8.2</td>
<td>29.7</td>
<td>9.3</td>
<td>-10.5</td>
<td>-16.5</td>
<td>8.1</td>
<td>19</td>
</tr>
<tr>
<td>10317</td>
<td>-0.6</td>
<td>-2.6</td>
<td>22.0</td>
<td>-0.2</td>
<td>-3.5</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-3.5</td>
<td>-7.2</td>
<td>2.7</td>
<td>43</td>
</tr>
<tr>
<td>10320</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>-16.5</td>
<td>21.8</td>
<td>5</td>
</tr>
<tr>
<td>10324</td>
<td>-0.6</td>
<td>-2.6</td>
<td>14.0</td>
<td>-0.2</td>
<td>6.1</td>
<td>-1.9</td>
<td>-11.8</td>
<td>3.8</td>
<td>16.5</td>
<td>-18.2</td>
<td>20</td>
</tr>
<tr>
<td>10328</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-16.6</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>3.5</td>
<td>4.9</td>
<td>-8.6</td>
<td>20.3</td>
<td>26</td>
</tr>
<tr>
<td>10330</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>32.3</td>
<td>-16.5</td>
<td>-18.2</td>
<td>7</td>
</tr>
<tr>
<td>10331</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-4.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>36.8</td>
<td>-18.2</td>
<td>15</td>
</tr>
<tr>
<td>10353</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>16.8</td>
<td>-10.5</td>
<td>-16.5</td>
<td>-18.2</td>
<td>7</td>
</tr>
<tr>
<td>10411</td>
<td>-0.6</td>
<td>-2.6</td>
<td>10.8</td>
<td>0.2</td>
<td>3.6</td>
<td>-1.9</td>
<td>5.8</td>
<td>1.2</td>
<td>-4.8</td>
<td>-18.2</td>
<td>17</td>
</tr>
<tr>
<td>10412</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>38.2</td>
<td>-10.5</td>
<td>16.5</td>
<td>-18.2</td>
<td>4</td>
</tr>
<tr>
<td>10416</td>
<td>-0.6</td>
<td>-2.6</td>
<td>4.1</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>10.4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>10417</td>
<td>-0.6</td>
<td>-2.6</td>
<td>6.3</td>
<td>-0.2</td>
<td>14.9</td>
<td>-1.9</td>
<td>-11.8</td>
<td>12.6</td>
<td>-16.5</td>
<td>-18.2</td>
<td>13</td>
</tr>
<tr>
<td>10420</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>-16.5</td>
<td>15.1</td>
<td>6</td>
</tr>
<tr>
<td>10424</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>29.3</td>
<td>-1.9</td>
<td>-11.8</td>
<td>-10.5</td>
<td>-16.5</td>
<td>-18.2</td>
<td>8</td>
</tr>
<tr>
<td>10428</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>33.7</td>
<td>-10.5</td>
<td>-16.5</td>
<td>-18.2</td>
<td>11</td>
</tr>
<tr>
<td>10433</td>
<td>-0.6</td>
<td>-2.6</td>
<td>-24.5</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>10.4</td>
<td>11.7</td>
<td>5.7</td>
<td>-18.2</td>
<td>9</td>
</tr>
<tr>
<td>10454</td>
<td>-0.6</td>
<td>-2.6</td>
<td>8.9</td>
<td>-0.2</td>
<td>-8.2</td>
<td>-1.9</td>
<td>54.9</td>
<td>-10.5</td>
<td>-16.5</td>
<td>-18.2</td>
<td>6</td>
</tr>
</tbody>
</table>
eSOTER map Chemnitz with soil component

zoomed in 1/6th of total pilot
eSOTER map Chemnitz with soil component
III. Case study: data poor environment Fes - landform units: Geomorphographic map (GMK) -
III. Case study: data poor environment Fes
Parent material information,
reclassification of Geological map (Schuler)
III. Case study: data poor environment Fes
Terrain units merging GMK with PM = 88 classes – (first 3 digits landform unit / last 2 parent material)
III. Case study: data poor environment Fes
2 soil maps for soil component
problem 1: poor spatial resolution
problem 2: poor semantic information
eSOTER draft map
validation trip with massive experience!!
validation trip: outcomes

• The delineations of terrain units were traceable
• The content of the soil component wasn’t reliable due to the quality of the soil data
• Nevertheless the eSOTER draft map can serve as a conceptual soil map
III. Conclusion

- Landform units / GMK
- parent material
- Terrain units
- Legacy point data
- Legacy polygon data
- cluster analysis
- e-SOTER units

≜ conceptual soil map
IV. Outlook

- In principle this procedure consistently implements the site factors relief and parent material
- Prestratification of the landscape according to soil regions required for larger mapping projects
- The conceptual of this soil components integrates existing soil data and SOTER mapping data of different scales and area coverage
- The validity to serve as a conceptual soil map is promising. Of course it needs further investigation by soil mappers
Derivation of random points