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## Multi-strata geomorphological database (MorphDB): a methodological breakthrough in geomorphological mapping approach

### SUPPLEMENTARY MATERIAL

#### *MorphDB fields*

All the landforms and the morphodynamics have been addressed to the stratum 'L&D' including the strata ST052 (natural landforms), ST053 (anthropogenic landforms), ST054 (other symbols) reported in the Q13 (Campobasso *et al.*, 2021). In particular it is composed of:

1. 'CARG\_50k\_sheet', the univocal name referred to the local basemap. In our case, it is referred to the name of the official Italian 1:50,000 geological sheet (e.g., Bardi) (<https://www.isprambiente.gov.it/Media/carg/>). However, this field can be referred to the local geological basemap.
2. 'Landf\_id', a univocal and numerical id associated to the single represented landform (e.g., 1 or 2 or 3 etc.).
3. 'LFD', indicating the code and landform name following the classification based on the morphogenetic processes indicated in (Campobasso *et al.*, 2021) (fig. 2b). This represents the Italian field called 'Sigla' in the upper mentioned document, (e.g., FD44-Colluvial talus).
4. 'Activity', representing the landforms activity (active, relict or NULL when this term cannot be addressed to a specific landform).
5. 'Age' of the landforms (e.g., Holocene).
6. 'Surv\_D', date of field survey.
7. 'Field\_note', indicating the most significative field evidence associated to each landform.

8. 'Geomorphosite', indicating if the landform has a particular geomorphological meaning (e.g., National interest).

Moreover, depending on the type of geometry (polygon, polyline, point), the MorphDB consists of a series of columns indicating:

1. 'Azimut mov', the azimuth of the landform's movement, if applicable. This field can be useful to automatically orient the symbols.
2. 'fid', a univocal field representing the count of the single polygon in the DB.
3. 'Slope\_min' and 'Slope\_max', the minimum and maximum slope value expressed in degree, or the value 'Slope' for the points and polylines.
4. 'Ele\_min' and 'Ele\_max', the maximum and minimum altitude or the elevation 'Elevation' for the points.
5. 'SHAPE\_area', the area of the landform.
6. 'SHAPE\_length', the length of each polyline.

The MorphDB also consists in a feature named 'BL\_polygon' which collects the lithological information of the bedrock, representing the stratum ST050 (Lithology) (Campobasso *et al.*, 2021) (fig. 5b). In particular it is composed of:

1. 'CARG\_50k\_sheet', the univocal name referred to the local basemap. In our case it is referred to the name of the official Italian 1:50,000 geological sheet (e.g., Bardi).

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2. 'Litho\_id', a univocal id associated to the bedrock represented.
3. 'Lithotype', the lithology of the bedrock, indicated in the field (e.g., Marls).
4. 'Charact', indicating by the lithological characteristics of the bedrock (e.g., cohesive).
5. 'Fracture', indicating the degree of fractures of the bedrock (e.g., very low).
6. 'Field\_note' indicating the peculiarity of the bedrock.

And it includes other two columns as well:

1. 'fid', a univocal field representing the count of the single polygon in the DB.
2. 'SHAPE\_area', indicating the area of the polygon.

Finally, a stratum called 'DE\_polygon' (fig. 5c), corresponding to the stratum ST055 (Deposits) of Campobasso et al. (2021), represents: i) a loose deposit or ii) an accumulation landform as reported in Q13 or a portion of a landform that has lost its morphological characteristics and significance but can still be clearly attributed to the original landform based on its textural and lithological characteristics. It is composed of:

1. 'CARG\_50k\_sheet', the univocal name referred to the local basemap. In our case, it is referred to the name of the official Italian 1:50,000 geological sheet (e.g., Bardi).
2. 'Dep\_id', a univocal id associated to each deposit represented.
3. 'Process', the morphogenetic system (e.g., Glacial).
4. 'Process type', indicates if the process is autochthonous or allochthonous.
5. 'Age\_inf', 'Age\_sup', the age of the deposits (e.g., Little Ice Age).
6. 'Grain\_size\_class', textural information inferred in the field or in the laboratory (e.g., Sand)
7. 'Dep\_type', indicates if the deposits are cemented or not.

And it includes other two columns as well:

1. 'fid', a univocal field representing the count of the single polygon in the DB.
2. 'SHAPE\_area', indicating the area of the polygon.
3. 'Landf\_id\_L&Dpol', a univocal ID associated to the column 'Landf\_id' of the stratum L&D\_Polygon.