FROM: "Practical classification of geotechnically complex formations with block-in-matrix fabrics ", Maria Lia Napoli, Andrea Festa, Monica Barbero (2022)
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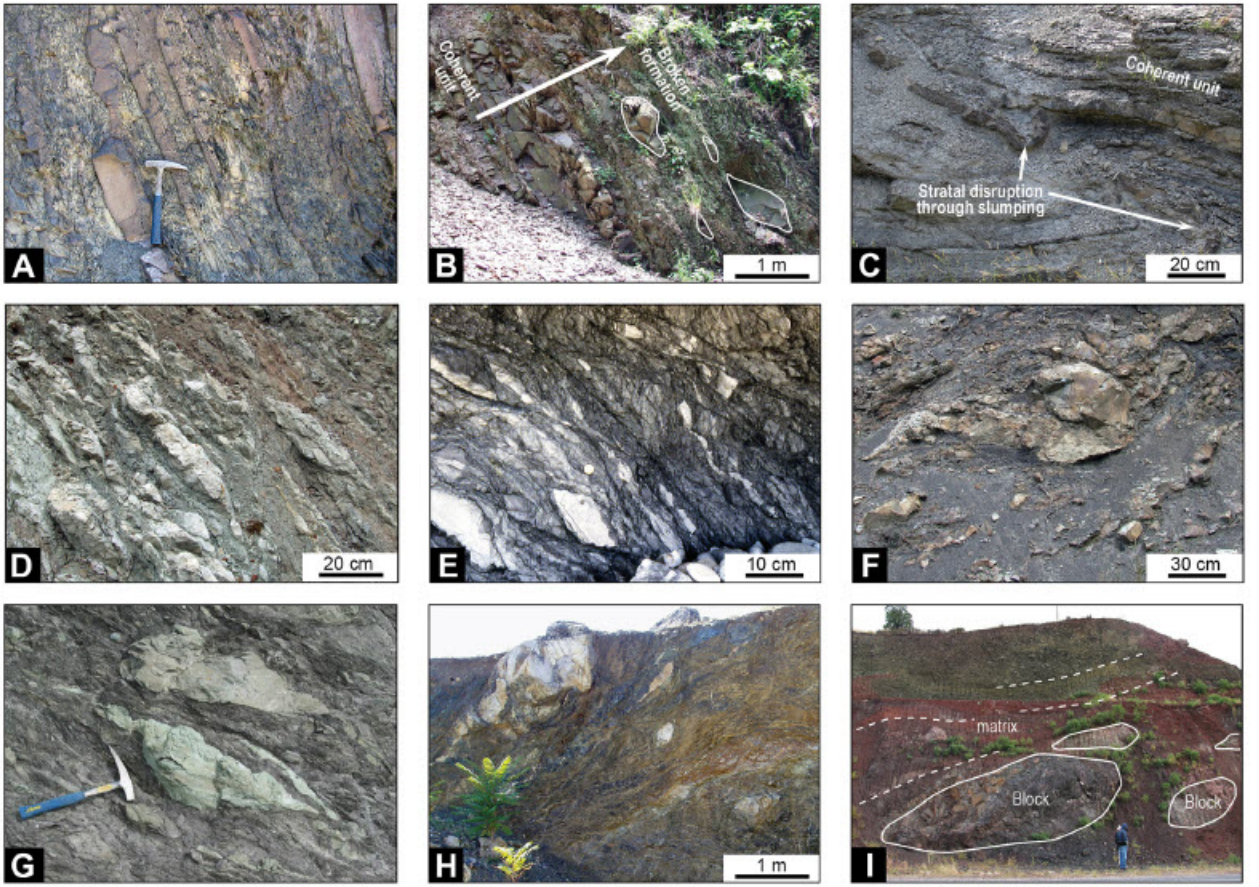

Fig. 3. Field examples showing the transition from a coherent unit (A) to broken formations (B—F) and tectonic mélanges (G-I). (A) Coherent, well-bedded, Ordovician flysch deposits consisting of alternating of sandstone and claystone from the Argentina Precordillera. Hammer for scale. Note early stages of stratal disruption through extensional boudinage in both the left and right side of the photograph. (B) Transition (white arrow) from a coherent unit, consisting of a normal bedded Late Ordovician succession of alternating graywacke and mudstone, to broken formation with elongated to lenticular graywacke blocks embedded in a mudstone matrix (Albany Berks County, Hamburg Klippe, Central Appalachians, USA). (C) Close-up view showing the transition from a coherent unit (top) to the early stage of development of a broken formation (bottom) trough slumping and related boudinage in the Miocene flysch deposits of the Marnoso arenacea Fm. (Passo dei Mandrioli) in Northern Apennines of Italy. (D) Progressive stratal disruption of a well bedded unit (Flysch Rosso) forming a broken formation with lozenge-shaped blocks of mudstone in a clayey marl matrix (Aventino valley, Abruzzi region, Central Apennines of Italy). Note that the matrix is deformed by a pervasive scaly fabric. (E) Sigmoidal to lozenge-shaped blocks of sandstone within a mudstone matrix displaying a pervasive scaly fabric (broken formation), due to tectonic deformation within a shear zone (Waimarama Beach, South Hawke's Bay, East Coast of North Island, New Zealand; Courtesy of G.A. Pini). Note that blocks long axes are aligned to the main shear zone. (F) Field-detail of a broken formation characterized by a high degree of stratal disruption with isolated hard sigmoidal blocks embedded in softer (clayey) matrix (Bobbio Tectonic Window, Northern Apennines of Italy). (G) Close-up view of tectonic mélange with lenticular exotic blocks in a sheared matrix (Franciscan Complex, CA-USA). Hammer for scale. (H) Sigmoidal to phacoidal Upper Triassic pelagic limestone blocks in a heterogeneous and variously deformed matrix composed of shale, mudstone, and sandstone in the Jurassic-Cretaceous Avdella mélange (Pindos Mountains, Northern Greece). (I) Huge exotic ultramafic and limestone blocks, lenticular in shape, embedded in a fine grained green reddish ophiolitic matrix of the Cretaceous Ankara Ophiolitic Mélange (Central Anatolia, Turkey). Geoscientists for scale. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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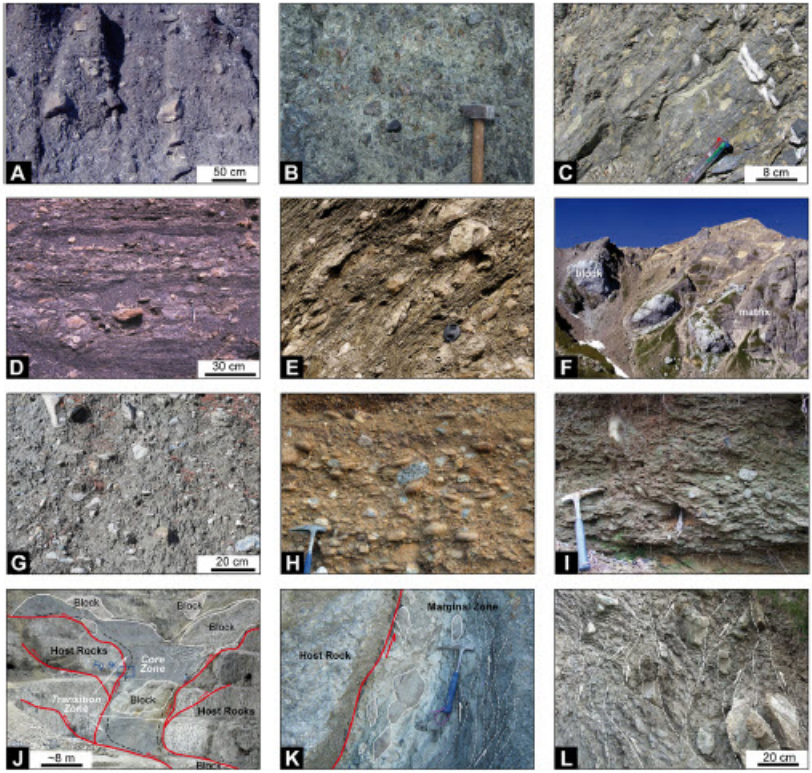

Fig. 5. Field examples showing different types of sedimentary (A-I) and diapiric (J-L) mélanges. (A) Internal arrangement of a sedimentary mélange, showing the random distribution (isotropic texture) of hard blocks (limestone, marlstone and sandstone) with a brecciated clayey matrix (Northern Apennines, Italy, modified from Festa et al., 2015). (B) Close-up view of rounded to angular clasts of ultramafic rocks in a fine- to medium grained matrix of the same composition (Ligurian Units, Northern Apennines, Italy); note the block-in-matrix isotropic texture (hammer for scale). (C) Detail of sedimentary mélange consisting of highly disordered block-in-matrix fabric of trench-related debris flow with variably shaped blocks (equidimensional, tabular, phacoidal, and irregular) of metavolcanic and metagraywacke rocks (Panoche Road, Franciscan Complex, California; see Wakabayashi, 2012 for details). (D) Outcrop view showing the block-in-matrix fabric of a sedimentary mélange, flattened and slightly deformed by compaction and tectonics, which reorganize the primary isotropic texture of the block-in-matrix fabric to an anisotropic one (Berceto, Parma area of the Northern Apennines of Italy). (E) Close-up view of a tectonically reworked sedimentary mélange (debris flow deposit) with blocks of an oceanic cover succession in a sheared, shaly matrix (Casanova Complex, Northern Apennines, Italy). Note that both the matrix and the block-in-matrix fabric define an isotropic texture (camera cap for scale). (F) Panoramic view of a sedimentary mélange showing the random distribution of huge Upper Cretaceous blocks (megabreccias or olistoliths) of calcareous limestone within a limestone matrix (Muttekopf, Calcareous Alps, Austria; see Amerman et al., 2009; Ortner, 2001). The mountain side is about 300 m high. (G) Close-up view of a bimsoil (diamicton, i.e., glacial till) showing the random distribution (i.e., isotropic texture) of angular blocks and clasts, which are suspended in a fine-grained (clay) matrix (Aosta Valley, Italy). (H) Bimsoil detail, consisting of unsorted to poorly sorted terrigenous sediments embedding rounded hard clasts (diamicton). Note that the block-in-matrix fabric defines a weak anisotropic texture acquired during depositional emplacement (Ivrea Morainic Amphitheatre, Northwestern Alps of Italy). Hammer for scale. (I) Close-up view of a bimsoil, showing a planar anisotropy defined by the occurrence of a pervasive scaly fabric in the clayey matrix, which overprints and rework the primary block-in-matrix fabric of the diamicton (Ivrea Morainic Amphitheatre, Northwestern Alps of Italy). Hammer for scale. (J) Panoramic view of the diapiric mélange, showing the internal zoning of deformation and the block-in-matrix arrangement (Northern Apennines, Italy). Note that in the center of the diapiric body (core zone), blocks, which are larger in size (i.e., up to tens of meters), are commonly angular, loosely clustered, and randomly distributed the irregularly folded matrix. Close to the margins (J and K), the block-in-matrix fabric shows a sub-vertical trending with phacoidal to tabular blocks, embedded within a fine-grained (shaly or clay) matrix, pervasively deformed by scaly fabric, and aligned to the intrusive contacts (red lines). Hammer for scale. (L) Close-up view of the marginal zone of a diapiric mélange showing phacoidal (rarely tabular) limestone and sandstone blocks aligned parallel to the subvertical fluidal fabric (dashed white lines) of the shaly matrix (Northern Apennines, Italy; see Festa et al., 2013 for details). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)