

RESEARCH TOPIC:

Mélanges, mélange forming processes and associated natural hazards in modern and ancient accretionary complexes.

PARTICIPANTS:

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RESEARCH DESCRIPTION:

Mélanges represent disrupted and chaotic rock units including sedimentary, magmatic and metamorphic rocks (often as exotic blocks) mixed by stratal disruption and tectonic, diapiric and/or sedimentary processes. Although mélanges may characterize diverse geodynamic environments of formation, they are commonly associated with subduction and obduction of oceanic crust, continental collision, and intra-continental deformation. In these cases, mélanges are cogenetic with deformation and uplift of ophiolites, emplacement of thrust and nappe sheets, onset and evolution of foreland basins, submarine landslides (olistostromes) and seismic activities. They are also involved in the general dynamics and mechanical stability of the accretionary and orogenic wedges, participating in (or being the product of) the redistribution of earth materials through the processes of offscraping, underplating, mass-transport movements (MTD, subduction channels (flow mélanges), and mud diapirism.

In this complex scenario, it is not uncommon that a mélange in any region may be identified and described with different names, and varying interpretations and models may be developed for its evolution as a result of different backgrounds of the investigating geoscientists and different tools of investigation.

The aim of this project is to better document: (i) the criteria helpful for distinguishing mélanges formed at different structural levels by different processes and their superposition; (ii) the role of mélanges in controlling the dynamics, mechanical stability and morphology of accretionary complex and the repeated shift from tectonic accretion to erosion; (iii) the role of mélanges in seismogenesis and formation of submarine landslides and mitigation of related hazards (e.g., tsunamis); (iv) the relationships between mélanges and geodynamic settings of formation to upgrade our former classification of mélanges.

The research project is developed through the comparative analyses of different types of mélanges in both modern (Nankai accretionary wedge – IODP Expeditions “NaTroSLIDE”) and ancient (Apennines and W-Alps in Italy, Sierra Nevada in California and Central-Northern Appalachians in Pennsylvania and New York, USA; Argentina pre-Cordillera) accretionary complexes.

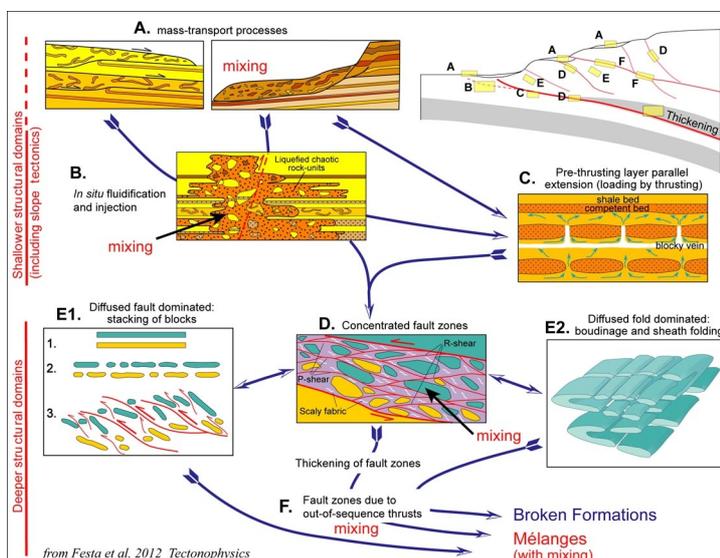
LABORATORIES OF THE DST IN USE:

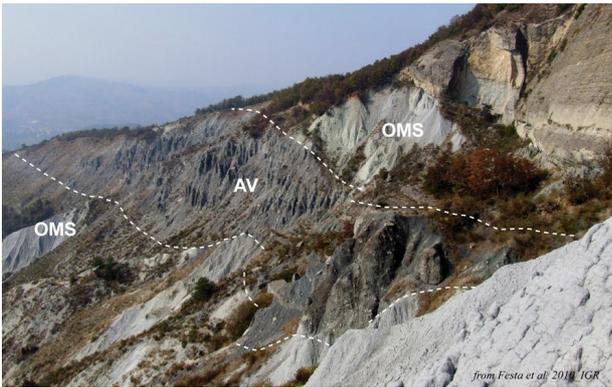
SEM-EDS

RESEARCH PRODUCTS:

- Festa A., and Codegone G. (2013) - *Geological map of the External Ligurian Units in western Monferrato (Tertiary Piedmont Basin, NW Italy)*. Journal of Maps, v. 9, issue 1, 1-14. DOI: 10.1080/17445647.2012.757711.

- Codegone G., Festa A., and Dilek Y. (2012a) - *Formation of Taconic Mélanges and Broken Formations in the Hamburg Klippe, Central Appalachian Orogenic Belt, Eastern Pennsylvania*. *Tectonophysics*, v. 568-569, 215-229. DOI: 10.1016/j.tecto.2012.03.017
- Codegone G., Festa A., Dilek Y., and Pini G.A. (2012b) - *Small-scale polygenic mélanges in the Ligurian accretionary complex, Northern Apennines, Italy, and the role of shale diapirism in superposed mélangé evolution in orogenic belts*. *Tectonophysics*, v. 568-569, 170-184. DOI: 10.1016/j.tecto.2012.02.003
- Dilek Y., Festa A., Ogawa Y., and Pini G.A. (2012) - *Chaos and Geodynamics: Mélanges, Mélangé-forming Processes and Their Significance in the Geological Record*. *Tectonophysics*, v. 568-569, 1-6. DOI: 10.1016/j.tecto.2012.08.002
- Festa A., Dilek Y., Pini G.A., Codegone G., and Ogata K. (2012) - *Mechanisms and processes of stratal disruption and mixing in the development of mélanges and broken formations: redefining and classifying mélanges*. *Tectonophysics*, v. 568-569, 7-24. DOI: 10.1016/j.tecto.2012.05.021
- Pini G.A., Ogata K., Camerlenghi A., Festa A., Lucente C.C., and Codegone G. (2012) *Sedimentary mélanges and fossil mass-transport complexes: a key for better understanding submarine mass movements?* In: Y Yamada et al., eds., *Submarine Mass Movements and Their Consequences*, Advances in Natural and Technological Hazards Research, v. 31 (8), p. 585-594, Springer, DOI: 10.1007/978-94-007-2162-3_52 (ISBN: 978-94-007-2161-6).
- Festa, A., (2011) - *Tectonic, sedimentary, and diapiric formation of the Messinian mélangé: Tertiary Piedmont Basin (northwestern Italy)*. In, Wakabayashi, J., and Dilek, Y., eds., *Mélanges: Processes of Formation and Societal Significance*: Geological Society of America Special Paper 480, p. 215–232, DOI:10.1130/2011.2480(10)
- Festa, A., Pini, G.A., Dilek, Y., and Codegone, G. (2010a) - *Mélanges and mélangé-forming processes: a historical overview and new concepts*. *International Geology Review*, v. 52, nos. 10-12, p. 1040-1105. DOI: 10.1080/00206810903557704.
- Festa, A., Pini, G.A., Dilek, Y., Codegone, G., Vezzani, L., Ghisetti, F., Lucente, C.C., and Ogata, K. (2010b) - *Peri-Adriatic mélanges and their evolution in the Tethyan realm*. *International Geology Review*, v. 52, nos. 4-6, p. 369-406. DOI: 10.1080/00206810902949886.
- Dela Pierre F., Festa A. and Irace A. (2007) - *Interaction of tectonic, sedimentary and diapiric processes in the origin of chaotic sediments: an example from the Messinian of the Torino Hill (Tertiary Piedmont Basin, NW Italy)*: *Geological Society of America Bulletin*, 119 (9/10), 1107-1119. DOI: 10.1130/B26072.1





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